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The Center for Preparation and Implementation of International Projects on Technical Assistance

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REPORT

The Feasibility Study
The joint Russian-American-Norwegian Project

Safety and Environmental Regime for Russian Offshore Oil and Gas operations

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U.S. Department of the Interior Mineral Management Service, Norwegian Petroleum Directorate - experts of these organizations took part in discussing of work progress, made their recommendations concerning goals and strategy of development as well as presented materials taking into consideration the experience accumulated in their countries in this field of activity.

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Introduction

The extensive continental shelf of the Russian seas is an important source of hydrocarbons, where the predicted resources of oil and gas are estimated as hundreds billion tons. Development of these resources in severe conditions of the Russian shelf is a complicated technical-economic problem including obligatory provision of conditions for rational nature use, industrial and environmental safety.

The use of natural resources is under the state control of the President of Russia, Government of the Russian Federation, Authorities of the Administrative Territories of the Russian Federation (Subjects of the Russian Federation), as well as a Federal Authorized Organ controlling the state fund of natural resources and State Mining Supervision Authorities.

The basic legislative regulation of the natural resources use is based on the Federal Law «About the Interior», «Statute on Procedure of Interior Use Licensing», Federal Law «About the Continental Shelf», Federal Law «About Agreements on Production Sharing», «Water Code of the Russian Federation», and the RSFSR Law «About the Natural Environment Protection».

According to the Russian Legislation, the users of natural resources can be bodies of business undertakings not depending what forms of ownership they possess, including juridical entities and citizens of other countries.

The right to use natural resources on the continental shelf can be given on the basis of the Decision of the Russian Federation Government made by the results of a competition or auction.

The Russian normative-legislative base to provide environmental and industrial safety presents at the present time a complicated system of federal laws, sub-lawful acts and regulatory documents, the action of which is limited often to a sphere of a single agency. Generally the usage of the existing normative-legislative base for the problems of environmental safety shows inside contradictions and insufficient methodological substantiation of regulative acts. Serious problem in regulation of industrial and environmental safety is that many requirements of the Law are not supported with necessary sub-lawful acts, a departmental interpretation of environmental regulations, insufficiently flexible definition of a number environmental norms and the absence of the efficient mechanism for these requirements implementation.

The analysis of the legislative, regulatory, juridical and normative-technical support of safe work on oil and gas production on the continental shelf of Russia has shown that it is enough in order to start the development of oil and gas deposits on the continental shelf, but not enough for required regulating regime of industrial and environmental safety and labor protection. The normative-legislative base consisting of a variety of documents, that regulate different aspects of research and practical activities on continental shelf, has a non-system and uncoordinated character, being, to a great extent, off-date and needs to be considerably revised and improved.

A number of countries (USA, Norway, Canada and others) accumulated an experience in regulation of oil and gas resources development in offshore regions. This experience must be taken into consideration in development of the Russian regulatory regime in this field.

In 1994, the Ministry of Fuel and Energy of the Russian Federation (Mintopenergo), the Norwegian Ministry of Industry and Energy and the Norwegian Ministry of Foreign Affairs, within the Norwegian/Russian Forum on Energy and Environment, agreed to a bilateral project to assist Russia in developing an environmental regime for the offshore oil and gas industry.

In 1994, under the aegis of the Committee on Science and Technology of the Russian-American Gore-Chernomyrdin Commission, the Ministry of Natural Resources of the Russian Federation (MNR of Russia) and the Minerals Management Service (MMS) of the U.S. Department of the Interior have signed the Memorandum on joint activities and exchange of information concerning the principles and methods of evaluation and development of mineral resources on shelf. Within this Memorandum the MNR of Russia suggested a joint Project, the implementation of which would create a normative base providing environmental and industrial safety during exploration and development of hydrocarbon deposits on the shelf of the Russian seas.

The World Bank expressed interest ant intentions to promote a wide multi-lateral approach to the implementation of the suggested Project. The MNR of Russia and MMS jointly with the Norwegian Petroleum Directorate (NPD) with the participation of the Ministry of Fuel and Energy and State Committee on Ecology of Russia have prepared proposals to the multi-lateral Project.

In February 1997 during the work of the Committee on Science and Technology of Gore-Chernomyrdin Commission, a joint Russian-American-Norwegian Project «Safety and Environmental Regime for Russian Offshore Oil and Gas Operations» was presented by the American Co-Chairman and approved by the Committee.

The Project shall analyze, incorporate and make additions to the existing legislative, normative-juridical acts, normative-technical documents, and help to introduce into practice the modern forms of oil- and gas-producing operations on the shelf. The Project must use existing international experience including regulatory practice for operations on the shelf, reference information, methodological and juridical documentation.

The MNR of Russia is the Executive Agency.

The Project implementation includes three phases:

1. *Feasibility study (FS) and obtaining the consent of Russia for further work.*
2. *Preparation of a structure of a safety and environmental protection regime.*
3. *Implementation of the approved regime.*

The goal of the Feasibility Study is to determine the probability of success of development and implementation of the safety and environmental protection regime while production operations on the continental shelf, which would satisfy the needs of Russia, taking into account international standards, including technical regulations and standards of USA and Norway, as well as acceptance of actions for obtaining the consent of the Russian Government to implement Phases 2 and 3 of the Project.

The FS includes the solution of the following tasks:

- definition of desirable goals;
- analysis and preliminary assessment of the existing legislative, normative-juridical base providing environmental and industrial safety, labor protection during works on continental shelf;
- working out proposals on preparation of additions and amendments, as well as new legislative acts, normative documents, technical regulations, state (branch) standards defining safety of works on shelf.

The main goal of the given FS is to analyze the current state of the Russian legislative, normative-juridical, normative-technical base for regulation of the interior use, industrial, environmental and operational safety) the actuality and substantiation of the joint (Russia-USA-Norway) Project «Safety and Environmental Regime for Russian Offshore Oil and Gas Operations».

With growth of development scales and taking into account that the Arctic environment is very sensitive, the development process shall be implemented on a principally new concept

the so-called «balanced development». This means that natural resources must be used in such amounts which would not create a threat to interests of future generations, nature and health of people living there. It is necessary to achieve, here, a development equilibrium between traditional local branches of economy, that use restorable resources, and industrial productions that exploit unrestorable resources. It is necessary also to stipulate a defense system for interests of social-economic and environmental requirements of low-numbered people of the North.

The started activities on development of hydrocarbon deposits on the shelf of the Arctic Seas in the Russian zone require to take urgent actions on working out and putting in order the normative-legislative acts, revision of the normative-technical base, which will make possible to prevent adverse consequences from activity on shelf and accidents.

The investigations of legislative-normative documents that determine the regime of natural resources use regulation on the Russian continental shelf, experience of the worldwide practice, ways of managing the problems of industrial safety and environmental protection in USA and Norway have enabled to formulate the main principles of the safety regime for operations in Russian offshore zones:

- provision of safe and sustained development of off-shore oil and gas production in Russia on the as much as possible complete, stable and non-contradictory legislative basis;
- creation (in a transient period) of an organizational-legal mechanism for settling disputes, obtaining explanations and interpretations of questions that are not clear enough and not regulated by legislation and normative acts;
- preliminary evaluation of environmental capacity and sensitivity of local and regional ecosystems, implementation of economic decisions on development of marine oil and gas fields considering full and objective estimations of expenses, benefits and risks;
- provision of conditions for successful development of local traditional branches of economy and protection of social-economic interests of indigenous peoples;
- obligatory control and monitoring of operational process, the state of artificial constructions and their interaction with the environment, including in-time detection of un-predicted effects;
- absolute priority for actions preventing adverse influences and accidents in comparison with measures on localization and liquidation of their consequences;
- development of mechanisms for economic regulation of industrial and environmental safety and provision civil-legal responsibility for damage caused;
- participation of public in decision-making in respect of projects on exploration and development of hydrocarbon deposits on the continental shelf of Russia.

A system of normative and legislative documents which must be developed, changed and supplemented is proposed to implement these principles of the safety regime.

Considering principles of the safety regime the feasibility study report covers the following issues:

- natural and climatic conditions, current environmental state and social-economic features of the Arctic shelf and near-shelf zone of Russia;
- status of legislative, normative, juridical, regulative-technical base for regulation of the regime of interior-, water- and land use, industrial, environmental and operational safety;
- description of functioning environmental monitoring and control systems;
- regulation of industrial and environmental safety while exploration, preparation, development, exploitation, conservation and liquidation of production installations at hydrocarbon deposits of continental shelf.
- operational safety and labor protection;

- emergency situations, measures on prevention and liquidation of their consequences;
- economic mechanisms of industrial and environmental safety management.

Authors express their gratitude to agencies, organizations and persons provided necessary information for this feasibility, took part in discussion of materials and gave valuable recommendations for the scope and structure of the feasibility study report.

Chapter 1

Natural and Climatic Conditions, the State of the Environment and Social and Economic Characteristics of the Arctic Shelf and Coastal Zone of Russia

1.1 Short Description of Natural and Climatic Conditions

1.1.1 Physical and Geographic Characteristics

The area under consideration includes Russia‘s continental shelves in the Arctic (Barents, Kara, Laptev, East-Siberian, Chukotka), the Far East (Bering, Okhotsk and Japan seas), and adjacent coastal zones.

The Barents shelf is generally characterized by deep water with several large troughs and sub-sea rises within its boundaries. Geologically this shelf corresponds to the Precambrian plate of the same name, except for the most southern and shallowest part, which is related to a younger structure - the Pechora plate of the Russian platform. Precambrian crystalline basement is overlain by a thick sedimentary cover. The bathymetric relief of the Barents Sea reflects relict subareal forms of glacial origin. Well-weathered submerged river valleys are widespread. Ancient coastlines of different ages and morphology are also expressed in the seafloor relief.

The Kara Sea shelf is separated from the Barents shelf by the St. Ann trench, a deep sub-bathyal trough. The relief of the northern part of the Kara shelf is very rugged due to seafloor exposures of bedrock. Islands are abundant in the Kara Sea. Unlike the Barents shelf, the Kara shelf is generally shallower than 200 m in depth. The southern part of the Kara Sea is a direct continuation of the West-Siberian plain and tectonically it is the continuation of the submerged epihercynian plate. Submerged paleo-valleys of the Enisey, Ob and other large rivers extend onto the shelf.

The Laptev Sea shelf is characterized by shallow water and smooth relief. The dominant seafloor geomorphology is a marine-accumulative plain. Coastal erosional and depositional features are observed along the coast. The seafloor is intersected by submerged paleo-river valleys.

The seafloor of the East-Siberian shelf is generally characterized by marine-accumulative geomorphology of low relief. However, a unique feature of this region is large ridges of the uncertain origin, usually with a smooth form mimicking the contours of the coastline. They have a height of 5-10 m and length of up to several tens kilometers.

The Chukotka Sea shelf is dominated by abrasive-accumulative plains morphology of differing ages. In the eastern part, the shelf is dissected by the large and complicated system of the Hope valley, as well as other large submerged valleys.

Geologically, most of the shelf of East-Siberian and Chukotka sea shelves are denuded, partially submerged rocks of the Mesozoic Verkhoyansk-Chukotka fold zone.

The Barents Sea shelf encompasses 45 % of the Russian continental shelf area. Over 400 miles in width in its northeastern part it is one of the biggest in the world. This wide shallow continental shelf continues east to the Laptev Sea and East-Siberian and Chukotka seas and through the narrow Bering Strait to the Bering Sea. The continental shelf along the Aleutian Island arch and the Russian coast is very narrow and borders deep trenches.

A shallow continental shelf occupies more than 40 % of the entire area of the Okhotsk Sea. Its width in the area of the Laperuz Strait is 120 miles, along the east coast of Sakhalin it is 30

to 40 miles, in the north it is 60-220 miles, in Shelikhov Bay - 90 miles and along the southern Kamchatka coast it is 30 miles wide.

The Japan Sea is deep and located in a continental to oceanic transition zone. The seafloor is divided into three parts: northern, central and southern. The northern part is represented by a wide trough that steps-down from north to south. The depression in the central part extends in a northeastern direction. In the southern part, between the underwater Yamato Height and Honsui Island there is a depression with depths to 3000 meters. The shelf has low sedimentation with erosional features in the eastern part of the Primorije area and Sakhalin Island. Terrigenous sand, gravel and silt predominate in the shallow part along the coast.

The Okhotsk and Bering seas are characterized by high seismic activity. The main seismic areas in the Bering Sea are adjacent to the Aleutian Island arc. In the Okhotsk Sea the biggest earthquakes are concentrated in the area of the Kuril Islands, some in the range of 9 points of magnitude. The weakest earthquakes are observed on Sakhalin Island (m 7-8) and in the northern coast (m 5-7).

In the Northern Arctic Ocean seismic areas are mainly located along the Gakkel ridge. In the Laptev Sea shelf, earthquakes with magnitudes to 7 have been observed. A relative increase of seismic activity has been observed in the coastal zone of the Chukotsk Sea (m 5-6).

1.1.2 Meteorological Conditions

Characteristic climate features of the Russian northern seas are created mainly by a combination of high latitudes and impact of the cold Arctic basin on the one hand, and the Eurasia continent on the other hand, with the addition of specific atmospheric circulation patterns. High latitude means long, 40 to 100 day, polar nights and continuous freezing of the underlying surface. The irregular character of the climate on the Arctic shelf is especially clearly expressed in the cold period of the year. In the summer, large differences in the meteorological parameters are smoothed out and their distribution is of a circumpolar character. There are considerable regional differences as a result of the influence of the Atlantic and Pacific oceans.

The Atlantic area including the Barents and the main part of the Kara seas, is subjected to the continuous influence of warm currents that penetrate far to the northeast and to the strong influence (especially in the cold period of the year) of Atlantic cyclones. Maximum temperatures, winds, cloudiness, precipitation, and seasonal and yearly variation of meteorological parameters are observed here. Southwesterly winds prevail.

The Siberian area includes the eastern part of the Kara Sea and the Laptev and East-Siberian seas. In winter, this area is under the influence of the Siberian anticyclone and is characterized by very low negative temperatures over the sea, with an abrupt decrease over the continent. The area has winds of moderate speed, unstable in direction, but generally prevailing from the south in winter and the north in summer. Cloudiness is low and there is little precipitation. The variation of meteorological parameters is considerably less than in the western and eastern areas.

The Pacific area includes the western part of the Bering and Okhotsk seas and the northern part of the Japan Sea. The climate and thermal regime of the region in the winter has little differences from conditions in the Arctic seas because of its similar physical-geographical features. The monsoon atmospheric circulation is regulated by interaction the main barometric pressure cells over the northern parts of the Pacific Ocean and Asian continent. Thermal contrasts between the Asian continent and adjacent parts of the Pacific lead to a rather large and steady disturbance and transfer of regional air masses. Freezing of

water in the winter causes intense ice formation on most of marine areas. The formation of the ice regime and warming influence of Pacific water depends on the character of the water exchange and the structure of permanent currents in various regions.

All areas are characterized by the following features:

- high variation of the weather conditions caused by the cyclone activity in the Atlantic and Pacific ocean areas;
- low air temperatures and their high inter-seasonal and yearly variations in the Atlantic and Pacific ocean areas;
- limited visibility due to fog and precipitation, especially in the ice-free period;
- considerable number of days with strong storm winds of more than 15 m/s;
- favorable conditions for atmospheric and spray icing of the engineering facilities, especially in October-December.

Analysis of the baseline winter circulation characteristics observed over the water and coasts of the Russian seas has shown that airflow can result in transfer and accumulation of industrial pollutants in snow cover. The contribution of the meridian transport from the average remote and local sources of pollution into water bodies and coastal areas of the Arctic and Far-Eastern seas increases in the summer-autumn.

1.1.3 Hydrological Conditions

Offshore hydrological conditions are defined by a vast specter of characteristics, among which the following are to be distinguished: currents parameters, sea waves, tides, temperature and salinity of water, and extreme changes of sea level due to different factors.

The coastal zone of the Arctic seas is generally characterized by a northeastward transportation water. The speed of average currents is about 20-60 cm/s, but the maximum values can exceed 100 cm/s. The biggest contribution is made by wind and tidal currents.

The average value of the tidal variation in the East-Siberian Sea is 0.2-0.3 m, in the Barents and Kara seas it is 0.5-0.7 m, and in the Far-Eastern seas it is about 0.5 m. In some places higher tides can be reached, for example on Bely Island it is more than 1.0 m, in Khatanga Bay to 1.5 m, and in the Ochotsk Sea up to 2.8 m. Storm waves are rather higher - in the Chukotka sea, 3.5 - 4.0 m, and in the Laptev Sea, up to 5 m. In the Kara and Barents seas storm waves are somewhat lower at about 2-3 m. In the Bering and Ochotsk seas they are 5-6 m, and during a typhoon can be up to 10 m in height. In the Japan Sea these values are 8-10 m for storm and 12 m for typhoon waves. In the Far-Eastern seas the tsunami waves are possible to a height of up to 10-30 m.

Wind waves are characteristic mainly for the ice-free period or when ice concentration is not very high. The most developed and highest wind waves are observed in the Barents Sea where the conditions for wave development are created by western winds. In general, wave height for water bodies of the Arctic and Far-Eeastern seas are 3-9 m and they are observed most frequently in September through November. The estimated wave heights possible once in 50 or 100 years can be to 14 m and higher. With a certain distribution of ice and wind in a pre-edge zone, an ice storm (high wind waves with rather thick ice) can happen.

Transportation of pollutants into the offshore marine areas by ocean currents is mainly associated with transportation by constant surface wind currents.

The role of tidal currents is limited by their participation, together with physical and chemical processes, in the formation of the short period (daily and mesoscale) variation of the pollutant concentration for specific local marine regions.

Actual transportation of pollutants by so-called residual tidal flow, emerging due to the open orbits of differently directed phases of the tidal currents, can not be compared with the transportation by surface wind currents.

Average speeds of the wind currents for different seas fluctuate from 2 cm/s (the Laptev Sea) to 40-50 cm/s (the Chukotka Sea), but the maximum speed of the cumulative current (the sum of all types of currents) can be much higher.

The transportation of pollutants that have accumulated in winter snow and ice cover from one area of the water body to another, and their introduction into surface waters during the melting of drifting ice can be considered as an independent factor influencing the level of anthropogenic impact created in such areas.

Arctic and Far-Eastern seas (with the exception of southern parts of Ochotsk and Japan seas) are covered with ice most of the year. In the winter water masses in the shallow water areas from the surface to the seafloor have negative temperatures. Only in the troughs of the Kara Sea and in the deep water part of the Laptev Sea is the temperature positive - approximately 1-1.5°C. Summer processes actively develop only in the comparatively narrow coastal zone free from ice for 2-3 months. Here, water is warmed to 8-12° C only in separate bays and in some limited areas of the coastal zone. In most of the Ochotsk and Bering seas water warms to the depth 30-75 meters.

Variation of the water temperature of surface layers in the Japan Sea is greatly dependent on the season. In the northern part, the water temperature changes from negative values in the winter time to an August temperature of 18-20°C in the west and 10°C - 23°C in the east, which is due to the warm Tsusim current.

Water masses have their own features in each sea. In the Arctic seas they are continuously filled with fresh river and melt water. Siberian rivers bring about 2340 km^3 of warm fresh water annually. The main mass of water and thermal run-off of the Siberian rivers enter the sea in spring and during the short Arctic summer.

The following are the main hydrological characteristics:

- low water temperatures, first of all at the sea bed layer and rather high salinity, especially in the winter period;
- considerable tidal variation of the level and currents speed;
- storm tidal waves and tsunami waves which are especially dangerous for low coasts and coastal terraces;
- flooding phenomena in the bays with a considerable influence of the river run-off;
- probability for the development of the high waves, including the winter period.

Some of the values of hydrological parameters are shown in **Table 1.1**

Table 1.1

Hydrological Parameters and Phenomena for the Offshore Fields of the Arctic Area

Parameters and phenomena	The Shtokman gas and condensate field	The Pechora Sea	The Baidaratskaya Bay	The north-western coast of Yamal	The Ob- Tazov area
1. Sea surface temperature, °C					
Minimum	-1.7	-1.8	-1.9	-1.9	-1.8
Average	2.4	2.8	0.9	-	-
Maximum	8.2	10.9	12.9	8.0	16.5
2. Salinity of the sea surface, ‰					
Minimum	34.68	12.67	20.65	0.19	-
Average	34.86	31.55	31.80	-	0-31
Maximum	35.03	33.46	35.44	30.56	-

3. Sea bed layer temperature, °C					
Minimum	-1.7	-1.7	-1.9	-	0.5
Average	-	0	-0.5	-0.6	-
Maximum	0.8	4.0	12.2	-	2.0
4. Salinity of the sea bed layer, ‰					
Minimum	34.8	28.0	23.0	-	-
Average				-	-
Maximum	35.1	34.5	35.5	-	-
5. Tides relating to the average sea level, cm					
Minimum	-46	-61	-51	-	-
Average	0	0	0	-	-
Maximum	51	83	55	-	-
Wave amplitude, cm	97	144	106	60-100	5-200 (Kamenny cape 80)
6. Extremely high sea level, cm (1 in 100 years)					
Minimum	-86	-170	-106	-	Flood wave 100-300cm
Average	0	0	0	-	-
Maximum	107	222	167	-	-
7. Speed of current cm/s					
Tidal	38	38	40	20-30	12-30
Summary	146	123	84	app.100	80-148
8. Wave height, m (0.1%)	23.7	9.0-10.0	-	5-7 (1%)	3-4 (3%)

1.1.4 Hydrochemical Regime

The natural conditions of Arctic and Far-Eastern seas are similar but each has specific features which are associated with their hydrologic and hydrochemical regimes, lateral and temporal variability of pollutant concentration fields, and levels of anthropogenic impacts on water and inland biological communities.

Warm and saline waters of the Atlantic are spread by surface currents into different parts of the Barents Sea and in the form of a deep (200-400 m.) layer they penetrate through the subsea trenches into the Kara, Laptev and Chukotka seas. Warm and saline Pacific Ocean waters are clearly observed in the Chukotka and partially in the East-Siberian seas. The influx of river water from the adjacent basins define many characteristics of the Arctic seas. They are, to some extent, fresher, relatively warm and occupy most of the Siberian Arctic seas.

The Barents sea. A good connection between the Barents Sea and the Atlantic and Northern Arctic oceans and relatively small and localized river run-off makes the chemical composition of the Barents Sea water extremely similar to that of oceanic water. General hydrochemical conditions of the Barents Sea are, to a large extent, defined by its edge location and features of hydrological processes, in particular, by good mixing of water layers. Content and distribution of gases dissolved in water and biogenic substances are closely linked with this mixing.

The Kara sea. Good connections with the ocean, formation and melting of ice, and large river run-off, influence the hydrochemical conditions, especially the content and distribution of oxygen and biogenic substances. In the beginning of summer and in autumn in the northern part of the Kara Sea, the upper water layer is generally over saturated in oxygen. Heating during summer is accompanied by a considerable decrease in oxygen. This is caused by the decrease in solubility of oxygen with the increase of water temperature and to oxygen consumption by aquatic organisms.

The Laptev sea. Large continental run-off and free connections with the northern Arctic Ocean influence hydrochemical conditions of the Laptev Sea. Salt compositions for the Laptev Sea show relatively low amounts of magnesium, sulfates, and chlorine and rather high

amounts of dissolved sodium, potassium, calcium, and carbonic acid, in comparison to salt from oceanic water.

The East-Siberian sea. In autumn and winter, waters of the East-Siberian Sea are well aerated. Specific oxygen content does not change considerably within that time - 96 to 93 % saturation. Decrease oxygen content is due to consumption by oxidizing organic substances, which is most intensive at the seafloor resulting in an oxygen-minimum bottom layer.

The Chukotka sea. A good connection with the Central Arctic Basin, small river run-off, and influx of Pacific Ocean water define the hydrochemical regime of the Chukotka Sea, which is characterized by oceanic features - the influence of continental water is almost negligible.

The Bering sea. The Alaska Current transports water masses to this sea and in its western part it is connected with the Chukotka Sea. According to the vertical distribution of water temperatures, the following water masses are defined: (1) Bering Sea water forming an upper layer of 25-50 m thickness over the whole area. Its lower boundary is characterized by a sharp change in temperature in the summer; (2) a cold intermediary layer with a lower boundary at the depth of 150-200 m; (3) Pacific water with lower boundary at the depth of 650-1000 m; and (4) deep-water masses, which compose more than 70 % of the volume of sea water. The warm upper layer disappears in winter due to convection and homogenous layer extending from the surface to the lower limit of vertical circulation is formed. These water masses differ in salinity and hydrochemical parameters.

The Okhotsk sea. Water masses in the Okhotsk Sea are formed from a transformation of Pacific water flowing through Kurily Straits. Flows through Laperuse Strait also participate in water exchange - continental run-off and precipitation have a smaller influence. The main water masses - Okhotsk Sea and the dipper Pacific Oocean differ in salinity, hydrochemical, and biological parameters.

The Japan sea. Water mass in the Japan Sea are divided into two parts, deep and surficial, by their specific regime and physical properties. The surficial water mass may be subdivided into three types: The East Chinese, The Pacific and Northern Japan Sea. The Northern Japan Sea water mass is located in northern and western parts and is formed by partial mixing of the East Chinese and Pacific water. The deep Japan Sea water mass underlies Pacific water in the east and Northern Japan Sea water in the west. It is formed by interactions of upper layer water masses.

1.1.5 Ice Conditions

When the processes of ice formation and growth take place in the Arctic and Far East seas, there are approximately eight months (from October to May) in the annual cycle of ice formation conditions. In the winter all seas of the Siberian shelf are completely covered by ice of different thickness with a concentration of 90 - 100 %. In shallow coastal-water areas, fast-ice forms. Starting at the end of May and the beginning of June, ice cover begins melting and degrading under the influence of warming processes. Almost simultaneously with the onset of ice melting, its area begins reducing and the seas gradually become open.

At the end of August, stable ice formation starts in the northern part of the sea. In the first part of September young ice forms at the northern boundaries of the Kara and Laptev seas, and a little later in September it forms in the northern part of the Chukotka Sea.

Ice formation in the Far East seas starts by November. First ice in the Okhotsk Sea appears at the beginning of November in river mouths and the near-coastal zone in northwest and north. In the Japan sea, ice forms earlier in the northern Tartar Strait.

Generally, the Laptev and East-Siberian seas are completely covered with ice for 35-40 days and the Kara and Chukotka seas for 80-85 days of the year. Perennial variations in the time of stable ice formation in the Arctic seas range from 30 to 90 days.

The maximum amount of ice in the Okhotsk Sea is observed generally in March when ice covers about 65 % of the sea in warm winters and almost the whole sea in extremely cold winters. Sea ice usually covers about 80-90 % of the Bering Sea, but it has never been observed to cover 100 %. Wide zones of fast ice form in Primorye, along the eastern coast of the Japan Sea, and fast ice sometimes forms in the northern part of the Tartar Strait near Sakhalin Island. Continuous but drifting ice cover is observed farther from shore.

After the stable ice formation has ceased, the growth of ice cover takes place. The rate of the ice growth in different areas of the Arctic seas varies. However, the temporal character of its growth in all seas is identical. From October to November the rate of ice growth increases. In November the rate of ice growth reaches a maximum (an average 12 cm within 10 days), and with the increase of thickness the process of ice growth slows down. By May, ice growth averages 2 cm within 10 days. By the time that ice growth ends, the greatest thickness of plain ice formed since the autumn are observed in the Laptev and East-Siberian seas where it is 190-220 cm - the minimum occurs in the southwestern part of the Kara sea where it attains a thickness of only 100-130 cm. It is a little thicker, up to 160 cm, in the southwestern part of the Chukotka Sea.

An important element of the ice conditions is fast ice, which starts forming in the Arctic seas when young ice thickness are 10-30 cm. Fast ice forms at different times - from the middle of September to the beginning of December. Seaward of the fast ice zone lies the area of drift ice. In the Kara and Laptev seas in the autumn-winter drifting is in northwestern directions and is accompanied by ice exportation into the Arctic Basin, facilitating the formation of polynias. In the East-Siberian sea the drift is directed to the west and west-northwest, resulting in little or no exportation of ice into the Arctic Basin and impeding the formation of an air polynias. In the Chukotka Sea, during the entire cold period, the drift is directed towards the coast causing importation of ice from the Arctic Basin into the sea. Near the western coast of the Okhotsk Sea the drift is directed to the south and southeast and ice is transported to the Pacific Ocean through the Kurily Straits. The speed of drifting ice in most areas of the Arctic during the autumn-winter period is about 10-30 cm/s and can reach 100 cm/s and more.

In the Arctic seas, one-year ice prevails. Two-year ice (ice which did not melt in the preceding spring and summer) and perennial ice, which forms ridges of the oceanic pack ice, are more often observed in the East-Siberian Sea and in the northern Laptev and Kara seas.

Depending on the geographic position of continental shelf and coastal regions of the Arctic, ice melting starts at different times and covers the period from the end of May to the middle of June. With the onset of melting and under the influence of dynamic processes, the zones of open water start to form with only scattered or rare ice. Ice with concentrations of 70-100 % are localized in ice massifs. The most intensive opening of Arctic seas takes place during August and stops at the end of September. Generally, the southwestern part of the Kara Sea is 95 % ice free, the eastern part of the Laptev Sea, 80-85 % ice free and southwestern Chukotka Sea almost ice, before the beginning of new ice formation. The northeastern part of the Kara Sea and western parts of the Laptev and East-Siberian seas are 50 % free from ice and in the eastern part of the East-Siberian Sea is only 27 % ice free by the end of the period.

Main characteristics of ice conditions of the offshore coastal areas important for engineering structures are:

- presence of drifting ice cover during most of the year and considerable variation in time;

- fast ice featuring ridges, hummocks, and tidal fractures forms mainly along the coast. In some areas fast ice may break off. Fast ice along the Urals coast of Baidaratskaya Bay can break off 3 - 4 times during the winter season;
- large ice formations: icebergs, ridges, hummocks, gigantic ice fields;
- ice piles on the coast, especially on the bars and beaches, which are most probable in the autumn and spring periods when there is no stable fast ice along the coast. Ice can be pushed a distance of tens to hundreds of meters from the waters edge;
- the possibility of intrusion of heavy ice from northern areas;
- seafloor exaration by ice formations. Ploughing of the seafloor by ice keels of drifting ridges is characteristic for all shallow water (less than 20 m) shelf areas. In Baidaratskaya Bay, the average ploughing depth is 0.8-1.0 m, sometimes reaching 2.2 m. Seafloor distortion by grounded massive hummocks is also possible.

Table 1.2 shows the parameters of the ice conditions for the offshore fields of the Arctic seas.

Table 1.2.
Ice Parameters and Phenomena for the Offshore Fields of the Arctic seas

Parameters	The Shtokman gas and condensate field	The Pechora Sea	The Baidaratskaya Bay	The North-western coast of Yamal	The Ob-Tazov area
1. Phases of the ice phenomena					
1.1 Beginning of the stable ice formation (day, month)					
early	XII	25.X	5.X	28.IX	28.IX
middle	IV	18.XI	17.X	7.X	6.X
late	V	23.XII	2.XI	30.X	23.X
1.2 Stable fast ice formation (day, month)					
early	-	23.XII	7.X	6.X	10.X
middle	-	22.II	1.XI	5.XI	23.X
late	-	11.X	4.XII	30.XI	20.XI
1.3 Beginning of the fast ice breaking (day, month)					
early	-	5.IV	12.VI	21.VI	30.V
middle	-	23.V	7.VII	-	18.VI
late	-	7.VII	21.VII	24.VII	4.VII
1.4 Entirely free from ice (day, month)					
early	25.III	10.IV	12.VI	29.VI	13.VI
middle	29.V	19.VI	4.VIII	5.VIII	3.VII
late	7.VII	30.VII	26.IX	5.IX	25.VII
1.5 Duration of the ice season, days					
minimum	0	131	239	-	-
average	45	213	300	300	270
maximum	186	272	365	-	-
2. Fast Ice					
width, km	-	3-15	5-20	15	20-70
average thickness, cm	-	110	140	150	150
Hummockness (%)	-	40-60	60	80	20
3. Drifting ice					
3.1 Ice thickness, cm					
level ice (average/max.)	150	80/145	100/	90/	70-120/
3.2 Thickness of snow on the ice, cm	-	40	30	40	-

3.3 Size of ice floe, km					
average	1.4	1.4	0.5-2.0	1.2	0.5-2.0
max.	-	17.5	-	-	-
1%	10	15	-	-	-
3.4 Ice concentration %	70-80	100	90-100	90-100	90-100
3.5 Ice hummockness, %	60	60-90	60	60	20
4. Ridges and hummocks					
4.1 Ridges sails height, m	3 (1%)	1.4	1.5	1.3	0.5-1.0
4.2 Keel draught, m	12 (1%)	3.7/8.2	7.0/18	-	-
4.3 Frequency of ridges occur. Per 1 km of profile	-	8	-	-	-
4.4 Average thickness of the consolidated part, m	-	2.9	-	-	-
4.5 Mass of ridges(th. t)	-	47-130	168(1%)	-	-
4.6 Sail height of hummocks, m	-	-	3-7	5	-
5. Icebergs					
probability of appearing. %	1-5	0	0	0	0
draught, m	100-120	-	-	-	-
mass, t	10^5 -10^6	-	-	-	-
speed, m/s	0.3-1.0	-	-	-	-
6. Average speed and direction of the general ice drifting, cm/s	-	5, NE	5	5, NNW	10
7. Total drift speed of ice, cm.sec	110 (%)	30-142	20-100	100	20-50
8. Speed of the tidal drift, cm/s	-	15-40	20-50	-	-
9. Ice salinity, ‰	6.0	3.5	2-5	-	0-1
10. Ultimate strength of compaction, MPa	1.3-6.0	1.7	0.6-1.2	-	2.7
11. Ultimate bending strength, MPa	0.5	0.5	-	-	1.7
12. Phenomena connected with ice					
seafloor exertion, m	-	-	1.0-2.0	>0.5	-

1.1.6 Geocryological Conditions

One of the main features of the Arctic region is permafrost, which is also present offshore on the shelf. Except in the Okhotsk Sea, the seafloor of the Arctic and Far-Eastern shelves contains permafrost sediments and exhibit negative temperatures. The coastal zone of the southeastern Barents Sea has thick permafrost sediments, which contain highly mineralized waters (cryopegs).The thickness of this layer is from several tens of meters (on the coast of the Pechora Sea) to several hundreds of meters (on the Asia coast). The further from the coastline

the less the thickness of permafrost sediments, and in offshore shelf areas they are present as an inclusion in perennial-cooled Rocks. Regional characteristics are extremely variable.

The most studied are geocryological conditions of the Barents-Kara shelf. In the Barents Sea the frozen or cryolite zone is widespread throughout the northeastern and southeastern (the Pechora shallow water areas) parts. In the deep water areas, it is manifested as perennially cooled rocks with temperatures of 0 to - 1.8°C and thickness of more than 20 m. In the shallow water Pechora shelf, which is underlain by widespread perennially cooled rocks, permafrost sediments occurs as the island type, representing the relict continental cryolite zone. The depth of the top of permafrost rocks varies from 25 to 40 m, and its base from 50 to 100 m and more. For the Pechora Sea there is a tendency for the top of the permafrost to get shallower in decreasing water depth. The thickness of frozen rocks as determined by drilling is several tens meters but can exceed 100 m. An unstable thermal field is a characteristic of these frozen rocks - they constantly melt from the top and from the base. On the Varandey oil and gas structure in water depths of 15.5 m, frozen rocks occur 63 m below the seafloor. On the Prirazlomnoye structure in water depths of 21 m, the top of the frozen rock massif was penetrated at the depth 23.5 m below the seafloor. On the Pomorskaya oil and gas structure they were encountered 41 m below the seafloor in a water depth of 28 m. In the northern part of the Pechora Sea shelf, near the Kara Gates in water depths of 50-70 m, hilly-shaped seafloor features are formed that exhibit a thick ice nuclei under the sediment. On the Kola-Kanin shelf permafrost sediments were degraded and now exhibit positive temperatures for both sediments and bottom seawater.

The Kara sea shelf is characterized by widespread perennially cooled sediments with a thickness of about 80 m and temperature of -1.6 – - 1.8°C. Offshore in the Kara Sea, permafrost soils are preserved in cooled rocks at water depths of 100-115 m. Geocryological conditions are known in greater detail for the marine part of the Kharasavey gas and condensate. Here, in water depths of 12-15 m, more than one hundred geotechnical coreholes were drilled. The seafloor is an erosional submerged surface that is frozen to a depth of 100-150 m along the coast in a band 0.5-1.0 km in width and a water depth of 2-4 m. In a zone 1 to 3 km from the coast, in water depths of 5-7 m, the seafloor is frozen to a depth of 30-40 m. And farther out, in band 8-12 m from shore, the seafloor is composed of cooled sediments among which occur large massifs of frozen rocks with an area to 5-7 km^2 and thicknesses up to tens of meters. Frozen sediments are likely to occur at greater depths.

Frozen seafloor sediments are characterized by high salinity (to 0.6 ‰ and higher) which defines their high corrosion activity. Large quantities of ice facilitate the deformation of sediments during the transition into a different state (for example, during melting). The emission of gases (mainly methane) from the seafloor is linked to the melting of frozen rocks. In particular, gaseous sediments and gas were observed along an entire submerged zone in Baidaratskaya Bay. There is no assessment of baseline concentrations.

Stability of soils in the coastal zone mainly depends on the amount of ice they enclose - melting results in subsidence of sediments and natural formation of thermokarst depressions. Instability can also arise from mass wasting of surficial permafrost sediment, especially where the formation ice occurs. The above-mentioned processes can be dangerous if the potential impacts are not thoroughly considered.

1.1.7 Dynamics of the Coastline and Seafloor

The entire extensive length of the coastline and seafloor is characterized by the impact of sea ice, currents, sea waves, thermal, and other factors. These all reflect the processes of reformation of the seafloor and changes of the coastline, especially its retreat. Taking into

account that loam, clay, sandy clay, and silt in the permafrost-state with high ice content are widespread in marine and coastal deposits, the effects of hydrodynamic, mechanical, and other impact can be rather strong. These impacts are of obvious seasonal character.

1.2 Base-line Levels of Environment Pollution

1.2.1 Petroleum Hydrocarbons

The following can be identified as sources for pollution from petroleum hydrocarbons that have penetrated into the waters and landscape of the Russian Arctic:

- natural hydrocarbons manifestation in the oil and gas bearing areas in the offshore zone of the Arctic seas;
- transportation of hydrocarbons by river run-off into the sea;
- drilling and completion of exploratory and production wells;
- direct discharge of fluid industrial and household wastes and emissions into the atmosphere in settlements on the Arctic coast;
- operation of all types of vehicles (sea and river vessels, aviation, automobiles and pipeline transportation);
- oil and oil products spills;
- atmospheric transfer of fuel combustion residues, decomposition and evaporation of oil in industrially developed areas;
- melting of sea and river ice polluted by oil products.

Pollution by petroleum hydrocarbons as the result of non-permitted discharge of bilge water and accidents resulting in fuel spills during the operation of marine and river vessels along the Northern Sea Route is relatively small (50 to 200 t of oil products during entire navigation period for different years) and can not be compared with the scale of impact from river run-off and atmospheric precipitation.

The huge annual river run-off into the Russian Arctic seas amounting to 2500 km^3, suggests that river run-off is the main source of petroleum hydrocarbon pollution of Arctic seawaters.

These pollutants are mainly transported into the Arctic area in the atmosphere (from September - October to May-June) and accumulate in snow cover during the winter. They are released in melt water run-off from Arctic water sheds and enter the sea.

The average levels of oil product content in waters of the lower reaches and mouths of Arctic rivers are similar and vary from about 18.0 mmg/l for the Khatanga and Indigirka, to 25 mmg/l for the Pechora river.

Variation of petroleum hydrocarbon content levels in bottom deposits are similar both at the mouths of Arctic rivers and in the corresponding offshore areas. The Maximum content of petroleum hydrocarbons in sediment are found in river mouth areas of the Pechora sea (to 250 mmg/g in dry soil), which is the result of the ongoing impact of oil producing installations located in its basin.

1.2.2 Polycyclic Aromatic Hydrocarbons (PAH)

PAH concentrations in the surface seawaters are between 0.01-0.08 mmg/l with a rather homogenous lateral distribution reflecting its background nature.

Maximum values for total PAH content in the thin surface water layer are found in the Novozemelsk Strait and near the western coast of the Yamal Peninsula, where they amount to

18 mmg/l. Further from the coast the concentration drops off rapidly - in samples from a traverse of the Cape of Wish, they did not exceed 1.41 mmg/l.

The range of concentrations and absolute values of total PAH content in the snow cover on the seas is considerably higher than the analogous values for seawater (0.10-0.30 mmg/l). Maximum concentrations of PAH from snow are found in the near-coastal zone of the southwestern Kara sea (the southern part of the Baidaratskaya Bay and the western coast of the Yamal Peninsula have concentrations of 0.3 mmg/l of melted water).

PAH content levels in the Russian Arctic are characterized by considerable variation. The highest values are found in areas of the western sector of the Arctic. This is especially true for southwestern part of the Kara Sea, Pechora Sea (including the coast), and the Yamal Peninsula. The range of concentrations of the identified PAH compound group vary widely, from nano-grams to tens of nano-grams per gram of dry weight (all studied areas are characterized by background concentrations of PAH).

1.2.3 Chlororganic Compounds (COC)

One of the main characteristics of the distribution of chlororganic compounds (COC) in Arctic ecosystems is their transportation over great distances in gaseous and aerosol form within atmospheric air masses. COC transported by water and river run-off are of great importance for marine and estuary ecosystems.

In surface seawaters of the Arctic COC are distributed rather homogeneously with the compounds a-, g-HCCH, 4,4DDT and its metabolites, and polychlorbiphenyls accounting for the most common and analytically abundant.

In the ice cover of all Arctic seas the total content of pesticides of the HCCH group does not usually exceed 1.5 ng/l and the g-HCCH group amounts to 30-40 % of the total content. However, in some years considerable deviations from such ratio of isomers occur.

In the snow cover of the Arctic seas the average content of hexachlorcyclohexane (HCCH) in different years varies from 0.5 to 3.5 ng/l and their distribution is characterized by a greater ratio of g-HCCH, (up to 60 %) to the total isomer content. The frequency of HCCH occurring in the snow cover for all Arctic seas under study is close to 100 %, but with considerable differences in concentrations from separate samples and from each of the studied regions. In general, the content of the HCCH group pesticides in snow cover generally exceeds their content in ice cover and underlying waters. This is indirect evidence that these pollutants are brought into Arctic waters by atmospheric precipitation.

1.3 The State of the Geoenvironment

The wide distribution of permafrost in the Arctic coastal and offshore zone presents a number of specific geoenvironmental conditions that must be considered for engineering purposes. These result from variety of cryogenic physical and geologic processes and from the lack fresh ground water in the fluid phase outside the cryolite zone (with the exception of a few local areas).

Cryogenic physical and geologic processes which influence or can influence commercial development of resources and the environment of cryozone include: thermokarst, thermoerosion, cryogenic swelling, cryogenic fracturing, solifluction, ice coating formation, and formation of new permafrost.

Occurrence of large inclusions of ice in shallow underground sediments has resulted in numerous accidents during industrial and development activities in the Arctic geologic environment.

In addition to ice formation, sagging, thixotropic, and easily washed out and icy soils, as well as modern exogenic geologic processes, all represent a considerable danger for the stability of the constructions.

1.4 The State of Specially Protected Natural Areas

Natural preserves adjacent to the coastline of the seas of the Northern Arctic and Pacific Ocean, and preserves which include within their boundaries (and protected zone) the adjacent marine aquatory and islands, are considered below.

The Barents sea part of the Kandalaksha preserve is located in the Severmorsk and Pechenga areas of the Murmansk region. The area of the Barents Sea part of the natural preserve, including the coast of the Kola Peninsula and archipelago Seven Islands, Inovs islands, and Gavrilov islands occupies 16.3 th. ha of which the marine area constitutes 12.4 th. ha.

Natural flora of the preserve are represented by bush tundra (on the continent), raven tundra type communities (on islands), low land marshes, fragments of tundra meadows and areas of willow bushes, sea meadows, and secondary herbivorous ornithogenic vegetation in habitat areas of large birds colonies (on islands).

Deterioration of the food source resulting from commercial fishing for school-type fish in the Barents and Norwegian seas, as well as other types of commercial activity, has had a negative impact on sea colonial birds. Selectivity fishing has qualitatively changed the complexes of the school-type fish, which in a number of cases caused an ambiguous response of sea birds.

The Belomor part of the Kandalaksha preserve is located in the Kandalaksha and Tersk areas of the Murmansk region, and the Loukh area of the Karelia Republic. The preserve has an area 54.3 th.ha including the coast of the Kola Peninsula, the northern group of islands in Kandalaksha Bay, Velikiy Island, and 37.2 th. ha of the White sea.

Natural flora complexes of the preserve are represented by pine tree woods, fir tree forests, primary root-type birch trees, low land marshes, coastal meadows, and raven tundra on small islands.

Discharge of oil products from passing tankers causing mass death of birds and marine animals and algae, are periodically observed in coastal areas of the preserve. Kandalaksha Bay water is polluted by household sewage coming from the Niva River and oil products from the Severnaya Dvina River.

The Gydan preserve is located in the Tazov area of the Yamal-Nenets Autonomous District. The area of the preserve, including the northern parts of the Gydan, Yavai, Mamoth, Oleniy peninsulas and Shokalskiy, Oleniy, Rovnyi, Proclyatye, Pestsovye islands, is 878.2 th.ha.

Natural complexes are represented by Arctic tundra with moss-lichen tundra, marshes of different types, and areas covered with willow bushes.

The marine part of the preserve is being polluted by waste water from ships passing along Northern Sea Route.

The Big Arctic Preserve is located in the Dixon area of the Taimyr Autonomous District. The area of the preserve is 4169.2 th.ha and covers the coast of the Taimyr Peninsula, the Kara Sea islands, Middendorf Bay, and the Nordensheld archipelago as well as, 980.9 th.ha of the Kara Sea aquatory.

Natural complexes in the preserve are represented by polar desert types and Arctic tundra.

The aquatory of the preserve is being polluted by sewage water from ships passing along the Northern Sea Route.

The Ust-Lensk preserve is located in the Sakha Republic (Yakutia). The area of the preserve covers the western part of the Lena River delta, northern edge of the Verkhoyansk ridge, and the coast and bays of the Laptevs Sea for a total of 1433.2 th.ha, including 603.9 th.ha of the Laptev Sea.

Natural complexes of the preserve are represented by northern sub-arctic tundra, polygon hilly tundra-marshy complexes, and mountain tundra.

The marine area of the preserve is mainly polluted by oil products with sewage from sea-going ships passing along the Lena River and the Northern Sea Route.

The Wrangel Island preserve is located in the Chukotka Autonomous District, includes the Wrangel and Herald islands for a total area of 795.7 th.ha.

Natural complexes of the preserve are represented by Arctic tundra and mountainous Arctic deserts.

The environment within the boundaries of the preserve is in relatively favorable condition.

The Koryak preserve is located in the Penzhin and Olyutor areas of the Koryak Autonomous District. The area of the preserve encompasses the Parapol depression and adjacent ridges of the Penzhin and Koryak highland, the Goven Peninsula and Lavrov Bay. The preserve is 327.7 th.ha in area including 83.0 th.ha of the adjacent Bering Sea.

Natural complexes of the preserve are represented by sedge-cotton grass tundra, poplar woods and chosenia (along the river valley), sub-alpine creeping vegetation, and high mountain tundra.

The Kronotsk Biosphere preserve is located in the Elizarov area of the Kamchatka region on the eastern coast of the Kamchatka Peninsula. The area of the preserve is 1142.0 th,ha, including 166.5 th.ha of the near-coastal water the Pacific Ocean.

Natural complexes of the preserve are represented by the rare high herbivorous stone birch trees, mountain tundra, marshy tundra, hummock marshes, high herbivorous meadows, and woods in the river valleys (willows, poplars, alder trees, chosenia).

The Komandor preserve is located in the Aleut area of the Koryak Autonomous District. The area of the preserve covers Bering, Medny, Kamen, Toporkov and other islands and amounts to 3648.7 th.ha, with 3463.3 th.ha of the adjacent Bering Sea and the Pacific Ocean.

Natural complexes of the preserve are represented by the plain mixed herbage and bush tundra, large herbage sedge-cotton grass, gramineous herbage and other types of meadows.

Natural complexes of the preserve are subjected to the unfavorable impact of wild animal breeding farms, polar fox hunting, marine animals and sea colonial birds, their eggs hunting and fishing.

The Magadan preserve (the Yamskoy area) is located in the Olsk area of the Magadan region. The area amounts to 38.1 th.ha, including the Yamskie islands in the Okhotsk Sea, the coast of the Pyagin Peninsula and the lower flow of the Yama River.

Natural complexes of the preserve are represented by valley poplar and chosenia, bushes and sedge, sedge and peat moss formations.

On the Koni Island, sea-going ship have filled their tanks with fresh water, resulting in the extinction of the snow ram and brown bear. Colonial birds nesting on the rocks are frightened away in a radius of 35 km from the water supply source.

The Djugdjur preserve is located in the Ayano-May area of the Khabarovsk region. The area of the preserve is 860.0 th.ha including the Djugdjur ridge, the Lantar and Tangui rivers basins, and the Malmin islands, as well as 55.1 th.ha of the Okhotsk Sea.

Natural complexes of the preserve are represented by mountainous larches, pine tree woods, cedar and alder dwarf trees, mountain tundra and by poplar and chosenia woods in the river plains and on islands.

The ecosystems of the preserve are subjected to intensive impact due to commercial fishing and crab fishing in the preserve area, residual pollution resulting from gold production in the past, consequences of the oil spill in the Ayan Bay, and from hunting and dear breeding.

The Kuril preserve is located in the South Kuril area of the Sakhalin region. The area of the preserve is 65.4 th.ha including the islands of Kunashir, Demin, and Oskolki.

Natural complexes are represented by polypody - fir tree woods and polypody forests, birch trees and bushes of cedar dwarf trees.

The preserve ecosystems have had negative impacts from fishing, household and agricultural water pollution, and drainage of the territories adjacent to the preserve boundaries.

The Poronai preserve is located in the Poronai area of the Sakhalin region, on the Okhotsk Sea coast. The preserve area is 56.7 th.ha.

Natural complexes of the preserve are fir trees and pine trees woods, larches, tundra-like marshy vegetation, and meadows on the sea coast.

Unfavorable impact on natural complexes of the preserve have been wood cutting at the sources of rivers and streams flowing across the preserve, settlement Vladimirskiy, the shooting and physical degradation of terrain by the military border guard unit along boundaries areas of the preserve, and hunting.

1.5 The State of Water Bioresources

1.5.1 Fish Resources

Offshore fishing in the Arctic seas is conducted mainly in the Barents Sea. Fishing of migratory fish (salmon) and semi-migratory types (sig family) takes place along the near-coastal and river parts of all Arctic seas.

Cod is the basis of Russian commercial fishing in the Barents Sea, the annual quota for cod fishing, based on estimated cod resources, can amount to 200 - 300 th.t in the Russian zone.

The good catch of haddock in recent years (approximately 15 th.t) can be explained by fishing high-harvest generation of haddock, the annual catch can be 651 th.t in the Russian zone. However, a reduction of the breeding resources from 407 to 320 th.t is expected.

Commercial resources of bass have been down due to the poor reproduction of these fish in 1986 - 1990. There has been no commercial fishing of bass recently. The catch of bass by all countries in the Barents Sea cannot be more than 7 th.t. (not more than 2 th.t for Russia).

The biggest concentrations of flatfish were observed in the Murmansk shallow water areas and in the eastern coastal (Kanin) area of the Barents Sea. The flatfish catch based on the estimated resources and fishing conditions can amount to approximately 4 th.t.

Due to the reduction of the black halibut resources its commercial fishing in the Russian zone is banned. The annual catch by all countries in the Barents Sea amounting to 14 th.t is estimated to be an extreme load on the resources of this species.

Fishing for deepwater-type of fish, such as Anarhichas, cannot be more than 12 th.t a year.

Depression in the resources of capelin led to the ban on their fishing since 1994, their breeding resources have recently increased and are estimated now at 250 th.t.

Annual catch of pollack can be 50 th.t.

Resources of putassu can sustain an annual catch of not more than 100 th.t.

Herring resources in the Barents Sea have recently grown and a possible quota for Russia can now be more than 200 th.t a year. The Russian commercial herring fishing season is mainly in February-April and September-October as it is in the Norwegian zone. Changes in the coastal infrastructure have led to the reduction in the catch of the Cheshsko-Pechera herring.

The state of the commercial resources of navaga (a small fish of the cod family) remains stable.

The state of resources of salmon is estimated to be critical. Salmon fishing is conducted during its breeding period and migration into the rivers of Karelia, Murmansk and Arkhangelsk regions. Due to the dramatic decrease in the amount of salmon during the last 10 years, commercial fishing in Karelia had been banned since 1994.

Fish resources of the sig family, both semi-migratory and river-mouth populations are reduced or in a state of depression. The reasons for reduction of fish of the sig family are anthropogenic in nature. Commercial fishing of sig is conducted in the Kandalaksha Bay of the White Sea. The state of sig resources has been greatly impacted by oil pollution of the Pechora River. As the result of accidents during oil and gas production, breeding areas of fish of the sig family were destroyed.

Commercial fishing in the Kara and eastern Arctic seas is not viable. The largest amount of bioresources (mainly semi-migratory fish of the sig family: muksun, pelyad, sig, ryapushka, and omul) are produced in the pre-mouth zones of the Ob and Enisey rivers. Along other areas of the coast, fish resources are small (Yakutia, Chukotka) and fishing is only for subsistence needs of the local population.

Sturgeon resources during the last 10 years have been decreasing and are now in a critical state. The reasons for the reduction of Siberian sturgeon resources are: irrational commercial fishing, reduction in natural production as the result of hydro-construction (dams of the Novosibirsk and Bukhtarmin hydroelectric stations cut off 40 % of the spawning habitats of sturgeon in the Ob River basin), and oil pollution in the lower flow of the Ob River.

Far-eastern seas are highly productive water basins of the world ocean as supported by results of investigation of plankton, bentos, fish, sea mammals and birds, as well as efficient production **(tables 1.3 - 1.5)**.

Table 1.3
Biomass and annual production of the main groups of sea organisms (in raw mass of substance) in Okhotsk Sea

Groups of organisms	Biomass, 10^6 tons	Production,10^6 tons
Fitoplankton	256	42300
Fitobentos	20	80
Zooplankton	205.3	2066
Zoobentos	250.4	625
Invertebrate productive	1.5	0.5
Fish	20-22	10-11
Mammals	0.17	0.03
Birds	0.006	0.002
Current production	1.5-1.6	-
Maximal production (middle of 70^{th})	2.5-2.7	-

Table 1.4
Biomass and annual production of the main groups of sea organisms (in raw mass of substance) in Japan Sea

Groups of organisms	Biomass, 10^6 tons	Production,10^6 tons
Fitoplankton	25.8	6000
Fitobentos	-	-
Zooplankton	57	590
Zoobentos	14	42
Invertebrate productive	0.06	0.02
Fish	11.0	5.0
Mammals	-	-
Birds	-	-
Current production	0.6-0.7	-
Specific production, t/km sq.	1.9-2.1	-

Table 1.5
Biomass and annual production of the main groups of sea organisms (in raw mass of substance) in Bering Sea

Groups of organisms	Biomass, 10^6 tons	Production,10^6 tons
Fitoplankton	124.5	20900
Fitobentos	-	-
Zooplankton	260	1043
Zoobentos	80	194
Invertebrate productive	1.0	1.67
Fish	38.7	19.3
Mammals	0.3	0.06
Birds	-	-
Current production	0.9-1.1	-
Specific production, t/km sq.	1.2-1.7	-

The main commercial fish in the Okhotsk Sea - herring, cod, plaice and salmon - have been under considerable production pressure during the last several decades. They provide and will provide the main part of the catch. However, the amount of the main types of fish in Okhotsk Sea is not fully understood and therefore, for many fish only an approximate estimation is possible.

Species which have or may have industrial value in the Japan Sea, include more than 40 kinds of fish, up to 40 kinds of sea mammals, about 15 types of invertebrates, and 4-6 kinds of sea plants. The variety of fish include salmon, herring, cod, plaice, mackerel, haddock, black halibut, pollak and others. Invertebrates include squid, crustaceans, and algae-laminariya. The total fish catch in the Japan Sea exceeds 1 million tons, including more than 0,6 million tons of the dominate pelagic species.

The Bering Sea provides the main part of the world's catch of mintai, cod, sea halibut, pacific herring, and halibut. Huge spawning places of halibut and mintai are located on this shelf. Very valuable products of the catch in the Bering Sea are also coal fish, shrimps, molluscs and crawfish. The total annual catch is about 1 million tons of fish.

1.5.2 Sea Animals

Populations of sea mammals in the Barents and White seas have recently stabilized.

The White Sea population of the Greenland seal is 400 th. heads, nerpa in the southeastern part of the Barents Sea is 200 th. Heads, and belukha (white whale) in the Barents and Kara seas are about 20 th. heads. Sea hare resources are small.

There has been an intensive catch of sea mammals in Okhotsk sea in an amount and structure of the seal populations. Restrictive and limiting measures were adopted in 1969 resulting an increase of total seal population to about 1.2 thousand heads.

Whales inhabit the Far-eastern seas. But more than a century whale hunting led to their near extinction in the Northern Hemisphere. As a result, several types of whales are included into the Red Book of Russia (endangered species list).

1.5.3 Crustacean and Molluscs

Reserves of northern shrimps have been reduced due to their consumption by cod. Catch of shrimp can be several thousands tons in the Russian zone and in the open part of the Barents Sea. The Kamchatka crab adopted to Barents Sea conditions has spread to the Trough of the White Sea and Kolguev Island, but it is most common along the Norwegian coasts. Commercial fishing of the sea comb in the White Sea trough and in Svyatonoss Bay in the amount of 9 th.t is possible.

The catch of invertebrates in the Russian part of the Okhotsk Sea in the 1980-s was about 42 th. tons.

Crustacean are represented by several types: shrimps, bivalve and cephalopoda molluscs, holoturia and their resources are abundant.

1.5.4 Algae

Production of anfelcia (1 type) and fukoid (2 types) is based on the storm ejections. The resources of laminaria in the Solovki Archipelago and Zhizhgin Island provide for an annual production during the last 10 years of 137.8 t of dry mixture. In Karelia, the annual production of anfelcia, fukoids and laminaria is not big (several tens of tons). Production of algae has recently decreased considerably due to economic reasons. Algae resources are estimated as good. It is possible to produce brown algae in the White Sea (more than 14 th.t of Laminaria including 6 th.t in Lembov Bay, and approximately 2 th.t of fucuses), as well as red algae (several hundreds tons of anfelcia).

Biomass of algae in the Okhotsk Sea is about 20 million tons. The Japan Sea contains prevalent amounts of Japanese laminaria growing on stony rocks in the coastal zone.

1.6 Social - Economic Aspects of the Assessment of Coastal Areas

1.6.1 Social Characteristics

The population of Arctic Russia consists of indigenous people of the North, populations of well-established (for centuries) ethnic Russians (such as in Mesen, Ust-Russkiy and othersareas), Yakutian populations from northern East Siberia, and Russian, Ukrainian, and Belorussian migrants from the last century. The indigenous population is 200.000, consisting of 30 «peoples» in 27 Subjects of the Russian Federation. Eleven indigenous groups live in the Arctic region (Saami, Entsi, Nentsy, Khanty, Nganasany, Dolgany, Evenki, Chukchi,

Eskimosy, Yukagiry), and 5 adjacent to the Arctic region (Selkupy, Chuvantsy, Mansi, Kety and Koryaki).

The total Arctic coastal population as of January 1, 1996 was 1669700 people of which the indigenous population accounts for 3.4 %. Migrants are concentrated in towns and settlements. Bad economic times and harsh living conditions have resulted in a reduction in population due to migration and mortality.

Development of mineral resource fields, construction of transportation networks and other industrial development activities, has damaged pasturing and hunting areas and breeding habitats in river valleys, undermining the material basis for the existence of indigenous populations. These impacts considerably the traditional lifestyles in settlements of indigenous people.

Existing Russian Legislation includes a certain legal basis for the ownership, use, and disposal of land and other mineral resources by indigenous people of the north, as well as the basis for the nature use. The most important rights of the population of the Russian Arctic region are defined in Constitution of the Russian Federation in Articles 69 and 72, constitutional norms on the Autonomous Districts as Subjects of the Russian Federation (Article 65), and on the basis of the use of land resources for the livelihood of the people living on the territory (Article 9). Some issues of ownership, use, and the right to dispose of land and other natural resources by the indigenous people of the North are contained in the Federal Laws «About the Environment Protection», «About Specially Protected Natural Areas», «About the Basis of the State Regulation of the Social-Economic Development of the Russian Federation Northern areas», as well as in the Russian Federation Presidential decree of 22.04.92 «On the Urgent Measures for the Protection of the Areas of Settlements and Economic Activity of the Indigenous People of the Northern areas», and others. The Russian Federation subjects also have legislative measures directed toward the solution of land (territorial) problems of indigenous people of the Northern areas. However, the existing legislative and normative documents are not enough to resolve the above-mentioned issues and the control over the implementation of the existing documents is not efficient.

Recently a number of sub-law acts, Russian Federation Presidential decrees, and Government resolutions directed toward the regulation of the social-economic situation in the Arctic and Northern areas, have been developed. These include the Federal laws «On the State Guarantees and Compensations for the people working and living in the far north regions and areas with the same status», and «On the Distribution of the Housing Subsidies between the Regions of the Far North Areas and the Areas with the Same Status», and the Presidential decree «On Additional Measures of the State Support for the People leaving the Far North Areas and Areas with the same Status», and others.

1.6.2 The Economic Aspects

Russian Arctic and northern regions with marine economic zones and an adjacent continental shelf constitutes more than 30 % of the Russian Federation territory. This region has predicted hydrocarbon resources of more than 200 billion tons of oil equivalent, of which according a 1993 evaluation, 100 billion t are in the Barents and Kara seas. It provides 80 % of Russia`s seafood products and 90 % of marine transport infrastructure. The Russian Arctic and Northern areas are the biggest suppliers of nickel, gold, copper, tungsten, diamonds, rare metals and semi-precious stone raw materials.

Even with an extremely low population density compared with the rest of Russia (1-5 people/km^2 as compared with 9 people/km^2), a greater anthropogenic load is put on the Russian Arctic and Sub-Arctic areas than for similar regions outside the country. And, though

there is no great size difference, the population living in the Russian Arctic and adjacent areas is four times bigger than in similar regions outside the country. According to different estimates, overpopulation is 20-40 %. A specific settlement structure has developed in the Arctic and adjacent areas - indigenous and old comers are distributed rather evenly throughout the entire area, while the so-called migrants constituting the main part of the population, are concentrated in local industrial regions.

1.6.3 Transport Systems

The transportation system of the Arctic consists of water, air, railway, and highway transport, and systems of oil and gas pipelines. Marine and air transportation is the most important for the near-coastal and coastal areas (Far North areas).

The Northern Sea Route is the main transportation route in the North of Russia. Its role in the economy of the country has been vital in the development and use of the natural resources of the Far North, without which the Russian economy can not function. The Northern Sea Route is also used as a main route connecting the northern and eastern areas of the country.

The Arctic sea transportation system in combination with other types of transportation systems not only connect areas of the Far North with industrial centers in the rest of the country, but also supply the population of the adjacent economic areas with provisions.

The tariff system for freight shipping along the coast was based on the economic relations between state-run companies in the centralized system of Arctic area supply, and the necessity to pay for transportation services. In the new economic conditions, tariffs and their system of structure do not reflect the actual costs of shipping in the Arctic area and do not facilitate efficient transportation services.

The material and technical base of the Arctic shipping system consists of the cargo and ice breaker fleet, reloading terminals, service facilities for the fleet and coastal installations, means of ensuring shipping operations, and system of control and management of Arctic sea operations. This complex includes departments and facilities belonging to different agencies and Russian Federation subjects, which makes management and administration of the shipping process more difficult.

1.6.4 Areas of Negative Impact

Recent studies conducted in the Arctic have identified areas with a high probability of change and damages to the environment due to pollution of the land, river, and offshore ecosystems with heavy metals, petroleum products, organic compounds of different origin, compounds of nitrogen, sulfur, and others, in addition to mechanical damage to soils and over-pasturing by deer. Crisis situation areas include the Kola, Severodvinsk, Norilsk and Sredne-Ob impact regions and critical areas have been identified as the Timan-Pechora, Novaya Zemlya, Vorkuta, Pur-Nadym regions. Dangerous situation areas exist in Yano-Indigirka (the area of the Deputatskiy settlement) and Valkumey region, which is in a development stage. The situation in the Bilibin impact region can be characterized as conditionally potentially dangerous, but if an accident of any scale happens at the nuclear power station it can become catastrophic (the same refers to the nuclear power station in the Kola region).

Table 1.6 gives a list of these areas with the main reasons for the environment damage. A lot of these areas include the estates of the indigenous people of the North.

Table1.6
The Impact Regions of the Russian Arctic Area

No.	Impact region	Sources of pollution	Pollutants	Situation
1	Kola	Metallurgy, mining industry, Nuclear power station, thermal power station, transportation, production and HC transportation	Oxides of sulfur, nitrogen, benzopiren, nickel, mercury, carbon fluoride, aluminium, strontium, radio nuclides, dust, oil products, methane	Crisis
2	Severodvinsk	Pulp and paper production, military facilities (Northern Navy), thermal electric station	Benzopiren, PAHC, mercury and etc., heavy metals, oxides of sulfur and nitrogen, carbon sulfide, formaldehyde	Crisis
3	Timan - Pechora	Oil and gas production	Oil products oxides of carbon, sulfur and nitrogen, strontium and radio nuclides	Critical
4	Novaya Zemlya (inland and offshore)	Military facilities (sunk nuclear installations and nuclear waste)	Radio nuclides, heavy metals	Critical (potential crisis)
5	Vorkuta	mining industry, cement production, thermal power station	Dust, oxides of sulfur and nitrogen, heavy metals, PAHC	Critical
6	Pur- Nadym	Oil and gas production	Oil products, oxides of carbon, sulfur, nitrogen, strontium and radio nuclides	Critical
7	Sredne- Ob	Oil and gas production	Oil products, oxides of carbon, sulfur and nitrogen, strontium and radio nuclides	Crisis
8	Norilsk	Mining and metallurgical	Dioxides of sulfur and nitrogen, formaldehyde, copper, nickel	Crisis
9	Yano-Indigirka	Mining industry	Dust, heavy metals (tin, lead, strontium, etc.), oxides of sulfur and nitrogen	Dangerous
10	Valkumey	Mining industry, thermal power station	Dust, heavy metals (tin, lead, strontium, etc.), oxides of sulfur and nitrogen	Dangerous
11	Bilibin	Nuclear power station	Radio nuclides	Potentially dangerous, to catastrophic (in case of the accident at the nuclear power station)

1.7 Hydrocarbons Resources of the Russian Continental Shelf

The peripheral marine area of Russia equals 6.2 mln. km^2, of which the shelf (200-300 m water depth) accounts for 4.2 mln.km^2.

Ninety percent of the offshore (3.9 mln.km^2) is prospective for oil and gas, about 2/3 of that for onshore. Two million square kilometers of thisis in the Western Arctic (the Barents and Kara seas), 1 mln. km^2 is in the Eastern Arctic (Laptevs, East-Siberian and Chukotka seas), 800000 km^2 are in the Far-East seas (Bering, Okhotsk, and Japan), and the remainder in the southern seas (Caspian, Azov-Black seas, and a small area in the Baltic Sea near Kaliningrad). Total estimates of offshore oil equalent resources as of 1993 is 133 bln.t. BTU

(British Thermal Units) (BTU estimated in oil equivalents), of which the recoverable resource equals 100 bln t. Seventy percent of these recoverable resources are in the Western Arctic (Barents and the Kara seas), and 10 % in total recoverable reserves (half in Sakhalin Island) in the Far East seas. The most plentiful resource is gas, estimated at 85 trln.m^3 (free and dissolved), whereas oil and condensate reserves are only 15.5 bln.t. Oil reserve estimates by region are: Barents and Pechora (3.8 bln.t.), Kara (4.7 bln.t.), Far Eastern Siberian (2.1 bln.t.), and Okhotsk (2.1 bln.t.).

Analysis of available information has shown that in some offshore areas the estimate of hydrocarbon resource potential can be increased considerably. This is especially true for the East-Siberian and Chukotka seas, where the predicted increase of oil resources can be as much as 2-3 times.

The degree of exploration of the initial recoverable hydrocarbon reserves for the Barents and Pechora seas amounts to only 10.5 % of the predicted total, including 11.9 % of free gas, and 0.4 % of oil. This index is considerably higher for the northeastern shelf of the Sakhalin where 76.7 % of the estimated reserves for oil and 28.3 % for free gas, and 57.6 % for condensate have been explored.

The main super giant fields in the Russian offshore are: the Southern Barents Sea (Shtokman gas condensate field with 3 trln.m^3 gas in the Jurassic reservoirs), Southern Kara Sea (Leningrad and Rusakov gas condensate fields with 4-6 trln.m^3 each in Cretaceous reservoirs), Pechora Sea industrial area (large Prirazlomnoye oil, gas and condensate field in Carbonates of Permian-Carboniferous), and Sakhalin (oil, gas, and condensate fields northeast offshore, Piltun-Astakhskoye, Arkutun-Dagin, Odopta and others).

Chapter 2

The Status of the Legislative, Normative, Legal, Regulatory - Technical Base for the Control of Interior-, Water- and Land Use, Industrial, Environmental Safety and Labor Protection

2.1 Legal Regulations of Interior Use

2.1.1 General Statements

In the Russian Federation land use is regulated by the Russian Federation Law «On Interior» (1992, 1995), Statute on Licensing Procedure for Interior Use (1992), Federal Law «On Agreements on Production Sharing» (1995), Federal Law «On Continental Shelf» (1995), Water Code of the Russian Federation (1995).

Land use within domestic sea waters, territorial ocean and continental shelf is also regulated by the legislative acts listed above.

The Russian Federation Law «On Interior» defines the subject of regulation in its general sense as «relations arising in connection with geological study, use and protection of the interior of the Russian Federation territory, its continental shelf, as well as in connection with utilization of wastes produced by mining industry and the related processing manufactures...».

The right of ownership of interior and extracted useful minerals includes:

- right of ownership of the interior;
- right of ownership of useful minerals and other useful properties of the interior;
- right of ownership of property and geological information gained in the course of interior use.

In Russia the right of ownership of the interior is characterized by the following:

- State ownership of the interior is declared in the Russian Federation Law «On Interior»;
- the Federate Treaty, the Constitution of the Russian Federation and the Russian Federation Law «On Interior» say that the interior resources of the territorial ocean as a part of the State territory are under the joint possession of the Russian Federation and its Administrative Regions, whereas the interior resources of the marine economic exclusive zone and continental shelf are at the disposal of the State Authorities of the Russian Federation.

2.1.2 State Regulation of Interior Use

In accordance with the Russian Federation Laws «On Interior» and «On Continental Shelf» the goals of the state regulation of interior use are as follows:

- providing geological study of the Russian Federation territory, its continental shelf...;
- providing development of mineral resources base and preparation of a reserve of interior allotments...;
- defining the amounts of basic useful minerals to be extracted for a current period and perspective for the Russian Federation as a whole and particular regions;
- establishing quotas of extracted mineral resources to be delivered;
- introducing payments for the use of interior and regulated prices for particular types of mineral resources;

- establishing the standards (norms, rules) in the field of geological study, use and protection of interior, safe conditions of work connected with interior use, as well as rational use and protection of interior resources.

In respect to continental shelf, in accordance with the International Right and Domestic Laws, the Russian Federation implements:

- sovereign rights for the purpose to explore the continental shelf and to develop its mineral resources. These rights are exclusive, meaning that if the Russian Federation does not explore the continental shelf or develop its mineral resources, no one can do it without Russian Federation consent;
- exclusive right to allow and regulate drilling activities for any purpose;
- exclusive right to construct, as well as to allow and regulate the construction, exploitation and use of artificial islands, plants and constructions; the Russian Federation implements jurisdiction over such artificial islands, plants and constructions, including safety, customs, fiscal, sanitary and immigration laws and rules;
- jurisdiction in respect to:

- marine scientific research;
  - protection and preservation of marine environment in connection with exploration and development of mineral resources and disposal of wastes and other materials;
- laying and exploitation of submarine cables and pipelines.

The right of the Russian Federation to continental shelf does not include the legal status of the waters on the shelf and the air space above these waters.

The competence of the Federal Authorities regarding interior use on the continental shelf involves:

- development and improvement of the Russian Federation legislative base regarding the continental shelf and all related activities;
- coordination of the federal agencies activities with respect to the continental shelf as well as economic activity, protection of rights and interests of the Russian Federation and mineral resources protection;
- defining the strategy of study, reconnaissance, exploration and development of mineral recourses based on federal strategy, programs and plans taking into account the conclusions of the state environmental expertise, as well as the special economic interests of small native nations and ethnic communities of the North and Far East of the Russian Federation and population permanently living on the territories adjacent to the Russian Federation waters. The Federal programs and plans for exploration and development shall be compiled with the appropriate agencies of Executive Authorities of the Administrative Regions of the Russian Federation, provided if these programs and plans stipulate the use of coastal infrastructure;
- establishing a procedure of mineral resources use, including the licensing procedure, and developing appropriate standards (norms and rules);
- establishing a procedure of competitions (auctions) to obtain the right of using allotments of continental shelf and determining winners;
- control over rational use of mineral resources, their defense and protection;
- state mining supervision;
- registration of activities on study, exploration and development of mineral resources; preparation of a federal balance of mineral reserves, federal account of continental shelf allotments used for study, exploration and development of mineral resources;
- concluding agreements on production sharing;

- introducing restrictions and special terms for the use of sea bottom and its interior in particular areas of continental shelf in connection with the prospects of mineral resources development, as well as in the areas of spawning of living resources;
- regulation and performance of resources and marine scientific research;
- announcing particular areas of continental shelf as closed for carrying out marine scientific research, due to introduction (or planning to introduce), in the above-indicated areas, of works on exploration and development of mineral resources, with indication of coordinates of closed areas in «Notices to Mariners»;
- establishment of a paying system, determination of amounts, terms and procedure of paying for the use of allotments on continental shelf for the purpose of prospecting, exploration and development of mineral resources;
- regulating construction, exploitation and use of artificial islands, plants and constructions for the purpose of study, prospecting, exploration and development of mineral resources, for other purposes, as well as for carrying out resources and marine scientific research;
- regulating and determining terms for laying of submarine cables and pipelines used for exploration and development of mineral resources or for exploitation of artificial islands, plants and constructions, as well as those to be lain to the territory of the Russian Federation;
- regulating drilling operations on continental shelf for any purpose;
- performance of State environmental expertise, State environmental control, State monitoring of continental shelf state;
- keeping a Russian State Fund of continental shelf mineral resources data;
- establishing a regime for the handling of environmental emergency situations and environmental disasters; providing urgent actions on liquidation of accidental consequences that lead to pollution by oil and substances other than oil;
- establishing environmental norms (standards) for a concentration of pollutants in wastes and other materials intended for disposal on continental shelf, lists of hazardous substances, wastes and other materials banned for disposal on continental shelf; regulating and controlling disposal of wastes and other materials;
- settling disputes concerning activities on the continental shelf;
- conclusion and implementation of international agreements of the Russian Federation on continental shelf and activities on it.

In the interest of safety and development of national industry and energy production of the Russian Federation, on the basis of representation of interested federal executive authorities, restrictions can be introduced for participation of foreign users in competitions (auctions) for prospecting, exploration and development of mineral resources in particular allotments, as well as organizing competitions (auctions) with participation of Russian users only.

The users of allotments on continental shelf are obliged to:

- implement technological, hydrotechnical, sanitary and other measures, as well as acceptable international norms and standards, laws and rules of the Russian Federation on protection of marine environment, mineral and living resources;
- keep regular contacts with the Russian Federation Coastal Services and transmit, if appropriate equipment is available, within basic international synoptic terms the operative meteorological and hydrological data to a nearest Hydrometeorological Center of the Russian Federation in accordance with the standard procedures of the World Meteorological Organization.

When working on continental shelf, foreign users are charged, in accordance with the Russian Federation Law «On Continental Shelf», with some additional requirements in particular they

are obliged to provide free pass for officials from the guarding authorities to the place of works and use means of communications, as well as covering expenses for accommodation and full maintenance of officials from the guarding authorities equally with the own steering staff.

2.1.3 Licensing of Interior Use

By the definition, given in the Law «On Interior» - «a license is a document that certifies the right of its owner to use of an interior allotment of a certain size in accordance with an indicated purpose for an established period with keeping to the stipulated terms».

The system of licensing the interior use is in the sphere of administrative right, therefore the basic component of the license - «stipulated terms» of the interior use - are formed on the basis of the administrative right. However, the practice has shown that to define the terms of interior use in one-sided permitting manner is impossible, especially at large objects needing high investments, and this is moreover so on the conditions of risk. In this case, the negotiations with a future interior user and account of his interests are required. The more and more growing use of contraction relations on the basis of the civil right is practiced in the interior use and licensing system. The example of this are «licensing agreements» that are prepared with the participation of a future owner of a license. With introduction into action of the Civil Code of the Russian Federation in 1995 the civil relations have got a strong legal basis and further development, including in the interior use.

The Federal Law «On Agreements on Production Sharing» has passed in certain cases the relations of interior use from the administrative-legal sphere into civil-legal one with the civil agreement as the basis of mutual relations between the State, being the owner of interior, and the user of interior. Conclusion and implementation of the civil agreement are regulated by the Civil Code of the Russian Federation. At the same time the Law has preserved the interior use on the conditions of agreements on production sharing within the frames of the existing licensing system.

At the present time the terms of interior use, being the basic component of the license, can be permitting, permitting-contractual and contractual. Permitting terms of interior use are established by the State authorities on the basis of the administrative right in accordance with the laws on interior and compiled in the form of a document «Terms of the Interior Use».

Permitting-contractual terms contain partly permitting conditions and partly contractual ones to be established on the basis of agreement between competent State Agencies and interior users, taking into account the norms of the Civil Code of the Russian Federation. Permitting terms are admitted to be the conditions of a competition for the right of using the interior. Permitting-contractual terms are compiled in the form of a document titled as «License Agreement».

Contractual terms of interior use are formed on the basis of agreements between competent State authorities and an interior user (investor), concluded in accordance with the Federal Law «On Agreements on Production Sharing».

The process of licensing in its general form consists of the following steps:

- approval of a list of objects that can be the subject of licensing;
- establishment of a competition commission and working out of competition conditions for particular mineral resources or groups of mineral resources similar by their geological and economic characteristics;
- publication of conditions and dates of competitions in central and local press;
- representation of geologic-geophysical information on mineral resources for potential interior users and reception of applications for competition participation;

- preparation of feasibility study reports on planned geological explorations or development of useful minerals by participants of a competition;
- performance of a competition and determination of winners, approval of results;
- preparation of licensing terms and giving a license to a competition winner, registration of a license.

The interior is given for use for a certain period or for unlimited time. The Law on interior states that periods of interior use for development of useful minerals are determined after the feasibility study has provided information to determine rational use and protection of the interior. For geological study of the interior a period of to 5 years is given, for development of useful minerals - 20 years, for combined types of use - up to 25 years. The period of interior use starts from the day when the right of use is given.

The licensing procedure for interior use is implemented through the State licensing system which presents a combination of organizational structures (informational, scientific-analytical, economic, legal) and an unified form of preparing and drawing up documentation.

Owners of licenses are obliged to conclude agreements with specialized anti-accidental services for cases of failures and emergency situations.

Generally, all requirements established by the Law of the Interior are subdivided into three groups defining:

- procedure of interior use;
- safety of mining activities;
- protection of the environment.

The user of interior is obliged to provide:

- following legislative requirements, and standards (norms, rules), approved in the established manner, on technology of activities connected with interior use and primary processing of raw mineral resources;
- following to the requirements of technical projects, plans and schemes of mining activities; not allow losses exceeding permitted norms and selective development of useful minerals;
- keeping of geologic and other information in the course of all types of interior use and its preservation;
- presentation of geologic information to a Territorial Agency of the Ministry of Natural Resources of the Russian Federation;
- presentation of reliable data on explored, extracted and left in the interior mineral reserves, components contained in them, on interior use for purposes not connected with development of useful minerals, to a Territorial Agency of the Ministry of Natural Resources of the Russian Federation, to Agencies on Statistics;
- safety of activities connected with interior use;
- observance of standards (norms and rules), approved in an established manner, regulating conditions of protection of the interior, atmospheric air, lands, water, as well as buildings and constructions against an adverse influence of activities connected with interior use;
- restoration of natural environment, deteriorated due to interior use, to a state suitable for further usage;
- preservation of exploratory wells, decommissioning, in an established manner;
- implementation of terms, established by a license, timely and proper payment for interior use.

Interior users can be required to have a special qualification and experience confirmed by a certificate allowing to carry out an appropriate type of work in the sphere of interior use.

The right to interior use stops by:

- formal circumstances - with expiration of a license if no appropriate extension has been filed;
- subjective circumstances - with refusal of a license owner from the right to interior use; in this case the interior user is not obliged to motivate his refusal;
- objective circumstances - when a stipulated condition exists prohibiting further development, as well as in case of a violation of the Law.

Additionally, the Ministry of Natural Resources of the Russian Federation and its Territorial Agencies can ahead of time cease, suspend or restrict the action of the right to interior use in cases of:

- a direct threat to life or health of people working or living in the zone of influence;
- breach of the existing terms of a license;
- systematic violation by the user of the established rules of interior use;
- emergency situations;
- when the user did not start full scale operations within a license-stipulated time;
- liquidation of an enterprise or other organization which was given the interior for use;
- initiative of a license owner.

In case of cessation, suspension, restriction of the right to interior use, the interior user can appeal this decision in an administrative or civil procedure.

The organizational procedures of the State licensing system is provided by the MNR of Russia and its territorial agencies through the state management system of mineral resources use.

Decisions on approval of the results of competitions (auctions) and on giving of licenses are taken jointly by an agency of executive authorities of the Russian Federation administrative region and the MNR of Russia or its territorial agency taking into account the agreements made with interested State management and control authorities.

A special procedure for summarizing competition (auction) results and making decisions on granting licenses is established for the use of mineral resources on the continental shelf of the Russian Federation. In this case a license is granted by MNR of Russia (Federal Interior Fund Department) in accordance with the Resolution of the Russian Federation. The resolution is prepared taking into account the opinions of the Russian Federation Administrative Regions, the territories of which will be used for all activities on the shelf.

During almost six-year operation of the State licensing system serving as the basis for the relations of interior use, according to the estimates made for 01.1997, 26620 licenses have been granted for the interior use for the purpose of development of useful minerals, including ground water, geological study of the interior, construction of underground constructions of different types. Among this total amount of licenses, 2230 were granted for oil and gas production, 5370 - for production of gold and other precious metals. The licenses were granted to 5600 enterprises (juridical bodies), including to 206 enterprises with the participation of foreign capital, and 7 foreign juridical bodies.

Since 1996 the licenses for useful minerals development have been granted only on the competition basis. By the present time (by the beginning of 1998) there were conducted 318 competitions, with the participation of 225 foreign companies. As a result, the licensing covered 90 % of balance oil reserves, 80 % of natural gas, 80 % of gold. However, Russia still has a considerable fund of poorly explored, but rather perspective areas of the interior, containing oil, gas, ore and other useful minerals. The subjects of competitions of the recent time more and more often become to be just the above-mentioned poorly explored, but rather perspective areas, the right to the use of which is given on the terms of combined licenses (prospecting, exploration, development). An increased risk of investing such areas is

compensated by decreased payments for the right of development and other concessions from the side of the State. However, in the situation when the State funds are absent and, hence, the geology-exploratory activities in new areas are sharply reduced, the above-mentioned approach, though leads to certain economic losses, is, nevertheless, the only way in the situation formed. By the estimate for 01 January 1997, 186 or 8 % among 2127 licenses for oil and gas are combined ones.

A certain interest has arisen for licenses to conduct geological study of the interior, which are usually granted without a competition for a period of 5 years or in some cases longer. Licenses of this type amount to a quarter of the total issued for oil and gas. In case when the owners of such licenses have identified mineral resources, they are compensated for their investment (this is stipulated by the terms of the competition) and are given a priority among other equal competitors.

Not many areas of the continental shelf have been licensed in the Russian Federation (e.g. Shtokmanskoye, Prirazlomnoye Fields and a few small areas).

Of a basic importance in the nearest time will be the improvement of the system of competitions and auctions. At the present time, under final preparation is the Statute on competitions (auctions) for the right of interior use, which will be submitted for approval to the Government of the Russian Federation.

One should expect in the nearest future a more wider use of the auction approach to the selection of winners, and no feasibility study of proposed activities will be required in this case, which considerably increases single payments for interior use («signature bonuses»).

An intensive work is being done on the preparation of amendments to the Federal Legislation, concerning the spreading of turnover norms, established by the Civil Code of the Russian Federation, on the right of interior use, i.e. the license. In particular, it is planned to liberalize the ceding of the interior use right (license), mortgage of this right (license).

It should be noted that areas of the interior, that are granted for use for development of useful minerals in accordance with the license, are given a status of mining allotment. Preliminary boundaries of the mining allotment are determined and a license is granted for interior use. After a technical project is developed and a positive resolution of the State expertise is obtained, the project is agreed upon with the authorities of the Gosgortechnadzor (State Commission on Mining Technical Control) and Goscomecologia (State Committee on Environment), the documents determining precise boundaries of the mining allotment are included in the license as its integral component. The interior user, who has obtained a mining allotment, has an exclusive right to use within its boundaries in accordance with a granted license. Any activity, connected with interior use within the mining allotment, may be carried out only with the consent of the interior user whom it is granted to.

There is also a concept of geological allotment which concerns only the licenses for geological study with minimal impact to notable disturbance of the interior integrity. Unlike the mining allotment, the geological allotment may be used for carrying out activities on geological study of the interior by several licenses, both similar and different by purpose. In this case, the relations between owners of licenses, implementing their activities within the same geological allotment, are determined in the license. Besides, the mining permit shall be limited by depth, whereas the depth of the geological studies is not limited.

2.1.4 Agreement on Production Sharing

The Agreement on Production Sharing (PSA) is a document in accordance with which the Russian Federation concedes to a representative of enterprising activity (referred hereinafter as investor) on the retribution basis and for a certain period the exclusive rights to

prospecting, exploration, development of raw mineral resources in an area of the interior, indicated in the Agreement, and to the related activities, whereas the investor pledges himself to implement the above-mentioned activities at his own expense and risk. The PSA defines all necessary terms connected with the interior use, including the terms and procedure of production sharing between the sides of the PSA in accordance with the statements of the Federal Law «On Agreements on Production Sharing».

The issues regulated by the Law include the relations arising in the course of prospecting, exploration and development of mineral resources, sharing of production, as well as its transportation, treatment, storage, processing, usage, realization or disposal of the production in another way.

Lists of interior allotments, for which PSA can be granted to an investor, are established by Federal Laws.

The PSA connected with the use of allotments on continental shelf, the exclusive economic zone (EEZ) and in areas referred to special State strategic interests, equally as the agreements concluded without conducting a competition or auction, are approved by the Federal Law.

Development of terms for interior use and preparation of projects of an agreement for each are implemented by a commission established by the Russian Federation with the consent of the executive authorities of an appropriate Russian Federation administrative region.

The agreement is concluded by the State with the winner of competition or auction not later than one year after the day of the competition except the cases stipulated by the Law.

The project of agreement shall envisage the requirements of rational use and protection of the interior, defined by the Law of the Russian Federation on Interior. If a granted allotment lies on continental shelf and/or within the EEZ, the agreement on PSA is signed by the Russian Federation Government (appointed agency - the Ministry of Fuel and Energy of the Russian Federation) with the consent of executive authorities of an Russian Federation administrative region.

The activities stipulated by the PSA shall be implemented following the requirements of the Legislation of the Russian Federation, as well as the standards (rules, norms), approved in the established order, on safety of work, protection of the interior, environment and health of people. Herein, the sides can agree upon the application of international standards used on safety of activities on prospecting and development of mineral resources, provided if the above-mentioned standards are preliminarily approved by appropriate state authorities of the Russian Federation.

2.2 Legal Regulation of Water Use

The Water Code of the Russian Federation (1995) defines the relations regulated by the Water Legislation of the Russian Federation as the relations concerning lands, forest, interior, vegetation and animal worlds, atmospheric air, that arise while use and protection of water objects, regulated to the extent that is enough for rational use and protection of water. The subject of water relations is a water objects or a part of it. Depending on physic-geographic, hydrological regime and other characteristics, water objects are subdivided into the following types: surface water, domestic sea waters, territorial ocean of the Russian Federation, underground water.

According to the Water Code of the Russian Federation, the general requirements to protection of water objects are: preservation of water objects, prevention of pollution and depletion of them, and liquidation of consequences from the above phenomena. While using water resources, citizens and juridical bodies are obliged to implement industrial-technological, land-reclamative, agrotechnical, hydrotechnical, sanitary and other measures

that would provide protection of water objects. Extraction of useful minerals from the bottom of water objects or siting of constructions with a bearing basement on a bottom must be performed by the techniques which would not exert an adverse influence upon surface water, bottom, shores of water objects, and upon aquatic bio-resources.

The Water Code of the Russian Federation defines the specific features of protection of ground water objects. Citizens and juridical bodies, whose activity exerts or can exert an adverse influence on the state of ground water resources, are obliged to take measures that would prevent contamination, choking up and depletion of water and an impact on the resources. Installation and operation of wells and the utilization of worked-out mineral deposits for disposal of waste and drainage water are permitted with observance of the requirements stipulated by the Russian Federation Water Code and the Law of the Russian Federation on Interior. Self-flowing and exploratory wells and those that are decommissioned are to be equipped with regulating devices, conserved or liquidated in the established manner. In cases where an aquifers are penetrated measures shall be taken, in the established manner, to protect the ground water resources and the information shall be provided to local authorities, specially authorized State Organs in the field of environmental protection, a State Organ on management of use and protection of the interior, and to a specially authorized State Organ on management of use and protection of water resources fund.

While geological study of the interior, exploration and development of useful minerals, construction and exploitation of underground structures which not connected with extraction of useful minerals, the interior users are obliged to avoid pollution and depletion of water objects.

An administrative and juridical liability is stipulated for violation of the water legislation. Citizens and juridical bodies who have caused a damage to water objects, shall indemnify it at their own free will or by judgment of court or arbitrage court in accordance with methodical procedures for evaluation of the damage brought to water objects or if such procedures are not available, by factual expenses for restoration of water objects taking into account the sustained losses, including financial loses.

The State represented by organs of MNR of Russia implements the control over use and protection of water objects. According to the Statute on State control over use and protection of water objects, these organs:

1) implement the State control over:

- following the requirements of the Russian Federation Water Legislation, standards, regulations, rules and other regulatory acts having a compulsory force for all water users while carrying out all types of work connected with use and protection of water objects, including domestic sea water and territorial ocean of the Russian Federation;
- following the legally-established procedure of granting licenses for use of water objects and concluding agreements on use of water objects, in-time and proper registration of licenses and contracts on use of water objects;
- following the legally-established procedure of State monitoring of water objects, State Water Cadastre and the State balance of surface and ground water in respect of use and protection of water objects;
- following standards and requirements contamination of water bodies by discharged waste water and wastes from treatment systems, facilities, and other sources;

2) jointly with the Goscomecologia implement the unified scientific-technical policy in formation of a regulatory-methodical base of the State control over use and protection of water objects; observance of the requirements of environmental protection in the use of water objects, and the requirements established by the Law for monitoring of water pollution sources;

3) jointly with the Gosgortechnadzor implement supervision over following the legally-established procedure of use of water objects and their bottom for extraction of useful minerals, performance of drilling operations, construction of underground structures, laying of pipelines, explosion- and other works.

2.3 Legal Base of Land Use

Land Code of the RSFSR (1991) with amendments and additions regulates the relations on use of land allotments for prospecting activities. The Code defines, in particular, the rights of enterprises, institutions and organizations to carry out prospecting activities. In particular, the basic obligation of enterprises is to restore land allotments at their own expense to the state suitable for purposeful usage.

Lands, occupied by water bodies as lands of the water fund, can be used for:

- construction and operation of installations;
- water-management purposes;
- agricultural purposes;
- environment-protection purposes;
- industrial and other State and public needs.

The State control over use and protection of lands is implemented by the appropriate State executive authorities.

The goals of the State control over use and protection of lands include: observance, by all State and public agencies, enterprises, institutions and organizations, as well as by citizens, of the requirements of the Land Legislation for the purpose of effective use and protection of lands.

The analysis of the Russian Federation Land Code has revealed the following: No norms that would regulate the relations on environmental safety of work while development of useful minerals are available in the Code. This is explained by that relations on development of useful minerals on continental shelf and issues on environmental safety of work on continental shelf have been regulated in a special regulatory-legal Act - the Law of the Russian Federation «On Continental Shelf of Russian Federation», whereas the Land Code of the Russian Federation includes only a claim that the Land Law can regulate this group of public relations. Thus, the relations on environmental safety of work while development of useful minerals on continental shelf are regulated also by the norms of the Land Law. However, the priority in legal regulation of relations on environmental safety of development of useful minerals on continental shelf belongs, nevertheless, to special laws.

2.4 Legal Base for Providing Industrial Safety

The basic legislative Act regulating the problems of industrial safety in the Russian Federation is the Federal Law «On Industrial Safety of Hazardous Industrial Objects» (1997).

This Law directly concerns the activities on oil and gas development on continental shelf, as all constructions connected with the entire vital cycle of these activities represent, to their considerable extent, hazardous industrial objects. The Law defines the basic legal norms of industrial safety, including in particular:

1) licensing types of activities in the sphere of industrial safety;

Activity on designing, construction, exploitation, extension, reconstruction, technical re-equipping, conservation and liquidation of a hazardous production object; on manufacturing, assembling, adjusting, maintenance and repairs of technical facilities used at a hazardous

production object; conducting an review of industrial safety; training of personnel working at a hazardous production object in non-educational institutions can be implemented on the basis of an appropriate license granted by the Gosgortechnadzor or its territorial subdivision.

When considering the question on granting a license for the operation of a hazardous production object, the applicant represents to the Gosgortechnadzor together with the documents, defined by the Laws and other legal Acts of the Russian Federation, also the following documents:

- document on formal approval of hazardous production object for exploitation or positive decision of the expertise of industrial safety;
- declaration of industrial safety of hazardous production object.

The license for the operation of a hazardous production installation is added with a notice saying that the applicant must have, by the start of exploitation and during the entire period of exploitation of hazardous production object, an insurance agreement for the risk of amenability for sustained damage during operations.

2) requirements of industrial safety to designing, construction and formal acceptance to exploitation of hazardous production object;

One of mandatory conditions for taking a decision on start of construction, expansion, reconstruction, technical re-equipping, conservation and liquidation of a hazardous production object is the availability of positive solution of expertise of industrial safety of project documentation, approved by the Gosgortechnadzor.

Deviations from project documentation in the course of construction, expansion, reconstruction, technical re-equipping, conservation and liquidation of hazardous production object are not permitted. Changes, introduced into project documentation, shall be subjected to expertise of industrial safety and agreed upon with the Gosgortechnadzor.

In the course of construction, expansion, reconstruction, technical re-equipping, conservation and liquidation of a hazardous production object, the developer of project documentation must do an author's supervision according to established procedures.

In the course of formal acceptance for the operation the operator must document readiness for the containment and elimination of accidents.

3) production control over observance of requirements of industrial safety;

An organization exploiting a hazardous production object is liable to organize and implement production control over observance of requirements of industrial safety in accordance with the requirements established by the Government of the Russian Federation. Information on organization of production control over the observance of requirements of industrial safety, and on people authorized to implement this control, shall be represented to the Gosgortechnadzor.

4) expertise of industrial safety;

The following is to be subjected to review:

- project documentation on construction, expansion, reconstruction, technical re-equipping, conservation and liquidation of a hazardous production object;
- technical facilities to be used at a hazardous production object;
- buildings and constructions at a hazardous production object;
- declaration of industrial safety and other documents connected with exploitation of a hazardous production object.

The industrial safety expertise is fulfilled by organizations that have a license for carrying out the above-mentioned expertise at the expense of the organization that is proposed to exploit or already exploits a hazardous production object. The result of the expertise of industrial safety is a solution. Having represented to the Gosgortechnadzor, it is considered and approved in the established manner. The procedure of expertise of industrial safety and

requirements to preparation of a solution of expertise of industrial safety are established by the Gosgortechnadzor. The expertise of industrial safety can be carried out simultaneously with other kinds of expertise in the established form.

5) federal supervision of industrial safety.

Federal supervision of industrial safety is organized and implemented in accordance with the Law of the Russian Federation and for the purpose of checking how organizations, exploiting hazardous production objects, implement the requirements of industrial safety, and is fulfilled on the principles of sovereignty and independence from organizations under supervision.

Federal supervision of industrial safety is implemented by the Gosgortechnadzor, its territorial subdivisions and other federal agencies of executive authorities in accordance with the Law of the Russian Federation.

It should be noted that, in total, the Federal Law «On industrial safety of hazardous production objects» creates the legislative base for regulation of problems of industrial safety at the objects of oil and gas development. However, preparation of a number of regulatory-legal acts which shall take into account the specific features of designing, putting into operation, exploitation, conservation and liquidation of oil- and gas-producing objects on continental shelf, and coordinate the activities of authorities of federal and regional levels, controlling and supervising agencies, on different aspects of industrial safety of objects.

2.5 Legislative, Normative-Legal Base of Environmental Protection and Provision of Environmental Safety

2.5.1 Environmental Legislation

The basic document of the environmental legislation is the Law of the Russian Federation «On Environment Protection» with amendments (1993).

When implementing economic activity exerting an adverse influence upon the environmental state, local authorities, other State agencies, enterprises, institutions, organizations, as well as citizens of the Russian Federation, foreign juridical bodies and citizens, persons without citizenship are obliged to follow the principles of environmental protection, in particular:

- rational use of natural resources taking into account the laws of nature, potential capacity of the environment, necessity to renew natural resources and not allowing irreversible consequences for the environment and health of people;
- following the requirements of the environmental legislation; inevitability of coming the amenability for violation of these requirements;
- dissemination of information to public organizations and population in solution of environmental problems;
- international cooperation in protection of the environment.

Environmental objects to be protected include interior, land, ground water and others. Therefore continental shelf including mineral and living resources is the object of the environment protection. Respectively relations arising with development of useful minerals on continental shelf, are regulated besides the Russian Federation Law «On Continental Shelf of the Russian Federation» also by the norms of the environmental legislation.

Location, designing, construction, reconstruction, putting into exploitation of enterprises, buildings and other objects imposes certain environmental requirements:

- to follow the requirements of environmental safety and protection of people’s health;

- to envisage the actions on protection of the environment, rational use and renewal and/or remedial of natural resources;
- to keep account of the local and remote environmental, economic, demographic, moral consequences from activities of the above-named objects with priority to be given to protection of health and welfare of population;
- to have a positive solution of specially authorized State organs of the Russian Federation of environmental protection, sanitary-epidemiological service and a solution of local authorities; when necessary while erection of objects interrelated with environmental interests of population, the decision is taken by results of discussion or referendum;
- to implement the best available and appropriate technology to restrict the maximum permissible loads upon the environment; to implement reliable and effective measures of warning, elimination of pollution of the environment by hazardous wastes, their remedial and utilization, introduction of resources-saving, low-waste and wasteless technologies of production.

The violation of the above-listed requirements shall lead to the suspending of activities on location, designing, construction, reconstruction of environmentally hazardous objects in accordance with directions of specially authorized State organs of the Russian Federation in of environmental protection, sanitary-epidemiological supervision. Projects, that do not satisfy environmental requirements, are not to be approved, and operations on the implementation of these projects are not financed by appropriate bank departments.

In order to follow the requirements of the environmental legislation and standards on quality of the environment, the Law provides for environmental control. Its goals are to observe the state of the environment and its changes under impact of anthropogenic and other activities; to check plans and measures on environmental protection, rational use of natural resources and, hence, observance of the requirements of the legislation. The system of environmental control consists of a State Service of observation of the environment and state operational and public control.

The State Service of observation over the environment is implemented by specially authorized State organs of the Russian Federation in the field of environmental protection with participation of ministries and agencies with using the system of observations at water objects and others. Its goals are:

- observation over physical, chemical, biological processes occurring in the environment;
- observation over pollution of atmospheric air, water objects, consequences of its impact upon vegetation and animal world;
- provision of interested organizations and population with current and emergency information on changes in the environment, warning and prediction of its state.

The State environmental control in the Russian Federation is implemented by the Federal Assembly of the Russian Federation, representative authorized organs of the Russian Federation Republics, the Government of the Russian Federation, the Governments of the Russian Federation Republics, appropriate local authorities, as well as specially authorized State Institutions of the Russian Federation and its Republics in the field of environmental protection, sanitary-epidemiological supervision.

For infringements of the environmental Law, illegal actions breaking the environmental legislation and bringing a damage to the environment and human health, officials and citizens shall bear disciplinary, administrative or juridical, civil-legal, material amenability; enterprises, institutions, organizations-administrative and civil-legal amenability in accordance with the Law of the Russian Federation «On Environment Protection», other Legislative Acts of the Russian Federation and Subjects of the Russian Federation.

Officials and citizens, enterprises, institutions, organizations, guilty in committing infringements of the environmental Law, namely:

- non-observance of standards, norms and other regulations of the environmental quality;
- breaking of environmental requirements in planning, feasibility study, designing, location, construction, reconstruction, putting into operation, exploitation of enterprises, installations, technological lines and others;
- pollution of the environment;
- non-fulfillment of obligatory measures on restoration of the deteriorated environment and reproduction of natural resources;
- contempt of directions of authorized organs implementing the State environmental control and others,

are subjected to a fine imposed in the administrative manner. Concrete size of a fine is defined by an authority, imposing the fine, depending on character and type of a committed infringement, a degree of guilt for committed infringement and damage caused.

The Law of the Russian Federation «On Environment Protection» defines obligations on compensation of a damage caused by an environmental infringement, i.e. concretizes the statutes of the Civil Code of the Russian Federation as applied to the Law on the environment and taking into account the specificity of public relations regulated by this Law.

Additionally, the relations, connected with environmental safety in development of useful minerals on continental shelf, are regulated also by other regulatory-legal Acts, which are described below and in Chapter 4 of the given Feasibility Study.

2.5.2 Regulation of Relations on Environmental Safety of Activities on Oil and Gas Development on Continental Shelf. Control and Supervision Over Implementation of Requirements

For implementation of the requirements of the Russian Federation Laws on environmental safety of activities on useful minerals development, it is necessary, in the first turn, to carry out environmental expertise. The Law of the Russian Federation «On Environmental Expertise» from November 23, 1995 gives a definition of the environmental expertise. Namely, the environmental expertise is ascertainment of compliance of planned activities with environmental requirements, and determination of permissibility to implement an object of environmental expertise for the purpose to prevent possible adverse influences of these activities on the environment and the related social, economic and other consequences.

According to the Russian Federation Law «On Continental Shelf of the Russian Federation», the State environmental expertise on continental shelf is the obligatory measure on protection of mineral and living resources, as carried out by a specially authorized federal organ in the manner stipulated by the Legislation of the Russian Federation.

Additionally, the State environmental expertise is compulsory for all types activity on continental shelf (and it underlined in the Law), not depending on their cost estimation. All types of activity, including the development of useful minerals, can be fulfilled only when a positive solution of the State environmental expertise is available. The subjects of the State environmental expertise must be drafts of federal programs and plans, pre-planned, pre-projected and projected documentation concerning regional geological study of continental shelf, prospecting, exploration and development of mineral resources.

The given Law defines authorized organs on protecting continental shelf, its mineral and living resources. Namely, the following organs implement within their competence the protection for the purpose of preservation of the resources, their protection and optimal use, defense economic and other lawful interests of the Russian Federation:

- boarder guard;
- MNR of Russia;
- Gosgortechnadzor of Russia;
- Federal Service on Fisheries;
- Goscomecologia of Russia.

The Russian Federation Law «On Continental Shelf of the Russian Federation» stipulates the responsibilities of the officials for the agencies listed above. In addition, the duties of officials of these agencies are defined in appropriate Statutes.

Currently international cooperation on questions of environmental protection and protection of marine ecosystems has become more common.

Activities for use of natural resources, environmental protection of inner marine waters and territorial seas is regulated by the Federal Law «About inner marine waters and territorial seas and adjacent zones of the Russian Federation» (No.155-FZ dated 07.31.1998).

The Law defines the main principles of economic relations during use the natural resources of inner and territorial seas, including:

- payments for use;
- responsibility for violation of economical activity conditions;
- compensation for damage to inner marine water and territorial seas, their natural resources, environment, historical and cultural monuments;
- financial provision of activities connected with natural resources restoration and protection of inner marine waters and territorial seas environment, historical and cultural monuments (Article 21).

Procedure and forms of implementing rights of authorities of the Subjects of the Russian Federation, territory of which is adjacent to inner marine waters and territorial seas, as established by the legislation of the Russian Federation, concerning investigation, exploration, operation and protection of aquatic bioresources and other natural resources of inner marine water and territorial seas, environmental protection and provision of environment safety, activities on specially protected natural areas, protection historical and cultural monuments are defined according to agreement between Federal authorities and corresponding authorities of the Subject of the Russian Federation (Article 20).

Preservation of marine environment of inner marine waters and territorial seas in state corresponding to environmental requirements is provided establishing and implementing of norms of maximum permissible concentration of hazardous substances and normative for maximum permissible adverse impacts on marine environment and natural resources of inner marine waters and territorial seas as well as other requirements and measures established by the legislation of the Russian Federation for environment protection and Water Legislation of the Russian Federation.

The procedure of developing and approving of norms for maximum permissible concentration of dangerous substances and norms for maximum permissible dangerous impacts to marine environment and natural resources of inner marine waters and territorial seas is established by the Government of the Russian Federation (Article 33).

The Law prohibits disposal of wastes and other materials and discharge of dangerous substances into inner marine waters and territorial seas (Article 37).

However, removal of wastes and other materials which are a result of normal operation of artificial islands, units and installations and are not exceeding maximum permissible concentration of dangerous substances and norms of maximum permissible dangerous impacts on marine environment and natural resources, is not considered as disposal. At the same time, the discharge of dangerous substances which is being done during exploration, operation and

processes connected with treatment of mineral resources in the sea, is not considered as discharge of dangerous substances as well.

Activities connected with wastes handling are regulated mainly by federal law «On wastes of production and consumption» (No. 89 F3 06.24.1998).

The Law defines the necessity of licensing of activities related to dangerous wastes handling (drilling wastes and oil and gas production wastes in its considerable part are considered as dangerous wastes (Article 9).

Dangerous wastes, depending of their danger for the environment and the human health, are subdivided into classes of danger using criteria established by specially appointed Federal organs of the executive authority in respect of wastes handling in the frame of their competence (Article 14).

Establishing and implementing the state control and supervision for activities in respect of wastes handling on the federal level and on the level of the Subjects of the Russian Federation has to be arranged. The Federal authorities rights include establishing state standards, rules, norms and requirements to safe wastes handling and establishing the state registration and reporting in respect of wastes handling.

The law prescribes the preparation of the passport for dangerous wastes. The passport has to be prepared on the base of data about content and features of dangerous wastes, estimation of their danger. Passportization procedure of wastes is defined by the Government of the Russian Federation (Article 14).

International cooperation is being widely developed now in problems of the environment protection including protection of marine ecosystems against pollution. It includes:

- assistance in cooperation of countries in study and use of marine ecosystems;
- control of international organs and countries over implementation and observance of commitments on protection of marine ecosystems against pollution;
- obligatory use by countries of international standards in protection of marine ecosystems against contamination;
- obligatory consultations in case of a pollution threat to marine ecosystems of coastal countries;
- possibility to help in case of pollution of marine ecosystems in coastal countries.

The environmental safety principle is reflected in the responsibility of countries to carry out any activity in such a way as to avoid hazardous pollution of ecosystems, not to bring a damage to territory of other countries.

The environmental safety in the course of any activity of countries in the world ocean is defined in a number of international agreements in particular, the UN Convention on the Law of the Sea which is in some way «all-inclusive constitution for the ocean».

For the purpose of resource management the Convention stipulates the rights of coastal countries to carry out exploration, development and preservation of natural resources, both living and non-living in the marine environment including the seabed and interior.

The Convention provides a coastal nation with especially severe climatic conditions the right to make and enforce laws and rules in its EEZ on the prevention, reduction and control of marine pollution.

Environmental safety standards contained in a number of multi-lateral agreements reflect the influence of the Convention on modern International law.

A more detailed discussion of normative regulation of environmental safety in oil and gas production on the shelf, including environment impact assessment (EIA) is given in Chapter 4 of this Feasibility Study.

2.5.3 Licensing of Environment-Protection Activity

The licensing of environment-protection activity is being implemented in accordance with the Procedure of granting (abolishing) licenses and permits for particular types of activity developed according to the Decree of the Government of the Russian Federation and the Statute on licensing of particular types of activity in the environment protection approved by the Government of the Russian Federation.

The following types of activity are to be licensed:

- utilization, storage, transportation (including trans-boundary), storage, disposal, annihilation of industrial and other wastes, materials and substances, except radioactive ones;
- environmental passportization;
- environmental certification;
- environmental audit;
- activities connected with works (services) of environment-preserve purpose;
- emissions, discharges of pollutants into the environment, as well as hazardous physical influence on the environment, and others.

The basic condition for obtaining a license and permit is the compliance of conditions of the activity with the requirements of the Legislation of the Russian Federation.

Consideration and approval of a decision on granting (abolition) of licenses and permissions are fulfilled by the Commission on Licensing of the Goscomecologia of Russia or its territorial organs (referred hereinafter as licensing organs). The Commission on Licensing is established by decree of a licensing organ. When necessary, the licensing organ develops and approves documents specifying and formalizing particular elements of the licensing procedure for particular types of activity in the environment protection. The applicant is granted an individual license for carrying out each of the above-mentioned types of activity. It is prohibited to pass licenses from one enterprise or physical person to another. The applicant who is refused a license, can again apply, after elimination of reasons of the refusal. Reconsideration of the application is implemented in accordance with the rules established for obtaining licenses and permissions. If a licensed activity is to be carried out at several separated installations, the licensee is given, certified and registered copies of the license with indication of each object location. Documents and materials represented for preparation of a license and registered by the licensing organ (except originals) are not returned to the licensee, whatever decision is made. The license issued by Goscomecologiya of Russia is registered in its territorial organs, on whose territories the licensed activities are planned.

2.5.4 Public Participation in Taking Decisions on Construction of Objects of Oil and Gas Development

Public participation in consideration and decision-making on construction or reconstruction of an installation with a possible environmental impact is a necessary and important component of the citizens right to influence appropriate life habitat.

The Law «On Environment Protection» states that enterprises, constructions and other installations are to be sited observing the requirements of the environment protection, rational use and renewal of natural resources, considering current and remote environmental... consequences from the activity with a priority to be given to health and welfare of people. When necessary, siting of objects that influence environmental interests of population the decision is made by the results of discussion or referendum.

According to the given Law, installations are put into exploitation by acts of accepting commissions, hereby the chairman and members of accepting commissions bear personal responsibility for infringement of the procedure of accepting objects in accordance with the administrative and juridical legislation. It is prohibited to construct and reconstruct objects before designs and land allotments are approved; it is not permitted to introduce changes into approved design or cost estimates to the detriment of the requirements of environmental safety.

The State guarantees to environmental and other public associations the possibility to implement the rights granted to them in the environment protection in accordance with the legislation of the Russian Federation and Subjects of the Russian Federation. Executive and administrative agencies, specially authorized State agencies in the environment protection, their officials are obliged to render all possible assistance to public associations and citizens in implementation of their environmental rights and duties, take necessary measures on implementation of their proposals and demands in organization of environment-protection activity.

Persons who obstruct public associations and citizens to exercise their environmental rights and duties connected with the Constitution of the Russian Federation and the requirements of law are imposed to disciplinary, administrative and civil responsibility in accordance with the Legislation of the Russian Federation and its Subjects.

An environment impact statement required by construction norms and rules is the subject of public discussion with the purpose to reveal and register all possible environmental and related consequences from carrying out a planned activity.

The Law stipulates rights for citizens and public organizations allowing them to participate in discussions of projects affecting the environment. Citizens can participate in sessions, mass-meetings, pickets, mass-processions and demonstrations, petitions, referendums, devoted to location, designing, reconstruction of enterprises, in discussions of plans and programs. An important power is the right to require from appropriate authorities timely, complete and reliable information on the environmental situation and measures on its protection. Citizens can demand in administrative or legal form to revoke decisions on siting, planning, construction, reconstruction of environmentally hazardous installations, to raise questions on imposing penalties on guilty juridical and physical persons and to bring action of compensation for damage made by environmental infringements to health and property of citizens.

Additionally, public environmental associations are entitled to recommend their representatives for participation in the State environmental expertise on issues of siting and designing of installations, carry out public environmental expertise, demand of appointment of a State environmental expertise, to publish their environmental concept in mass-media.

2.6 Legislative Support of Labor Protection

The Legislation of the Russian Federation on labor protection consists of appropriate regulations of the Constitution of the Russian Federation, Foundations of the Russian Federation Legislation in the labor protection, issued in accordance with the legal and other normative Acts of the Russian Federation and its Republics. Here, under «labor protection» one means a system of safety provision for life and health of workers in the course of activity, including legal, social-economic, organizational-technical, sanitary-hygienic, curative-prophylactic, rehabilitative and other measures.

The Foundations of the Russian Federation Legislation on labor protection (1993) establishes guarantees for workers specifically regulating the relationship between employers

and employees at enterprises, institutions and organizations of all forms of ownership. The purpose of the regulations are to create satisfactory working conditions and protect the life and health of employees.

The management of labor protection is carried out by a State Organ, the functions and powers of which are determined by the President of the Russian Federation or on his behalf by the Government of the Russian Federation. Presently, such organ is represented by the Ministry of Labor and Social Policy of the Russian Federation (Mintrud of Russia).

Regulations and rules on labor protection, approved by Mintrud of Russian are applicable to all enterprises and ministries of the Russian Federation independently of ownership forms and kinds of economic activity.

Ministries and agencies of the Russian Federation, as well as concerns, associations and other groups of enterprises are obliged to establish services of labor protection or employ labor protection specialists on a contract basis. Structures and number of workers for such services at enterprises are determined by the employer taking into account the recommendations Mintrud of Russia.

For the purpose of organizing cooperation on labor protection between employers and employees and/or their representatives, an enterprise with a staff of more than 10 persons establishes a joint committee (commission) on labor protection, which includes, on the parity basis, representatives of employers, trade unions and other representative organs authorized by workers. The responsibility for conditions and protection of labor at an enterprise is lain on the employer.

Public control over the observance of lawful rights and interests of workers is fulfilled by trade union within their appropriate organs, and by other representative organs, authorized by workers, which can establish their own inspection bodies.

The Decree of the President of the Russian Federation has approved the Statute on federal labor inspection under the Mintrud of Russia (Rostrudinspekcia).

The basic tasks of the Rostrudinspekzia and its State labor inspections are the following:

- state supervision and control over following the Russian Federation legislation on labor and protection of labor, as well as the related legislative and normative legal Acts on compensation of the damage to workers health, social insurance...;
- protection of labor rights and achievement of safe labor conditions for workers, as well as protection against illegal actions by employers, officials and other managing persons of enterprises;
- development of proposals to improve the laws and normative legal acts on labor protection...;
- training for employers and employees to become proficient in the legislation and acting regulations of labor protection... The Rostrudinspekcia gives resolutions on drafts of construction norms and rules (SNiP) and other regulatory documents concerning their compliance with the requirements of norms and rules on labor protection;
- participation in development of standards on labor protection;
- control over observance of the established procedure of investigation and account of production accidents.

The more detailed description of normative support of labor protection during oil and gas development on the Arctic shelf is given in Chapter 5 of this Feasibility Study.

2.7 Normative Support of Industrial, Environmental Safety and Labor Protection

2.7.1 General Statements

The implementation of a safety concept in oil and gas production on the shelf implies the use of a system of normative-technical documents, which satisfy the structure of federal executive agencies, their controlling and supervising functions, the sharing of responsibilities between the Federal Center and Subjects of the Russian Federation as well as satisfy the requirements of a system approach to account for international experience of normative-legal regulation of offshore safety problems.

Many Federal organs of Federal authority, in the frame their competence, are accepted the normative documents regulating problems of industrial, environmental safety and labor protection. For instance, Gosstroy of Russia is accepted construction norms and rules (SNiP), a number of rules for design and other normative documents. Gosgortechnadzor of Russia is accepted rules, requirements and instructions, Gosstandard of Russia - state standards, Gosepidnadzor (Federal Service on Sanitary and Epidemiological Supervision) - sanitary rules and norms (SanPiN), gygyenical normative and other. Normative documents approved by federal organs which provide control and supervision in corresponding fields of activities are obligatory.

2.7.2 State Standards

In accordance with the Russian Federation Law «On Standardization», the State standards are accepted by the Gosstandard of Russia, whereas in the construction industry and the industry of construction materials - Minstroy of Russia.

Requirements, defined by State standards for providing production safety, works and services for the environment, life, health and property, for providing technical and informational compatibility, exchangeability of products, unity of methods, control over them and unity of marking, as well as other requirements, established by the Law of the Russian Federation, are obligatory to all State executive authorities, subjects of economic activity.

This Feasibility Study considers only the State standards that are applied to the given Project, namely, the standards concerning the problem of normative support of work safety, i.e. on environmental protection and safety in emergency situations.

2.7.3 Branch Standards, Agencies Norms, Guidelines, Regimens

At the present time, the problematic sphere of designing and construction of oil and gas production installations on the continental shelf of Russia includes about a thousand of normative-technical documents, many of which are adopted from the branches of production, transportation and storage of oil and gas as well as regulatory documents of the former USSR - Ministries of Energy, Transport Building, Water Management, Navy and others.

A part of normative-technical documents regulate procedures of engineering investigations: geodetic, hydrographic and other activities for installations of hydrotechnical construction, constructions of marine transport, equipping of marine oil and gas fields.

There are normative-technical documents regulating geophysical and geotechnological investigations geological formations and wells for oil and gas, determination of resources characteristics and others.

A considerable number of documents are devoted to normative regulation of the procedures for development, carrying out scientific research and experimental-design works, designs on construction, preparation and agreements of designing and technological documentation on development of deposits, their equipping, construction productive and other hydrotechnical objects.

The system of regulatory documents in designing norms, calculations and design rules, standards on fire safety, calculation of basements and foundations of hydrotechnical structures, reliability of constructions, engineering equipping of buildings and units, design of production objects, systems of collection and initial treatment of oil and gas contains over 250 documents. There are more than 70 documents on general positions and requirements to designing and construction of offshore stationary platforms and artificial island constructions and underwater oil and gas pipelines.

There are documents concerning production, acceptance of constructions with the requirements to bearing and fencing structures, protective coverings, performance of diving and underwater works, etc.

In the sphere of environmental protection, there are a few tens of departmental normative documents regulating particular technological processes in offshore oil and gas production in respect of their impact on the environment.

The analysis of the available normative-technical documents and experience of working out of investment projects on development of oil and gas fields on the shelf of the Barents and Okhotsk Seas of Russia show that the particular normative documents of the level of State departmental standards have considerable gaps in thematic spheres, unconformity with requirements of the modern normative-legal base, and lags behind the advanced scientific-technological level of normative-technical provision of work safety for marine oil and gas production accumulated in such countries as the USA and Norway.

Requirements to operational safety in exploration and development of oil and gas fields on the continental shelf of the former USSR, produced in 1980s, were based on the experience of oil and gas production in the Caspian Sea. These requirements concerned only one- and two-staged platforms, installed in water of unfreezing seas, and having a limited number of wells drilled from them and excluding safe storage of produced oil and others. The application of these documents to the Arctic continental shelf can be connected with considerable environmental consequences of regional or even global scale. This was justly informed, for example, in the Resolution of the Board of the USSR Minneftegasprom in 1990. Even relatively new regulations, such as «Rules of operational safety in oil and gas industry», approved by the Gosgortechnadzor of Russia in 1994, actually do not cover problems of industrial and environmental safety of works on exploration, development, equipping of wells on the sea shelf.

In accordance with the State Standard System of Russia standards of industrial branches are accepted by a State managing authority within its competence as applied to products, activities and services of branch importance. Under branch here one should understand a combination of subjects of economic activity, not depending on their branch affiliation and forms of ownership, developing and/or producing products (performing works or rendering services) of certain types, which have similar consuming or functional importance.

The standards of branches must not break obligatory requirements of the State standards, as well as rules and norms of safety, established by State supervising organs within their competence.

2.7.4 International Standards

International standards, approved by the International Standardization Organization (ISO) and International Electrotechnical Commission (IEC), regional standards, national standards of other countries are applied on the basis of international agreements (treaties) on cooperation or with permission of appropriate regional organizations and national authorities on standardization, provided that the requirements of these standards satisfy the demands of national economy.

In accordance with the statements of the State System of Standardization (GSS) of the Russian Federation, international and regional standards (on term if the Russian Federation will join them), as well as national standards of other countries (if appropriate agreements with these countries are available) are applied on the territory of the Russian Federation as State standards.

If an international, regional or national standard of other country, that is accepted to be used, contains references to standards not applied in the Russian Federation and where no State standards are available, it is necessary, before its application, to solve the problem on usage of these standards.

International, regional standards, national standards of other countries can be used as standards of branches, standards of enterprises before they will be approved as state standards.

The International Standardization Organization (ISO) has a number of Technical Committees (TC), the scope of activities of which corresponds to the problems considered in the given Project, including ISO/TC 8 «Shipbuilding and Offshore Constructions», ISO/TC 67 «Materials and Equipment, Offshore Platforms for Oil and Gas Industry», ISO/TC 21 «Tools of Fire-Protection and Fire-Fighting», ISO/TC 146 «Air Quality», ISO/TC 147 «Water Quality», ISO/TC 190 «Soil Quality», ISO/TC 207 «Environment Management» and others.

Chapter 3

Description of the Functioning Monitoring and Control Systems

3.1 Aims and Purposes of Geoenvironmental Monitoring

In accordance with the Resolution of the Government of the Russian Federation No.1229 «On Establishment of an Unified State Environmental Monitoring System (USEMS)», environmental monitoring implies: specialized observations over natural media, natural resources, vegetation and animal world, sources of anthropogenic impact; assessment of the state of the above-listed observation objects and prediction of their changes.

The purpose of the environmental monitoring is to provide appropriate information for management of the environment protection and preservation of favorable habitat for human life. The basic aim of the environmental monitoring is to reveal in proper time and reliably the zones of possible environmental risk and inform about it the interested consumers in order they could work out sustained and urgent actions on provision of environmental safety in Russia.

3.2 Analysis of the Existing Environmental Monitoring Systems

3.2.1 The Unified State Environmental Monitoring System (USEMS)

The following objects of environmental monitoring are defined as basic in the USEMS:

- natural environments and resources (atmospheric air, surface waters, sea waters, lands and soil cover, geoenvironment and mineral resources, vegetation and animal world);
- anthropogenic impacts and their sources (those which are connected: with supply into the environment toxic and environmentally hazardous substances causing deterioration of natural media; natural complexes and their components; extraction or change of natural resources);
- environmental systems, natural and engineering complexes;
- effects of habitat's factors on people health.

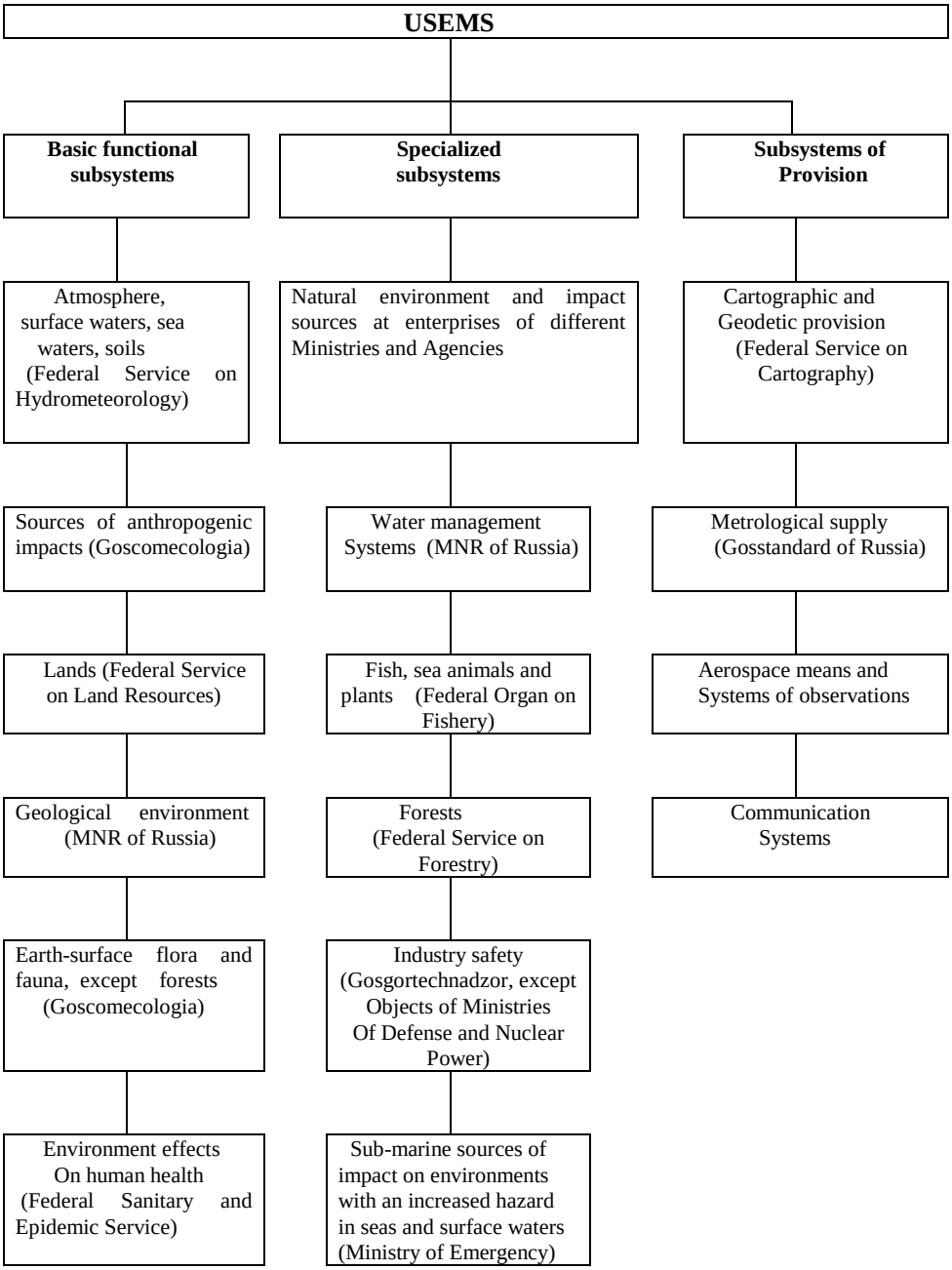
The basic purpose of the USEMS is to:

- assess and predict the natural environment state, levels of anthropogenic impact, characteristics of biosphere, functional integrity of environmental systems to be used for substantiation of correcting actions and means that would provide stable economic development, preservation favorable habitat for human life and environmental safety in the country;
- supply necessary information for federal authorities and other interested consumers in the field of environmental protection (EP) and rational use of natural resources;
- obtain reliable and comparable information on the state of the natural environment, biota and environmental systems, sources of anthropogenic impact, habitat's factors affecting people's health.

The USEMS operates on the basis of an unified organizational, methodological, metrological and informational approach in accordance with the territorial-departmental principle providing for the as much as possible use of abilities of existing federal and departmental monitoring systems.

The USEMS includes the basic functional, specialized and providing monitoring subsystems **(Fig. 3.1).**

Fig. 3.1. The USEMS subsystems



The territorial systems of environmental monitoring (TSEM) are established in the Russian Federation Subjects. They are the basic system-forming elements of the USEMS. Like the latter, the territorial subsystems are organized on the basis of basic functional and special subsystems with participation of the appropriate-level systems of provision.

Besides the above-mentioned subsystems, the territorial level includes also local environmental monitoring systems, established by enterprises and organizations that conduct economic activities on a given territory of.

The TSEMs are organized in the Russian Federation Subjects by unified methodological principles with the aim that the exchange information between them would be comparable. They include both a basic monitoring network of a federal level and an appropriate network for observing the objects interesting directly for a given Russian Federation Subject.

The TSEM shall solve the tasks of the USEMS on the territory of a certain Russian Federation subject taking into account:

- monitoring of objects through controlling parameters that are of a federal importance as well specific for a given territory;
- preparation of generalized data for informational systems of an upper hierarchical level.

Data from all the TSEM sections are collected in specialized centers of the basic functional and specialized subsystems. After being analyzed and generalized these data are transferred to appropriate federal (regional) centers of the mentioned subsystems.

To assess an anthropogenic impact from objects of economic activities, monitoring systems are established for controlling environment-affecting sources and the zones of their direct influence (impact monitoring). These systems operate within the appropriate functional and special USEMS subsystems.

The decisions obliging enterprises to arrange the mentioned monitoring systems are made by the authorities which issue licenses for certain types of natural resources use with the concordance with Goscomecologia and Federal Service on Hydrometeorology. The establishment of such impact-monitoring systems is financed from the budget of a Russian Federation Subject. The regulations of their operation are to be approved by the USEMS steering authorities.

Regional tasks of environmental monitoring can be solved by the USEMS of regional level.

The USEMS of federal level implements the following basic functions:

- generalization of data obtained at territorial or regional level;
- provision of data of a required quality at all levels of the USEMS;
- data provision of federal authorities for management of environment protection and safety;
- informing population and public of Russia about basic environmental characteristics on the territory of the country and large-scale trends in their change;
- providing proper operation of environmental monitoring subsystems having a federal importance, as well as of special monitoring systems that do not have territorial and regional levels;
- providing the Russian Federation participation in international including global systems of environmental monitoring.

To control the reliability and comparability of data within the USEMS a data-quality provision system is established the operation of which is implemented via federal centers coordinating the activity of appropriate basic functional and special USEMS-subsystems.

The USEMS takes part in international projects and programs on environmental monitoring, implements informational interaction with these systems, carries out works on concordance of methodology and metrological provision of monitoring.

3.2.2 Departmental Monitoring Systems

The general critical situation in science and branches of marine economy has led to a sharp decrease of field investigations, disorganization of formed informational fluxes and systems. All this is aggravated by commercialization of environmental data, which has already caused a disturbance in the information exchange and considerably narrowed the sphere of research activities. The efforts of data holders to preserve the monopoly on their archives and data bases with the hope to get profit from the use of them in future lead, finally, to this information becoming out of date and growth of expenses for its processing and storing.

In the recent years some ministries and agencies, the interests of which are closely connected with activities on the Arctic continental shelf, basing on the historically formed system of environmental data collection and adequately estimating the existing situation in Russia and its prospects for future, have forced the establishment of departmental specialized environmental monitoring services, using their own divisions. This has been done already before the Russian Federation Government Decree No.1229 «On Establishment of an Unified State Environmental Monitoring System (USEMS)». The specificity of economic or other activity has become the basis for the differentiation of these surveys. In the Arctic Region most developed presently are the departmental monitoring systems in the Barents Sea.

The monitoring systems of Federal Service on Hydrometeorology, Federal Service on Fishery, Military Marine Fleet (MMF), Norwegian SEAWATCH System and the System of the Russian Academy of Sciences are suggested to consider as examples of regional departmental surveys of environmental monitoring in the Barents Sea.

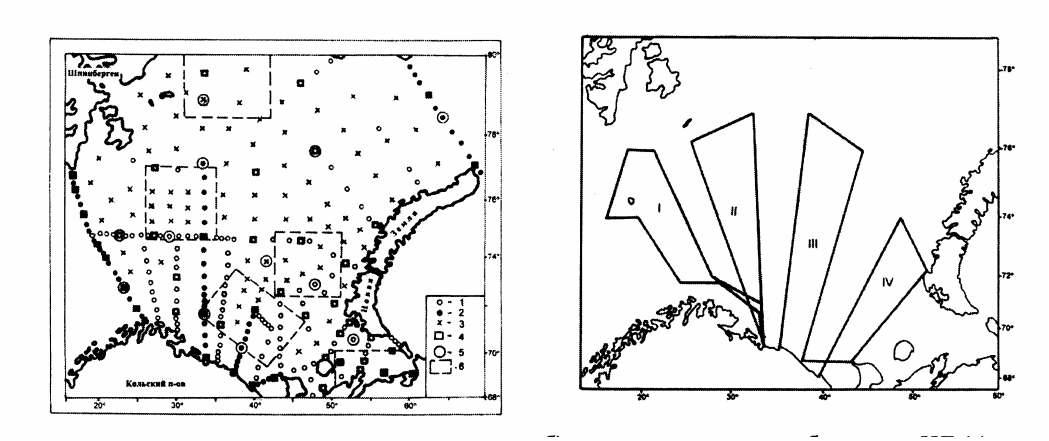
3.2.2.1 The System of the Federal Service on Hydrometeorology

At the present time the climatic and geochemical monitoring of the Barents Sea aquatory and its coasts is being implemented by the Murmansk Territorial Department of the Russian Federal Service on Hydrometeorology and Environmental Monitoring (Murmanskhydromet). The south-western aquatory of the Barents Sea (the Pechora Sea) is monitored by the North Territorial Department (Sevhydromet), the areas of the Novaya Zemlya Archipelago - by the Amderminsky Territorial Department. It should be noted that the Federal Service on Hydrometeorology Observation System does not cover the entire combination of marine natural processes. Its basic aim is to obtain necessary data on current hydrometeorological situation in the Barents Sea, short- and long-term hydrometeorological forecasting, control over the aquatory contamination. The coastal and on-islands stations are carrying out, within synoptic terms and by strictly regulated standard methodical procedures, daily meteorological observations over atmospheric pressure, wind, temperature and humidity of air, gas components content, precipitation, cloudiness, atmospheric phenomena and snow cover. The hydrological observations include measurements of sea water level, temperature and salt content of water, characteristics of brazed ice, and visual observations of the sea surface state.

The measurements are performed within a network the rigidly fixed standard hydrological cross-sections, including the sea stations of the All-State Environmental Observation and Control System (ASOCS) of Federal Service on Hydrometeorology. The given System of stations has been formed historically since the early 1920`s to the beginning of 1960`s. Initially it has been oriented only to study the hydrological regime and, in particular, spatial and temporal variability of hydrophysical fields. Temperature, salt content, limpidity, pH, oxygen, silicon, nitrogen, phosphorus and other parameters have been measured at the stations 3-4 times per year in an iceless period at standard levels from the sea surface to the bottom.

In mid 1980`s the implementation of the interdepartmental Project «Barents» has changed the regional measuring network. The Project included a number of large oceanographic experiments covering actually the entire aquatory of the Barents Sea (for example, «BAREX - 84», «BAREX-86» and others). This made possible not only to obtain the scientific data, but also to work out a new observation system serving as the basis of climatic and hydrochemical monitoring. A distinctive feature of the new observation system over the hydrological regime in the Barents Sea lies in that it provides for periodic performance of complex oceanographic surveys. The oceanographic surveys are being carried out within a general network of 285 stations **(Fig. 3.2a)**. The network has been constructed on the basis of the network of ancient and standard cross-sections added then by stations in the regions where observations are poor (e.g. the Barents Sea northern part, Central Depression area and others). The additional stations were installed taking into account the preliminary investigations of spatial statistic characteristics of fields of water temperature in different areas of the Sea, basic physico-geographical features (bottom relief, quasi-constant streams, etc.), and with the use of a special algorithm of objective analysis. The latter enables an estimation of errors in field restoration depending on location of observation points. The distance between stations in the general network is 60-65 miles in the northern part (decreasing to 40-45 miles in some areas with a more complicated structure of oceanographic fields), in the southern part – 30-35 miles. The shorter distances between stations (10-20 miles) remained on the long-term and standard cross-sections.

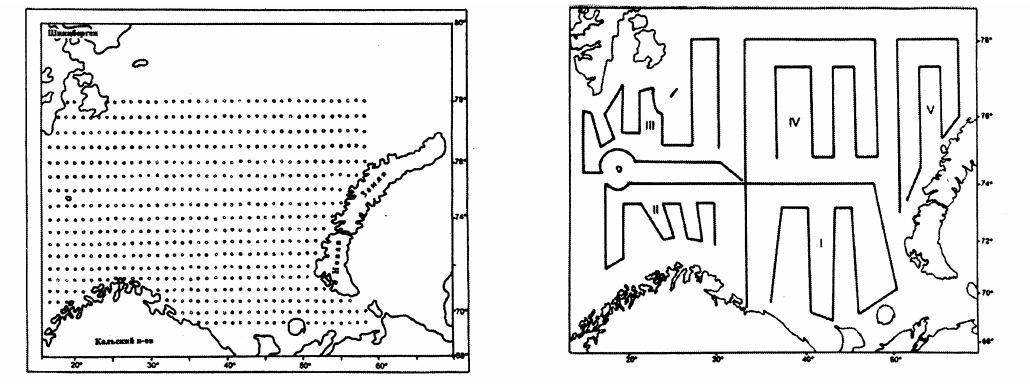
Fig.3.2 The observation network of Federal Service on Hydrometeorology in the Barents Sea



(a) grid of stations (b) air-tacks of an aircraft-laboratory IL-14

Stations: 1 – standard cross-sections; 2 – ancient cross-sections; 3 – additional Networks; 4 – ASOCS; 5 – bench-mark; 6 – areas of polygon (stationary) observations.

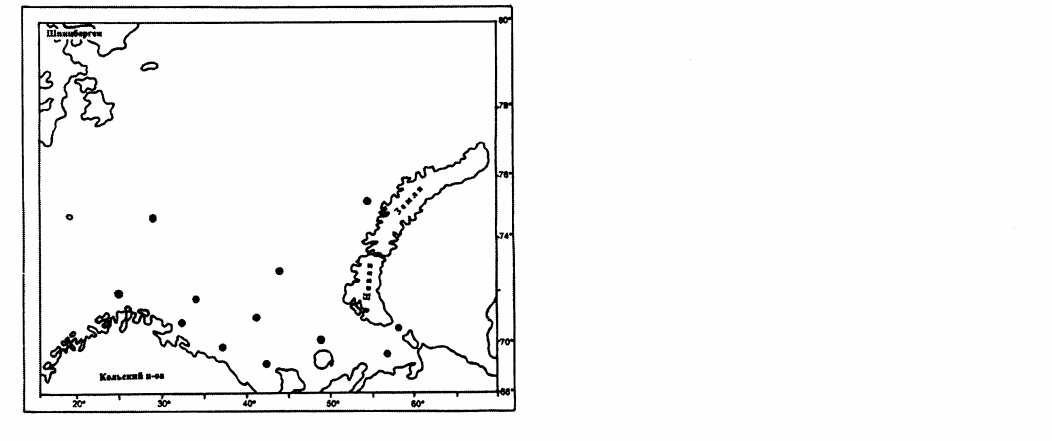
Fig.3.3 The observation network of Federal Service on Fishery



(a) grid of stations for trawl-acoustic surveying

(b) air-tacks of an aircraft-laboratory IL-18 DORR

Fig.3.4 Buoys' location of the Project SEAWATCH



The main methodical requirement to large-scaled oceanographic surveying are the shortened terms of their implementation in order the temporary variability of hydrophysical fields would not bring a notable misrepresentation of their spatial distribution. By the available estimates, the accepted duration of a single surveying of the entire Barents Sea is about 20 days.

By the end of 1980's the program of large-scaled annual oceanographic surveys of the Barents Sea has begun to be added with polygon works. The latter was caused, from the one hand, by a new understanding of the importance of the polar and near-edge frontal zones in the formation of the Barents Sea hydrological regime, and from the other hand, by the fact that large-scaled survey by a rather rarefied network of hydrological stations could not provide necessary information on occurring processes.

The use of remote sounding (RS) for regional climatic monitoring of the Barents Sea has also a long history. Since 1970's the air-thermal survey has been performed by the

Murmanskhydromet on the aircraft IL-14. A scheme of standard tacks was compiled for these purposes **(Fig. 3.2 b)**. It was oriented, first of all, to monitoring of ice-edge position and large-scaled background measurements of the water temperature field in the surface layer.

With introduction into operation of an aircraft-laboratory (AL) IL-18 DORR in 1986, the Department «Sevrybpromrazvedka» of Ministry of Fishery of the USSR has worked out and tested a new grid of air-tacks of climatic monitoring in the Barents Sea **(Fig. 3.3 b)**. The considerable disadvantage of it was, in spite of its higher detality against the grid of Murmanskhydromet and possibility of regular air-survey of the entire Barents Sea area, in the following: it did not take into account the regional features of hydrological regime and specific functioning of an ecosystem (e.g., the basic fishery areas are poorly studied). Therefore, aircraft flights by a tack grid were abandoned with transition to operative planning of routes.

The «BAREX-87» Program included the complex survey of the southern part of the Barents Sea along the grid of standard cross-sections, as well as the western, eastern and northern polygons.

This made possible to verify the use of remote sounding in the course of complex oceanographic surveys of the Barents Sea area from ships, aircraft's and Artificial Earth Satellites (AES), elaborate a method of complex experiments and interaction of participants in implementation of three-level research scheme «AES-aircraft-ship», and obtain information on a structure of hydrophysical fields and oceanic processes.

In the end of 1991 the system of climatic and hydrochemical monitoring in the Barents Sea began suffering a considerable crisis. In the first turn, this crisis was connected with the deterioration in the total economic situation of the country and insufficient financing from the state budget. From year to year Murmanskhydromet began decreasing its own program of field works. In 1991 the regular air-thermal survey was fully stopped. In 1994 the regular implementation of the major standard hydrological cross-sections was suspended. At the time being, purely provided is the operative forecasting of meteorological conditions in the Barents Sea. The basic data, here, are the co-performed measurements from non-specialized ships navigating in the Sea. The information from AESs is received regularly.

3.2.2.2 The System of the Federal Service on Fishery

The departmental environmental monitoring of fishing industry in the seas adjacent to Russia is performed by territorial research fishery institutes and the Center of branch monitoring system for fishery and sea biological resources. It includes the direct satellite monitoring of fishery areas in the north-eastern Atlantic, Barents, Baltic, Black and Caspian Seas.

The monitoring is implemented by six specialized research ships (SRS), SL AN-ZOD (earlier IL-18 DORR) and stations receiving data from AES INMARSAT-C/GPS and NOAA.

The basic aim of the monitoring is to collect necessary data on the state of fish populations of sea hydrobionts, predict and scientifically support fishery quotes, control of fishing (continuous observation of ship location in fishery areas, account of daily and single fish catch by each ship, information support of fishery guard vessels).

The data from AES and operative ship information from fishery areas are continuously transmitted to the Data Processing Center. Besides, a complex trawl-acoustic surveys of the Barents Sea area is being performed twice a year (before 1996 with the participation of foreign research ships from the organizations-members of ICES). The survey is implemented by a beforehand agreed-upon regular grid of stations, which can from year to year be partly transformed depending on a particular state of fishery objects **(Fig. 3.3)**.

The SL IL-18 DORR flights before 1992 were regular and had, depending on particular purposes, an average periodicity of 4 times per month. Later, the flights were sharply reduced. At the time being, SL AN-ZOD is used only episodically (2-3 times per year) for special operations, namely for survey of sea animals stocks, complex trawl-acoustic explorations, etc. Nevertheless, in spite of a decrease of measurements, the regional environmental monitoring system of the Federal Service on Fishery stays in the Barents Sea the only steadily functioning system able in full measure to solve the tasks entrusted.

3.2.2.3 The System of the MMF North Navy of Russia

The special monitoring of the Barents Sea for the MMF interests is implemented by the MMF Hydrographic Service of the North Navy. The MMF ships regularly collect necessary data on the environmental state over the entire Barents Sea aquatory and carry out specialized polygon works. Partly aircraft's and AESs are used for obtaining information. The data are transferred to the Hydrometeorological Center (HMC) of the North Navy. Also the Center receives information from Murmanskhydromet, Polar Institute of Fishing and Oceanography (PINRO) and others. The HMC implements a daily complex analysis of the current environmental state with the aim to provide solving the Navy tasks.

3.2.2.4 The SEAWATCH System

The implementation of the Project SEAWATCH has been started in the Barents Sea in 1993 by Norway (Oceanor Company, Trondheim) and Russia (MMBI KNC RAN, AMIGE, Murmansk City). The climatic and geochemical monitoring is performed with the aid of a system of automated buoy stations (ABS).

The SEAWATCH System consists of ABS Tobis with transducers, a data transfer system (transferring data in real time), and a data processing, representation and distribution system.

The buoys are supposed to be located as shown in **Fig. 3.4**. It is considered that this will make possible to:

- obtain information on state and changes in the marine environment including its contamination;
- obtain data on deviations of selected environmental parameters from standards;
- obtain environmental information which would serve as the basis for taking decisions in emergency situations (ES) with possible adverse economic or environmental consequences;
- create objective preconditions for working out a strategy to struggle with pollution; for working out methodical procedures for purification of industrial waste water and documentation of the results obtained;
- prevent accidents on sea, decreasing, thus, the risk of pollution of the marine environment through improving the quality of hydrometeorological forecasting for sea operations;
- obtain new knowledge on an anthropogenic impact on the environment, necessary in designing sea structures.

The SEAWATCH Project will be implemented in two phases: I – implementation; II – exploitation. Phase I includes:

- demonstrating to potential users the abilities of up-to date methods for environmental study, prediction and information transfer system;
- obtaining data for verifying places for buoy location;
- creating a necessary modern infrastructure for buoy-system management;
- adjusting the information and prediction system to regional consumers.

In 1994 two buoys were installed to perform measurements in the Barents Sea: the first – in the area of the Shtockmanovskoye Gas-Condensate Field; the second – in the area of Kanin Nos Cape.

3.2.2.5 The System of the Russian Academy of Sciences

The environmental monitoring of the Russian Sector on the Arctic shelf is being implemented, mainly, by the Murmansk Marine Biological Institute of the Kola Research Centre (MMBI KNC RAN, Murmansk) in accordance with the programs of the Russian Academy of Sciences (State Scientific-Technical Program «World Ocean», Projects: «Barents Sea», «Arctic Ecosystems», «Dynamics of Ecosystems» and others).

The regular observations of the marine environmental state and biota, started on the Kola Meridian in the beginning of this century, cover presently the entire Western Arctic. A large data bank has been established on hydrological regime, composition, seasonal dynamics, quantity and distribution of bacteria-, phito- and zoo-plankton, bentos, ichtio-fauna, marine birds and mammals. Annual surveying, accompanied by operative data processing, provide monitoring of the sea water characteristics, sea biota state, and environmental prediction.

The basis of the MMBI expedition plans of the recent years and for the nearest future (1998-2000) is the environmental monitoring of the seas and archipelagos in the Western Arctic for the purposes of:

- to study scales and mechanisms of a response of marine ecosystems to global climatic changes (trends, adaptation, stability);
- to observe dynamics of anthropogenic pollution of the Arctic marine environment and biota; analyze cumulative effects (external advection of pollutants, local damping of chemical and radioactive wastes, oil and gas production on shelf, etc.);
- integrated account of traditional and non-traditional biological resources; define a strategy of their rational use, not damaging the ecosystem structures of sea basins (faunistics, systematization, functioning);
- to assess the current status of biosphere and work out recommendations on creation and keeping of specially reserved zones on the seas, coasts, islands and archipelagos of the Arctic.

Since 1985 the MMBI has carried out the integrated expedition investigations in the perspective oil- and gas-bearing areas on the shelf of the Barents, Pechora and Kara Seas, and in the Ob-Tazov Basin.

3.2.3 Production-Environmental Monitoring (PEM)

In the recent years the Ministry of Fuel and Energy of the Russian Federation has started to establish an automated PEM system for the Fuel and Energy Complex (FEC) of Russia. The term «production-environmental monitoring» means that the Ministry production sources and objects affecting the environment are to be under control for the purpose of their safe operation.

The PEM of the FEC is oriented to provide all the management levels with necessary environmental information for making appropriate economic and organizational decisions on the observance of the environment legislation, acting norms, rules and requirements in the environment protection.

The basic principle of the FEC PEM arrangement is integrity which is provided through:

- general conceptual approach to establishment and exploitation of the system in all sectors and at all objects of the FEC;

- integrity of tasks to be solved and functions to be implemented;
- unified technical base and unified technical principles of data obtaining, collection, transfer, processing, storage and distribution.

At the same time, the system integrity implies the account of branch and regional specific features, specificity of large companies and particular enterprises.

The RAO «GASPROM» is one of the first companies in Russia which has developed and put in practice the PEM system, having made it the basis for the environmentization of its activity.

The PEM of the gas industry includes a complex of engineering means and methods, regulatory documents and an organizational structure, providing measurements and control of waste emissions and discharges from the technological objects of the gas industry, as well as from the objects of the social-municipal and production infrastructure both during construction and exploitation periods.

The PEM system consists of:

- a data collection network including on-surface (stationary posts, mobile and stationary laboratories) and aerospace facilities;
- data collection centers at the level of objects (DCC);
- centers of data collection and analysis, planning of environment-protective activities at the level of enterprises (CCPE);
- centers of data collection and analysis, planning of environment-protective activities of the RAO «GASPROM» (CCP);
- systems of information collection and transfer from the data collection network to the RAO «GASPROM», as well as to regional and federal centers of the USEMS;
- regional information-analytical centers (RIAC) which carry out methodically-organizational activities in their regions, organize obtaining and processing of data from the federal information centers, preparation (jointly with branch organizations) of measures on mitigation of possible emissions and discharges.

The structure and ramification of the PEM network are different for different enterprises depending on composition and quantity of objects at an enterprise, natural features of the territory and the related necessity to implement one or another type of environmental monitoring, and other factors.

At the present time, there are developed the regulations controlling industrial emissions and atmospheric air quality, rules to control surface and waste waters. The technical requirements are defined to: a typical automated station for atmosphere pollution control; an universal mobile environmental control laboratory; an automated gas emission control system; a system controlling explosion-hazardous and toxic gases; a typical automated surface and waste water control station; the central analytical laboratory.

The PEM System in gas industry is a part of the USEMS regional environmental monitoring. There are worked out principles of informational interaction and separation of functions between PEM and USEMS.

It should be noted that PEM does not replace the environmental monitoring. Moreover, at the present moment the FEC PEM System by no means does not include (and does not have appropriate subsystems for this purpose) the control of processes of marine hydrocarbon deposit production and development.

3.2.4 International Aspects of Monitoring

The fact that the state boundaries do not coincide with the boundaries of natural zones makes the problems of protection of the environment and natural resources to be of a wide international character. The foreign policy of Russia in this sphere is directed to creation of favorable conditions for development, guarantee of environmental interests of this country, and corresponds to the statements of the Russian Federation Foreign-Policy Doctrine.

The top-priority is defined in the Doctrine for the following international actions on environmentally sustainable development:

- working out the measures on prevention of a hazardous impact of global and trans-boundary environmental processes;
- active participation of Russia in the elaboration of measures on mitigation of an anthropogenic impact on the biosphere;
- provision of environmental interests of Russia in the external economic activities;
- active participation in international research programs on sustainable development.

The International Convention on Environment Impact Assessment (EIA) in a trans-boundary context (1991) can be considered the most important document which regulates the international aspects of environmental protection in hydrocarbons production on the continental shelf and laying of oil and gas pipelines.

According to the Convention, the Parties, on individual or collective basis, implement all the required and effective actions on prevention of a trans-boundary impact from the planned activities, as well as on its mitigation and control.

Two - and multi-lateral and other agreements can include:

- development and/or improvement of methods and programs on environmental data collection, analysis, storage and distribution;
- definition of threshold levels and critical loads of trans-boundary impacts;
- development, improvement and/or concordance and joint implementation of EIA and monitoring.

It is obvious that activities including designing, construction, exploitation and liquidation of sea objects on the Russian Arctic shelf fall under the action and must be regulated by the above Convention.

The main objects of monitoring are the pollution levels in different Arctic natural environments by hydrocarbons, heavy metals and radio-nuclides.

3.3 Recommendations on Development of the Environmental Monitoring Structure

The establishment of the complex environmental monitoring structure was based on the analysis of matter of modern bottom sediments, suspended substances, chemical elements and compounds that belong to I and II Class of toxicity, biogenic elements, organic matter, molluscs tissue, as well as physiological state of plankton community in interrelation with specific features of hydrological and hydrochemical structures of aquatic media in coastal and sea ecosystems.

The observation results are expressed in quantitative and qualitative values characterizing the changes in the state of on-coast and in-sea located pollution sources (CSLPS). These values can be absolute or relative ones and reduced to a certain date or period.

To summarize the informational function of the CSLPS monitoring, the following types of works are recommended to do:

- preparing monitoring projects, designing, establishment and exploitation of an observation network;

- carrying out observations of the CSLPS characteristics;
- assessing, controlling and predicting the CSLPS state by quantitative and qualitative values;
- creation and maintenance of a data bank by the CSLPS monitoring results;
- creation and maintenance of constantly functioning models of natural and natural-anthropogenic objects located in administrative-territorial divisions;
- control over CSLPS monitoring and information transfer to an environmental monitoring authorized organ and international advisory organizations;
- registration and assessment of existing and liquidated CSLPSs; registration of newly introduced enterprises and other anthropogenic objects that are potentially able to lead to formation of pollutant sources;
- working out recommendations and conclusions on CSLPS localization and environmental protection within CSLPS;
- generalizing research results for natural and natural-anthropogenic objects within administrative-territorial divisions, transferring and exchanging the generalized information at the state level;
- developing a conceptual scientific system, observation tools, chemical-analytical base, technique and technology of investigations;
- preparation and provision of urgent information on CSLPS and emergency situations to official authorities and higher-rank organizations;
- preparation of information bulletins on the CSLPS state and provision of current information by requests of organizations, local authorities and citizens, as well as implementation of works by application and request;
- compiling and keeping maps of the CSLPS state on the basis of the worked out geoinformation system (GIS);
- compiling and keeping annual and multi-year overviews on the CSLPS regime;
- expertise and concordance of projects on observation networks within CSLPS.

Chapter 4

Regulation of Industrial and Environmental Safety During Exploration, Development, Operation, Conservation and Liquidation of Hydrocarbons Fields on the Continental Shelf

4.1 Normative Regulation of Submitting and Agreeing on the Investments Justification

In this Feasibility Study the process of development, submitting and agreeing on the (projects) investments substantiation is being considered with taking into account the following characteristics:

- availability of the renewed normative requirements for the design stage of the investment projects in the Russian Federation;
- ensuring the use of Russian requirements for the development of the oil and gas fields;
- the fields are located offshore of Arctic seas and are to be developed on the Production Sharing Agreements with foreign contractors and suppliers of the equipment.

4.1.1 Pre-Investment Stage, Development of the Investments Justification

Regulation of the design stage of the investment activity in the Russian Federation has been considerably transformed since 1995 and it should be regulated by the following documents:

- System of normative documents in construction. Main Provisions. Construction norms and rules (SNiP 10-01-94);
- Order of development, agreement, confirmation and the composition of the investments justification in construction of enterprises, buildings and structures (Code of Rules - SP 11-101-95);
- Instruction and order of the development, agreement, confirmation and composition of the project documentation in construction of enterprises, buildings and premises (SNiP 11-01-95).

Regulation of the investment process has been considerably simplified by introduction of the above-mentioned documents and had been brought closer to the world practice and conditions of the market economy. The following main stages of the pre-design and design works have been defined at present:

- Application (declaration) on intentions;
- substantiation of investments and business plan on its basis;
- feasibility study (Project);
- working Design (documentation).

4.1.2 Investment Process in Oil and Gas Industry

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Investment projects in oil and gas production should follow the legislative and normative requirements of the specific nature:

- legislative requirements defined by the Federal Law «On Interior»;
- the issues of interior use are regulated by the «Instruction on the Order of mining allotments for the development of oil and gas fields» (Gosgortechnadzor of Russia);
- technical and technological issues of the fields development are regulated by «Regulations for drawing up technological documents for the development of oil and gas-oil fields» (RD 153-39-007-96).

Moreover, there is a vast amount of the industrial normative and technical documents of the former USSR, defining individual requirements for the development of oil and gas fields and the applicability of these documents must be considered both from the point of view of legal necessity for Investor and its contractors and from the point of view of technical and economic expediency.

Russian legislation and normative acts define that reserves of mineral resources of the explored fields should be submitted to the State expertise evaluation in order to create the conditions for the rational use of subsoil resources, for defining the amount of payment for the use of subsoil resources and for defining the boundaries of subsoil resources areas for which the right to use is awarded.

State expertise evaluation can be conducted at any stage of the geologic study of the field, provided that geologic data can yield the objective evaluation of the amount and quality of the mineral reserves, their national economic value, mining and technical, hydrogeologic, environmental and other conditions for their extraction.

The Ministry of Natural Resources of the Russian Federation and its territorial subdivisions by the resolution of the Russian Federation Government as of 02.28.96 No. 210 «On the Bodies Carrying out the State Expertise Evaluation of the Mineral Resources and Geologic, Economic, Environmental Information on the Areas of Subsoil Resources for which the right to use is awarded», are specially authorized Russian Federation State agencies conducting the State expertise evaluation of the reserves of mineral resources and geologic, economic information on the areas of interior resources for which the right to use is awarded.

The State expertise of the environmental information on the site of interior for which the right to use is awarded is ensured by the Goscomecologya of Russia and its territorial branches, authorized to conduct the State environmental expertise.

The State geologic control over the geologic study, rational use and protection of interior resources throughout the entire territory of the Russian Federation and on its continental shelf shall be carried out by the Department of the State Geologic Control of the MNR of Russia on the basis of the «Statement on the Organs of the State Geological Control of the Russian Federation» approved by the Russian Federation Government Decree as of 11.20.95, No. 1124.

The unified order of allocation of mining plots and the definition of their boundaries in awarding licenses for the right .to use interior resources for the development of fields of oil, gas and condense and for the construction and operation of the underground gas storage's and products of hydrocarbons refining has been defined by the «Instruction on the Order of mining allotments for the development of oil and gas fields» (Gosgortechnadzor of Russia No. 35 as of 09.11.96) and agreed on by Roskomnedra (No.VS-31/1831 as of 08.07.96) and Mintopenergo of Russia (No. VG-3163 as of 05.28.95).

4.1.3 Oil and Gas Fields Development on the Continental Shelf

The issues of location and operation of objects and facilities within the aquatory of the inner sea shall be governed by the «Water Code» (Articles 105 - 106), where the list of the State authorities which have to agree on the issues of the object location is provided The regulation of the activity on the continental shelf is considered in a more detailed way in the Law «On Continental Shelf», Chapter II, and this Law establishes special controlling measures from the side of the State in conducting drilling operations.

At present two documents are still in action (they have not been canceled) on the protection of the sea waters in the economic zone of the former USSR:

- Instruction on the Protection of the Sea Economic Zone of the USSR (Minvodkhoz, USSR , 33.5.3.08-87);
- Methodology of the Calculation of Losses Incurred by the Pollution of the Marine Environment in the Economic Zone of the USSR (USSR Minvodkhoz of the USSR, Minrybkhoz of the USSR, Minfin of the USSR, 1987).

Though the order of the implementation of their provisions requires additional study in connection with the legal problems of the definition of the legal legacy of the managerial organs of the former USSR and the Russian Federation.

4.1.4 Investment Process in the Production Sharing Agreement (PSA)

Regulation of the investment project carried out in accordance with the Federal Law On PSA can have some individual characteristics and differ from the widely accepted order. One of the most important issues which requires conceptual and legal interpretation is the issue of referring the Agreement itself to a certain phase (stage) of the investment process.

Though the application of the Investor to participate in the tender for the right to use interior resources is analogous to the Declaration on Intentions and the conclusion of the Agreement directly follows the tender, the requirements to the content of the Agreement and obvious interests of the Parties under Agreement lead to the assumption of the existence of some intermediary preparation stage (not longer than 1 year in duration - Article 6, Item 1), in the process of which technical and economic information, sufficient for the justification of the positions of the Parties on terms and conditions of the production sharing should be developed.

Only Investment Justification by its nature and content, can be such a document, but here the question arises whether the requirements of the documents to Investment Justification should be applied to the materials of the preparation stage and, in particular, whether Investor should register them as Investment Justification and should submit them to the State expertise prior to the Agreement conclusion.

Though the legislative and normative documents do not contain directives in this relation, preparation and conclusion of the Agreement could be considered as a content equivalent of Investment Substantiation in its content and formal features (in particular, obligatory issue of the license for the right to use interior resources (see Article 2, Item 2) and conducting the State expertise of the Agreement terms and conditions) (see the Law «On Environmental Expertise», Article 11, Item 7, paragraph 6 and etc.).

Investor as a Party under the PSA, while considering the status of the technological design documents (see further subsection 4.1.3 and section 4.2), should bear in mind the following possible dilemma: after the preparation of the technological scheme of the field development, when Investor will have the information on defined mining plot, will such defining of the mining plot area lead to the re-consideration of the PSA or will it be enough to introduce amendments only into the License for the right to use interior resources. Though the Law on PSA envisages some certain mechanisms for the current resolution of the arising questions

through the Programs, Projects and Plans of the work implementation (Article 7, Item 1) and settlement of issues through the Steering Committee (Article 7, Item 7), the lack of sufficient experience in practical implementation does not allow to evaluate their efficiency and possible impact on the progress of the Agreement implementation.

4.2 Analysis of the Process of Implementation of the Pre-Design Stage of the Investment Project

The acting documents envisage the following main stages of the implementation of the investment programs in oil and gas industry:

- prospecting and exploration of fields;
- field development;
- field completion;
- field exploitation;
- conservation and/or liquidation of installations.

4.2.1 Prospecting and Exploration of Oil and Gas Fields

The readiness of the explored oil and gas fields for commercial development is defined by the extent of conducted geologic and field studies. The explored field or part of the oil and gas field is considered to be prepared for commercial development, according to the existing normative documents, when the following main conditions have been observed:

- production testing of exploration wells and, if necessary, production testing of geological formations or test commercial development of the representative parts of the field have been done;
- balance and recoverable reserves of oil, gas, condense and components contained in them and having commercial value have to be approved by the State Commission on the mineral reserves of the Russian Federation (Russian abbreviation - GKZ of the Russian Federation) and perspective oil, gas and condense reserves should have been estimated (designing and putting into production fields, with recoverable oil reserves up to 3 mln.t and gas up to 3 bln. m^3 should be carried out on the basis of the reserves approved by the Central Commission on Oil and Gas Reserves (Russian abbreviation CKZ - oil Mintopenergo of Russia);
- approved balance reserves of oil, gas and condense and the reserves of the components contained in them, used to draw up design documentation for commercial development, should amount to not less than 80 % of the C_1 and 20 % of the C_2 category. The possibility for the commercial development of the explored fields (formations) or parts of the oil and gas fields with C_2 category reserves more than 20 % is approved as an exception by GKZ of the Russian Federation during the approval of the reserves on the basis of the expertise of the estimation data;
- composition and properties of oil, gas and condense, content of components of commercial value in them, characteristics of the field development, flow rates of oil, gas and condense, hydrogeologic, geocriologic and other natural conditions should have been studied to a degree providing initial data for drawing up technological design documents for the field development.

While evaluating the applicability of the above-mentioned requirements, the specific features of the hydrocarbons fields development on the continental shelf should be taken into account. In particular, due to the specific characteristics of the marine oil and gas production,

the requirement on conducting production testing is hardly applicable due to purely technical reasons.

4.2.2 Design Technological Documentation for the Development of Oil and Gas Fields

As has been mentioned before, oil, gas, gas-oil and gas-condense fields shall be put into commercial development on the basis of technological design documentation. Drawing up, consideration and confirmation of technological design documentation for the development shall be done in compliance with the existing «Provision on the Order of Drawing up, Consideration and Confirmation of Technological Design Documentation for the Development of Oil and Oil Gas Fields» (Minnefteprom of the USSR). The structure and composition of the technological design documentation for the field development shall be defined by the «Regulation of Drawing up Technological Design Documentation for the Development of the Oil and Gas-Oil Fields», confirmed by the Mintopenergo of Russia and agreed on by the Gosgortechnadzor of Russia. Technological design documentation for hydrocarbons fields development are made up, as a rule, by specialized organizations possessing the licenses for the right to do engineering design and shall be considered in the established order by Central Commissions for Development of the Mintopenergo of Russia or RAO «GAZPROM» and territorial Commissions, set up in agreement with the Mintopenergo of Russia.

Technological design documentation are the main documents on the basis of which oil and gas producing enterprises carry out commercial development of oil and gas fields and conduct test commercial operations on testing new technologies. They are the basis for developing design documentation for drilling and field completion, investment justification and feasibility studies, projects for forecast of oil, gas and condense production, reconstruction of the fields development, schemes of development and location of the objects of oil and gas production industry in a region, development of annual and perspective forecast of oil and gas extraction, amount of drilling operations and water injection into the formation, capital investments, geologic and technical activities used on a field.

Engineering design of the development as well as exploration of fields is done by stages. Technological design documents are the following:

- designs for production testing;
- technological plans for commercial production testing;
- technological plans for development;
- designs of development;
- improved designs for development (further development);
- analyses of development.

The following additional technological documentation may be prepared should new geologic data considerably changing the earlier assessments of fields reserves and economic factors of the development, or should of new efficient technology be introduced:

- amendments to the designs of production testing and to the technological schemes of the test commercial development;
- amendments to the technological schemes of development.

Firming up and re-consideration of individual design solutions and parameters of the development, which do not change the approved principal provisions of technological design documents can be done in the following:

- in amendments to the technological plans;
- in the process of the author's supervision over the fulfillment of technological plans.

Drawing up technological design documents for the field development shall be done in compliance with the Technical Terms of Reference submitted by Investor. Together with the Technical Terms of Reference for the technological scheme or the project for the development, Investor shall submit to the Contractor the estimates of the reserves of oil, gas, condense and associated components, if they have commercial value, approved by the State Commission on the Reserves of the MNR of Russia, protocols of its consideration in the GKZ of the Russian Federation and other materials.

Technical Terms of Reference shall be agreed on by the Gosgortechnadzor of Russia and shall be approved by interior user.

The following requirements and recommendations shall be used during the drawing up of plans and designs for the oil and gas fields development:

- ensuring the possible complete extraction of oil, gas, condense and associated components from the formation while observing the requirements for the protection of the interior resources and environment, rules of conducting mining operations;
- the exploration data, reserves estimates, results of laboratory studies of the processes of impact, production testing of the exploration wells or the areas to be first developed, requirements of Technical Terms of Reference normative basis are the initial primary information for working out technological plans for the fields development. Technological scheme should be done with taking into account the detailed studies, ensuring the firming up of the geologic structure and details of the structural plan, reservoirs boundaries, location of the contours of gas and oil bearing areas in the productive horizons with complicated structure in order to substantiate well location. While working out the development projects, field geologic data, generated in the process of implementation of the confirmed technological plans, the results of special studies, information from the author supervision and development analysis are used additionally;
- technological plans of the development shall be worked out for initial balance reserves of oil, gas and condense of the $A+B+C_1$ and C_2 categories, as a rule, approved by the GKZ or considered CKZ Mintopenergo of Russia. Projects and firmed up projects of the development shall be developed for the residual balance reserves of hydrocarbons as of the date of the design documentation development;
- in the technological schemes of the development of formations, which considerable part of reserves refers to the C_2 category, project decisions should be made with taking into account the necessity for further exploration and prospects of the entire field development. Technological parameters of development (amount of oil and gas production, of water injection, number of production and injection wells) of the category C_2 reserves shall be forecasted separately and they are used for designing the field development, infrastructure development and perspective planning of the production of oil and gas and for defining the amount of drilling operations;
- all design documents shall include the alternative calculations of the technological parameters of development varying in the selection of the production objects, methods and agents for formation treatment, systems of location and density of the wells networks, conditions and methods of well operation, production profiles and duration of the stable production. In the technological schemes there should be not less than three estimated alternatives and in the projects and firmed up projects - not less than two, one of which is proposed as the base one. This base variant, as a rule, is a confirmed variant of the development by the last design document with taking into account the change in the amount of oil and gas reserves;

- within a month after the confirmation of the project documentation at the CKZ Mintopenergo of Russia, the designing institution shall be given necessary initial data on the maximum levels of extraction of oil, gas, condense and fluid, injection of agents and other information for designing field development. The designing institution, if necessary, will define the number and location of the sites of field development for which it shall make additional calculations of technological parameters after conducting well-head clustering;
- justification of the projects of the forecast of oil and gas production and the amount of drilling operations shall be done in accordance with the existing methodological instructions to the variant recommended for the confirmation in the Central Commission on the Reserves separately for the $A+B+C_1$ and C_2 categories for each production object and for the entire field;
- if in the process of implementation of the confirmed documents the assumptions on the geologic structure, the rate of drilling or implementation of the development system and other conditions are changed dramatically, the amendment to the design document shall be made. In this amendment technological parameters shall be firmed up with taking into account the changes in the conditions of the development. Amendments are integral part of the confirmed technological schemes and designs of the development. Consideration and confirmation of the amendments shall be done in the established order;
- if the boundaries of the pools are extended, the accrual oil bearing area shall be developed under the earlier approved design system of development and with the earlier approved well pattern. Wells located on this area shall be additional wells of the main well fund.

4.2.3 Pre-Design Documentation for the Installations on Oil and Gas Fields

Practice and methodological principles established in SP 11-101-95, SNiP 11-01-95, a number of state branch norms for working out documentation in the investment activity for the construction of the objects of the oil and gas fields development define the composition of the necessary documentation at all stages of the life cycle of the investment project and the order of their preparation, agreement and approval.

The development of the investment project - from the initial idea to putting the object into production - is in the form of a cycle, consisting of two separate phases: pre-investment phase and investment phase. Each of these phases, in its turn, is subdivided by stages, which include pre-design activity, engineering design and construction documents. There is a list of documentation which is to be composed at each stage of the project and there is inter-connection between all stages and phases of the investment project.

The Pre-investment phase embraces the period from the birth of the idea of the project, study and analysis of the financial, economic and legal conditions of the investment, working out the investment substantiation, agreement on the results of the substantiation for the investment opportunities, if necessary with local, regional and Federal authorities, receiving the act on the selection of the site prior to working out terms and conditions of conducting tenders for the contractors and tender documentation.

Composition of the pre-investment phase:

- Explanatory Note
- Application (Declaration} on Intentions.
- Substantiation of the Investments.
- Tender Documentation.

The investment phase covers the period from the stage of preparation of the necessary technical and commercial proposal for project implementation, conducting contractor's tenders for designing, design of the object, contractors' tender for the construction and assembling works, purchase of the equipment and materials, construction prior to putting objects into operation.

Composition of the investment phase:

- Tender Documentation.
- Technical and Economic Substantiation (Project).
- Working Documentation.
- Production and Operation Documentation.

4.2.3.1 The Pre-Investment Phase

The documents, allowing to study the possibility and necessity of the investment project, permitting documents for administrative authorities, substantiation of the investments for financing institutions shall be prepared at the pre-investment phase.

Agreement and approval of the results of substantiation of the investment opportunities with local administration and supervision organs are conducted, the site of the construction shall be selected and the conditions of the sites and routes of the construction shall be studied at this stage. Moreover, the terms and conditions of conducting contractors' tenders for the design works shall be developed at the pre-investment phase.

Explanatory Note is a document from which the investment project starts (the name of the document can be different). This document defines the aim of the investment, designation and capacity of the object of construction, types of products, the sites of the object location with taking into account the requirements and conditions of Customer (Investor). The Explanatory Note shall contain the reference to the potential investor which will support further study of the possibility of the project implementation, will finance further stages of the project implementation. Possible position of the government agencies, which will either support the project or will not at least be against its implementation, should be taken into account.

Declaration on Intentions. In the investment process the design preparation of construction under the existing Russian legislation consists of three stages. In the first stage, while defining the aim of the investment and with taking into account the decisions made, Customer shall submit in the established order the Declaration on Intentions. Declaration on Intentions is a mandatory document and shall be submitted to the local executive authorities for getting preliminary agreement on the site of the object location and for further decision making by Customer on working out Investment Substantiation.

As participants of the project on this stage Designing institution Contractor and Organs of local management must be mentioned.

Declaration on Intentions in addition to the information about Investor (Customer) and location of the object shall also contain the following:

- characteristics of the object;
- justification of social and economic necessity of the designed construction;
- need in resources during the construction and operation - land, mineral, water, biological, labor, energy;
- list of main structures and their parameters;
- transport provision;
- possible economic consequences of the field development;
- sources of financing;

- schedule of planned construction.

Investment Justification. If the Declaration on Intentions has got a positive solution, Customer shall start the next stage of the investment project - working out the Justification of the Investments in construction. Working out the Substantiation of the investments in construction shall be carried out on the basis of the received information, requirements of the State authorities and interested organizations in the scope which is sufficient for Investor (Customer) to make a decision on the expediency of further investment, to receive a preliminary agreement on the location of the object from the relevant executive authority (Act on the Site Selection) and on the development of design documentation.

The main document regulating relations of Investor and involved organizations (legal and physical entities) is Terms of Reference for the development of the Justification of the Investments where initial data and Investor requirements are included:

- object location;
- nomenclature of the production (the scope of provided services);
- requirements to the technology, products manufacturing and to the main equipment;
- requirements to the architectural-planning, construction and engineering decisions;
- requirements to the environment protection;
- specific conditions of the construction;
- main technical and economic characteristics and parameters of the object.

The following shall be enclosed into Terms of Reference:

- materials received from the executive authorities including decisions by the results of consideration of the Declaration on Intentions;
- preliminary conditions for possible attachment of the enterprise to the sources of supply, engineering networks and communications;
- cartography materials, situation plan and etc.;
- requirements for sanitary-epidemiological and environmental conditions;
- established technical characteristics of the production, information on the price;
- requirements on the creation (use, application) of technological processes and equipment;
- other materials.

Within the Justification of the Investments the following sections are usually developed:

- initial data and conditions;
- market and competitiveness of the enterprise;
- main technological decisions;
- providing resources for the enterprise;
- site of the location of the object;
- main construction decisions;
- assessment of impact of the object on the environment (EIA};
- safety declaration;
- structure of the company, personnel;
- schedule of the investment project implementation;
- efficiency of investments;
- conclusions and proposals.

Justification of the Investments shall be submitted to the State expertise including environmental one, in the established order and then it shall be approved by Customer. The materials of the Justification of the Investments shall be directed to the relevant authority for the registration of the Act of the Land Plot Selection (site, route) for construction, enclosing

necessary agreements and decision on the confirmation of the preliminary agreement on the object location.

Business Plan shall be developed on the Customer's decision in the process and/or after the confirmation of the Substantiation of the investments. Business Plan shall be based on the general concept of the company development and the economic and financial aspects of the strategy shall be developed in details on the data of the Substantiation of the Investments and it shall provide technical and economic justification for the concrete measures.

The procedure of the agreement on Business Plan, using the State financial support, possesses specific nature related to its consideration in the State agencies, in some cases in the Federal Department on Bankruptcy attached to the Russian State Committee on Property (the issues on the solvency restoration) and in the State Committee on Property of the Russian Federation (the issues of management of the State share of property) and the preparation of the Contract (Agreement) on this basis for providing the State financial support to the company (including on the results of the allocation of the centralized investment resources on the tender basis).

4.2.3.2 The Investment Phase

The investment phase shall include the stages of design, construction, putting the object into operation and it should contain a lot of documentation.
The selection of designers, builders and suppliers of equipment and materials shall be done on the tender basis.

Tender Documentation is a system of documents regulating on behalf of the State the process of preparation, organization and conducting tenders and during the tender the normative legal base and the experience of conducting tenders with the participation of local and foreign entrepreneurs should be taken into account.

The following can be the subject of the tender:

- construction, reconstruction, capital repair of enterprises, buildings and structures, including on the turn-key conditions.
- implementation of designing, prospecting, construction, assembling and other types of works covering full technological cycles, including the above-mentioned works:
- delivery of the complete technological equipment including on the turn-key conditions;
- project management, consulting, technical supervision.

Composition and content of the tender documentation depend on the scope of the investment project, the object of engineering design, subject of the tender, availability of the outcoming permitting documentation, which is necessary for the fulfillment of the corresponding stage of the engineering design works, availability of the outcoming documents relating to the subject of the tender and the information on technological, technical, commercial, organizational and another parameters of the object of design

Tender documentation in accordance with the Provision on the Competitive Tenders in the Russian Federation consists of the following sections:

Deleted: ¶

- general information on the subject of design and the subject of tender;
- terms and conditions of the tender and the order of its conducting;
- instruction for a contender;
- the form of the documents included into the offer;
- general and special conditions and terms of the Agreement (Contract);
- technical part.

Feasibility Study (Project) - the 1st stage of design.

SNiP 11-01-95 defines the technical and economic substantiation for the construction (Feasibility Study for the construction) as the main design document for the construction of objects (in this case - for the equipping). The decision on the Feasibility Study for the construction shall be made by the Customer after conducting the State expertise of the Justification of the Investments, agreement on the planned decisions on the object construction and terms and conditions of the preliminary agreement on its location.

The main document defining the relations between Customer (Investor) and Designer (Contractor) regulating legal financial relations, obligations and responsibilities of the parties is the Agreement (Contract) on the Feasibility Study for the construction.

The Assignment for the engineering design including technical and economic, social, environmental and other requirements which, by the view of Customer, should be taken into account in the Feasibility Study, shall be enclosed into the Contract. The Assignment can also describe the composition of the Feasibility Study and main content of its chapters. If the Contract does not include special requirements on the composition of the design documentation given to Customer, the documents should be provided in the amount defined by SNiP 11-01-95.

Taking into account that the supervising authorities require the following to all standards, norms and rules existing at the date of submitting Feasibility Study (project) for consideration, agreement and confirmation, Customer and Contractor, dealing with an object or structure which is new, very complicated or especially important and for which the existing normative and technical basis has been incomplete, contradicting or outdated, have the following principal opportunities:

- to conduct the designing in accordance with standards, norms and rules which are known to them, proposing technical and technological decisions based on the best world and recommended practice, their own experience and etc., leaving any unsettled issues and disparity for further consideration in the Feasibility Study (Project) by a supervising and regulating bodies;
- to initiate the development of Temporary requirements and conditions, agreed and/or approved by relevant supervising and regulating bodies so as further consideration of the Feasibility Study (Project) to be fulfilled on their basis.

Taking into account the existing Russian normative and technical basis for designing of the marine and coastal facilities for the development of offshore oil and gas fields, participation of foreign Contractors and the experience from a number of the similar projects, the following documents should be developed as a minimum:

- on safety provision during designing, construction and exploitation of the oil and gas producing platform on the sea (it should be approved by Gosgortechnadzor of Russia)
- on ensuring fire and explosion safety for the sea oil and gas producing platform (it should be approved by the State Anti-fire Service of the Ministry of Internal Affairs of the Russian Federation);
- on classification requirements for the marine oil and gas producing platform (it should be approved by the Marine Register of Russia);
- on designing and construction of the marine underwater pipelines and offshore and coastal facilities for the pipelines to land onshore (it should be approved by Gosgortechnadzor of Russia);
- on ensuring prevention, limitation and liquidation of oil spills and pollution of the coastal lines (it should be approved by the Ministry on Emergency Situations of the Russian, Federation Goskomecologia of Russia and Gosmorspassluzhba of Russia).

It should be noted that the above-mentioned SNiP 11-01-95 does not cover the following issues which can arise at the stage of the Feasibility Study expertise, especially during the implementation of the project under the PSA terms and conditions:

1. The chapter «Efficiency of Investments» shall be prepared in accordance with the «Methodological Recommendations on the Evaluation of the Investment Projects Efficiency and Selection for Financing», approved by the Ministry of Construction of the Russian Federation, Ministry of Economy of the Russian Federation and State Committee on Industry of the Russian federation 03.31.94, No. 7-12-47 and it should, in addition, reflect the state and the ways to reimburse the costs of the Federal Budget and budgets of other levels.
2. Engineering and technical measures on the civil defense and measures on the prevention of emergent situations should be designed in a complex way supplementing each other. This section should include measures and technical solutions directed towards prevention or maximum possible reduction of the intensity of the negative impact due to the processes arising during emergent situations, including operational and technological failures and they should ensure the protection of the production facilities and personnel as well as adjacent area and population. At the same time the evaluation of the probability of emergent situations occurrence (technological accidents) and the solutions on their prevention should be considered in the section «Technological Decisions».
3. The Environmental Impact Assessment which has to be developed in the section «Environment Protection» for the particular object should contain in full volume the description of the probable negative consequences for the environment and all data allowing to assess how and to which extent all sanitary rules are being followed, whether the permissible norms are exceeded in respect of radiation, chemical and other types of impact on the environment and population and what compensation for damage is envisaged. At the same time the methodology for EIA in Russia is not fully developed (and requires special consideration).

Feasibility Study for the construction of objects, independent on the sources of financing, form of ownership and property, should be submitted to the State expertise in accordance with the established order. Approval of the Feasibility Study shall be organized or conducted by Customer in accordance with the existing order, taking into account the sources of financing for the object construction.

Working Documentation - the 2nd Stage of the Design.

The following documents can be used as the basis for the development of the working documentation:

1. Feasibility Study (Project) developed and confirmed in the established order.
2. The decision made by Customer by the information of the Substantiation of Investments on the development of the working design (working documentation is a part of the working design).

The working documentation shall be prepared on the basis of the approved Feasibility Study (Project) (two stage design - Feasibility Study (Project) and working documentation).

The Working Design can be developed for technically simple and small objects on the basis of the approved substantiation of the investments (the part to be approved and working documentation), i.e. one stage design. General technical requirements to the development and composition of the working documentation shall be defined by a complex of normative organizational and methodological documents - standards of the System of Project Documentation for the Construction (SPDC) which establish rules of working documentation preparation within the project documentation.

Moreover the working documentation for the construction of the objects of oil and gas industry can include the following:

- working Documentation by GOST 21.501 for the construction products (it should be done in cases specially set forth in the Assignment for the development of the Working Documentation);
- specifications of the equipment, products and materials by the main sets of the working drawing by GOST 21.110;
- lists and Joint Lists of the scope of the construction and assembling works by GOST 21.101 (it should be done in cases specifically set forth in the Assignment for the Development of the Working Documentation);
- budget documentation (object and local budgets) shall be done during the one stage design, and during the design of the Working Documentation in cases specifically set forth in the Assignment for the Development of the Working Documentation;
- design documentation for the manufacture of the non-standard equipment, constructions, units and details (in cases specifically set forth in the Assignment for the Development of the Working Documentation);
- special chapters defined by the Contract.

Control over the quality of the Working Documentation (conducting control over the observation of the norms) shall be done in accordance with GOST 21.002-81.

Control over the observation of the norms shall be carried out for the following:

- project - budget Documentation;
- amendments introduced in the project - budget documentation developed earlier and given to Customer.

Control over the norms observation is the final stage of the development of Design Documentation at all stages of its development.

4.2.3.3 Production Documentation

According to SNiP 3.01.01-85 the organization of the construction should create necessary conditions for the use of the project capacities. All construction and assembling works shall be fulfilled with the observation of SNiPs, standards and other normative documents, including the labor safety, fire and explosion safety, environment protection and prevention of emergent situations.

The construction of the facilities should be done according to the working drawings permitted for the execution of the works. The permit shall be given in a form of a corresponding stamp of the technical supervision of Customer (Investor) on the working drawings. Any deviation from the working drawings during the execution of the construction and assembling works shall be agreed with the engineering design organization which developed the working drawings.

The form and the content of the production and executive documentation during the preparation of the construction and fulfillment of the construction-assembling works shall be defined by the general contractor company in accordance with SNiP 3.01.04-87.

4.3 Analysis of Management of the Feasibility Study (Project) Development and Accounting for the Requirements of the Industrial, Sanitary - Epidemiological and Environmental Safety

4.3.1 Feasibility Study (Project) Structure

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General principles of the development of the project documentation governed by the documents describe only the composition and content of the Feasibility Study (Project) as a final document; the content of the chapters is defined in rather general form (for some important chapters - as a reference to some other normative documents) and they do not establish any special requirements to the order and consequence of the documentation development.

Investor, inviting foreign contractors, should take into account natural conservatism which makes it more difficult to prepare the project documents in the Russian «format», as the structure (composition and content of the chapters) of the Feasibility Study (Project) in a number of items differ considerably from the practice accepted in large foreign oil, gas and design companies.

Within the Feasibility Study (Project) the so-called «engineering block», consisting of the following parts, is defined:

- general plan and transportation provision;
- technological solutions;
- • architectural and construction solutions;
- engineering equipment, networks and systems.

A number of chapters form the «safety block»:

- organization of conditions of work of the employees;
- environment protection;
- engineering and technical events of civil defense. Events for preventing emergency situations.

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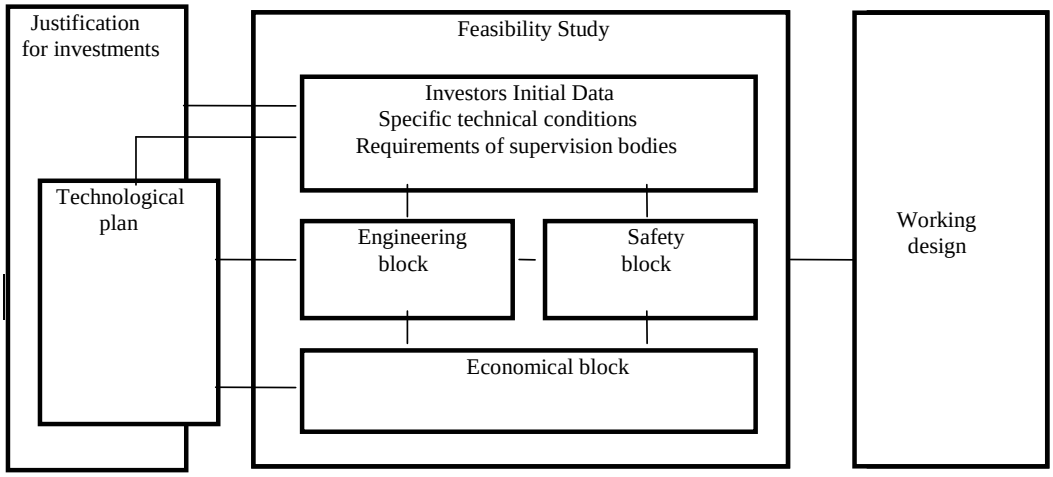
The balanced project as a whole is provided by joint consideration of conclusions within the economic block, including the following chapters:

- budget documentation;
- efficiency of investments.

In conditions of a complete and non-contradicting regulating information the development of the project could have been represented by the following simplified scheme:



However, in practice such logical ideal process (initial data - engineering solutions - safety systems - economic evaluation) can be applied only for relatively simple projects, consisting of separate objects and implemented in well known external conditions.

The following should be taken into account in the real process:

- normative and technical basis is not complete, contradicting and it is not harmonized with international and foreign standards and in a number of issues its applicability to the conditions of the project is dubious or arguable;
- external conditions are not precisely defined and they should be further studied simultaneously with the project development;
- intermediary agreements with controlling and supervision agencies are required;
- blocks of project are of complicated inner structure and the connections between them is not only direct, but also reverse.

The experience of implementation of large oil and gas projects with joint participation in the development of both Russian and foreign contractors has shown a tremendous importance of the management in designing. It is especially true for the development of the chapters relating to the industrial, sanitary-epidemiological and environmental safety, which, due to some natural reasons, are given the greatest attention during consideration and agreement of the project with controlling and supervision authorities.

4.3.2 The Structure of the Normative Documents

The system of project management should take into account the following:

- composition and structure of Russian normative requirements;
- specific structure of the Russian project;
- requirements for the non-contradictory of the materials of the project.

Russian normative requirements can be classified in the following way:

- **directives**, requiring to include (or ban) into the project some certain measures, equipment and etc. (they are checked directly by the project documentation);
- **normative requirements**, defining some boundary conditions, the observation of which should be ensured by the applied measures (the designer should prove their provision);
- **procedure requirements**, describing some procedures the fulfillment of which should be proved by the documents;

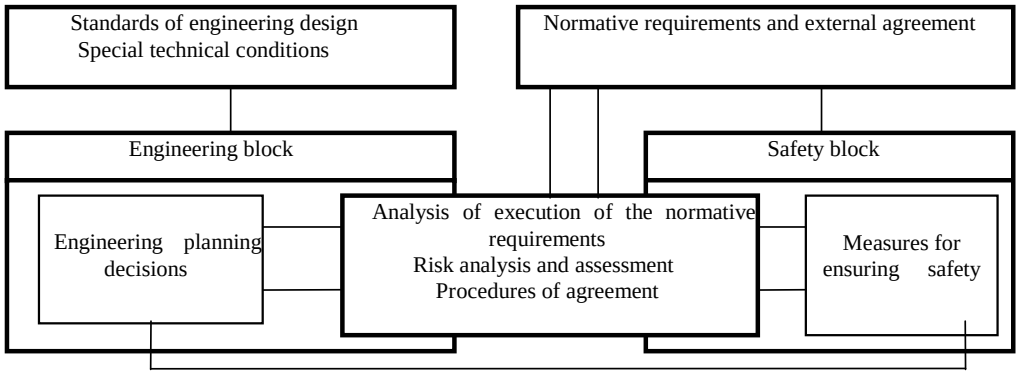
Due to some historical reasons different systems of requirements to the safety have been formed in different regulating agencies in Russia:

- **industrial and mining safety** (Gosgortekhnadzor of Russia) - mainly directives;
- **fire safety** (State Service of the Anti-fire Supervision of the Ministry of Internal Affairs) - a combination of directives and normative requirements;
- **personnel safety** (sanitary and epidemiological well-being, Gossanepidnadzor of Russia) - a combination of normative (Sanitary Rules and Standards - SanPIN, maximum permissible concentrations and etc.) and procedure requirements (establishing of the sanitary protection zones);
- **environmental safety** (Goscomecologiya of Russia) - mainly procedure requirements (the assessment of the impact on the environment, substantiation of the maximum permissible discharges, agreement on the terms and conditions of nature resources use and etc.);
- **safety for the population and the territories** (Ministry on Emergency Situations) - mainly procedure requirements (declaration of safety, plans for the emergency response and rescue and etc.).

The fact that the concept of the non-zero risk has not been reflected in the general normative documents and correspondingly it has not been reflected in the Russian format of the Feasibility Study (Project) is to some extent impeding the achievement of the inner correspondence of the project materials. In particular, there are no direct requirements for the risk assessment and analysis as a potential possibility for the violation of the norms of safety, requiring special project consideration of the emergency regimes and situations. It is not by chance that chapters of the safety block in all documents, without any exception, contain only reference norms.

4.3.3 Management in Designing

The inner correspondence of the project assumes that the transition from the engineering planning decisions to the evaluation and safety measures should be carried out both for the normal functioning of the facilities (checking the fulfillment of the execution of normative requirements) and for the emergency situations, where engineering systems of protection and safety will be used (with a certain degree of reliability). Due to this fact the links between the engineering block and the safety block become more complicated as is shown in the following scheme:



As is seen from the scheme, the block of risk assessment and analysis plays two important functions:

- provides links between the blocks (inner correspondence);
- provides accounting and agreement of the conditions of the project implementation (external correspondence);

and it holds a central place in the project management.

Though due to the intermediary nature, the results of the block of the risk analysis can not be reflected in the final project document, Investor should define the organizational forms for its implementation. There are, in general, the following possibilities to fulfill it:

- independent execution of the analysis functions and achieving agreements by Investor;
- instructing its main technical Contractor to fulfill these functions;
- instructing the main Contractor to fulfill functions on the evaluation of social and environmental impact of the project;

- instructing a specially appointed consulting company or a group of qualified consultants working for the Investor to fulfill these tasks.

Due to the inter-disciplinary nature of the tasks the first and the third alternatives are more preferable.

4.3.4 Assessment of Impact on the Environment

The block of assessment and analysis in relation to the environmental safety is known as Environment Impact Assessment (EIA). The Federal Law «On Environment Protection» does not contain any reference to EIA, but in Article 41, Item 1 it says that «During the location of the enterprises, structures and other facilities it should be ensured that the requirements for the environment protection, rational use and replenishment of natural resources, account for nearest and future environmental, economic demographic, moral consequences of the activity of the above-mentioned objects should be fulfilled, while giving the priority to the protection of the health of the people and the welfare of the population». Later the MNR of Russia adopted the Provision on the Environment Impact Assessment in the Russian Federation referring to Article 41 of the Federal Law and Convention on the assessment of impact on the environment in the Transboundary context**.** Provision defines the EIA as «The Procedure of Accounting the Environmental Requirements of the Legislation during the Preparation and Decision Making on the Social and Economic Development of the Society». Direct legislative reference to the Assessment of impact on the environment has been for the first time introduced into the Federal Law On the Environmental expertise, where conducting the State environmental expertise is facilitated by the presence of the «documentation ... containing the materials of the assessment of impact on the environment...» (Article 14, Item 1, paragraph 2) in the submitted materials.

At the present time there is no officially approved methodology for conducting of EIA in the Russian Federation. Therefore, it is necessary to be guided by practice of submitting and consideration by State Expertise the EIA in the similar projects content, which have been implemented earlier.

Investor and Contractors should resolve the following main tasks:

- to define primary physical and chemical impacts (volumes and intensity of the emissions and discharges of the pollutants and the level of physical impacts);
- to define the scope and to fulfill engineering ecological studies to collect the data on the base-line state of the environment and to evaluate sufficiency of the engineering and geologic data;
- to define the ways of spreading, physical and chemical transformations of the pollutants;
- to define and to assess impact on the ecosystems in the zone of the project influence;
- to develop and to agree on with the external organizations recommendations for preventive, protective and compensation measures;
- to develop and to agree on within the frames of the project the proposals on organization of physical and environmental monitoring with external organizations.

The process of agreeing is defined in the following ways:

- conducting public hearings;
- agreeing on the terms and conditions of nature use;
- agreeing on the designed measures and monitoring with the external organizations.

At the same time the scheme accounts for practical recommendations to Investor on the project management, received by the results of the impact on the EIA procedures conducted earlier:

- inclusion a special block of Risk Analysis into the project;
- maximum combination of engineering-geologic and engineering-environmental studies;
- strictly selective (on the results of the analysis of the spread of impact) definition of the ecosystems in relation to which the impact analysis is being conducted;
- planning protective measures both directly on the objects and in the location of the ecosystems;
- evaluation of the sufficiency of physical monitoring of the environment due to the difference in the tasks of the engineering block and safety block;
- correction of the tasks of engineering and environmental monitoring by the results of the assessment of impact;
- conducting external consideration and agreements in timely manner.

4.4 Ensuring Environmental Safety during Construction, Exploitation and Liquidation of the Oil and Gas Production Objects.

As there is a lack of the experience in Russia in construction, exploitation and liquidation of marine oil and gas installations on the shelf of Arctic seas, the experience of the normative legal substantiation of the measures for ensuring environmental safety which is given below, is used as a basis in the Feasibility Study for the Prirazlomnoye oil field in the Pechora sea.

The development of the Prirazlomnoye field within the frames of this document can be considered as a model project.

4.4.1 Construction of the Ice Resistant Platforms (IRP) and Underwater Pipelines

Manufacturing and assembling of the ice resistant stationary platform and underwater pipelines is fulfilled in such way as to ensure their constructive completeness with the aim of ensuring safe drilling, operation and repair works with taking into account concrete conditions of the environment in the area of the fields.

In compliance with the existing normative legislative documents it is necessary to make alternative calculations for the definition of the types and amount of loads and their specific combinations to which the platform will be subjected in the process of construction and operation. These calculations should guarantee that the recommended alternatives of the basement structures will be able to withstand all types and amount of loads expected during their life time.

Detailed engineering-geological studies define the zones of the possible dredging of the sea bed along the route of the underwater pipelines by drifting ice, potential threat for the marine platform and pipelines, created by the dissolution of the sea bed deposits or loose sea bed sediments, soil subsidence, erosion of the deposits caused by sea waves and currents and human made objects.

Potential threat to the ice resistant platforms and pipelines caused by the dissolution of the sea bed deposits or loose sea bed deposits, soil subsidence is minimized or eliminated by proper location of a platform and pipelines outside the areas apt to the anomaly behavior or by the use of the corresponding technical solutions.

Strengthened constructions of the platforms and pipelines able to withstand the wash out and lateral loads are used in order to minimize the danger related to the deposits erosion and plowing by ice.

The man made objects (i.e. underwater well-head equipment, pipelines, cables, sunk ships, military property and etc.) are circumvent or withdrawn.

The pipelines are calculated to withstand the blows of the trail boards which can be used by the fishing boats on the proposed route of the pipelines during their entire life time.

Assembling of the IRP and pipelines shall be done in the ice free period. The selection of this period allows to reduce considerably or to avoid the impact of the wind waves, sea ice or icing of the structure. If the weather conditions are unfavorable or there is a strong sea waves and icing, the operations on the construction of the platform and pipelines are temporary suspended till more favorable conditions are established.

The preference is given to the method of the fast discharge of the big amount of raw materials and not to the method of the continuous discharge among the alternative methods of the ice resistant platform and pipelines construction connected with excavation, shifting and discharge of the sea bed deposits. The pipeline routes are laid outside the habitat and breeding areas of valuable commercially fish and other preserved types in compliance with the recommendations of the fish protection agencies.

The schedule of shipping to the construction objects, routes and height of aircraft flights shall be organized in such way as to minimize the contradictions between the fishery and impact on the biologically vulnerable types in the periods of nesting, breeding and migration.

The ships and barges shall be supplied with separation and cleansing installations in accordance with the existing Russian standards, in order to prevent marine environment pollution in the period of construction of the marine hydrotechnical structures. To prevent small operational spills, borders, drains and saucers shall be installed as well as drainage system tanks, equipped with level regulators preventing overflows and leakage of the polluting fluids. Ventilation and cooling systems shall be designed in such way as to prevent discharge of liquid hydrocarbons together with gas into the sea. Construction equipment shall be supplied with mufflers to reduce the noise of the engines.

4.4.2 Measures on the Environmental Safety in the Period of the Operation of the Field Facilities

Normative documents on the operational safety on the oil and gas fields define that the most efficient measures for the environment protection are well organized processes of operation and technical maintenance. Norms and standards for operation and maintenance shall be set up for each object. They ensure the efficiency of methods and measures for minimizing the impact on the environment.

Operation and service personnel shall be trained in the training centers for personnel and shall get a detailed instruction on the environmental safety during the fulfillment of their duties. The programs for checking the devices controlling the quality of the environment shall be made for all objects of the project.

During the operation of the IRP, general measures for preventing or minimizing the pollution of the environment by introducing norms and standards relating to the order of storage and accounting for the hazardous materials, using constructive and technological solutions for the marine environment protection shall be fulfilled. Sewage installation in compliance with the norms and rules, preventing the pollution of the water bodies shall be used for cleansing the sewage waters. It is not allowed to dump hard waste from the platforms and supply ships onto the ice.

4.4.3 Measures for Preventing the Pollution of the Environment by the Drilling Waste

The activities preventing pollution of the environment in the process of well drilling are based on the requirements of the normative documents banning the discharge of the waste

formed during the wells construction into the sea. Due to this reason the drilling system of the ice resistant platforms shall be equipped with the following:

- technical means for collecting, utilization or transportation of the drilling cuttings;
- hermetically sealed system of collection, storage and delivery of powder chemical agents and heavy loader;
- closed circulation system of the drilling mud with the pipeline to transport the exceeding amount of fluid from the ice resistant platform;
- system of collection, cleansing, circulating and reuse of the drilling sewage waters.

In order to prevent oil and gas shows, emissions, and open blows during the wells drilling the following shall be envisaged:

- selection of well design shall be done in accordance with the requirements of the «Methodological Directives for the Selection of the Design of Oil and Gas Wells on the Exploration and Production Areas»;
- wells drilling, assemblage and operation of the anti-blow-out equipment shall be conducted in accordance with the requirements of the «Unified Technical Rules of Conducting Works during the Wells Drilling»;
- equipping wells with anti-blow-out equipment mounted on the casing head wiring the technical casing and conductor;
- conducting testing of the sealing of the conductor and intermediary casings and their sealing prior to the penetration of the productive formations in accordance with the «Temporary Instruction for Well Testing for Sealing».

4.4.4 Measures for Preventing the Environment Pollution during Oil Production, Collection and Processing on the Ice Resistant Platform

The oil wells shall be equipped with a complex of the well equipment for operational safety, simultaneous drilling and maintenance:

- for the automatic shutting-in the well;
- for well study with depth gauges;
- for underground repair works without pulling out the tubing;
- for pulling out the well equipment without preliminary killing of the well and etc.

The operational complex of the block modules includes the following equipment:

- for collection, cleansing and utilization of the products of well operation and testing;
- for collection, discharge measurement and separation of the products of the producing wells;
- for deemulsification and cleansing oil from hydrogen sulfide and bringing it to the commercial condition;
- for the cleansing the formation water from mechanical impurities and oil;
- for de-aeration, cleansing from mechanical impurities and microbiological treatment of the sea water;
- for injection of water into the productive horizons for formation pressure maintenance;
- for operative metering and account of the produced oil.

Oil field technological equipment installed on the ice resistant platform forms a technological systems of continuous action, equipped by a complex of a anti-accident automatic equipment to reduce the environment pollution by oil and other components. During the assemblage the equipment is installed in such a way as to collect the possible spills of the well products which are sources of pollution, into special tanks.

The environment pollution is caused during the damage of the tanks of the separators and pipelines leading to the loss of sealing and during the failures of the anti-accident automatic units or shutoff valves operated by these units. Each element of the system should be equipped with shutoff unit with automatic or manual drive, which will stop the influx of products into the damaged part of the system in order to limit the consequences of the equipment failures.

4.4.5 Environmental Safety during the Conservation and Liquidation of the Fields Facilities

Conservation and liquidation of the field facilities on the completion of the field development should be done by a separate project. At present, there are no normative requirements in Russia for the decommissioning of the marine oil and gas field installations, except for the rules of conservation and liquidation of the prospecting and exploration wells.

In accordance with the above-mentioned rules, the wells should be left in the stable and safe state. It means that the wells should be plugged by cement. The productive zones shall be isolated to avoid the migration of the fluids in both directions; the open part of the hole shall be isolated from the cased; all annular and production casing shall be plugged by the cement solution and then the casings and the production casing shall be cut off at the sea bed level.

4.4.6 Organization of the Operational-Environmental Control

In accordance with the Russian legislation all users of the sites of the continental shelf should carry out the works on hydrometeorological and environmental monitoring and to submit the data received in the result of these works to the relevant Russian organizations. In accordance with the concept of the Unified State System of the Environmental Monitoring of Russia developed by the MNR of Russia in 1992, it is necessary to envisage the coordination and competitiveness of the information flows in the system on the basis of the unified co-ordinate - time system, use of the unified system of classification, coding, formats and data structure. The system of the environmental monitoring of a marine field, in this sense, should be as a reference point in the collection and processing of the environmental information at the local level, fulfilling double functions.

The main tasks of the program of the operational and environmental control at all stages of drawing up the project for the development of the Arctic oil and gas resources are the following:

- generating the information necessary for the assessment of the impact on the marine environment and its biota at all stages of the project development;
- collection of the information for general characteristics of hydrometeorological and environmental conditions in areas of the fields location.
- long term control over the environmental situation on the aquatories of marine oil and gas fields and definition of the environmental effects which have not been forecast earlier.

During the implementation of the program of operational and environmental control standard equipment traditionally used in the international practice for environmental studies should be applied. Highly skilled specialists, laboratories and companies with corresponding licenses for conducting environmental monitoring should be used.

Methodology of sampling, field measurements, laboratory analyses and information processing should correspond the requirements of the Russian normative documents and generally accepted world practice.

It is absolutely clear that natural conditions of functioning and technical opportunities of the location of the elements of the operational environmental control in the Arctic aquatories define the necessity to fulfill the following requirements:

- metering units should function reliably under low temperatures;
- infrastructure of the metering network should not require additional facilities for its installations;
- information network should provide collection and concentration of the data from the metering devices in a unified computer center by international standards;
- data processing system should minimize the requirements to the metering system;
- system of data presentation should provide the possibility of multy-profile assessment of the state of the environment to the field management.

4.5 System of Ensuring Industrial and Environmental Safety

As it is shown by the world experience in design and development of the marine oil and gas fields and practical work of RAO «GAZPROM» on the onshore fields, environmental safety on the oil and gas field facilities is achieved by using the system of management of the environment protection. It is necessary to develop the analogous system for the development of the fields on the Arctic continental shelf.

The system should act at all stages of the project implementation, ensuring the guarantees for inclusion into the project all assigned nature protection measures and their observation at the stages of construction, operation and abandonment. During the entire life of the project strict official control over the state of the environment should be envisaged.

The main functions of the system of management of the environment protection for different stages of project implementation are the following:

- At the design stage - organization of studies for the assessment of the base-line state of the environment; if there is lack of information additional studies should be conducted with the aim to generate a complete evaluation of the environment prior to the completion of the design; the expertise of the project in general and the part of the system of management of the environment protection should be conducted with the aim to evaluate the correspondence of the project solutions to the legislative and normative requirements for environmental protection; working out methodological provisions for all work groups in the project;

- **At the construction stage** - to define the organizations-performing the work, boundaries of the construction sites; receiving permits-licenses for discharges of gaseous and fluid waste and for dumping solid waste and the definition of the requirements relating to the dumping place; conducting unified policy on the environment protection by all subcontractors; organizing regular control over the observation of the measures for environment protection;

- **At the stage of prospecting, exploration and production drilling** - to ensure reliable work of the drainage systems, removal of the drilling waste, emissions from flaring and other sources into the atmosphere, correct use and utilization of the drilling mud and cuttings; sealing of wells and utilization of fluids during well completion and operation; development of measures for the liquidation of the fluid spills during oil and gas shows and well operation; organization of the system of observation and control over the drilling activity;

- **At the stage of oil and gas production, transportation, processing** - to ensure reliable system of utilization of the formation water, drainage and utilization of different types of sewage; development of measures for the safe utilization of waste including chemical, solid and household waste; measures for the use of production and drilling agents including storage,

utilization and etc.; development of the environmentally safe measures for technical maintenance of the underwater pipelines, as for example inner cleaning by pigs and pressure testing while connecting and disconnecting the hoses; obtaining permits necessary to fulfill the works;

- **At the stage of the field liquidation** - to ensure alternatives and selection of the environmentally acceptable alternative of the decommissioning of the field facilities, observation of normative requirements during the liquidation works.

The practice of operation of the oil and gas fields and the accidents on marine fields have shown the necessity of the development of not only nature protecting measures but plans for the emergency response, if the situations threatening human life, environment or material values emerge. The issues above mentioned will be considered in chapter 6.

Chapter 5

Safety and Protection of Personnel Labor

5.1 Normative and Legal Security of Labor Protection and Safety Measures

The security of safe and sound working conditions for industrial facilities and activities and the guarantee of the protection of labor and health rights of working people are provided by the Labor Code of the Russian Federation (1992) and the Legislative Fundamentals of the Russian Federation on labor protection (1993).

According to the distribution of the competence between State management agencies governed by the Statute on Ministries, the Ministry of Fuel and Energy of the Russian Federation (Mintopenergo) is responsible for labor protection in the oil and gas industry.

These responsibilities include the following:

- ensuring safe working conditions for the operation of oil and gas facilities;
- labor protection in this branch of industry, prevention of occupational diseases, industrial injuries and accidents;
- development and approval of norms and rules, and control over their observance.

The direct responsibility for providing safe conditions in oil and gas activities lies on leaders and management of the industrial enterprises.

Employers, officials and other company personnel bear administrative, disciplinary, juridical and other responsibility as established by acting Legislation of the Russian Federation.

According to the Legislation of the Russian Federation all persons performing operations under agreements for individual contractors (contracts) are subjected to mandatory social insurance. The Federal Law «On obligatory social insurance against accidents on production and professional diseases» dated July 24, 1998, No. 125-FZ puts the responsibility for this type of insurance on the employer.

General principles are:

- introduction of the terms «professional risk» and «a class of professional risk» which will be defined in future sub-law acts for branches (sub-branches) of industry;
- compensation through mandatory social insurance does not deprive and does not limit the rights of the insured person on compensation for damage in general civil-legislative manner;

- compensation of salary loss and expenses connected with illness and loss of working ability;
- insurance reimbursement in case of the death of an insured person as fixed lump sum (60 times of minimal monthly labor payment) and monthly payments to dependents at time of death that is based on the insured persons salary.

It should be noted that the introduction of this Law into force is the result of adoption of the Federal Law on insurance tariffs in mandatory social insurance that must be established taking into consideration classes of professional risk.

5.2 Requirements of Personnel Training and Testing

The Ministry of Labor of the Russian Federation approved the «Typical Statement on Procedure of Training and Examination of Officials and Specialists of Enterprises, Institutions and Organizations in Labor Protection» on October 12,1994, which stipulates mandatory training and examination of all industrial workers, including management, in the labor protection. Training and examination on labor protection knowledge is implemented in accordance with The State Standard 12.0.004 - 90.

«The Rules of Safety in Oil and Gas Industry», agreed upon by Mintopenergo and approved by Gosgortechnadzor in 1992, stipulate the following:

- to allow only those persons who have higher or secondary technical education in appropriate specialties and have been certified with the appropriate documentation in operations on drilling, development and repairs of wells, geophysical investigations in wells, and on production and initial treatment of oil and gas;
- to allow persons, only after appropriate training and examination, to perform independent work on maintenance of equipment, well installation, geophysical investigations, development and treatment of oil and gas, or to carry out production operations.

The general rule is that professional preparation of personnel shall be implemented in specialized training institutions that are licensed by Gosgortechnadzor.

The procedure of training and training programs for professions that require increased safety, instruction, examinations, and certification of personnel for independent work are regulated by statements worked out by the appropriate federal authorities according to agreements with the Gosgortechnadzor for this branch of industry.

The organization of timely and quality training and examination on labor protection for an enterprise, is generally the responsibility of its director, and for its divisions (workshop, sector, department, laboratory, etc.), it is the responsibility of division chiefs. Control over timely implementation of training and examination of personnel is the responsibility of a Labor Protection Service established at an enterprise.

However, the general statements above have not been developed for workers and engineering employees engaged in works connected with preparation and development of offshore oil and gas deposits.

5.3 Factors Affecting Personnel in the Zone of Operations

The following industrial and natural factors will affect employees working on the Arctic shelf:

- acoustic noise, general and local vibration, ultra sound;
- electrical and electromagnetic fields, X-rays, radioactivity;

- vaporous pollution from hydrocarbons, sulfur compounds, and aerosols from electrical welding;
- low air temperature, increased humidity, high wind velocity, low atmospheric oxygen, lack of ultra-violet radiation, sharp changes in atmospheric pressure, long polar nights and days, and frequent magnetic storms;
- heavily busy working schedule, long continuous working periods, rough sea conditions and support vessel or platform oscillations, work under life-threatening conditions, work in strained conditions within small operational areas.

While transporting workers from a vessel to a platform and back the human organism may be affected by a pitching with a 2-4 m displacement of deck bottom. Air transport via helicopter can also cause physical and physiological stress.

In addition to the general working conditions, such as shift lengths, the safety of personnel employed in the development of oil and gas deposits on the Arctic shelf of Russia also depends on the type of work and the type of facility (e.g. on a stationary platform, on an off-shore drilling rig, at laying pipelines, on vessels, etc.).

At the present time, there are no special requirements for working conditions on oil and gas production facilities in the offshore Russian Arctic. For preliminary estimation of working conditions on marine stationary platforms (MSP), data from onshore oil and gas operations, as well as general statements of hygienic classification of work, are used. According to which, conditions of work on marine installations may be considered as medium difficult and difficult (when two or more hazardous or dangerous factors of work are present, conditions of work must be classified as the most difficult).

In principle, the existing legislative and normative base has working condition requirements for all basic production-related factors. However, it requires a correction for marine operations taking into consideration complex influence of working conditions, operational factors, and natural-climatic features of Arctic region.

The standard values of natural-climatic parameters for the northern latitudes that are used in calculations, are presented in Standard 2.01.01-82 «Building Climatology and Geophysics». Development of a special normative document may be recommended.

5.4 Sanitary-Hygienic Conditions and Regimes of Work and Rest of Personnel, and Medical-Rehabilitative Measures

Analysis of the existing legislative and normative documentation shows that requirements for sanitary-hygienic conditions need improvement with regard to specific features of work on the Arctic shelf.

Analysis of personnel sanitary-hygienic working conditions in the Arctic show that one of the main natural-climatic conditions for protection of human health is adequate nutrition and safe water supply. Though no normative-legal documentation on measures for the protection of personnel health working in the Arctic zone of Russia is available, the analysis and generalization of collected information permits definition of requirements for special normative and legal documents.

The basic physiology and hygienic requirements for nourishment and water supply of people working in the Arctic offshore zone are as follows:

- correspondence of quantitative and qualitative content of a daily food ration to energy expenditure of personnel in marine oil and gas activities;
- compliance of daily diets to predetermined norm of nutritional need for different categories and professions of personnel taking into account special Arctic and marine conditions;

- contents of food and finished dishes must be sorted to account for the influence of difficult climatic, living, and working conditions;
- finished food must have good flavor, quality, variety, be safe in a sanitary-epidemiological respect, and must be balanced in quantity and quality;
- diet must be specially developed for protection of human health while working in exploration and development of oil and gas fields the Arctic zone;
- feeding regime must provide the proper number of meals during a day, as well as the daily food ration in meals during a day, taking into consideration shifting work schedules;
- regular supply of all necessary micro-nutrients - vitamins and mineral substances, in order to replenish any deficit of nutrients, and to help increase resistance to illness and adapt to unfavorable living conditions;
- timely, valuable and safe provision of water satisfying sanitary standards, soft drinks, and especially drinks rich in vitamins, micro-elements and biologically active substances;
- strict sanitary-hygienic control over feeding products, preparation of food, water supply, places of consuming and preparing food.

Analysis of statistical data on changes in employees functional physiological state in Arctic conditions (cardio-vascular system, vegetative nervous system, thermo-regulative system, etc.) shows it is necessary to conduct a series of medical-rehabilitative measures. These measures shall be implemented in rehabilitation-recreating centers arranged in different areas of the Arctic zone.

The goals of the above-mentioned centers are:

- pre- and after-shift-work examination of personnel coming from different regions;
- determination of ability to work and medical certification to work;
- development of recommendations on staffing of teams and recreation of personnel.

The provision of medical-sanitary service for personnel working on oil and gas installations in the Arctic zone can be arranged by the specialized services of the Minzdrav which has a network of medical-sanitary posts, including areas of development and transportation of oil and gas in the northern regions.

5.5 Systems of Personnel Life Provision in Emergent Situations

The following requirements for personnel safety should be met when designing and constructing living, service, public, and sanitary buildings:

1. Organization and equipping of working place:

- equipping of working places with indicators and warnings of dangerous production factors (detectors for gas, smoke, noxious fumes, fire and etc.), and with systems of emergency notification, communication, etc.;
- availability and accessibility of means of individual protection and rescue;
- mandatory provision of two equal evacuation exits from each floor of technological rooms and each living floor (one exit is permitted for rooms where presence of people is short term and irregular);
- organization of evacuation exits from floors of technological rooms and upper level working decks to outside or interior closed stairwells with natural illumination.

2. Location of a living block:

- proper orientation of a platform considering prevailing currents and wind directions;
- living, service, public and sanitary buildings should be placed on a separate block of the foundation with observance of a safe distance (eg. not less than 50 m) from drilling and development works;

- defense of living buildings against damage from possible falling drilling and/or torch masts;
- explosion and fire danger areas must be separated from technological rooms and open decks;
- water-curtain supply on the side of a living block which faces industrial-technological buildings, drilling and exploitation wells;
- protection of living and public buildings by exterior anti-fire walls and covers with a fire-proof limit of not shorter than an hour;
- installation of blind windows and port-holes in walls of controlling posts, living and public buildings that face a drilling rig and open drilling equipment (a well), as well as equipping of such windows and port-holes with inside shields made of steel or equivalent material.

3. Provision of personnel evacuation should correspond to the following requirements:

- development of rules, in a set of operational documentation, for behavior and safety provision for personnel during evacuation in cases when continued occupation of a platform is life threatening due to uncontrolled fire, or oil or gas emissions, when it is impossible to eliminate them by the available means; due to a risk of heel, strong storms, etc.;
- provision of total (emergency) evacuation in such a way that calculated time of evacuation would be shorter or equal to time necessary for evacuation. For example, reaching of embarkation places or temporary shelters should take a few minutes from any most remote point; total time for moving to a shelter and/or embarkation into rescue vessels launching on water in calm conditions must not exceed 10 minutes. However, this time will vary according to ice and climatic conditions, type of facility, and mode of evacuation; eg. marine vessel or helicopter;
- emergency evacuation routes, temporary shelters, and places with collective life-saving means must be located so that buildings and multi-stage constructions could protect personnel from direct heat radiation in case of fire at the well head of production wells;
- marine stationary platforms must have mooring-landing facilities located to account for the possibility of personnel embarkation in vessels with the wind and seas coming from any direction;
- platform design must not have cantilever grounds and other constructions exceeding, by dimensions, mooring and mooring-embarking facilities (except landing grounds of helicopters, if in this case no obstacles will be created for mooring);
- if there are reasons to believe that, due to possible conditions of an emergency situation and unfavorable weather, that the calculated time of platform evacuation cannot be provided, the platform must be equipped with a temporary shelter able properly to protect personnel;
- teaching and training of personnel in evacuation actions with examination and drills of respective knowledge and experience.

4. Evacuation routes and exits, and passages to collective life-rescue means during crew evacuation must satisfy the following requirements:

- safe arrangement of exits (requirements for dimensions and installation of openings, passages, turns, staircases and flights of stairs and overpasses, selection of materials for floor covering, emergency lighting, marking and etc.);
- arrangement of pipelines at floor level where they cross evacuation corridors, with the installation of foot bridges above them, and avoiding flanges, welded and other conjunctions of pipes and cables in a corridor crossing areas;
- correspondence of passages to landing (boat) grounds to «The Rules of Classification and Construction of Sea Ships of the Register»;

- provision of safe grounds for embarkation to collective rescue means in conditions of open flowing of wells and accidental break of pipelines;
- installation of mooring and mooring-landing facilities (grounds) with account of provision of mooring anti-fire and other vessels from several sides and other measures of safety provision.

5.6 Proposals on Improvement of Regulatory-Legal Base for Provision of Working Conditions and Human Health Protection in Operations on the Arctic Shelf

Analysis of materials related to problems of safety protection of personnel in the process of this feasibility study leads to the following recommendations:

1. To develop in the frame of the System of safety standards «General requirements to safety and labor protection in operations on the continental shelf» and accept them as a respective State standard.
2. To revise existing legislative and normative documents on labor protection and provide:

- necessary jurisdictional status and time of applicability according to existing legislation for documents which are recognized as suitable for the purposes and tasks of labor protection and corresponding to requirements of GOST «General requirements to safety and labor protection in operations on the continental shelf»;
- preparation and implementation of a Program for development of new, or changes and additions to current documents taking into consideration «General requirements to safety and labor protection in operations on the continental shelf»;
- preparation and implementation, as a periodically renewable normative document «A register of obligatory legislative and normative acts and recommended for usage documents in labor protection for personnel occupied in marine operations connected with oil and gas fields exploration and development».

3. To foresee, in the frame of the Program, development and correction of the following documents:

- «Sanitary rules and norms for works on stationary constructions on oil and gas development on the Arctic shelf»;
- addition of «Sanitary rules for floating drilling units» No. 4056-85 of sections reflecting specific features of work on the Arctic shelf;
- addition of Hygienic Labor Classification (by harmfulness and hazard of production-related factors, difficulty and tension of working process) No. 4137 from August 12, 1986 of articles taking into account the specific features of marine work and a work on the continental shelf;
- sanitary-hygienic requirements for organization of expeditionary-shift method of work in exploration and development of marine oil and gas deposits on the continental shelf;
- addition to the Statement «On the Ministry of Health Department on Medical-Sanitary Provision of Workers at Oil and Gas Complex» of articles on provisions of works on the marine oil and gas operations;
- rules of arrangement for systems of life-support and evacuation of personnel from marine stationary and floating installations connected with development marine oil and gas fields on the Arctic shelf in conditions of threat and occasions of emergency situations;
- a Statement on the State expertise, certification and procedures of the state supervision for labor protection and rest of personnel on marine units of oil and gas complex.

4. To develop and introduce into action «Typical Statute of enterprises and organizations carrying out exploration and development of marine oil and gas fields» where the following issues must described:

- duties of operators in development operations of marine oil and gas installations, in a set of operational documentation that is presented in a process of submission and acceptance, by devising Statutes for these units based on the «Typical Statute...»;
- mandatory requirements of the Statute for all personnel temporary or permanently present on marine installations connected with exploration and development of oil and gas fields independent of their belonging to enterprises, organizations and departments.

5. Mandatory requirements and programs on training and testing of personnel occupying marine installations and units for exploration and development oil and gas fields.

6. To provide, taking into consideration mandatory requirements of labor protection, normative documents defining demands to designing and exploitation of marine installations and units for exploration and development of oil and gas fields.

Chapter 6

Emergency Situations, Preventive Measures and Response

6.1 General Provisions

Marine oil and gas production and associated operations are one of the most dangerous kinds of industrial activities because they are carried out in complicated and not fully investigated natural conditions, deal with great volumes of dangerous substances and materials, and are implemented using new and quite complicated technologies. A characteristic of marine oil and gas production hazards is the possibility of so-called emergency situations (ES), i.e. unpredicted events and uncontrolled processes with a threat of serious damage to health, life and welfare of people and the natural environment.

Possible emergency situations in marine oil and gas production may be subdivided in the following way:

1. According to sources (reasons) of their occurrence:

- extreme natural or physical phenomena (earthquakes, anomalous formation pressure, emissions of oil and gas, loss of foundation stability, extreme storms, ice loads);
- uncontrolled fire, explosion, and emissions of dangerous and toxic substances (formation of explosive mixtures, leakage of toxic compounds);
- failure and damage of technical equipment (collisions of vessels with structures and other vessels, grounding of vessels, accidents with helicopters, accidents during loading - unloading operations, falling items, etc.);
- human error (wrong actions, inaction, navigation error, management of technological processes, etc.).

2. According to main dangerous factors:

- emission or leakage of great amounts of dangerous substances beyond protective barriers (clouds of toxic gases, oil spills, etc.);
- dangerous factors of fires (clouds of toxic gases, oil spills, etc.) and explosions (impact wave, splinters, etc.);
- mechanical damages and failure.

3. According to main effects:

- safety of personnel;
- environment contamination;
- property damage.

Though the occurrence of each ES (beginning, development, and results) is a complicated combination and sequence of causes and effects, the above mentioned subdivision may serve as a starting point to develop a regime of safety, regulation, planning, implementation and control of measures directed on ES prevention, limitation and elimination of their consequences.

Marine oil and gas installations are considered as dangerous industrial objects and therefore the Federal Law «On Industrial Safety of Dangerous Production Objects», governs marine oil and gas installations and, as was mentioned in Chapter 2, prescribe and regulate safety procedures and provisions in the following phases:

- licensing of the activity concerning designing, construction, exploitation and conservation (liquidation) of oil and gas extraction installations and manifolds;
- licensing and certification of technical equipment used on dangerous industrial objects;
- requirements for designing, construction, approval and operation of industrial activities;
- plan of preparedness for actions on localization and elimination accident resulting from an oil and gas production installation or manifold;
- industrial control on following requirements and industrial safety expertise.

Analysis of the existing system and development of proposals for prevention and liquidation of ES must be carried out within cycles of management (prediction, planning, management, control, estimation of results) and according to operational cycles of the project (geological investigation, pre-design investigations, exploration of the field, design and investigation, development and drilling, exploitation, treatment and transportation of products, conservation and liquidation of installation). These steps are implemented by regulatory bodies and operators, within their respective organizations and in interaction with each other.

Normative and legal problems of preventing and liquidation of ES are considered in a number of legislative and regulatory documents:

- the Law «On Interior» prescribes the interior user the duty «to take special measures on prediction and prevention of unexpected gas emissions...»;
- the Law «On Continental Shelf» demands submittal of «data on prevention and liquidation of ES» and contains a special Article 39 - «Marine accidents»;
- «Water Code» prescribes to water-users «timely implement measures on prevention and liquidation of accidents and other emergency situations...»;
- the Law «On Agreements about Production Sharing» puts on investor «insurance of responsibility to reimburse the damage in case of accidents...»;
- the Law «On Industrial Safety of Dangerous Production Objects» introduces the term and procedures to develop «Declaration of Safety for Dangerous Industrial Enterprise» which according to normative acts must include:
  - identification of especially dangerous production facilities;
  - risk and dangers assessment;
  - safety assessment of industrial object;
  - provision of object preparedness for localization and liquidation of emergency situations;
  - insurance data.

Normative documents regulating composition and content of design documentation (SP-11-101-95 and SNiP 11-01-95) requires the inclusion in the «Declaration of Intents» data about «possibilities of accidents (probability, scale, duration of impact», in «Investment

Justification» data about «risk degree and probability of accidents occurrence», as well as, in the Feasibility Study for the Project:

- subsection «Safety assessment» in «General Explanatory Note»;
- subsection «Estimation of accidents possibility and measures on their prevention» in the section «Technological solutions»;
- section «Engineering-technical measures of civil defense. Measures on emergency situations prevention».

Below, sections 6.2 and 6.3 consider two main aspects of safety provision in emergency situations. Each of them is a specific field of normative-technical regulation:

- fire and explosion safety of habitable marine structures for hydrocarbon fields development;
- measures on liquidation of emergency oil spills.

6.2 Provision of Fire and Explosion Safety of Marine Installations

6.2.1 Fire and Explosion Safety Regulation

Fire and explosion are the most dangerous of ES for marine oil and gas installations. Until now Fire Prevention was covered by the normative documents:

- «Rules of Fire Safety on Objects of Oil Industry on Continental Shelf» (RFSMO-88);
- «Guidelines on Vitality of Marine Stationary Platforms and Floating Drilling Rigs» (DD-39-470803-5-89).

These documents were developed for the Caspian Sea and when applied to the Arctic must be estimated individually. In lieu of specific normative documents dealing with design of ice resistant stationary structures for the Arctic continental shelf, requirements of the following documents were taken as a basis:

- GOST 12.1.004-91 «Fire safety. General requirements»;
- GOST 12.1.010-76 «Explosion safety. General requirements»;
- SNiP 2.01.02-85 «Anti-fire norms»;
- Rules of classification and building of sea vessels.

Requirements of normative documents of the Ministry of Construction of Russia (Minstroy) for designing, including design of engineering systems, must be kept in mind, as well as Statements of Rules for electric equipment assemblage, documents of State Anti-fire Service, GOST`s, etc.

The premises of marine structures with respect to fire and explosion danger are subdivided by categories A,B,C and D, according to ONTP 24-86/MVD of the USSR «All-Union norms of technological design. Definitions of categories of premises and buildings by fire-explosive and fire danger», depending on the fire-explosion properties of substances and materials stored in rooms and considering specific features of technological processes of production.

Classification of explosion and fire danger zones inside premises and outer equipment to choose fire safe electrical equipment is cariied out according to Rules for electrical equipment assemblage (REEA-86) Mintopenergo.

6.2.2 Provision of Fire and Explosion Safety

The concept of fire and explosion safety in respect to oil and gas production facilities on the continental shelf must include international experience in design of such objects, the experience of former USSR, and the experience in floating drilling rig design reflected in requirements of Maritime Register.

These recommendations are valid for the Feasibility Study stage (Project) and may be used in the development of respective working designs with mandatory additions, solidification, and specification of demands reflecting main features of purpose, design and exploitation of installations.

A concept of fire protection for marine oil and gas production enterprise must be developed considering the following main requirements and conditions:

1. Requirements to the location of production platforms and infrastructure facilities within the offshore leasing zone including:

- preparation of a list of permanent and temporary structures, boundaries of construction zone (within licensed zone) and protective zones (zones of safety) for separate objects;
- location of objects offshore, distance between platforms, and between other marine and onshore structures with consideration of technological, anti-fire and other requirements including navigation and maneuvering of vessels (especially rescue and anti-fire);
- defining the regime of access and other kinds of economic activities and navigation within defined zones;
- agreements with interested organizations in respect of defined zones, delineation of these zones on navigation maps, and including in «Notices to Mariners»;
- provision of proper marking and lighting of facilities;
- defining of proper orientation of platforms with oil and gas (gas-condense) wells keeping in mind safety of living quarters and prevailing sea streams and winds;
- location and disposition of oil and gas production units considering free access of fire vessels from all sides to marine stationary (including island type) platform;
- disposition of rescue vessels considering the distance of drilling and production units from fleet bases and/or routs of duty navigation.

2. A choice of architectural and lay-out solutions for marine oil and gas production structures should considers:

- delineation of functional zones with definition of minimal safe distances preventing escalation of emergent situations;

Note: the following delineation of zones is recommended:

- drilling and exploitation of oil and gas wells;
- general buildings, structures and installations;
- parks of production reservoirs;
- by-work production buildings and structures;
- living and administrative quarters;

- development of three-dimensional solutions considering safety of functional zones;
- architectural and lay-out solutions concerning location and grouping of wells on marine stationary platform in rows and groups must consider safety problems:

- simultaneous processes of development (drilling, production);
- type of extracted resource (oil, oil with high content of gas, gas condensate, natural gas);
- provision of access during exploitation, maintenance and repair;
- limitations on maximal number of wells, formation and head pressures and planned discharge;

- requirements for well head locations in respect to outer boundaries of functional zone, pipelines and posts;
- conditions of well locations during the use of several drilling rigs and when one unit serves several rows of wells;
- requirements for connections of sealing pipes from mud pumps and/or grouting units to well head water separating casings, and foundations for anti-fire units;
- mandatory usage of valves inside wells and group switch-off for wells in emergency situations;
- take-outs and fixings for pipes from preventer units manifold;
  - control panels and control posts location, arrangement of remote controlled and automatic systems;
  - separation of wells zone by anti-fire zones and rules of anti-fire zones as well as protecting barriers and drilling rigs paneling construction;
  - arrangement of under-deck space without tanks and equipment containing flammable liquids and gases.

3. A choice of three-dimensional and constructive solutions includes:

- definition of fire resistance of main and barrier structures (as a rule not lower than respective structures of 1 and 2 groups fire resistance);
- inflammable materials may be used only for paneling of living quarters and administrative premises excluding passages, halls and stairways;
- sectioning of top structures by constructing anti-fire walls and covers with the limit of fire resistance not less than 1 hour (type A-60) with separation of some blocks and rooms;

  Note: the list of sectioned premises may include but not be limited to:
  - rooms and areas (decks) with technological equipment intended for initial treatment, measurement and transportation of well products;
  - rooms of power plant including diesel electric plant, transformers, control panel, reservoirs for fuel and oil;
- rooms of control and management for processes of well drilling and production of oil and gas;
- rooms containing equipment for geophysical well logging, control panel of blow-out preventers, gas analyzers, equipment of fire alarms, etc.;
- rooms of helicopter control, navigation, radio stations and other means of communication and management;
- boiler room;
- laboratory, workshops (plumbers, carpentry, device repair, communication units repair, etc.);
- store rooms for materials, balloons and equipment;

- conditions of location on decks of upper stage and above them equipment, devices and tanks;
- installation of constructive elements limiting oil spills to the living quarters.

4. Technological systems of marine structures must take into account the following requirements:

- equipping of technological rooms and sites must include barriers and thresholds to prevent spreading of liquids outside rooms or sections of the deck;
- separation of rooms from technological sites containing gas-separators, reservoirs with easily inflammable and inflammable liquids and other similar equipment;
- construction of windows, scuttles and hatches in anti-fire barriers with required limits of fire resistance;

- limitation of fuel reservoirs for engines located in fire and explosion danger zones;
- equipping engines exhaust pipes by spark preventers and heat insulation, elimination of contact of exhaust gases with sources of gas emissions as well as vapor of oil and oil products;
- construction of hermetic passages of pipelines through walls.

5. Constructive features of reservoirs and pipelines must satisfy the following conditions:

- storage of fuel, oil and methanol must provide necessary autonomy of operations and life support of the unit;
- location of methanol reservoirs must correspond to sanitary norms;
- construction of protective screens for reservoirs and heat insulation of heated equipment and pipelines;
- equipping reservoirs for oil and other easily inflammable and inflammable liquids by breathing, preventive and lock devices, sampling and measuring devices, pumps and drives in anti-fire and anti-explosive variants;
- construction of reserve stations of reception and pipelines for supply of fuel and methanol from vessels;
- elimination of fuel and methanol pipes location through dangerous premises and near-by, underneath and above living quarters;
- exploitation posts of underwater pipelines on many-level platforms must be located only near wells and outside permanent moorage zone for vessels;
- protection of exploitation posts of manifolds and pipelines against destructive action ice fields movement;
- constructing of reverse valves before equipment for measuring and separation of well products and on well‘s pipelines before collector or manifold;
- construction of cut-off valves on pipelines leading to exploitation block.

5. Heat producing equipment must satisfy the following conditions:

- location of units with flame furnaces (boilers, heaters, etc.) on separate platforms not containing oil and gas wells and other equipment with oil and gas;
- usage of flame furnaces only in boilers for hot water and steam for domestic and technological purposes as well as in units for thermal treatment of sludge;
- specific requirements to boiler rooms on platforms.
  Note: these specific requirements are:
  - maximal distance from production wells with minimal distance 15m;
  - screening of boiler room from premises of A and B categories impermeable to gases with fire resistance not less than 1 hour;
  - existence of separate exit from boiler room in direction opposite to rooms and decks with explosion dangerous zones;
  - absence above boiler room premises of A and B categories with permanent presence of people;
  - equipping boiler room with explosion valves;
  - presence spark-preventers in chimneys;
  - construction of natural ventilation in boiler room and emergency draw-out ventilation with mechanical starter blocked with gas analyzer;
  - provision of triple air exchange during 1 hour in normal conditions not including amount of air used by boiler furnaces;
  - equipping boilers by automatic devices stopping fuel supply in emergency regimens;
  - equipping boilers by systems of steam or inert gas supply to furnaces in emergency situations;

7. Torch(es) for gas burning and candles for gas outlet must satisfy the requirements:

- location of torch outlet pipes for flowing gases and products of well testing in respect to other installations;
- location of candles for gases discharge and dispersion in atmosphere from separators of initial de-gasification of drilling mud, equipment and parts of pipelines during preparation for repair;
- construction of foundations for torches and candles;
- possibility to direct well products to a burner located leeward;
- equipping burners with automatic remote duplicate lighting, supply of dehydrated gas to lighting device, and provision of a water screen from the side of the platform.

8. During designing of engineering safety systems it is necessary to provide:

- construction of systems for emergency ventilation, smoke removal, devices for decreasing explosion pressure in fire-explosion and fire- dangerous rooms;
- measures on reliable power supply for anti-fire systems of units;
- usage of explosion protected electrical equipment or, when usual electrical equipment is used, provision for its switch-off in conditions of high gas content;
- inclusion in protection equipment systems of lightning protection and protection against accumulation and discharge of static electricity;
- construction of systems for heating, ventilation and air conditioning in fire-explosion protected version with protection against gases including emergency removal of inflammable gases, prevention of gas leakage from room to room, blocking of gas media control systems in rooms and opened decks (sites);
- construction of canalization systems providing fire-safe collection and removal of possible spills of easily inflammable and inflammable liquids.

9. During designing of anti-fire protection for marine structures systems providing necessary degree of reliability of fighting a fire on the platform must be developed which include:

- equipment for automatic fire extinguishing (water, foam, gaseous, halon, powder, air suspension, etc.);
- fire alarm systems;
- anti-fire water pipelines including fire taps and water gun-carriages;
- stationary units for fire extinguishing and water screening;
- anti-fire mechanisms and equipment including appropriate cloths and heat reflecting costumes, etc.;
- initial means for fire extinguishing.

6.2.3 Proposals on Improvement of Normative-Technical Provision of Fire and Explosion Safety

Due to the wide variety of geological and physical conditions, variety of purposes, technology, types of fixed marine oil and gas production facilities, and comparatively small number of projects (not more than 5 projects for Arctic and Far-East region up to 1998) it is hardly possible now to develop normative-technical base fully covering all problems regulating fire and explosion safety.

It seems reasonable to accept an individual or case-by-case approach to each project based on the following statements contained in SNiP 11-01-95:

- «additional detailed designing development project solutions concerning separate objects, sections and problems... may be done for technically and environmentally complicated objects» (par. 2.5);
- «while designing especially complicated and unique structures the customer... must develop special technical conditions reflecting specific features of their designing, construction and exploitation» (par. 3.3);
- «substantiated deviations from requirements of normative documents are permitted only by organs which approved and/or introduced these documents into action» (par. 3.5);
- possibility for the customer to receive «initial data, technical conditions and requirements issued by organs of federal supervision (control)» (par. 3.6).

It is possible to recommend development of individual technical conditions (TC) of fire-explosion safety for big stationary marine structures intended for oil and gas development on continental shelf (platforms, terminals, pipelines, etc.) taking into consideration these requirements. These TC may be developed by agreement with separate regulatory agencies or by agreement with all such agencies (Gosgortechnadzor, Gospoznadzor, Maritime Register, MES and others). The last variant is recommended as preferable because during joint consideration, possible contradictions and discrepancies in the current normative base can be discovered and eliminated.

Development and approval of TC as well as estimation of following their requirements can be carried out in the frame of existing routine for expert organs particularly the Expertise of the Ministry of Civil Defense (MES) (A statement on state expertise concerning protection of population and territories in emergency situations. The Decree of MES of Russia No. 446, dated 06.23.95), and of Gospoznadzor (The order of agreement by organs of State Fire Supervision of Russian Federation design-economic documentation for construction. NPB 03-93, the Decree of MVD of the Russian Federation No. 521, dated 12.06.93).

The individual or case-by-case approach does not exclude preparation and introduction into force of general normative documents when they are ready and sufficient experience is available.

6.3 Measures on Preparedness Provision and Emergency Response to Oil Spills

Arrangement of emergency response system on oil spills must take into consideration the following:

- results of risk assessment for emergency pollution and oil spills behavior in offshore petroleum activity areas;
- typical hydrographic and hydrometeorological conditions for the zone under consideration;
- the possibility of oil spill reaching the coast;
- specific features of oil spill behavior (evaporation, formation of oil-water emulsion).

The rate of possible marine environment pollution in case of emergency from accidental oil discharge depends of following factors:

- the volume of discharge ;
- the place of discharge;
- hydrometeorological conditions at accident site;
- environmental vulnerability of marine environment and coast line;
- composition, disposition and preparedness of forces and means of fast response.

6.3.1 Possible Scenarios of Emergency Situations Development

Experience shows that there are no similar oil spills and it is impossible to foresee all emergency situations at a facility or installation. However, it is important when an operator arranges an emergency response system that they prepare and analyze scenarios of possible oil discharge in advance.

Development of emergency situation depends on such factors as:

- physical and chemical properties of oil (or gas-condensate);
- hydrometeorological factors (season of the year, temperature, sea conditions, fog, ice conditions, visibility, sea currents, wind, etc.);
- position and method of oil production (the type of marine structure, sea depth, distance from the shore, etc.);
- construction and tanker deadweight, character and location of accident.

The following types of discharges may happen on marine petroleum complexes:

- underwater discharge caused by well accident;
- underwater discharge from oil pipeline;
- under ice discharge from well or pipeline;
- underwater or surface discharge from equipment;
- on solid ice discharge;
- on broken ice discharge.

Underwater discharges from wells and pipelines are characterized by an increase in speed and turbulence of escaping liquid during its ascent to the surface. Oil moves in a radial direction from the center of the spill under influence of wind and surface currents. The thickness of the oil film is usually very small in the case of underwater spills. Depending on weather conditions such films usually rapidly mix with water and form viscous emulsions.

Above water discharges from wells mix with air much quicker forming a cloud of fine drops of easily inflammable liquid. Usually the oil slick and thickness of film during surface discharges are higher than for underwater spills and therefore are easier to control and collect oil using traditional methods.

Modern methods of modeling permit calculation of the size and area of oil slick, film thickness, amount of oil evaporated and dispersed in water (lost), predicted viscosity and water content in emulsion, temperature of thickening emulsion (temperature when fluidity stops).

Accidents on tankers accompanied by oil spills differ from accidents on marine drilling units (MDU) in frequency and volumes of oil spills.

Scenarios of surface oil spills accidents from tankers and equipment are characterized by comparatively small initial discharge rates though in case of catastrophic destruction of reservoirs and tanks, large oil spills into marine environment can happen.

Specific scenarios and results of modeling of oil spills behavior must be developed by oil industry operators for specific marine zones of the continental shelf in the framework of the Environmental Impact Assessments (EIA) and included in plans of measures on Elimination of Oil Spills (EOS) as initial data. Moreover, the operator must estimate and model oil spills even in the process of emergency response.

6.3.2 The Technology of Oil Spills Elimination

The main methods of oil spills elimination in international practice are:

- localization or containment of spills and collection of oil using mechanical devices;
- elimination by dispersion of oil spills using chemical compounds;

- elimination of oil spills using biological compounds;
- drowning of oil;
- oil burning.

A choice of optimal technology and schemes of oil spills elimination must be done considering the following factors:

- maximum possible oil collection from the sea surface and elimination of coastal pollution;
- minimal damage to the environment during large scale clean up work on the shoreline;
- use of chemical and biological compounds or the burning and drowning of oil is permitted only in regions where it has been agreed to be allowed in advance, and in cases when results of the environmental impact are less than damage caused by the oil spill or big scale cleaning work on the shore;
- economic expediency to involve forces and means of cooperating organizations and clean up work cost;
- public opinion.

The choice of vessels for containment and collection of oil from the sea surface and for transportation of oil-water emulsion (ignition temperature of more than 60°C) is based on an estimation of efficiency for their use. Therefore, the use of multi-purpose vessels is preferable, particularly supply vessels that involve a minimal re-equipment for oil collection operations, which should include:

- free deck space;
- towing wench;
- stern sleep;
- good maneuvering and navigation qualities;
- the possibility to work for a long time at low speed;
- availability of tanks for storage of oil-water emulsions;
- on-deck loading crane;
- stationary equipment for fire extinction;
- stationary equipment for oil dispersion;
- availability of a grab (for oil collection from ice surface).

For crew rescue from vessels and emergency evacuation of oil filling complex, the rapid containment of the spill source, the prevention of oil slicks and spots dispersion, and the protection of marine and coastal priority zones, fast boats must be used that are equipped with quickly unloaded boom barriers. Such boats may also be equipped with a system for oil dispersion.

Oil barges may be used for receiving and transportation oil-water emulsion to coastal storage-treatment facilities. Containment equipment and autonomic oil collection systems may also be installed on them.

Boom barriers may generally be divided into four groups depending on their deployment and hydrometeorological features of the region:

- to protect coastal structures;
- to protect shore and coastal strip (light booms);
- to protect offshore zone near the coast, some important zones and harbors (medium booms);
- to prevent oil spreading in the open sea (heavy booms).

The main requirements to containment equipment:

- sufficient retaining ability;
- reliability and strength of materials and construction;

- sufficient flexibility on water;
- fast deployment;
- oil resistance;
- sufficient strength to break;
- convenience of maintenance, cleaning, repair and storage;
- temperature limitations;
- hydrometeorological limitations;
- weight an size features.

Efficiency estimation for oil collection facilities must take into consideration the following factors:

- autonomy;
- productivity;
- limitations on viscosity and mechanical inclusions;
- reliability and repair suitability;
- explosion safety;
- mobility;
- convenience for maintenance, storage and transportation;
- content of water in collected emulsion (for skimmers);
- normative duration of exploitation;
- hydrmeteorological limitations (for marine skimmers).

Sorbents, chemical and biological substances, burning and drowning are used when collection of oil from the water surface is impossible or inefficient.

Chemical methods of oil spills elimination include:

- dispersion of oil in water;
- de-emulsion (layering) of oil-water emulsion formed due to intensive mixing by wind, waves or pumping;
- gel-forming (transfer of oil in gel-state) to prevent its further spreading and make easier its collection.

The main criteria to choose chemical and biological compounds are:

- environmental safety (maximum permissible concentration - MPC);
- retaining ability (for sorbents);
- quantity ratio with treated oil or emulsion;
- efficiency;
- methods of implementation ;
- duration of storage;
- temperature limitations;
- technology of storage and transportation;
- cost.

To prevent the danger of further discharge of oil from MDU, tankers or inland reservoirs, autonomous oil-unloading stations of high capacity, means for storage and transportation of collected oil and emulsion.

Specific technologies include:

- oil spot treatment by bio-compounds;
- burning of oil spill;
- methods and means of EOS in ice conditions.

Oil burning methods are used in EOS practice in complicated hydrometeorological conditions when:

- mechanical means of oil collection are not possible;
- it is impossible to treat oil spill by dispersents or bio-compounds;
- burning of oil will make less damage to the environment than oil an spill.

Burning of oil forms considerable amount of smoke therefore burning is only recommended:

- far-away from settlements;
- at the distance not less than 60 miles windward from sea animals habitat (walruses, seals, etc.) as well as birds;
- when a thickness of oil film is not more than 1 mm;
- when wind velocity is less than 10 m/s;
- when oil viscosity is no more than 2000 sst.

Oil burning operations must begin immediately after a decision with federal controlling organs is made.

Burning of freshly spilled oil and oil products is the most efficient - it is possible to burn about 90 % of spilled oil. Burning of highly watered oil on water or on soil for more then 2 weeks is inefficient and does not provide desired results.

Oil on water with floating ice will extend on the ice surface, and can be partially adsorbed by ice. Extension of oil under ice is mainly influenced by the density of the oil product. The density of the majority types of heavy oil under temperature of 0°C is higher than the density of ice and the difference increases during process of oil degradation (appearing like ice crawling over oil). Light oil will go under ice under the influence of wind and currents. For instance, when the wind velocity is 12 m/s, the current is 0,5 m/s, and the thickness of ice is 15-45 cm, the oil is easily pushed under the ice. The broken and uneven lower surface of ice forms good conditions for the long term accumulation and storage of oil under ice. It drifts together with ice or moves under influence of a current velocity that exceeds «limit speed» (tearing-off point). The ability of oil to adhere to an ice surface covered by snow increases and the oil adsorbed by ice forms a viscous gruel. During thawing, oil under the sun light warms faster than ice, penetrates deeper into ice. During the next temperature drop, oil freezes into the ice, forming a layered structure.

Currently, there are no efficient technologies of EOS in ice conditions. Experience of the USA, Canada, Finland, Norway and Russia shows that in winter time the following technologies can be used:

- burning of oil using fire-resistant booms or without them;
- collection of crashed ice socked with oil, its melting and separation of oil and water;
- collection of oil in polynias by skimmers, dredges or by specially designed devices (for instance oil collecting attachment «Lorry Ice»).

6.3.3 Work Organization in Emergent Situations

1. Emergency service of the object (ESO)

An emergence service of the object must be established on every structure and vessel as well as the technical means and materials for containment and collection of local oil spills.

The main tasks of ESO are:

- evacuation and rescue of people from inland and marine units in emergency situations;
- containment and elimination of oil spills on inland and marine units including adjacent areas;
- carrying out local work in emergency situations.

2. Cooperation and enlisting additional forces and means, coordination of coastal and marine forces and means, regional rescue services

Practically all emergency situations resulting from accidental oil spills, according classification adopted in the Russian Federation, have regional character because oil spills are capable of changing living conditions and activity of a considerable part of the populations in coastal regions, and the damage due to their occurrence and the expenditure for their clean-up can be considerable. Determination of emergency situations as «regional requires that, together with object, zonal and regional EOS services must be established.

Zonal (regional) services include all local services and, if necessary, may comprise additional response bases and other units, and organizations whose activity is coordinated by EOS plans at a corresponding level.

Depending on the scale and character of possible emergency situations, tight interaction is required between headquarters and commissions on ES of territorial authorities, branch and municipal rescue divisions and similar services of industrial enterprises, and organizations of respective region. This is especially true connected with fires and oil spills in the zone of oil filling complex and adjacent territory.

The following organizations must and can be involved in the frame of cooperation to eliminate oil spills:

- territorial Headquarters of Civil Defense and ES;
- the nearest Coordination Center of Marine Harbor Administration;
- territorial Committee on Environment Protection;
- territorial Inspection of Fishery Control;
- the nearest Hydrometeo-Center;
- rescue and environment protection forces of nearest organizations and enterprises.

Elements of cooperation and involvement of additional forces and means for accident elimination are regulated by an approved EOS plan, treaties, instructions, a statement on cooperation, and zonal plans.

3. Planning of EOS measures

EOS plan in general should include the following sections:

- general positions which mention the purpose of the plan, scheme of its introduction into action, ending of action, scheme of information transmission concerning oil spill (who, when, whom, where to);
- zone of the planned action and characteristics of the region. Zone of the planned action as a rule covers aquatory adjacent to MDU borders, which are shown in oil development license;
- headquarters for operations management. This body is established by operator to provide guidance of operations EOS in the area of responsibility, interaction with other similar organizations of federal, regional and municipal levels (a statement on headquarters must be developed including personnel assigned with detailed duties description and scheme of notification. Headquarters must include representatives of local administration, territorial environmental organs and the Ministry on Emergency Situations. Headquarters must be headed by representative of the operator);
- operative plans of EOS which describe steps of action and technologies to be used;
- measures on operational safety provisions;
- recruiting of experts;
- documentation and procedures of expenses accounting for EOS operations;
- checking of plan efficiency, teaching, training (how often, a source of funding).

Attachments to the plan include:

- maps of the zone of operator's responsibility;
- a list and location of EOS means;
- a list of technical equipment involved in EOS;
- a structure of headquarters;
- schemes of decision making in EOS;
- schemes of work on oil collection, its burning, dispersing;
- scheme of notification about a spill, its form and content;
- the main data about oil, its behavior on water surface, under ice, in thawing, on ice, on shore;
- maps of environmental sensitivity of the region.

The administration of the company-operator, the territorial environment protection bodies, as well as other involved organization must be notified in all cases of oil spills according to the Instruction on procedures on transmission about oil spills in the sea and Temporary statement on procedures of cooperation federal authorities in case emergency discharge of pollutants.

Collection of reliable information about a spill and hydrometeorological conditions is very necessary to organize effective measures for its clean-up. A leader of rescue operations must be provided by maximum detailed information about:

- location of accident;
- features of source of spill;
- weather forecast;
- prediction on situation development.

A prediction of oil slick spreading along water surface is being done using known techniques and methods:

- oil slick drift calculation using graphs, tables and other information;
- mathematical simulation using computers.

Depending on the scale and place of accident, operations may be headed by:

- the leader of the team or division on duty;
- the captain of the vessel on duty;
- the leader of fast response group;
- the leader rescue operations division (ROD);
- the administration of oil filling complex.

Administration of the complex calls the Headquarters for operations management (HOM) which is established on permanent basis for organizing and coordination of emergency response operations and for involving additional forces and means of cooperating organizations.

The structure and HOM staff are defined by a zonal plan agreed upon by administrations of cooperating organizations and approved by administration of oil filling complex.

If a permanent member of HOM is absent (vacation, business trip, illness, etc.) his duties fall to his deputy on the main job.

HOM may appoint and invite experts on following problems:

- legislation and international law;
- hydrometeorology and weather forecast;
- economy;
- environment protection;
- marine operations and fishery;
- oil spreading and migration, sampling and express-analysis of samples;

- air-watch and control;
- protection of shores and engineering works;
- technology of oil spills containment and clean-up;
- destruction and burying of non-utilized oil-containing materials.

Priority actions of HOM include:

- assessment of information about oil discharge accident;
- prevention of reoccurring oil discharge;
- analysis of accident situation;
- prediction of development;
- putting into operation forces and means on duty;
- containment of spill source and protection of priority zones.

The order and schemes of resources usage to contain and clean-up oil spills are contained in zonal and local plans, instructions and guidelines.

Vessels crews and ROD personnel must pass theoretical studies, practical exercises and training in system of technical education for forces and means of ROD in order to be prepared for operations of emergency response. This training includes following topics:

- characteristics and property of oil, oil migration and negative results of pollution;
- scenarios of possible emergency situations, schemes of decision making and steps of action;
- methods and means for oil spills containment and clean-up;
- safety of operations.

Leaders and controllers must regularly carry out training on communication and cooperation, which improves skills in choosing optimal variants, methods and means of emergency response and organization of operations.

Periodically, headquarters and marine training must be carried out with participation oil collecting facilities and arranging orders.

6.3.4 Normative and Legal Regulation of Prevention and Elimination of Oil Spills

The main documents regulating prevention and elimination of emergency situations of natural and technological character are:

- Decree of the Council Of Ministers of the USSR No. 48 dated 01.15.91 «On measures to increase safety on the sea, improving rescue operations and organization of work on elimination of oil, oil products and other dangerous substances spills in the sea»;
- Decree of the Russian Federation Government No. 1113 dated 11.05.95 «On the State system for prevention and elimination of emergent situations (A Statement)»;
- Decree of the Russian Federation Government No. 164 dated 02.20.95 «On interagency commission for prevention and elimination of emergent situations»;
- Decree of the Russian Federation Government No. 1094 dated 09.13.96 «On classification of emergent situations of natural and technogenous character»;
- Decree of the Russian Federation Government No. 1340 dated 11.10.96 «On procedures to establish and use reserves of material resources for elimination of emergent situations of natural and technogenous character»;
- Decree of the Russian Federation Government No. 989 dated 08.26.94 «On procedures of funding of measures directed on prevention and elimination of results caused by emergent situations on industrial enterprises, in construction and on transport»;

- Decree of the Russian Federation Government No. 632 dated 08.28.92 «On approval the Regulation of calculation of the payment and its upper limit for natural environment pollution, waste disposal, other types of harmful impacts»;

Federal laws and under-law acts listed above generally form legislative regime for operations on continental shelf but do not subdivide clearly the rights of Federal Authorities (ministries and agencies) and Subjects of the Federation.

At the present time, the mechanism for supervision and control of an operator`s for emergency situations, including criteria of preparedness is absent. It is not clear what federal body and in what volume must check the preparedness of the operator (its personnel and equipment) for actions in emergency situations, their methods of teaching and periodicity of training, schedules of equipment check (including the equipment of subcontractors participating in emergency plans), control of reserved funds in case of immediate reimbursement of expenditures for accident clean-up or compensation for damage and restoration.

All these problems must be regulated by respective statements, guidelines, instructions, techniques, programs and other normative documents which must be developed by authorized federal agencies and must be mandatory for all oil industry operators independent of forms of ownership.

It is necessary to solve the problem of Federal Organ competence subdivision - what federal organ will carry out technical supervision (equipment, units, regime measures) for assurance that requirements are followed on prevention of marine environment pollution, prevention and elimination of accidents. Sub-law acts need to be clarified which subdivide supervision functions between federal agencies (Gosgortechnadzor, Maritime Register, Gospoznadzor, MES and others) during stages of designing, construction and assembling, tests and operations start-up, exploitation of stationary marine structures, as well as their provision by respective environment protection equipment and means for prevention and elimination of oil spills.

Recognizing that until now oil fields on continental shelf of Russia were not industrially developed, Gosgortechnadzor has no practical experience and respective marine specialists dealing with prevention of marine environment pollution and development of national norms and rules, which would comply with international conventions and standards.

Therefore, now Russia has no normative base, which would set mandatory rules, requirements and norms for marine platforms in respect to prevention of the environmental pollution.

This problem can be solved by many ways but in any case accepted variant (scheme) must take into consideration:

- minimal federal funding;
- restructuring of respective federal agencies, rearrangement if necessary of their functions;
- international practice, accepted rules, norms and standards;
- agreement with interested Subjects of the Federation, public opinion and NGO's;

Particularly the following scheme may be proposed:

- Gosgortechnadzor and Maritime Register make an agreement according to which schedules and procedures are established for examination and control of environment protection installations on marine platforms, falling under international requirements and norms of marine conventions, while both organizations carry out joint supervision until a correction of acting national standards or development of new ones is completed (a list of these documents should be included in the agreement);

- Mintopenergo of Russia by its special decree or act extends the validity of a part of normative documents (or some of their parts) of the Maritime Register on marine platforms independently on the form of their ownership;
- Gosstandard, Gosgortechnadzor, MNR of Russia and MES of Russia during the action of Maritime Register's documents will develop national normative-technical documents for marine structures of oil industry complying with international requirements and norms;
- corrected or newly developed documents are enforced according prescribed procedures.

According to the Law «On protection of population and territories against emergency situations of natural and technogenous character» the Government of the Russian Federation approved «A Statement on state system for prevention and elimination of emergency situations» (decree No. 1113 dated 11.03.95), which defines the composition of this system and includes as one link in it «object level» (article 4).

Each level of this system must contain:

- coordinating units (commissions on emergency situations);
- permanently acting management bodies authorized to take decisions on acting in emergent situations;
- forces and means;
- reserves of funds and material resources;
- systems of communication, notification and informational provision.

A demand on preparedness provision of the oil and gas complex to actions on localization and elimination of oil spills is written also in Federal Law «On industrial safety of dangerous production objects».

It is necessary to mention that some sub-law acts are in many respects contradictory and do not correspond to new economic conditions, or norms of international conventions and agreements. For instance, there are discrepancies in following documents:

- Instruction on schedules of information transmission about marine environment pollution (registered by Minjust of Russia No. 598 dated 06.14.94);
- Temporary statement on federal authorities cooperation schedules in cases of accidental emissions and discharges of pollutants and extremely high contamination of the natural environment (registered by Minjust of Russia No. 946 dated 09.11.95);
- A statement on cooperation of rescue forces of ministries, agencies and organizations in the sea and water basins of Russia (registered by Minjust of Russia No. 917 dated 07.28.95).

Documents mentioned are related first of all to cooperation of administrative organs but do not regulate interaction of these organs with enterprises beginning oil development on the shelf.

An approximate list of documents to be developed, their status and short content is given below.

6.3.5 Proposals on Improvement of Normative-Technical Provisions for Prevention and Elimination of Emergency Oil Spills

It is proposed in the frame of the project to develop following documents regulating provision of preparedness and implementation of measures on elimination of oil spills:

1. The schedules and procedures of examination and control of environment protection equipment on marine platforms falling under international requirements and norms of international conventions.
2. The statement on organization of operations connected with prevention and elimination accidental oil and gas discharges on marine installations on the continental shelf of Russia;

3. Guidelines on liquidation of oil spills on marine and coastal installations of oil and gas production;
4. Typical zonal plan of emergency measures oil spills elimination on marine oil and gas production units;
5. Guidelines on safety rules during operations connected with oil and gas discharges elimination from marine and coastal objects of oil and gas production
6. Typical duty instructions for personnel of rescue services of marine and coastal objects of oil industry.
7. General instruction on schedules of notification about marine environment pollution.
8. Instruction on usage of chemical and biological substances for elimination of oil spills from marine and coastal objects of oil industry.
9. A course for special training of oil industry rescue forces in fighting with oil spills.
10. Typical agreement conditions of oil industry operator and contractor about provision of marine object preparedness to oil spills into the sea.

Moreover it is reasonable to develop the following methodological documents:

1. Typical mathematical model of oil spill, prediction of the situation and the choice of optimal solution for elimination of oil pollution caused by spills from marine objects of oil industry.
2. Typical composition of technical means, equipment and materials for operations connected with elimination of oil and gas discharges from marine and coastal objects of oil and gas industry.
3. A list of recommended equipment, control devices and materials for prevention of environment pollution from marine and coastal objects of oil and gas industry.

Chapter 7

Economic Mechanisms of Industrial and Environmental Safety Management

The main body of normative documents concerning environmental protection in the Russian Federation has been developed during the last decade. Lately, economic mechanisms of environmental protection have received the most attention, and have become an important factor influencing the strategy and tactics of economic and technological decisions.

With respect to marine oil and gas production they include:

- payments for environment pollution in established limits and for over-limit pollution;
- compensation payments;

- payments for nature use.

This chapter considers regulatory possibilities of environmental protection. Currently, mechanisms of environmental protection are based on norms and rules, which have a prohibitive limiting and/or prescriptive character. The main attention in this chapter is paid to principles of the structure of such mechanisms and respective factors. Proposals for improvement of the legislative and normative basis, as well as, other methodological problems are given below.

Problems connected with legislatively defined civil responsibility of the operator for the damage caused by his economic activity are left outside of this analysis.

7.1 Payments for Environment Pollution

Payments for environment pollution are collected on the basis of the Russian Federation Law «On Environment Protection» (section IV, par. 20) which was adopted in 1991. The Law prescribes that payment for environment pollution and other impacts are collected for:

- emissions (discharges) of pollutants, storage of wastes and other kinds of pollution within established limits;
- emissions (discharges) of pollutants, storage of wastes and other kinds of pollution exceeding established limits.

If the nature-user has no permit for emission, discharge, or storage of dangerous compounds then the payment for over-limit pollution of the environment is applied.

Payments for maximum permissible impacts are made at the expense of product prime cost (operating costs). Payments for exceeding of these norms are made at the expense of the nature-user`s profit.

Payment for environment pollution does not make the nature-user free of environment protection actions and reimbursement of damage caused by breaking the environmental legislation.

7.1.1 Payments for Air Pollution

The general approach to define payment rates for emission of pollutants is based on the concept of maximum permissible emissions (MPE), the choice of which is tightly connected with the idea of sanitary protection zones (SPZ). According to normative documents in force, SPZ are established based on maximum permissible concentrations (MPC) of pollutants in the air of population settlements. Existing baseline contamination levels are taken into consideration in establishing an SPZ. Rates of payments are usually defined taking into consideration the regional environmental situation. MPE are used as threshold values to calculate payments for minimal rates of pollution.

Though a mechanism of payment calculation and collection is rather formalized it has some possibilities for regulation which can be implemented by incorporating the following:

- defining MPE and SPZ on the basis local levels of pollution;
- differentiation of payment rates on the basis of regional environmental situation;
- a possibility to channel payments for implementation of environmental protection measures (agreed with environment protection organizations);
- payment for pollution within defined limits may be included in prime cost of product.

Mechanism of payment for environment pollution initially was not oriented to environment protection on the continental shelf, therefore its implementation to marine oil and gas development is in some way problematic. Particularly the following features may be noted:

- the usage of SPZ concept for emissions in the air has little sense for offshore installations on the continental shelf because they are far away from human settlements;
- impossibility to apply normative documents for the establishment of sanitary protection zones makes normative documents for MPE subjective for oil and gas production units;
- the existing procedure for the assessment of the regional environmental situation, which is not fully clear itself, can be considered as a direct administrative arrangement (because the respective official document describing principles of choosing required coefficients was never published). It does not take into consideration specific features of operations on the shelf and related to big territories (sea basins and seas as a whole). As a result, payments of the operator do not depend, for instance, on the production installation's distance from the shore, which inhibits the development of offshore fields unnecessarily. Similarly, it is unreasonable to calculate equal payments rates for marine and coastal installations;
- the existing normative base is in some way discriminative in respect to newly created objects (therefore to all oil and gas objects on the shelf) because it demands rigid adherence to MPE norms from the beginning of exploitation, whereas the majority of operating objects use poorly motivated, temporary permissions and norms;
- new objects formally and essentially are deprived of a possibility to use the privilege to direct funds on additional environment protection measures during development and exploitation because technologies used are mainly new and are not cost effective.

Analysis of both regulatory possibilities and limitations allows us to propose the development of a separate document regulating problems of air pollution for marine oil and gas producing units.

Taking into consideration specific features of marine oil and gas producing units it would be reasonable to reconsider the principles of choosing MPE norms and their resultant calculated payment rates. Considering that the main source of air emissions are autonomous power units, it would be useful to study the following problems:

- transition from assessment of local concentration of pollutants (this factor must be considered in estimation of permissible gas content in the working zone) to bulk annual limits of green house gases and ozone-destroying admixtures, which would correspond to international conventions introduced into force in recent years;
- connection of payments rates to total energy consumption by oil and gas complexes for extraction and treatment of products on marine units and living condition provision for crews;
- geologic features (for instance formation pressure influencing the method of extraction - oil-gusher or pumping) and technological scheme of development (for instance, consideration of gas factor and water content in the formation), etc.;
- location and hydrometeorological features at sites of marine structures and more detailed zonation of continental shelf sites and consideration of possible trans-regional and trans-boundary transfer of polluted air masses;
- consideration of the life-cycle of installations (generally, energy consumption varies over time, as when the formation pressure varies, or when transportation, storage, treatment etc. activities vary during production phases).

Limits for emissions may be connected with the best appropriate technology, which would allow technically sound emissions from power plants that are comparatively stable for leading producers of such equipment and depend on technical progress in this field.

Development of such document is important also for the following reasons:

- the Russian Federation Law «About the Continental Shelf» does not contain special statements related to protection of atmospheric air;

- at the international level (supplement VI to MARPOL 73/78, 38th Session of IMO, 1997) there were recommendations adopted concerning air pollution from ships and, therefore, from stationary marine installations. Statements of these recommendations must find proper place in Russian regulatory documents.

7.1.2 Payments for Water Pollution

A system of payment collection for pollution of water media is based on the concept of maximum permissible discharge (MPD), and sanitary and fishery maximum permissible concentrations (MPC) of contaminants in water. MPD in respect to near shore sea water (this is essentially inner and territorial sea) are established based on not exceeding MPC on so-called control profiles, which are located at a distance 250m from the point of polluted water discharge.

MPC are used as threshold values to calculate rates and collect payments for water pollution considering regional environmental situations.

This scheme is directly transferred from mainland water body protection rules and, strictly speaking, govern near shore sea water (inner and territorial sea in terms of the UN Convention on the Law of the Sea). Even though environmental protection agencies are trying to follow these rules for objects on the continental shelf, a document which extends their validity on the exclusive economic zone (EEZ) still does not exist.

The UN Convention on the Law of the Sea, in principle, provides a possibility to strengthen international norms and rules of environmental protection in the EEZ. However, delineation of such regions must be substantiated, and must be announced as «special» with the publishing of respective information in «Notices to Mariners».

The Russian Federation recognizes requirements of MARPOL 73/78 according to which stationary marine structures must follow the same rules for the prevention of marine environmental pollution as ships. However, the rules for the oil and gas industry in Russia are actually more strict. This leads to serious complication of investments conditions and, because economically efficient technologies for treatment of oil containing water to required concentrations are nonexistent, this results in a non-economic regulation.

There are even more strict statements as, for example, in sub-notes to Appendix 5 to Rules of Protection of Near-Shore Sea Water Against Pollution (Minwodhoz of the USSR, Minzdrav of the USSR, Minrybhoz of the USSR, 1974) which says that discharge of oil containing water from stationary platforms is prohibited. Not only is it methodologically unclear what principal differences exist between discharge of oil containing water from moving ships and stationary platform but the Rules themselves contain contradictions:

- as mentioned in the title the Rules are for near shore sea water;
- according to Rules these areas are defined as «waters of territorial and inner seas of the USSR...»;
- it is mentioned in defining of goals and purpose of the Rules that «Rules are valid for territorial waters of the USSR, waters of inner seas of the USSR...and continental shelf of the USSR...»;
- this contradiction is not eliminated and is not explained, even though the Rules of 1974 were reconsidered and amended in following years.

Double meanings and contradictions in the Rules are additional examples of reasons that regulatory problems of environmental protection need to be put in order.

The usage of the Rules system within EEZ is not fully substantiated due to:

- the concept of a control profile generally refers to the position of observation posts outside of some water-economic object, but the term of such an object, as well as its location (250m from the point of discharge), is not fully clear for the EEZ;
- the meaning of the idea, «regional environmental situation», is only generally defined (sea basin as a whole) and is not connected to existing regional divisions of marine aquatories in other branches of economy (for instance, it is not clear how this general definition of «regional environmental situation» accounts for regional fishery and/or fish productivity values calculated by using MPC for fish production areas);
- the establishment of MPD is based on the local approach and does not consider hydrographic conditions, sea depths, large scale water mass transfers, possibility of pollutants accumulating on some sea sites, sea ice conditions and other important factors. As a result, payments of operators located in completely different natural and environmental conditions are often equal and therefore do not perform any regulatory function.

It is necessary to mention that there has been some activity in Russia to establish regulatory order in water use and water protection. For instance, MNR of Russia is developing an approach to introduce norms of Maximum Permissible Impacts on Water objects (MPIW). If it is adopted, a logical and coordinated regulatory system would be established:

- water resources protection is generally provided by a system of sanitary and fishery MPC;
- MPIW are defined on the level of water objects, corresponding to the ability of each water object to accept a total anthropogenic impact independent of the source of pollution. It allows the establishment of quotas of impact which may be additionally introduced without damage to the environmental welfare of the object;
- impacts from concrete industrial installations including MPD are estimated together with existing quotas on impacts and are permitted if the object has sufficient environmental stability when all planned impacts are summarized.

Though development of MPIW covers only water objects under jurisdiction of the Water Code (in marine part they are inner and territorial sea), development and implementation of a similar system for the exclusive economic zone would create an objective basis for defining MPD. This would open the door for regulation of summary impacts by exchange of quotas and/or implementation of compensating measures in protection of water media.

Procedures of MPIW development were supposed to be adopted in 1997 but respective work was not finished due to financial and organizational reasons. A tendency developed to change from the concept of MPIW for water object to the well-known concept of MPC for the source of impact, which seems to result from the absence of necessary interagency and interdisciplinary cooperation. The appearance of «new» MPC on the old methodological base resulted only in the transition of the leading role in their development and further in defining of payment rates from environment protection agencies to organs of nature use management.

Realizing that the main methodological problem will not be solved in the absence of a definition of the term, «water object», as applied to waters of the EEZ, the following approach to estimation and agreement procedures for impacts caused by oil and gas installations on the continental shelf may be recommended for long-term program of development:

- step by step coverage and detailed mapping, documentation and categorization of marine sites (delineation of water objects) taking into consideration natural features, directions and scales of water mass transfers, biological productivity, value and sensitivity to pollution, value for fishery, etc.;
- development of methods for estimation of maximum permissible harmful impacts on delineated water objects in EEZ;

- an inventory of existing and predicted impacts in nearest and distant future considering pollution caused by other adjacent water objects;
- an estimation of permissible quotas on dangerous impacts, delineation of water objects whose quotas are exhausted or nearly so due to existing impacts, and designation of such regions as special regions;
- an estimation of expenditures and compensation payments required for stabilization of environmental situation on water objects where actual impacts exceed MPIW;
- development of the document regulating preparation and approval norms of MPD for designed oil and gas installations taking into consideration previously established quotas for impacts;
- development of the document defining procedures for development, agreement, implementation and control of compensation measures for water objects protection which permit the expansion of environmental quotas for newly constructed installations as well as mechanism of quota exchange between projects;
- development of procedures for calculation and bringing payments for water pollution on specific water objects taking into consideration expenses on the environment stabilization in specific regions which are influenced by impacts of such objects according to balances of pollution transfer.

7.2 Compensation Payments

7.2.1 Compensation to Fish Related Industry

A number of Russian normative documents prescribe the operator to implement compensation measures regarding the fisheries industry, which must be included in project documents, if the unavoidable damage to fish related industry is proved.

Damage to reproduction of water bio-resources can be defined in natural and monetary terms. Normative documents presently in force (Temporary methodology for assessment of damage caused by construction, reconstruction and expansion of enterprises, installations and other objects as well as other types of activity on water bodies which are valuable for fish related industry, 1990) take into consideration direct losses of fisheries, and worsening of conditions for natural reproduction (feeding base, losses of spawning places, etc.), fattening, and winter stay.

The following factors of impacts must be taken into consideration:

- full loss of fish productivity of water object or of its part;
- decreasing of fish productivity due to worsening of conditions for reproduction, spawning and winter stay connected with changes of hydrologic conditions;
- direct deaths of feeding organisms and fish on water intakes and due to other reasons.

If the project does not damage resources of especially valuable fish and damage to resources of other types of fish does not exceed 50 tons per annum, the project may define only the general volume of capital investment. In other occasions the cost and time lines for measures directed on recreation of fish resources must be implemented in the same water body or if it is impossible, in other water basins.

Compensation payments are used for construction of installations on reproduction of fish resources. Time-lines of designing and construction of these installations must correspond to steps of implementation of the main project and must be done under control of nature and fish protection agencies (Instruction on control for designing, construction of fish recreation

objects and their exploitation. Minprirody of the Russian Federation, Roscomrybolovstvo, 1995)

Estimation of the damage to the fish related industry due to pollution of the sea is a specific problem. Though existing normative documents refer to consideration of hydrochemical factors in the estimation of the damage caused by pollution of water bodies, there is a lack of methodological basis and shortage of reliable statistical data for such estimation. At the same time it is necessary to remember that such documents were existent earlier and their validity can be recovered.

7.2.2 Compensation to Other Branches of the Economy

Though legislation does not contain direct requirements on compensation to other branches of the economy due to environmental impacts, some reason of environmental, economic and social character may lead to the consideration of a number of compensation measures.

While following comparatively strict conditions of environmental protection the impact of marine oil and gas installations will be localized and generally will not noticeably influence the regional environmental situation and especially living conditions of population. Such an approach opens some additional chances to minimize environmental impacts.

The environmental welfare of the population makes it reasonable to consider such a form of cooperation between the marine installation operator and regional authorities. At the expense of some loosening requirements for impact of distant offshore units the economy of funds takes place. This permits solving environmental problems of local settlements and allows implementation of regional environmental measures. It may be noted that such or similar situations really happen in practice, though not always on an official level, during contacts of the operator with regional or local authorities. The operator directly or indirectly is pressed to accept some social obligations in exchange for cooperation in receiving necessary agreements and permits. Efforts to make this approach an official one are seen when social obligations are included in tender conditions of some kinds of interior use. This is more similar to «bonus» collection and does not relate mutual interests of the operator and authorities.

The approach described above may be called «the exchange by quotas for environmental impact» or in contrast to obligatory compensations - «voluntary compensations» - which may be more productive, transparent and controlled. For this purpose it is necessary to fulfill the following minimal conditions some of which are foreseen in existing legislation:

- authorities must have a right to loose requirements to environmental impacts and provide respective privileges in payments for pollution and natural resources use what in principle is permitted by two steps limitations on environmental impacts (so called environmental norms and limits - temporary norms for some predefined period of time) though it is limited by the necessity to use «over-limit» payments when impact exceeds environmental norms;
- strictly purposeful channeling and usage of restructured funds must be provided with a guaranty that they are used for environment protection needs;
- the operator must have an official possibility to include objects, works and services covering «quotas exchange» or «contract compensations» and connected expenditures into project budget that, for instance, is important for definition of compensatory part of product, for production sharing agreements, calculation of taxed base of income, calculation of tax for added cost (TAC), etc.;
- considering that interests of the federal level are always present in marine interior use, actions and expenditures concerning quotas exchange or contract compensations must be

included in the project and implemented with official approval of federal authorities (general or specific for each project);

- a voluntariness of the operator and federal or local authorities concerning quotas exchange and contract compensations, as well as, mandatory actions connected with these relationships are the issue for special long-term agreements. These agreements are equal to civil-legislative acts and have the same status in state and financial accounting as subcontractor agreements, products supply for industrial and technical needs, paid services, etc.;
- proposals on voluntary compensations, funds released by the operator, expediency and necessity of compensation measures implementation, designs of respective objects and installations, as well as, agreements between the operator and authorities, must be an item for state environmental expertise and must be open to public expertise in pre-project and project documentation.

When mutual interests of the parties are present, this category of contract compensations, in principle, may include contract compensations to fish related industry and will be done supplementary to mandatory part, which is defined on the basis of calculated damage to fish related industry.

It is reasonably to include the above proposals and the conditions of their implementation in a separate normative document (with the preliminary title of - The procedures for development, agreement, submission and approval of the documentation on contract compensation measures in implementation of marine oil and gas fields development projects). Adoption and implementation of such a document would provide flexibility for conditions of the interior use, especially for newly constructed installations, optimize environmental achievements according to the criteria «cost-efficiency» and it would provide a better balance of state, regional and commercial interests.

7.3 Payments for Wastes Disposal, Bottom Dredging and Dumping

7.3.1 Wastes Disposal

The problem of waste generated in marine oil and gas operations is one of the most complicated in Russia and this was confirmed in the first stages of projects being implemented.

Wastes disposal can be done in the following ways:

- transportation of wastes for burying and/or utilization on the shore;
- storing of wastes in geological formations;
- location (dumping) of wastes on the sea bottom.

Each of these methods requires an adoption of interrelated organizational, administrative, technical, environmental and economic solutions. This must be done in spite of unclear legislative and normative conditions, contradiction of participating parties interests and a lack of sufficient experience in solving apparent problems by the operator as well as by administrative and regulatory organizations.

The most complicated problem is the disposal of solid wastes from exploratory and production wells drilling (sludge and remains of drilling mud) and oil production (solid residue of formation liquids separation, residue of technological equipment for oil treatment and oil storage, products of washing and cleaning of pipelines and technological equipment, etc.). Practically, such wastes have different physical and chemical composition and require different approach to their collection, treatment, removal and burying.

There are significant differences in regulation of burying (dumping) of wastes for territorial waters and continental shelf.

In the first case the Water Code (article 96) directly prohibits dumping and burying of wastes on water objects though does not contain definitions of terms «wastes» and «dumping» and/or their combination. Meanwhile existing legislative precedent like the Convention MARPOL 73/78 clearly exclude the term «dumping» a removal into the sea wastes and other materials which are products of normal exploitation....of platforms. If we admit that, for instance, drill cuttings (sludge) are a result of normal exploitation of an exploratory and/or production platform then removal of sludge out of the platform into the sea according to the definition of MARPOL 73/78 is not the dumping if:

- loading of wastes on special vessels for dumping at sea is not carried out;
- the character of wastes after their preparation for removal is such that they do not fall into a category prohibited for dumping according to MARPOL 73/78 list (i.e. trace concentrations of hydrocarbons pollutants will not exceed MPC after their dumping into the sea).

Besides that, the newly adopted Law «On Handling Wastes of Production and Consumption» refers to Federal Classification Catalogue of Wastes (Goscomecologya of Russia, 1997) does not mention drilling cuttings as wastes.

If this interpretation is valid and can be confirmed during official inquiry, then dumping of sludge with trace presence of oil and other toxic compounds should not fall under prohibition according the article of the Water Code. Therefore, this may become an issue for technical-economical and environmental consideration in regard to application of water legislation.

Concerns storage of wastes onshore, it seems the problem may be solved easier for installations located in territorial sea, as the water body is under joint jurisdiction of the Federation and respective subject of the Federation, which is responsible for the land use. Solution of waste storage onshore from offshore installations may be more complicated because the coastal Subject of the Federation is not interested due to problems with offshore interior use and respective payments for the right to offshore interior use are the competence and problem of the Federation.

Some difficulties may be created by undevelopment of distant coastal areas and necessity to arrange respective infrastructure that is expected to be economically ineffective for small and medium enterprises. In this case, construction of regional sites of the wastes storage on a cooperative basis may be recommended. This regional sites may benefit, for instance, Timan-Pechora province covering onshore, and some small marine fields and/or Sakhalin, where there are implemented and planned 4-5 big and medium marine projects.

Underground disposal of wastes in absorbing geological formations has been developed widely abroad but practically has not used in Russian Federation. Operators and regulatory organs have to solve several new problems, like additional investigation of geological formations (possibly in the regional scale), receiving and separation of new licenses and geological allotments, estimation of receiving ability of geological formations, a proof and respective expertise review of the environmental safety of waste disposal, substantiation and choosing of technologies for preparation of wastes for pumping, establishing the geo-environmental monitoring system, etc. Taking into consideration that practical solution of all mentioned and other problems will require prior development of a normative basis it is recommended to have fast development of a special document regulating problems of underground storage of oil and gas industrial wastes.

The Federal Law «On Continental Shelf» foresees a possibility of wastes storage on the sea bottom provided some conditions and respective payments are followed. A sum of payments for a permit to store wastes and other materials is calculated on the basis of direct expenditures on preparation and carrying out the state environmental expertise and

expenditures on preparation, drawing and registration of a permit. A revenue for permit to store wastes and other materials goes to the organ issuing a permit.

The main problem is the criteria of environmental safety of wastes storage, which must be defined by respective normative documents in the context of article 1.2 «maximum permissible dangerous influence on water objects».

7.3.2 Bottom Dredging and Dumping

Practically all designs of marine oil and gas installations include some volumes of bottom dredging and disposal (dumping) of extracted material (preparation of sites for stationary marine structures, trenching of inside oil field and transport pipelines, extraction of nonferrous materials for construction, etc.). This creates some specific problems of nature use (usage of the sea bottom sites) and environment protection (permissible dumping of sediment, impacts assessment payment for marine pollution, possible compensation payments) which are regulated by separate normative documents.

Designing and preparation of such operations must include additional specific studies (for instance special engineering-geological investigations to define chemical and geological properties of extracted and filled ground). In addition, the existing normative basis needs considerable modernization.

Temporary Order of the payment calculation for pollution of water objects which are the property of the Russian Federation during works connected with movement and removal of bottom deposits, extraction of nonferrous materials from underwater quarries and storage of the ground in underwater fills (Goscomecologya, Mineconomiki, Minfin, MNR of Russia, 1997) refers to general procedures of payment calculation for environment pollution (payment on basis rates within limits of norms and payment 5 times exceeding basis rates when exceeding established limits), though it contains a number of unclear positions and complicating conditions:

- it is not explained what the difference is between permissible normative (which seems to mean pollution not exceeding maximal permissible concentration) and limits about which it says that these are defined on the basis of levels maximal concentrations of pollutants;
- there are no references on sources and/or the order of defining norms for bottom sediment pollution (at least neither the Rules of Near-Coast Sea Water Protection, 1974, nor the Methodology for calculation of maximum permissible discharge of compounds into water objects, 1992, do not define the mentioned norms);
- it is not mentioned what the difference is between operations in the inner and territorial sea and on the continental shelf.

Actually vagueness mentioned does not permit the operators to use The Temporary Order...in practice. Therefore, development of a new regulating document may be recommended or supplementing the existing Temporary order...to make it usable for practical needs in the mentioned kind of the nature use, thus solving problems of the environment protection.

7.4 Economic Methods for the Environment Protection Regulation

The Law of the Russian Federation «On Environment Protection» (article 24) addresses economic incentives for environmental protection measures, which include:

- tax benefits and other privileges to federal and other enterprises, institutions and organizations including those of nature protection if they implement low waste and wasteless technologies for production, use secondary resources, and other activities providing nature conservation effect;

- release the environmental funds of taxation;
- partial transfer of environmental funds on a contract basis as a percentage of loans to enterprises, institutions, organizations and citizens for implementation of environmental protection measures that decrease pollutants, emissions, and discharges;
- establishing higher norms of amortization of the main production assets for environmental funds;
- usage of encouraging prices and increments on environmentally clean products;
- establishment of special taxation on environmentally dangerous products and products made with the usage of environmentally dangerous technologies;
- use of privileged loans to enterprises, institution, organizations independently which effectively implement environment protection measures.

Only subjects of the Federation benefit by including environment protection measures and receive a reduction of payments for pollution of the environment. Though as was mentioned earlier this measure does not work for newly constructed units. In addition, the joint competence of the Federation and its Subjects in respect of nature use of inner and territorial sea waters, as well as, exclusive competence of the Federation in nature use on the shelf and EEZ, supposes that payments go partially or fully into the federal environmental fund and a budget. However, the respective procedure of privileges provisions is not mastered yet and is not supported by necessary experience of preparation and making decisions. It may be seen that in the nearest future in conditions of budget deficit payments of enterprises on environment protection measures will not be counted as their payments for the environment pollution or at least this procedure will be difficult.

It must be noted that the draft of the Tax Code does not contain a possibility of tax privileges in respect of environment protection measures.

In essence, the only field of economic regulation in nature use is a solution of environmental economic problems in a frame of the project when a choice of organizational, technological, environmental and economic variants are made by joint consideration and optimization by the criteria «expenditures-efficiency» or cost effectiveness.

7.5 Payments for Natural Resources Use on the Continental Shelf

Article 40 of the Federal Law «On Continental Shelf», stipulates a system of payments for mineral resources use and the storage of wastes and other materials on the continental shelf including:

- payment for participation in tender (auction) and license for mineral resources use;
- payment for geological information about mineral resources;
- payment for mineral resources use;
- payment for mineral resources recovery;
- excise;
- payment for a permit on wastes and other materials discharge.

Though a majority of payments mentioned are mandatory and made according to predetermined rates and tariffs, the legislation leaves a possibility for economic or financial adjustments by the state to the operator:

- rates of payments fall in a range (for oil and gas they are 6-16% of the product's cost) which provides sufficient chances to regulate the relationship between the state and resource user including favorable or unfavorable geological conditions, expenditures on development and extraction of products, provision of the interior and environment protection, etc.);

- the Law states that interior user may receive a reduction in payments for mineral resources use if he develops oil and gas fields with unfavorable geological and mining conditions and/or difficult extracted resources; there is a normative document defining conditions and procedures for implementation of the privileged payments regime;
- a negotiation process is foreseen in the frame of production sharing agreements which permits the adjustment of payments on the basis of defining compensation and beneficial parts of extracted resources and the distribution of beneficial part of product between the investor and the State.

The calculation of payments for the usage of aquatory and the sea bottom has not been solved but should take into consideration the character and properties of the aquatory (water depth, productivity of the area, existence of navigation routs, communication and technical installations). A most difficult situation has been created due to requirements for calculation of payments using registers compiled on the basis of zoning of the continental shelf and the EEZ by geographic, economic and environmental parameters.

Actually compiling of registers, zoning of aquatories and seabed sites is not finished and therefore, a necessary methodological background for such operations is also not developed. It seems that one of the problems of the near future is preparation and putting in force respective normative and methodological documents.

7.6 Civil and Legislative Responsibility

Marine oil and gas production is a comparatively dangerous kind of activity and can harm life and health of population, third party property and the environment. This harm or impact may be caused directly by oil and gas production facilities or by negative impacts on the environment connected with their operation.

Russian legislation (article 1064 of the Civil Code of the Russian Federation «General basis of responsibility for causing the damage») states the full civil responsibility of the damage maker if he can not prove the absence of his guilt and increases this responsibility for owners of more dangerous sources (article 1079 of the Civil Code «Responsibility for harm caused by the activity creating the danger for the surrounding»). They are free of the responsibility only in the case when they can prove that the damage happened due to natural causes or due to criminal intent.

The Law of the Russian Federation «On Environment Protection» considers the responsibility for the natural environment damage as infringement of environmental law, i.e. the guilt for the offensive actions. The High Arbitrage Court had to explain that for the activity connected with high danger for the environment the liberation from compensation for the damage comes only in the case of natural causes which makes the Law comply with statements of the Civil Code. Some discrepancies still remain because a qualification of the activity as dangerous for the environment is made by special decision of the Arbitrage Court. Therefore it may be recommended to eliminate this complication in new version of the Law «On Environment Protection».

In any case a problem of covering accompanying risks is necessary requirement for safe development of marine oil and gas production. The most radical solution of this problem would be the obligation of the operator to keep financial reserve, material resources, etc. sufficient for full and timely compensation of damages to third parties if, of course, if such damages can not be prevented (safety measures to prevent accidents, systems of emergency response to decrease a possible responsibility) and have legislative basis. This requirement though is unattainable due to the uncertainty of the possible scale of responsibility and experience shows it is burdensome.

The conventional approach consists in diversification of coverage by its distribution through different sources and optimization of expenses considering possibilities (availability and periods of funding, etc.) for each direction:

- the operator's own funds invested in different financial instruments;
- outside guaranties (the state, national and international institutions, joint funds, etc.);
- insurance of responsibility (obligatory, voluntary, reciprocal, etc.).

The usage of some sources is mandatory, though uniform legislative statements are not developed yet. For instance, the Law «On Environment Protection» (article 23) quite uncertainly states that in the Russian Federation there are voluntary and mandatory environmental insurance of enterprises, institutions, organizations as well as citizens, their property and incomes against environmental and natural disasters, accidents and catastrophes. Whereas environment insurance funds are used for elimination and prevention of negative consequences. This uncertainty has lead to the result that environmental insurance did not attain a sufficient scale.

The Law «On Industrial Safety of Dangerous Production Objects» which was approved in 1997, prescribes «...conclude a contract on the insurance of risk responsibility for the damage due to operation of dangerous industrial object» (article 9), «...to have financial reserves and material resources for localization and liquidation of accidents results according to the legislation» (article 10) and defines minimal scale of responsibility which is obligatory for insurance (article 15).

The Law «On Agreements on Production Sharing» (article 7 «Conditions of carrying of the work») prescribes that agreements must include «…investor's obligations on the insurance of responsibility to cover the damage in case of accidents which entail harmful influence on the natural environment».

There are important international conventions and agreements (about civil responsibility for pollution of the sea by oil, the scale of its minimal coverage, etc.), which can be reasonably used in the national legislation for marine oil and gas producing and transportation complexes, though they did not find a reflection in Russian legislation.

Up to now the scale of responsibility for the owner of marine stationary installation, which must be covered by mandatory insurance, is limited by 70 000 minimal rates of salary (the Law about Industrial Safety), about 940 000 USD according to current exchange rate. According to insurance rules, the insurance tariff for this kind of insurance is accepted in a range 1-2 % of the responsibility limit and such insurance is available at a cost of 15 thousand USD per year. These figures show that such scale of the responsibility covered by mandatory insurance does not solve the problem. Newness of the issue and general undevelopment of the Russian insurance market makes it problematic to expect a development of voluntary insurance of the responsibility in marine oil and gas production.

It is quite obvious that marine installations for oil and gas production have some specific features, which make necessary special regulation in respect of operator's responsibility. The problem is complicated by the fact that according to Russian legislation problems imposing financial obligations on the subject of economic activity must be solved within legislative procedures (in practice, minimal legislative requirement is the adoption of special regulatory statements defining kinds and forms of obligations and delegating to authorities the rights to establish their scales and procedures).

It seems reasonable to make the following recommendations:

- develop methodological approaches and define a scale of responsibility subjected to mandatory coverage depending on natural-geographic conditions of location, geological features and technology of oil field development, character and size of structures, risk of possible accidents and a danger of their results;

- formulate conditions of the responsibility coverage as early as possible (preferably in conditions of tenders and deals);
- study the problem and take necessary measures for Russia to join international agreements in force and operators - to international agreements, funds and clubs dealing with responsibility coverage;
- develop and implement measures on widening and strengthening possibilities of the insurance market (establishing specialized pools, societies of mutual insurance, etc., removing of limitations to include funds for voluntary insurance of marine oil and gas producing facilities in expenditures, etc.);
- consider a possibility of creating state's non-budgetary funds of the responsibility insurance in marine oil and gas production;
- foresee a possibility of the state guarantee for coverage of responsibility (over insured and reserved limits) and invite guaranties of international financial institutions for this purpose.

While developing and implementing these measures it is necessary to remember that scales of projects in marine oil and gas production are so big that their implementation requires the drawing of loans from the world financial and investment market, which have developed some definite rules and traditions in respect to coverage of civil responsibility of the borrower.

Chapter 8

Conclusions and proposals

8.1 The State of, and Possibilities for Developing, the Russian Safety and Environmental Regime for Oil and Gas Activities on the Continental Shelf

Being a comparatively new sector of the fuel and energy industry of Russia, offshore oil and gas activities do not have a complete legislative and normative basis. This is due to historical reasons, as well as the influence of the general transformation processes in the society, the federal administration and national economy.

8.1.1 The State of the Legislative and Normative Basis Concerning Safety and Environmental Protection

The body of legislative acts and normative documents, which regulates safety and environmental protection in the offshore oil and gas activities, includes a comparatively small number of specialized documents and a great number (several hundred) of documents of general character. They pertain to environmental protection, industrial and operational safety as well as organizational directives on these issues.

The following features characterize this body of documents:

1. There are three interconnected levels of normative documents:
   - legislative acts;
   - legislative and normative documents that regulate the responsibilities of and interaction between federal, regional supervisory agencies and the operators;
   - normative-technical documents that establish specific requirements, parameters, limitations, and other factors relating to technical safety and environmental protection.
2. The majority of legislative acts were enacted in the 1990's. The main normative-technical documents were adopted in the 70's and 80's, whereas normative legal documents were stipulated mainly in the 80's and 90's. The reason why these documents were developed and adopted at different times is due to the last decade's lag in the use of scientific-technical experience in marine oil and gas developments. Another problem is that the last decade's development of the legal basis and the organizational structure of state regulation have not been followed up by revisions of sub-law acts.
3. The norms are prescriptive in character and quite different in nature, both with regard to the titles of documents and to their legal status. There are about 20 different types of documents, such as, norms, rules, guidelines, instructions, prescriptions, methodologies, and recommendations, etc. There is no particular structure in the body of these documents, for instance, in relation to the place in the hierarchy of the governmental institutions that stipulated them, or by the subject they regulate.
4. It is difficult to assess the correct application of a great number of these documents, which makes it difficult for operators to assess what their obligations are. These difficulties are related to:
   - the question of whether earlier documents are applicable to private enterprises or not;
   - the problem of assessing whether documents are still in force or whether they have been succeeded by new documents;

- the problem of succession of authority among state agencies, as well as assessing which agency enforces the document today when the one that stipulated it has been dissolved;
- the shortage unavailability of expertise to conduct qualified revision of documents or to decide whether they should be repealed.

5. The definition and subdivision of the responsibilities of management agencies in their duties to approve, permit, and control industrial activity is disorganized. It is difficult to assess which regulatory agencies are involved in enforcement activities, what their responsibilities are, what permits or licenses they issue, etc. This is due to the last years' recent number of reorganizations and redistribution of functions of the federal administration.
6. There have been difficulties in fully complying with general construction and branch norms, and rules related to the design, completion and development of constructions, when developing marine oil and gas fields in the Arctic.

Such features are common when a country develops a new industry sector and corresponds with the experience of other countries that have had development of hydrocarbon fields on their continental shelves. There is often an abundance of irrelevant principles, norms and rules pertaining to industrial safety and protection of the environment, a great number of regulatory agencies, and detailed regulation of an operator's activity. However, when a country has fully developed this sector, one will often find they have established specialized systems of regulation, regulatory agencies, and generally arrange a transition from prescriptive regime to one of goal-setting related to safety and environmental protection which are exclusive for regulating the offshore oil and gas industry. Some may have established a special agency responsible for supervising the activities, and developed their safety and environmental protection supervisory regime from prescriptive to performance based. There are no reasons why the Russian environmental and safety regime should not be developed in the same way. By studying and implementing international experience, Russia could develop its part of the world fuel and energy industry to a powerful sector.

8.1.2 The State and Possibilities of Developing the Supervisory System

The Russian Federation's regulatory systems are characterized by detailed technical and other requirements for structural design and technical design solutions. Control inspection and supervision are based on formalized checks for correspondence of design and operation documentation, technological issues and physical condition of equipment to prescribed norms and rules. This approach, developed under the planned economy, may be effective for supervision of comparably simple, stable and widely applied technologies and equipment. However, this approach to inspection and supervision for technically complicated and large-scale projects would be very expensive, require great labor consumption, high competence of the personnel of supervisory agencies, and corresponding funds.

In such a regime, which is often referred to as a prescriptive regime, the duty of the operator is to adhere to normative requirements and directions given by the supervisory bodies, who thereby take on themselves a considerable responsibility for safe operations. This approach is not adapted to the situation in market economies, where the operator bears full civil responsibility for negative impacts, regardless of how carefully the norms of supervisory agencies for safety and environmental protection were followed. It is fully responsible for ensuring compliance with all safety and environmental protection provisions and to initiate corrective measures for non-conformance's. To continue the prescriptive approach to regulation in Russia may contribute to contradictions, and create conflicts of interests and opposition in the relationship between operators and supervisory agencies.

The limitations of the prescriptive regime are well known:

- underestimation of the need to apply a holistic system approach to ensuring safety during design, construction and operation of large scale technical-industrial (man-machine) systems. Even though such installations have individually reliable and safe elements, it does not mean there is an acceptable overall level of safety;
- inflexibility with regard to implementation of technical innovations and absence of incentives for the industry to search for and implement new organizational-technical solutions;
- for comparatively complicated objects, it is in principle impossible to develop detailed regulations that cover all issues relating to safety and environmental protection;
- economic aspects with regard to ensuring safe and environmentally sound conditions are often neglected. Cost efficiency in analysis, estimation, and choice of alternative solutions are seldom accommodated for.

The current economic situation of Russia requires an accelerated development of the continental shelf resources. In this situation, the continuation of a prescriptive regime is not appropriate, because:

- there is limited practical experience in design, construction and operation of big marine structures in the environmental conditions of the Arctic and Far-Eastern continental shelves;
- there is limited qualified personnel for development of an all-inclusive regulatory system with legal requirements and for conducting supervisory functions;
- to develop specific, detailed safety and environmental protection requirements for all possible design and construction solutions with regard to marine stationary structures, and for the operation of these, will be expensive and time consuming.

Therefore, and since each big marine structure is unique in construction, have organizational-technical systems designed for comparatively full autonomy, as well as for the specific geological and natural conditions in situ, and since the number of such installations will remain relatively small, it will be useful to expand the use of introduce the internal control system, and a system for technical-economic estimation of safety and environmental protection in the offshore oil and gas industry. This type of regime is based on the policy of keeping risks «As Low As Reasonably Possible», a policy which should apply for both the industry and the regulator.

The current approach to regulation of industrial and environmental safety (i.e. for instance the mandatory certification of serial and unique equipment, the practice of regular inspections of installations and equipment, the strict requirements with respect to environmental impact limitation, the requirement of employing environmental expertise in assessments of safety and environmental issues, etc.) should be the basis for this development. The existing basis of normative-documents should also be subject for development.

8.1.3 Development of the Legislative and Normative Base

The main conclusion of the Feasibility Study is that it is necessary to radically revise the safety and environmental regime for marine oil and gas activities. This revision should be based on a new concept and organizational structure for federal control and supervision supported by a special system of legislative and other normative acts and documents. A Proper development will be dependent on active and well-coordinated drafting, approval, and implementation of norms. In recent years, the organizing of the work to develop rules and

regulations has been much criticized. In particular, sub-law acts regulating technical and design criteria for marine oil and gas installations significantly lag behind the energetic development of legislation in respect to use of marine resources, which goes on despite the significant lack of development of practical sub-law acts concerning technical and design criteria of marine oil and gas installations.

In addition to the deficiencies of the existing normative base, there are the following defects in the process to develop norms:

- there are no coordinated programs and setting of priorities in development of the legislative and normative base;
- there is no clearly established division of responsibility for providing safety and environmental protection between executive agencies themselves and with and operators;
- the procedures for confirmation of interagency decisions, and the mechanisms for settling disagreement concerning development of new documents or their application, are not clear.

In the current situation, it is urgent to develop a proper regime for the Arctic continental shelf and similar areas. However, since there are few resources available in terms of time, personnel and funds, the regulatory agencies often apply norms, requirements and rules which are stipulated for onshore activities or other marine areas, such as the Caspian, Baltic and Black Seas. Requirements for industrial safety as well as for environmental protection, which are applicable to activities on the coast and near-coastal waters, are also transferred to offshore regions of the continental shelf. Realizing that oil industry on the Russian mainland is not a particular environmentally clean sector of the industry, a transfer of its requirements to these environmentally harsh and sensitive areas is palliative and prevents the use of progressive, more suitable technical solutions.

It should be mentioned that some stabilizing tendencies have appeared over the last years, which have lead to the introduction of more comprehensive systems for federal control and supervision. These take accumulated experience, analysis of reasons and causes, the expanding of civil rights, and market principles of the economic structure, into account. Industries, such as, the nuclear power industry, the air and space industry, shipbuilding, and others, have introduced new supervisory systems, which incorporates modern principles for regulation, and which are particularly adapted to ensuring safety and environmental protection for unique and especially complex industrial systems. Furthermore, the nuclear power industry has established active international cooperation in the framework of the International Agency for Atomic Energy (IAAE). The experience of these regulators should be incorporated in the development of an offshore oil and gas regime.

8.1.4 Problems Related to Correct Application of Legislation

An important pre-condition for establishing safe and environmentally sound activities is that the application of legislation and its application is clear. The large scale, cost and duration of oil and gas projects, as well as the considerable expenditures related to providing for safety and environmental protection, make the correct application of rules particularly important. Good decision making in large investment projects is dependent on full legal clearness and assurance of a stable legal regime in general, and in particular for the safety and environmental regime.

Where the normative base is not fully developed, or is contradictory, it is especially important that:

- there is clear legislative definition of the necessity and possibility for flexible application of flexibility is exercised in applying rules and regulations when addressing unforeseen or new problems that evolve during the process of project implementation;

- there is a clear description of the procedures and possible simplification, which the operator will have to comply with in order to apply for and obtain the necessary agreements, approvals, permits, licenses, etc.

For any stage of project development, the following important legal provisions should be established:

- a set of applicable, relevant normative requirements;
- the possibility to use existing provisions of norms and rules;
- all decisions made by regulatory agencies concerning the projects must have legal justification (be pursuant to legal requirements).

The Feasibility Study has identified gaps, contradictions and legislative uncertainties in the existing body of legislative and normative acts, but there has not been sufficient time to suggest mechanisms for solving these problems.

In particular, the following problems appear unclear:

- how, and from which agency, can the operator obtain guidance and interpretation concerning the application of normative requirements;
- which procedures regulate the settling of disagreement between the operator and the regulatory agency, or disagreement between the agencies
- what are the juridical procedures for submission, consideration and resolution of appeals, claims, and suite against which procedures guide the development and presentation and handling of applications and possible appeals of the agencies' decisions.

Interagency disagreement and/or the lack of relevant competence at the agencies, often lead to loss of regulatory predictability and complicated procedures for control and supervision. For instance, an operator planning to drill exploratory wells must file applications for permits with a number of federal and regional agencies. They all have individual and uncoordinated procedures for applying for a permit for the operation, obtain a license for use of water, obtain approval of maximum permissible discharges, or for having the operation assessed by the environmental expertise, the similar fisheries related expertise, and by the industrial safety expertise. It often happens that one agency not only imposes on an operator compliance to comply with its own requirements, but also those of other federal, regional and local authorities. Actually, there is one declaration currently in force, which allows an operator to apply for one all-inclusive license for use of natural resources, however, this possibility seems to be ignored in practice.

Naturally, Investors would prefer to be aware of requirements they shall have to comply with in advance. In the majority of field developments, however, such information has not been received until after the agency of the executive authority has evaluated the project documentation (for instance, after the assessment of the environmental expertise). The formal possibility to contest a decision of an executive authority agency in court exists only for juridical persons. In fact, and the legal (arbitrage) settlement of conflicts will not take place until the executive agency has made a decision, i.e. after the investor has made considerable and perhaps unrecoverable expenses on design and expertise.

Some general legal norms allow regulatory agencies decisions, their application of normative acts, or their handling of applications to be contested by filing a court suit (for instance, as stipulated in the Law «On Information»). Such precedents, however, are absent in juridical practice.

It would be useful to study and apply the experience of other countries, which use a single-agency approach to regulation, which coordinates activities of other involved agencies in the supervision of marine oil and gas activities. As a step in this direction, it could be useful to:

- prepare and approve bi- and multi-agency agreements on procedures for evaluating and approving projects for marine oil and gas development in order to reduce the number of applications and simplify the procedures for approving these;
- establish a special, interagency governmental organ, which in a transitional period will have the right to carry out and coordinate supervision of current operations, to regulate safety and environmental protection, and to prepare and implement a program for a development and transition to a new structure of oil and gas industry management based on the single agency approach to regulation.

8.2 The Normative and Legal Basis for Current Projects and the Goals for a Transition Period

The existing legal and normative base is characterized by its unsuitability to accommodate for the demands of the marine oil and gas activities, and its inability to address current and potential problems of field developments. A very unsatisfactory situation has developed, for example:

1. On the shelves of the Arctic, Far-Eastern and Caspian Seas, large development projects have entered the technical design phase, whereas there is no proper or relevant legal base to guide this or future phases of the developments.
2. Because of this lack of relevant legal base, the implementation of these projects has been regulated by the strictest requirements of onshore or inner-waters normative basis, which has resulted in considerable additional expenses.
3. To compensate for this lack of guidance by using international or foreign norms and standards, which have not been approved by federal agencies, involves a risk of designing and constructing installations that will not be in conformance with requirements of a future the Russian legal or normative basis. This could result in the earlier issued approvals being revoked.
4. It not likely that it will be possible to develop and adjust the existing body of normative documents for marine oil and gas activities within an acceptable time, because of the prevailing organizational-financial situation of the agencies that will be responsible for conducting such work.

The transition period will be of sufficient duration to develop a new safety and environmental regime utilizing the existing competence of executive authorities provided there is a consistent application and flexible approach to (1) the consideration and agreement of proposed projects, (2) implementation of state control and supervision, and (3) the reconsideration of existing and issuance of new regulatory documents. The problem consists in making this transition period controllable, limited in duration, and oriented toward achieving long term goals.

8.2.1 Strategies for Development of an All-inclusive Regulatory Regime for Safety and Environmental Protection

A practical work to change the present situation should be guided by two interrelated and parallel implemented strategies:

- in the short and middle term - Reorganize and reconstruct the existing normative base. Meanwhile, the assessment of design and technological solutions for projects already underway, or in the late planning stages (about 10 oil and gas fields), should be addressed on a case-by-case basis;

- in the long term - Develop an all-inclusive safety and environmental regime on the basis of the newly developed system of legal and normative documents.

To develop a legislative base for a transition period, and to apply a flexible, individual approach to designing and building of constructions, are both options that are already available according to provisions of the existing system of normative documents for design, as well as other documents. With regard to establishing relevant norms for the specific features of marine oil and gas installations, one could issue a mandatory requirement that the operator, together with the leading design organization, develop general, technical specifications and operational procedures. These should be agreed upon by the supervising and controlling agencies. A preferable variant would be to formally adopt technical specifications and operational procedures that have been jointly developed by a wider circle of involved regulatory bodies. This could help removing possible contradictions and add a wider perspective to assessments and agreements concerning particular design solutions.

Since foreign design and construction companies with established reputation are widely used in development of current Russian projects, it may be anticipated that international expertise and experience in developing technical constructions will influence the development of the normative basis. Actually, the interrelated process of developing a plan for a project, and expertise assessment of this plan, will contribute to transfer of accumulated experience and to a gradual harmonizing of the legislative and normative base for safety and environmental protection.

Not all Federal agencies are responsible for assessing and agreeing to the terms of reference of design and other pre-design documents. Therefore, the sequences of development activities, the procedures for conducting expertise assessment, and the composition and scope of technical documentation should be accounted for in a special normative document.

The proposed system will not guarantee against occurrence of uncoordinated action by the various managerial or supervisory agencies, or against the issuing of requirements, appeals, claims and suits in case of violation of the legislation. However, this should not serve as an obstacle for implementing the proposed approach. No regime can prevent such incidents, albeit the less complete the regime is the more detailed the development of solutions to legislative problems and the prediction of possible legislative conflicts must be carried out.

A positive factor is that agencies of the state management, whose supervision in this period will be focusing on a comparatively small number of large individual projects, will gain unique experience. This knowledge will be necessary for the transition from a prescriptive supervisory regime based on many detailed formal provisions to a modern performance oriented regime based on clearly defined safety and environmental protection goals. Also for the development of a suitable system of external and internal for regulatory supervision that achieve formulated goals and internal control (based on such as standards as the ISO 9000 standards for Quality Assurance and ISO 14000 for Environmental Management).

It will be necessary to allow for a transitional period of some 4-5 years for the development towards a new regime, because there is limited practical experience in implementing marine oil and gas projects. During this period, agencies of the executive authority can accumulate practical experience and prepare the personnel so that they will be capable of carrying out efficient state supervision in accordance with the new regime in this new branch of industry.

8.2.2 Scope of the Transition Period

The use of individual approaches to regulate each project, will require the implementation of special organizational-administrative measures, in particular:

- a normative document should be adopted in order to establish the temporary regime for the transition period;
- the existing body of normative documents should be analyzed, and development of necessary legislation should be initiated;
- interagency agreements should be set up and signed, perhaps after having reviewed and rearranged the agencies competence and duties, in order to provide additional coordination of their regulatory activities;
- procedures for notification, arbitrage and settling unclear or conflict situations should be developed;
- the competence of the state expertise with regard to assessing offshore oil and gas installation design and engineering should be increased, as a means to prevent subjective and unqualified assessments of safety and environmental issues in the agreement and permit processes.

An urgent need is to establish the status and relevance to regulation of Russian offshore oil and gas activities of the existing body of normative documents. This will require a thorough analysis of their contents and substantiated assessments should be made of their applicability to such organizational and legal actions as revocation, additional agreements, partial redevelopment, registration by the Ministry of Justice of Russia, etc. This work should include:

- juridical assessments to identify and decide which provisions or documents are not relevant for regulating safety and environmental issues in the offshore oil and gas industry and therefore should be revoked or reconsidered. This can be a problem, because according to the general provisions of the Administrative Right Act, a revocation and/or reconsideration of normative acts must be done by the same organ which first stipulated the document;
- assessments of which agency enforces each particular normative act or document. Many normative documents have been stipulated by agencies, which no longer exist. This can be a problem, because according to the general provisions of the Administrative Right Act, a revocation and/or reconsideration of normative acts must be done by the same organ which first stipulated the document;
- identification, where necessary, of the applicability of documents to maritime zones as they are defined in accordance with statutes of the UN Convention «The Law of the Sea». This convention has different jurisdiction and legislative regimes in resources and water use;
- normative acts, or parts of them, which are recognized to still be in force and/or prolonged by organs of the justice, should be submitted for registration in a pre-described order.

The result of this review and organizing of the legislative and normative base should be summarized in a document listing all mandatory and recommended normative documents. This document should have the status of a legislative document and be systematically updated be normative and regularly edited. This task may be entrusted to the Gosstandard of Russia and Mintopenergo of Russia, for instance, to its Technical Committee for Marine Oil and Gas Production, established 1997.

Ongoing legislative and normative development activities should be balanced and coordinated to account for existing and potential future problems. It is particularly necessary recommended:

- to give priority to the development of a mandatory normative document that will guide when appropriate the revision of existing documents and the all development of new normative documents so that they will be compatible with a future all-inclusive safety and environmental protection regime. Normative documents of this regime should make reference to Russian and international standards;

- to coordinate the various agencies' work on developing normative documents in order to avoid duplication and to ensure that such documents will be in conformance with requirements of the safety and environmental regime. This can be done either by formal agreements of cooperation, or by making a common plan for the development, which can be adopted by all involved ministries an agencies;
- to formalize and simplify the procedures for the hearing of draft documents by ministries and agencies, and also speed up this process.

A number of Federal laws have recently been adopted, such as, «On Territorial and Inner Sea», «On Handling of Wastes of Production and Consumption», «On Payment for Water Objects Use», «On Leasing of Some Kinds of Activity» and others. This has created a great demand for developing supportive sub-laws and normative documents dedicated to implement the objectives of these laws. In the past there has been problems related to implementation of action to bring acts of executive authority agencies into compliance with these newly adopted federal laws.

It would be extremely useful to establish regular organizational or procedural forums in order to facilitate and stimulate to:

- exchange of information between industry and executive authority agencies, which would facilitate mutual understanding of goals, tasks and requirements of safety and environmental protection as well as awareness of newly stipulated normative documents;
- accelerate the introduction of foreign achievements in safety and environmental protection in the development of normative documents, and in the development of modern concepts and forms of control and supervision;
- involvement of foreign experts and organizations in assessments and evaluation of marine oil and gas projects.

The task of revising and re-arranging the current body of normative documents cannot be initiated and monitored by the executive authority alone. It would be useful to develop a procedure for notification of new legislative initiatives, as well as, for the monitoring of the progress of developing legislative drafts, which shall be considered by the Federal Assembly. There are presently some dozen laws at different stages of preparation, including some of great importance for providing safety and environmental protection, such as, the new version of the Law «On Environment Protection», and the revised version of the Law «On Interior», etc.

It is possible that such coordination of legislative development activities should be done by the Ministry of Justice, the Cabinet of the President or by a specially appointed interagency organ.

8.2.3 Organizing the Activities of the Transition Period

It seems hardly possible to implement and monitor the proposed organizational, administrative and legislative actions without the establishment and support of an interagency body (for instance, Interagency Commission of the Government of the Russian Federation on the Offshore Hydrocarbons Development). Such a body should be responsible for:

- developing a proposal on the implementation of a unified state and regional policy for offshore hydrocarbon resource developments;
- coordinating the current activities of the Federal organs of executive authority in their development and implementation of a supervisory safety and environmental protection regime for oil and gas activities on the Russian continental shelf;

- developing, approving and monitoring the realization of current plans for the development of a legislative and normative base for safety and environmental protection;
- assessing drafts of legislative and other normative acts concerning safety and environmental protection, and interpreting and explaining provisions of existing normative documents, including assessing their correct application;
- identifying and evaluating organizational and methodological problems, and proposals of organs of the state management of the Russian Federation and industry on safety and environment protection in the marine oil and gas activities;
- preparing and submitting proposals concerning management of safety and environmental protection in the marine oil and gas activities to the Government of the Russian Federation;
- developing proposals for Russian Federation participation in international cooperation, which will contribute to establishing a proper regime for safety and environmental protection.

To be able to conduct these tasks, the proposed organ should have the status of a governmental agency, and be authorized to:

- coordinate development and implementation of inter-branch and interregional programs for safety and environmental protection;
- organize working and expert groups with participation of representatives of the interested ministries and agencies as well as Russian and foreign specialists;
- represent, by appointment of the Government of the Russian Federation, the interests of Russia in international and foreign organizations;
- prepare and submit, together with other interested ministries and agencies, to the Government regular reports on the state of safety and the environment in marine oil and gas activities;
- prepare and submit, in accordance with established procedures, proposals for solving problems that require a decision of the Government of the Russian Federation;
- publish, on behalf of the Government of the Russian Federation, mandatory decrees and decisions on issues related to safety and environmental protection.

Additional measures can be to establish interagency agreements and also agreements between Federal agencies and interested Subjects of the Russian Federation. However, judging by previous experience, initiatives to prepare and implement such agreements will be dependent of persistent and energetic efforts of the Government of the Russian Federation.

8.3 The Future All-inclusive Safety and Environmental Regime

The development of a new Russian offshore oil and gas safety and environmental regime will be based on a new concept called «balanced development». This means that natural resources must be developed in such a way that would not create a threat to the interests of future generations, environment, and the health of local populations. The new regime will also consider the special interests of the northern indigenous communities and strive to minimize negative impacts to their economic, social, cultural, and health needs.

8.3.1 The Concept of the Safety and Environmental Regime

The future safety and environmental regime will have the following characteristics:

- it will provide for safe and environmentally sound offshore oil and gas activities;
- the legal basis will be complete, predictable and non-contradictory as possible;

- it will have mechanisms for settling disputes between industry and authorities as well as intergovernmental disputes and for providing regulatory interpretations of legal requirements;
- risk assessments and cost-benefit analyses will be conducted to ensure that implementation of economic decisions are based on minimal safety or environmental risk and best appropriate technology;
- it will ensure that oil and gas activities do not have a negative impact on other sectors of industry, economy, health or social conditions;
- it will have there will be a reasonable combination of prescriptions, limitations and prohibitions, as well as incentives that stimulate to enhancing safety and environmental protection through use of appropriate technology that is cost effective;
- it will ensure that regional environmental statements (evaluations) will be conducted prior to opening up areas for oil and gas activities, and that environmental impact assessments (EIA) are made for all activities;
- the enforcement system will be based on a combination of obligatory character of State control and supervision for safety and environmental protection, company internal control, use of 3rd party control, and regulatory auditing of internal control systems;
- there will be mandatory monitoring of environmental conditions as well as of the impact of oil and gas activities by the companies;
- regulatory action or decision-making will give due consideration to social and cultural factors, economic conditions, health and the interests of indigenous people in the project areas;
- it will have provisions ensuring full and fair compensation for possible negative impacts of the oil and gas activities;
- it will have suitable mechanisms for securing economic regulation of industrial safety and environmental protection;
- it will have provisions for full legal/civil responsibility compensation for damage caused by the oil and gas activities;
- priority will be given to implementation of accident prevention measures, and to action to minimize the mitigation of their consequences;
- the development of safety and environmental measures will be based on sound science.

8.3.2 Principles for Development of the body of Normative Documents

A body of normative documents should be developed to regulate the activities of:

- the executive authority agencies, when they conduct functions of the state management and supervisory activities related to safety and environmental protection in the marine oil and gas industry;
- operators in providing for safe and environmentally sound projects and operation of marine oil and gas activities.

The system of normative documents should consist of a totality of interrelated documents promoting and supporting safety and environmental protection in marine oil and gas activities and covering all phases and all aspects of interior use and oil and gas activities, such as:

- geological survey, exploration and reserves estimation;
- design, construction of marine structures, units and installations, exploitation, removal of installations, transportation and supply;
- production, storage, treatment and transportation of oil and gas;
- supporting marine and other special operations.

The development of normative documents for safety and environmental protection should be based on the existing legislation of the Russian Federation, taking into account the following:

1. A normative document, which defines scope, content, procedures for development and adoption of a legal documents system for the marine oil and gas activities (abbreviation - LDS MOGA) should be developed. Simultaneously, a comprehensive list of documents of the system concerning safety and environmental protection should be prepared. The list should group the documents in the following sections:
   - industrial safety including fire- and explosion protection, chemical, technical and marine safety;
   - environmental safety and protection;
   - labor protection and provision of life support;
   - organizational and legal protection, safety control and supervision.
2. A technical and juridical expertise review should be carried out for all legal, normative-technical and other documents, to assess their relevance to the LDS MOGA. If a document and/or its particular provisions are accepted as relevant, then such a document should be revised and included in the system with proper registration of its legal status and other essential information.
3. An analysis of foreign systems and normative documents for safety and environmental protection should be conducted to establish their compatibility with requirements of LDS MOGA. If the analysis proves positive, then measures should be taken to develop harmonized, analog documents, which could then be included in the system.
4. New documents should be developed for the parts of LDS MOGA, which are not covered by existing Russian or foreign documents, or for which a revision of existing documents is not considered feasible.
5. Previously valid but superseded documents should be amended or revoked.

Actions on development of LDS MOGA should carried out within the framework of an agreed upon single program with proposed steps for branch development, set priorities and time-lines. The following existing organizational and financial conditions should be taken into account:

1. The unified program should be developed and implemented under the guidance of an over- or interagency organ specially appointed by the Government of the Russian Federation (executing organ of the program). The work should be carried out in accordance with agreements between ministries, agencies and managerial organs of interested Subjects of the Russian Federation.
2. The program should be implemented on the basis of a consolidated budget, including grants from funds of the state, budget and non-budgetary funds of ministries, agencies and Subjects of the Russian Federation, as well as from funds of international financial institutes, and funds allocated for support of the program by active or potential investors of the oil and gas industry.
3. The Executive organ of the program should establish expert groups, which include leading Russian and foreign specialists, and allow participation in these groups by representatives of interested ministries, agencies and Subjects of the Russian Federation.
4. Should implementation of oil and gas development projects require immediate attention, it should be possible to develop specific and individual safety and environmental protection requirements for at the expense of the investor. It should also be possible to develop temporary normative documents with additional funds from interested ministries, agencies and Subjects of the Russian Federation. Use of regular funds allocated to the program for development of LDS MOGA for such purposes should not be permitted. The Executive

organ of the program should register the particular and individual technical solutions and temporary normative documents that are made in the program. Such registration should be mandatory.

5. The Executive organ of the program should prepare and conduct periodical reviews and updates, and publicize the List of documents being in force. The List of normative documents should have status as a normative document of LDS MOGA.
6. The Executive organ of the program should take measures for bringing documents of LDS MOGA (including the document on its establishing and the List of documents) in conformance with newly adopted or revised legislation of equal status.

Initially propose structure of LDC MOGA is shown in the Attachment 2.

It is proposed that the following Federal organs should be invited to participate on the program:

- MNR of Russia;
- Goscomecologia of Russia;
- Mintopenergo;
- Federal Service on Fisheries;
- Goscomsever of Russia;
- Federal Service on Hydrometeorology;
- MVD of Russia (State Anti-Fire Service);
- Gosstandard of Russia (Technical Committee on Standardization in Marine Oil and Gas Production);
- Gosgortechnadzor of Russia;
- MES of Russia;
- Mintrans of Russia (Federal Service of Marine Register and Gosmorspassluzba).

The following agencies may be invited to participate in some activities:

- Minfin of Russia;
- Federal Border Service of Russia;
- State Custom Committee of Russia;
- Federal Service of Airways of Russia.

8.4. Proposals on the Implementation of Phases 2 and 3 of the Project «Safety and Environmental Regime for Russian Offshore Oil and Gas Operations»

Expert estimations have shown that the work covering phases 2 and 3 of the Project (the main part of the Project) will require about 5 years. The most important preconditions of success in implementation of the Project are:

- commitment of Federal organs of the Executive Authority (ministries and agencies) to development and implementation of Russian regime of safety and environment protection in development of hydrocarbons resources on the shelf and in territorial sea of the Russian Federation, complying with Russian and international requirements;
- interest and participation of Russian and foreign operators in development and implementation of the mentioned regulatory system;
- establishment of the interagency organ (Commission) of the Government of the Russian Federation on problems hydrocarbons resources development on the continental shelf, which would have a right to decide on problems of the transition period;

- participation of foreign organizations, experts and international financial institutions which have accumulated considerable experience in regulation and control in safety and environmental protection problems during development of hydrocarbons resources of marine fields.

Proposed activities for the end of 1998 and following period include:

1. Finalizing the Feasibility Study phase:

- consideration of the Feasibility Study results and approval of the report -November 1998;
- distribution of the report and summary among potential investors (interested ministries and agencies, national and international oil and gas companies, international financial institutions) to collect comments, recommendations and proposals on participation in the main part of the Project - November 1998;
- preparation of a draft of the Russian Government decision on continuation of the Project and establishing of the interagency organ (Commission) for regulation of safety and environment protection in development of marine oil and gas fields - December 1998 - January 1999;
- sending letters of invitation to foreign participants of the Project: MMS (USA) and NPD (Norway) - December 1998.

2. Activity on the main part of the Project (1999-2003):

- organizational period (project group, interpreters, office premises, office equipment, etc.) - January-February 1999;
- preparation of terms of reference, time-lines, budget - February 1999;
- establishment of the Executive Committee and proposals on working groups - January-February 1999;
- preparation of terms of reference, time-lines and budget for working groups-March 1999;
- international conference on Feasibility Study results and recommendations on the main part of the Project activities - middle of March 1999;
- agreements on project activities with interested organizations, coordination with other projects and foreign participants - April-May 1999;
- development of proposals on reconsideration and changes of acting and development of new normative documents - June-December 1999;
- reconsideration and changes of acting documents - 2000-2002;
- development of new normative documents on regulation of safety and environment protection in development of marine hydrocarbons fields - 2000-2003;
- development of structure and design for information system of legislation and legal-normative base of documents regulating safety and environment protection in hydrocarbons development on the Russian shelf and in territorial sea - June-December 1999;
- filling and maintaining of the information system - beginning 2000;
- development of control and supervisory system for safety and environment protection in marine operations in oil and gas industry - July 2000-June 2001;
- implementation of control and supervisory systems July 2001-June 2002;
- testing of control and supervisory systems in model project - 2002-2003;
- development of programs for personnel (of operators, supervisory and controlling organs) training -July-December 2001;
- releasing of legal and normative documents - as they are ready.

Therefore, total 5-year period is conditionally subdivided by 3 phases. The first phase (inception) includes solution of technical problems (establishing of project group, personnel, office premises, office equipment, communication, etc.), development of detailed terms of

reference for the Project and for working groups of experts, establishment of the Executive Committee for guidance and control of the work progress, solution of financial problems, coordination with other projects. Duration of this phase is 12 months, awaited expenditures - 300-400 thousand USD. Necessary funding for phases of development and implementation must be estimated during this first phase. Preliminary evaluation shows that it should be about 700-800 thousand USD annually.

Attachment 1

A List of Legislative Acts Regulating Activities for Exploration and Development of Oil and Gas on Russian Arctic Shelf

No.	Name of acts	Date of approval	Reg. Number
1	**Legislative acts of the Russian Federation**		
1.1	Constitution of the Russian Federation.	Dec. 12.1993	
1.2	Land Code of the Russian Federation.	Apr. 25.1991	1103-1
	The new version	Dec. 24.1993	2287
1.3	Water Code of the Russian Federation.	Nov. 16.1995	167-F3
1.4	On Industrial Safety of Hazardous Industrial Objects.	July 21.1997	116-F3
1.5	Legislative Fundamentals of the Russian Federation on Labor Protection.	Aug. 06.1993	5600-1
1.6	On Protection of Atmospheric Air.	July 14.1982	
1.7	On Interior.	Feb. 21.1992	2395-1
	The new version	March 03.1995	27-F3
1.8	On Wastes of Production and Consumption.	June 24.1998	89-F3
1.9	On Information, Informatization and Protection of Information.	Feb. 20.1995	24-F3
1.10	On Wildlife.	Apr. 24.1995	52-F3
1.11	On Fire Safety.	Dec. 21.1994	69-F3
1.12	On Environment Protection.	Dec. 19.1991	2060-1
	The new version	June 02.1993	5076-1
1.13	On Continental Shelf of the Russian Federation.	Nov. 30.1995	187-F3
1.14	On Standardization.	June 10.1993	
	The new version	Dec. 27.1995	211-F3
1.15	On Protection of Population and Territories against Emergent Situations of Natural and Technogenous Character.	Dec. 21.1994	68-F3
1.16	On Specially Protected Natural Areas.	March 14.1995	33-F3
1.17	On Environment Expertise.	Nov. 23.1995	174-F3
1.18	On Agreements on Production Sharing.	Dec. 30.1995	225-F3
1.19	On Certification of Production and Services.	June 10.1993	5151-1
	The new version	Dec. 27.1995	211-F3
1.20	On Radiation Safety of Population.	Dec. 05.1995	
1.21	Civil Code of the Russian Federation.	Nov. 30.1994	52-F3
1.22	On Rescue Forces and Status of Rescue Personnel.	Aug. 22.1995	151-F3
1.23	Legislative Fundamentals of the Russian Federation	July 22.1993	5487-1

	on Health Protection.		
1.24	On Hydrometeorological Service.	July 19.1998	113-F3
1.25	On Sanitary-Epidemiological Welfare of Population.	Apr. 19.1991	1034-1
1.26	On Rates of Payments for Mineral Resources Recovery.	Dec. 30.1995	224-F3

No.	Name of acts	Date of approval	Reg. Number
1.27	The Crime Code of the Russian Federation. Environmental Crimes.	June 13.1996	63-F3
1.28	On the Federal Law «On Ratification of United Nations Convention on the Law of the Sea».	Jan. 22.1997	1039-II-SD
1.29	Decree «About a draft of Federal law on concession and other agreements, contracted with foreign investors.	Apr. 03.1996	210 DSD
1.30	On ratification the convention about biological variety.	Feb. 17.1995	16-F3
1.31	On ratification the frame convention about climate changes.	Nov. 04.1994	34-F3

1.2 Decrees of the President of the Russian Federation

1.2.1	About activities of physical and juridical entities on exploration and development of mineral resources on the continental shelf.	Nov. 25.1994	
1.2.2	About urgent measures on the environment protection and economic activity of indigenous peoples of the North.	Apr. 22.1992	397
1.2.3	About natural resources protection in the territorial waters, on the continental shelf and in the economic zone of the Russian Federation.	May 05.1992	436
1.2.4	About the concept of transition to sustainable development of the Russian Federation.	Apr. 01.1996	440
1.2.5	About urgent measures on development of new great gas fields on the Jamal Peninsula, in the Barents Sea and on the Sakhalin Island shelf.	June 01.1992	539
1.2.6	About measures to accelerate activities on development of oil and gas fields on the continental shelf of the Russian Federation.	Nov. 30.1992	1517
1.2.7	About state supervision for following the Russian Federation legislation on labor and labor protection.	May 04.1994	850
1.2.8	About Federal natural resources.	Dec. 16.1993	2144
1.2.9	About the approval of the Statute of the Gosgortechnadzor of the Russian Federation.	Feb. 18.1993	234
1.2.10	About measures to provide beginning of exploitation of oil fields.	Dec. 23.1993	2274
1.2.11	About priority measures to improve activities of the oil companies.	Apr. 01.1995	327
1.2.12	About establishment of industrial and operational	May 23.1996	765

basis for development of hydrocarbons fields on the Arctic continental shelf.

No.	Name of acts	Date of approval	Reg. Number
2	**Decrees and normative acts of the Federal executive authorities in the Russian Federation**		
2.1	About the approval of the Statute of the Ministry of Natural Resources.	May 17.1997	588
2.2	About the approval of the Statute of the State Committee of the Russian Federation on the Environment Protection.	May 26.1997	643
2.3	About social-economic development of regions of the Far North and equaled to them territories.	May 12.1992	308
2.4	About the approval of the Statute of the Ministry of the Health of the Russian Federation.	June 03.1997	659
2.5	The Statute of Committee on special underwater operations by the Government of Russian Federation.	Aug. 10.1993	789
2.6	About the approval of the Statute of the State Committee on the habitat and construction policy.	Dec. 11.1997	1542
2.7	On establishment the Unified State Environmental Monitoring System.	Nov. 24.1993	1229
2.8	About the approval of the Statute of the Ministry of labor and social policy.	Apr. 23.1997	480
2.9	About the Agreement between the Government of the Russian Federation and the Government of the Kingdom Norway about cooperation in the fight against oil-pollution in the Barents Sea.	May 24.1994	779
2.10	The Order of leasing activities.	Dec. 24.1994	1418
2.11	About priority measures to fulfill Vienna Convention on ozone layer protection and Montreal Protocol on compounds destroying ozone layer.	May 24.1995	526
2.12	About priority measures to fulfill the Federal Law «About ratification of the Bazel Convention on the control for trans-boundary transportation of dangerous wastes and their removal».	July 01.1995	670
2.13	About the approval of the Statute on leasing of some kinds of activity connected with geological investigations and usage of the interior.	July 31.1995	775
2.14	About the approval of procedures to develop and approve environmental norms for emissions and discharges of pollutants into the environment, limits of natural resources usage, storage of wastes.	Aug. 03.1995	545
2.15	About the approval of the Statute of leasing some kinds of activities in hydrometeorology and environmental monitoring.	Aug. 07.1995	787

2.16	About changes of decisions of the Government of the Russian Federation due to adoption of the Law «On especially protected areas».	Oct. 09.1995	990

No.	Name of acts	Date of approval	Reg. Number
2.17	About unified state system for preparedness and response of emergency situations.	Nov. 05.1995	1113
2.18	About the approval of the Statute of the Fund for restoration of mineral resources.	Aug. 02.1997	986
2.19	About the «Red Book» of the Russian Federation.	Feb. 19.1996	158
2.20	About the approval of the Statute of leasing some kinds of activities in environment protection.	Feb. 26.1996	168
2.21	About organs responsible for state expertise of useful minerals reserves, geological, economic and environmental information about sites of the interior proposed for usage.	Feb. 28.1996	210
2.22	About specially appointed state organs responsible for protection, control and regulation of usage of wild life and its habitat.	Apr. 15.1996	457
2.23	About changes and additions in the Statute on the State natural reserves in the Russian Federation.	Apr. 23.1996	527
2.24	About the approval of the Statute of the State environmental expertise.	Sep. 22.1993	942
	additions	June 11.1996	698
2.25	About the order of activities of Russian physical and juridical entities connected with development of mineral resources on the sea bottom beyond the continental shelf.	Apr. 25.1995	986
2.26	About the state regulation and control for trans-boundary transportation of dangerous wastes (Approval of the Statute of State regulation of transportation of dangerous wastes).	July 01.1996	766
2.27	About Russian Federation joining to the Agreement on the Book of rare and being under a danger of disappearing kinds of animals and plants - Red Book of CIS countries.	Aug. 13.1996	952
2.28	About the approval of requirements to prevent the death of wild life during production processes, as well as during exploitation of transport ways, pipelines, communication lines and electrical power lines.	Aug. 13.1996	997
2.29	About the approval the Statute on the order and conditions of payments for the right of the interior use, aquatory and sites of the sea bottom.	Oct. 28.1992	828
	additions	Aug. 26.1996	1007
2.30	About the classification of natural and technogenous emergency situations.	Sep. 13.1996	1094
2.31	About additional measures on implementation of the	Sep. 19.1996	1120

Federal Program on development minerals base for exploratory operations.

No.	Name of acts	Date of approval	Reg. Number
2.32	About the Federal Specific Program«Prevention of dangerous climate changes and their negative consequences».	Oct. 19.1996	1242
2.33	About the order to maintain the State Cadastre of especially protected areas.	Oct. 19.1996	1249
2.34	About the order to maintain of state registration, state cadastre and state monitoring of the wild life.	Nov. 10.1996	1342
2.35	About maintenance of water cadastre of the Russian Federation.	Nov. 23.1996	1403
2.36	About the approval the Statute on water protection zones of water objects and their coastal protective bands.	Nov. 23.1996	1404
2.37	About the Federal Specific Program for creation of high-tech installations, machines and equipment for marine oil and gas production and development of hydrocarbons fields on the Arctic continental shelf «Shelf».	Dec. 07.1996	1469
2.38	About the order for development and approval of norms for maximum permissible dangerous impacts on water objects.	Dec. 19.1996	1504
2.39	About the signing the Convention on transboundary influence of industrial accidents.	Nov. 04.1993	118
2.40	About the approval the Statute on State control for usage and protection of water objects.	June 16.1997	410
2.41	About the approval of the Order for inventory sites and objects of extraction, transportation, treatment, usage, collection, storage and dumping of radioactive substances and sources of ionizing radiation on the territory of the Russian Federation.	July 22.1992	
2.42	On establishing of Interagency Commission for development of proposals to implement decisions of the UN Conference on the environment and sustainable development.	Aug. 19.1992	
2.43	About the approval of the Procedure to define payment and its limits for natural environment pollution, location of wastes, other kinds of dangerous impacts.	Aug. 28.1992	
2.44	About the approval the Statute on the State Committee of the Russian Federation on civil defense, emergency situations and liquidation of natural disasters results.	Nov. 25.1992	
2.45	About the approval the Statute on the Committee of the Russian Federation on social-economic	Dec. 25.1992	

	development of the North.		
2.46	About the establishment of state natural reserve «Great Arctic» of the MNR of Russia.	May 11.1993	

No.	Name of acts	Date of approval	Reg. Number
2.47	About the competence of the executive authority organs of regions, districts, autonomic subjects and cities of the federal order in leasing of some kinds of activities.	May 27.1993	
2.48	The Statute «On the environment impact assessment».	Dec. 08.1994	
2.49	About initial measures to solve a problem of wastes in the Russian Federation in 1996-1998.	Feb. 28.1996	
2.50	About the approval of the Order for usage of payments for restoration of the minerals base and releasing of interior users of mentioned payments.	May 17.1996	597
2.51	About the forces and means of unified state system for prevention and liquidation of emergency situations.	Sep. 03.1995	924
2.52	About the approval of the Statute of the Ministry of Fuel and Energy of Russia	Jan. 27. 1996	60

3 International Documents

3.1 International Conventions and Agreements ratified by the Russian Federation

3.1.1	Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (Washington, London, Mexico, Moscow).	1972
3.1.2	Convention on the Prohibition of Military or any other Hostile Means of Impact on the Natural Environment (Geneva).	1977
3.1.3	Convention on Long-Range Transboundary Air Pollution LRTAP (Geneva).	1979
3.1.4	Vienna Convention on Ozone Layer Protection (Vienna).	1985
3.1.5	Helsinki Protocol on Reduction of Sulfur Emissions or their transboundary Fluxes by at least 30 % to the Convention on LRTAP.	1985
3.1.6	Montreal Protocol on Substances that Deplete the Ozone Layer (Montreal).	1987
3.1.7	Protocol to the 1979 Convention on Long-Range Transboundary Air Pollution concerning the Control of Emissions of Nitrogen Oxides (Sofia).	1988
3.1.8	Convention on Environmental Impact Assessment in a Transboundary Context. Economic and Social Council. European Economic Commission (Finland).	1991
3.1.9	Amendment to the Montreal Protocol on Substances	1990

that Deplete the Ozone Layer (London).

No.	Name of acts	Date of approval	Reg. Number
3.1.10	Convention on Transboundary Effects of Industrial Accidents.	1992	
3.1.11	Protocol to the 1979 Convention on Long-Range Transboundary Air Pollution concerning Further Reduction of Sulfur Emissions (Oslo).	1994	
3.1.12	Basel Convention on the Control of Transboundary Movements of Hazardous Wastes.	1989	
3.1.13	The UN Framework Convention on Climate Change.	1994	
3.2	**International Conventions and Agreements which are not ratified by the Russian Federation**		
3.2.1	Convention on Fishery and Protection of Living Marine Resources.	1958	
3.2.2	Geneva Convention on the Continental Shelf.	1958	
3.2.3	Geneva Convention on the Territorial Seas and the Contiguous Zone.	1958	
3.2.4	Geneva Convention on the High Seas.	1958	
3.2.5	International Convention relating to Intervention on the High Seas in cases of Oil Pollution Casualties (Brussels).	1969	
3.2.6	International Convention of Establishing an International Fund for Compensation for Oil Pollution Damage (with amendments) (Brussels).	1971	
3.2.7	Convention on Wetlands of International Importance Especially as Waterfowl Habitat (Ramsar).	1971	
3.2.8	Stockholm Declaration on the Human Environment (principle 24).	1972	
3.2.9	UNEP Program. UN General Assembly Resolution.	1972	
3.2.10	Convention concerning the Protection of the World Cultural and Natural Heritage (Paris).	1972	
3.2.11	Agreement between the United States of America and the Union of Soviet Socialist Republics for Cooperation in the Field the World Ocean Investigation.	1973	
3.2.12	Charter of Economic Rights and Obligations of States (Adopted by XXIX Session of the UN) (New York).	1974	
3.2.13	Convention for the Prevention of Marine Pollution from Land-based Sources (Paris).	1974	
3.2.14	Convention on Civil Liability for Oil Pollution during Exploration and Development of Marine Mineral Resources (London).	1975	
3.2.15	Convention on Future Multilateral Cooperation in	1980	

	the Fishery in north-eastern Part of Atlantic (London).		
No.	**Name of acts**	**Date of approval**	**Reg. Number**
3.2.16	UN Convention on the Law of the Sea (Montegue Bay, «Register», pp. 228-233).	1982	
3.2.17	Protocol to the Convention on Long-Range Transboundary Air Pollution, 1979, concerning long-term funding of the joint program of observation and migration of air-pollutants on long-range distances in Europe prepared in Geneva.	1984	
3.2.18	Protocol changing the Convention on Wetlands of International Importance Especially as Waterfowl Habitat (Paris).	1985	
3.2.19	International Convention on Oil Pollution Preparedness, Response and Cooperation.	1990	
3.2.20	Convention on the Protection and Use of Transboundary Watercourses and International Lakes.	1992	
3.3	**Documents of International Organizations**		
3.3.1	All-inclusive Plan of Global Investigation of the World Ocean Pollution and Main Methodological Recommendations of UNESCO. Intergovernmental Oceanographic Commission.	1976	
3.3.2	Problems of Safety in Oil Industry in the Shelf Development. ILO (Geneva).	1978	
3.3.3	Guiding Principles of UNEP Concerning Environment Protection in Connection with Marine Extraction of Useful Minerals and Drilling within National Jurisdiction (Nairobi).	1982	
3.3.4	Some Economic Aspects of Oil Spills Response (International Organization on Economic Cooperation and Development).	1982	
3.3.5	Products of Oil-chemistry Industry (Criteria of the Environment Pollution) (WHO, Geneva).	1982	
3.3.6	Materials on the Environment Protection provided by IOECD.	1985	
3.3.7	Montreal Guiding Principles of UNEP for the Prevention of Marine Pollution from Land-based Sources (Montreal).	1985	
3.3.8	UN Program on the Environment (UNEP). A Report of the Association for Collaboration with UN. (New York).	1986	
3.3.9	Montreal Protocol on Substances that Deplete the Ozone Layer (Montreal).	1986	
3.3.10	Guidelines for Oil Pollution Response. Part 2.	1988	

Consideration of unforeseen accidents. IMO (London).

No.	Name of acts	Date of approval	Reg. Number
3.3.11	Prospects of the Environment to 2000 and in Future. UNESCO Program. Environment (Nairobi).	1988	
3.3.12	Economic Levers for the Environment Protection (IOECD).	1989	
3.3.13	Post-design analysis in EIA. EEC UN (New York).	1991	
3.3.14	International Policy on Estimation of the Impact on Habitat. EEC UN (Geneva).	1991	
3.4	**Intergovernmental Agreements**		
3.4.1	Agreement between the Government of Finland and the Government of the Russian Federation on cooperation in the field of environment protection.	Apr. 21.1992	
3.4.2	Agreement between the Government of Norway and the Government of the Russian Federation on cooperation in the field of environment protection.	Aug. 03.1992	
3.4.3	Agreement between the Government of the Kingdom of Sweden and the Council of Ministers - Government of the Russian Federation on cooperation in the field of environment protection.	Feb. 02.1993	

Attachment 2

Legal Documents System for Marine Oil and Gas Operations - section (Safety and Environment Protection) (LDS MOGO)

No.	Contents of documents, subject of regulation
1	**General statements**
1.1	Marine oil and gas production. General terms and definitions.
1.2	General requirements for safety and environment protection in marine oil and gas operations.
1.3	Requirements for stages, preparation, submitting and approval of technological, design and operational documentation during exploration, completion and development of marine hydrocarbons fields.
1.4	Technological documentation. Stages of design, submitting and approval.
1.5	Design documentation for development of oil and gas fields.
1.6	Design documentation for installations on oil and gas fields.
1.7	Production documentation. The mandatory requirements for contents and composition.
1.8	Requirements for industrial safety. General statements.
1.9	Environmental safety and environmental protection. General statements.
1.10	Requirements for labor protection during marine oil and gas fields development. General statements.
1.11	Engineering investigations for designing of marine stationary installations for oil and gas production.
1.12	Navigation and hydrometeorological provision of marine oil and gas activities.
1.13	The list of legal documents for ensuring safety regime during operations on exploration and development of marine hydrocarbons fields.
2	Environmental safety and environment protection
2.1	Requirements for environmental safety and environment protection during development of marine hydrocarbon fields.
2.2	Environmental requirements and terms of competition and leasing agreements for the permitting of marine oil and gas field development.
2.3	Environmental justifications and environment impact assessments (EIA) during exploration and development of marine hydrocarbons fields.
2.4	Requirements for development of the «Environment Protection» section in designs for conducting of exploratory drilling on marine hydrocarbon fields.
2.5	Requirements for development of the «Environment Protection» section included in the Feasibility Study (Designs) for marine oil and gas fields development.
2.6	Requirements for development of the «Environment Protection» section included in

	technological designs (schemes) for marine oil and gas development.

2.7	Rules for water protection during marine oil and gas operations in inner marine waters and territorial sea of the Russian Federation.
2.8	Rules for water protection during marine oil and gas operations on the continental shelf and in the exclusive economic zone of the Russian Federation.
2.9	Rules for atmospheric air protection during marine oil and gas operations.
2.10	Procedure for handling wastes in marine oil and gas operations.
2.11	Development of norms for maximum permissible discharges of pollutants into the environment during exploration and development of marine oil and gas fields.
2.12	Environment protection during the location and construction of installations for marine hydrocarbon field development.
2.13	Environment protection during the location and construction of marine stationary structures.
2.14	Interior protection during marine hydrocarbon fields development.
2.15	Establishing an Environmental Service on enterprises and objects for exploration and development of marine oil and gas fields.
2.16	Establishing of Operational-Environmental control during exploration of marine oil and gas fields.
2.17	Establishing of Operational-Environmental control on stationary marine structures for marine oil and gas development.
2.18	Methodology of environmental damage assessment during marine oil and gas operations.
2.19	Methodology of damage assessment for the fish industry during marine oil and gas operations.
3	**Industrial safety**
3.1	The order of drafting, consideration, and confirmation of temporary technical conditions for engineering design and equipping of marine oil and gas installations for production, processing and storage.
3.2	Classification requirements for marine stationary structures.
3.3	Safety rules during development and exploitation of marine oil and gas fields.
3.4	Requirements for provision of fire and explosion safety for objects of marine oil and gas field installations.
3.5	Constructive features of underwater installations and communications for marine oil and gas fields.
3.6	Constructive features of oil and gas condensate storage for marine fields.
3.7	Construction features of mooring and load-unload equipment for liquid hydrocarbons for marine stationary installations.
3.8	Navigation provision of moorage and load-unload operations for marine stationary installations.
3.9	Declaration of safety for production objects in marine oil and gas operations.
3.10	Analysis of dangers and risks during marine oil and gas operations.
3.11	The main regulations, methods and algorithms of quality and quantity risk analysis during exploration and development of marine hydrocarbon fields.
3.12	Protection, safety, and exclusionary zones in regions of marine stationary structures and underwater pipelines location.

4	**Labor protection**
4.1	Typical statute for personnel occupying objects of marine oil and gas operations.
4.2	Typical rules of labor protection and rest of personnel occupying marine stationary structures.
4.3	Hygienic norms and requirements for the work places on marine oil and gas operations.
4.4	Requirements for ventilation, heating and air condition systems on marine stationary installations.
4.5	Construction features of temporary shelters on objects of marine oil and gas fields development.
4.6	Equipping of habitable marine stationary installations by individual and collective life-rescue and evacuation means.
5	**Preparedness and response in emergency situations**
5.1	Methodology of the sensitivity assessment of the aquatory and coastal areas in respect of oil pollution.
5.2	Requirements for equipping of marine stationary installations with means for containment and clean-up of oil spills on marine aquatories and means for protection of coastlines against oil spills.
5.3	Planning of rescue and environment protection measures during industrial accidents and unfavorable environmental conditions.
5.4	Planning of basin and object activities for liquidation of oil spills.
5.5	Coordination of marine and coastal activities during a threat and during actual marine oil spills.
5.6	Methodological directives for prediction of oil spill behavior.
5.7	Means for discovering and control of oil spills behavior in Arctic conditions.
5.8	Means for clean-up of oil spills and coastlines protection in Arctic conditions.
5.9	Definition of areas influenced by marine oil and gas production objects in connection with possibility of oil spills.
5.10	Environmental sensitivity of marine aquatories and coastal areas to influence of oil spills.
5.11	Procedures of operations during well blow-outs and uncontrolled oil flow from marine wells.
5.12	Establishing and spending of funds allocated for urgent measures to liquidate oil spills.
5.13	Requirements for financial provision of emergency measures and rehabilitative-restoration activities in case of emergency oil spills.
6	**Organizational-directive documents**
6.1	Statement on inter-branch Governmental Commission for development of marine oil and gas fields.
6.2	Procedures of development, submission, consideration and approval of conditions for nature use and environment protection during marine oil and gas operations.

6.3	Harmonization and receiving permissions for application of international norms, rules and standards concerning industrial and environmental safety and environment protection during marine oil and gas operations.
6.4	Procedure for preparation, consideration, agreements and approval of permits for operations connected with exploration of marine oil and gas fields without construction and location of stationary structures on the sea bottom.
6.5	Procedures of state control and supervision during development and exploitation of marine hydrocarbon fields.