

Policy options

This section aims to identify feasible policy options that target key components identified in the Causal chain analysis in order to minimise future impacts on the transboundary aquatic environment. Recommended policy options were identified through a pragmatic process that evaluated a wide range of potential policy options proposed by regional experts and key political actors according to a number of criteria that were appropriate for the institutional context, such as political and social acceptability, costs and benefits and capacity for implementation. The policy options presented in the report require additional detailed analysis that is beyond the scope of the GIWA and, as a consequence, they are not formal recommendations to governments but rather contributions to broader policy processes in the region.

According to the results of the Scaling and scoping, and the Causal chain analysis, the following issues were chosen for the Policy option analysis:

- Overexploitation of fish;
- Modification of ecosystems;
- Oil spills;
- Radionuclides.

Overexploitation of fish

Problems

The analysis of the root causes behind the overexploitation of fish concludes that the existing fisheries practices during the past two decades have the potential to completely undermine the stocks of the commercially most valuable fish species in the Barents Sea. However, such a pessimistic prediction is believed to be unlikely, as an understanding of the necessity to stabilise the situation in the fisheries sector has increased

in both Russia and Norway. Overfishing is also a focus of interest of the UNO, FAO and other world organisations related to the environmental protection. Thus, although the concern Unsustainable exploitation of fish and other living resources was assessed as having moderate impact at present, it was predicted to improve by 2020, both regarding the environmental and the socio-economic impacts.

Root causes

The root causes behind overexploitation of fish were identified as:

- Economic: overinvestment, unequal payments for the access to bioresources, price of vessels' quota-rights, high taxes and fish prices, failures of economic reforms in Russia, and market failures.
- Technological: low selectivity of fishing gear, and lack of alternative fishing gear.
- Political: disagreements within the Joint Norwegian-Russian Fisheries Commission regarding the setting of annual TAC.
- Governance: imperfection of fishery control systems, gaps in fishery statistics, and faults in the fishery management system.
- Legal: inappropriate legislation regulating the fisheries sector in Russia.
- Knowledge: scientific uncertainty, and inappropriate assessment methods.

Policy framework

The legal basis for fishery policies in the Barents Sea region is the Third United Nations Conference on the Law of the Sea (UNCLOS) from 1982, and national regulations on the protection of water living resources adopted in accordance with the Law of the Sea Convention.

The national regulations relevant to overexploitation of fish are:

- a) In Norway:
 - Law on the Norwegian Territorial Sea and contingent zone of 27.06.2003, establishing a 12 nautical mile territorial sea.

- Law on the Norwegian Exclusive Economic Zone of 17.12.1976, establishing the Norwegian Exclusive Economic Zone (EEZ).
- The Law on the right to participate in the fisheries of 26.03.1999, which regulates the participation in the fisheries. It establishes that participation is limited to nationals, technical criteria for the fishing vessels and registration and licensing regulations.
- The Law on first-hand sales of fish of 14.12.1951, which regulates the sale of fish at first-hand, from fisher to buyer. It dictates that all such sales shall be conducted through mandated sales organisations. These organisations have the mandate to regulate prices and, in specific cases, the conduct of fisheries.

b) In Russia:

- Federal Law on the continental shelf of the Russian Federation from 1995.
- Federal Law on the Exclusive Economic Zone of the Russian Federation.

The principles regulating the work of the Joint Norwegian-Russian Fisheries Commission (Norwegian Ministry of Fisheries 2004) have also been taken into consideration. The Commission sets total allowable catches (TACs) for the shared fish stocks (cod, haddock and capelin), throughout their migratory routes across borders of jurisdiction in the Barents Sea. The TACs are based on scientific advice from the International Council for the Exploration of the Sea (ICES 2003b) and national research institutions. The parties also exchange fishing quotas according to established fishing patterns and provide mutual access to fish in each others national EEZs. During the 1990s, cooperation in control and enforcement as well as in marine research has been strengthened.

For the policy option analysis, other international documents and agreements, aimed at improvement and better coordination of international cooperation on the problem of overfishing, have also been used, e.g. United Nations Food and Agriculture Organization (FAO 2004) and FAO's Code of Conduct for Responsible Fisheries (FAO 1995).

Also at the international level the policy to achieve sustainable fisheries management and sustainable development of marine and coastal areas and their resources was defined in the text of the two international documents: World Summit on Sustainable Development (WSSD 2002) and United Nations Conference on Environment and Development (UNCED 1992).

At the World Summit on Sustainable Development in Johannesburg in 2002, sustainable fisheries were discussed and an action plan was

agreed upon and several actions to achieve sustainable fisheries were suggested (WSSD 2002). The UNCED Agreement sketched the key provisions for the protection of the marine environment and coastal areas and protection, rational use and development of living marine resources.

The above-mentioned national and international laws and agreements have formed the basis for the suggested policy options.

Achievements and unsolved problems

Although measures to decrease overexploitation of fish have been taken in both Norway and Russia in recent years, serious problems still remain. Therefore, both the main achievements leading to improvement of the situation in the fisheries sector and the obstacles that still remain are presented.

Achievements

- The United Nations Fish Stocks Agreement of 1995 (UN 1995), applying to straddling fish stocks such as cod and herring, dictates that States shall apply the precautionary approach (Article 6). To execute this agreement, the principles, parameters and models applied for stock assessments in the Barents Sea have been changed. For example, recommendations have changed from one specific catch-level, to a series of options with various consequences. ICES's recommendations have changed from being based on maximum sustainable yields (MSY) to be based on the basis of the precautionary approach. Moreover, following a revision of historical catch data, the precautionary reference points (B_{pa}^1 and B_{lim}^2) for the cod stock were altered (ICES 2003).
- To handle political pressures within the Joint Norwegian-Russian Fisheries Commission and the scientific uncertainties related to the development of fish stocks, the parties have established a decision-making rule for the setting of TACs for cod and haddock entering into force in 2004. Based on the scientific estimates of F_{pa}^3 for the following 3 years, the TACs shall be set according to the average value of the 3-years prediction. The following year, the same procedure is followed, however the TACs shall not vary more than $\pm 10\%$ for cod and $\pm 25\%$ for haddock, from the previous year's TAC (Norwegian Ministry of Fisheries 2002). In cases where the stocks fall below precautionary levels (B_{pa}), lower quotas shall be considered by the Commission. The effectiveness of the decision-making rule to ensure the sustainability of the Barents Sea fisheries remains to be seen.
- Since 1993, Norway and Russia have increased their cooperation on control and enforcement through a permanent working-

¹ B_{pa} = Biomass precautionary approach reference point. ² B_{lim} = Biomass below which recruitment is impaired. ³ F_{pa} = Fishing mortality precautionary approach reference point.



Figure 22 Fishing boat at sea.
(Photo: Getty Images)

group under the Joint Norwegian-Russian Fisheries Commission. The cooperation of enforcement agencies has been formalised facilitating the exchange of catch information, inspection data and exchange of inspectors. In addition, both parties have implemented vessel-monitoring systems (VMS), in the Norwegian case for vessels over 24 m. In Russia, to decrease negative effects of overexploitation of fish stocks, the time at sea for vessels was limited in 2002 and the above-mentioned vessel-monitoring system was introduced. However, such practices, already introduced in some EU countries, have proven to have low effectiveness as they only reduce but do not eliminate overfishing (Ozolin'sh & Spiridonov 2001).

- Norway is to establish an integrated management plan for the Barents Sea in 2005. The aim of this plan is to provide for industrial development and environmental protection within the framework of an ecosystem approach. The plan is to be developed in cooperation between the Ministries of Fisheries, the Environment, and Foreign Affairs and of Petroleum and Energy.
- In 2003, Russia established the Conception of the development of its fishery sector till the year 2020. The conception defines the main

directions of the state policy in the sphere of the development of the fisheries sector of Russia for a long-term period. The conception presents an analysis of the current situation in the Russian fisheries sector, its problems, aims and tasks to be solved.

Existing problems

a) General problems:

- Increased competition in the world fisheries and general deterioration of fisheries conditions.
- Dominance of political and economical considerations in the work of the Joint Norwegian-Russian Fisheries Commission, which in some cases leads to TACs being set beyond scientific recommendations. Negotiations of the Joint Norwegian-Russian Fisheries Commission on the setting of TACs are not open to the public.
- Inability of the Commission to establish other regulatory measures.
- Overcapacity of the fishing fleet exceeding the stocks of commercial species in the Barents Sea.

- Lack of an efficient state regulatory system for sustainable long-term management of marine living resources.
- Vulnerability of fisheries to the impact of anthropogenic factors and natural variability which increases the financial risk both in fisheries and the fishing industry as a whole.
- Lack of efficient state policy to decrease unemployment among fishermen, to support the coastal fishery and to increase the living standard of coastal settlements, for which the fishery is the traditional backbone of the economy.
- Lack of an efficient mechanism to control illegal fishing.
- Gaps in fisheries statistics, low quality of collected data on which science is based.
- Lack of knowledge on the ecology of some commercial species and the features of the Barents Sea ecosystem. All this implies great scientific uncertainty.
- Lack of knowledge on the impacts of natural variability and anthropogenic factors on the Barents Sea ecosystem, which makes their effects difficult to forecast and reduces the quality of long-term predictions.

b) Russian problems:

- Economic crisis resulting from mistakes made in the transitional period. Lack of efficient state policy and state support for the national fishery sector under the conditions of market reforms.
- High level of mechanical wear and obsolescence of the fishing fleet in Russia, and a low selectivity of the fishing gear.
- Overfishing of the commercially most valuable species on the world market (cod and haddock) together with the decrease in state control over the fishermen's export activities.
- Increased export-oriented fishery with a reduction in fish consumption by the population in Russia.
- Lack of an efficient policy to control by-catches and discards and lack of financial support for the processing of fish of low market value.
- Lack of transparency in the system of allocation of fishing quotas, which leads to increased corruption, illegal transactions and conflicts between groups of fishermen.
- Under-development of financial-credit relationships, lack of an efficient market for fish products and market infrastructure.
- Absence of a Federal Law on fishery, protection and conservation of marine living resources, which would meet the requirements of sustainable exploitation of living resources, market realities and prevention of poaching and corruption. Without such a law many provisions of the "Conception of the development of the fishery sector of the Russian Federation till the year 2020" cannot be realised.

The analysis of the root causes and achievements in the sphere of the protection of living resources, and existing problems, allows an array of measures to be developed, aimed at sustainable exploitation of living resources in the Barents Sea.

Policy options

Table 37 presents the root causes and policy options for overexploitation of fish. Some of the policy options have been discussed by Government of the Russian Federation (2003), Dvornyakov (2000), Voitlovsky et al. (2003) and Titova (2003).

The main purpose of the development of the fisheries sector for the period till 2020 is the restoration of the fish stocks and the increased sustainability of their exploitation. There are several international agreements relating to sustainable fisheries and suggested actions to increase sustainability of the world fisheries.

World Summit on Sustainable Development (WSSD) concerning Sustainable Fisheries

Paragraph 31 of the WSSD (2002) suggests to; "maintain or restore stocks to levels that can produce the maximum sustainable yield with the aim of achieving these goals for depleted stocks on an urgent basis and where possible not later than 2015". The Barents Sea ecosystem is dynamic, and capelin and herring undergo cycles, which not only has consequences for these stocks but also the availability of food for cod and haddock (major commercial species in the Barents Sea fisheries). Thus, managers have to take into account ecosystem considerations (anthropogenic and biophysical factors) in the management of the Barents Sea fisheries.

The document also suggests an "implementation of the 1995 Code of Conduct for Responsible Fisheries..." and a development of national and regional plans of action for eliminating illegal, unreported and unregulated fisheries by 2004. Another suggestion was to "establish effective monitoring, reporting and enforcement, and control of fishing vessels" (WSSD 2002).

United Nations Conference on Environment and Development

Chapter 17 in UNCED (1992) "Protection of the Oceans, All Kinds of Seas, Including Enclosed and Semi-enclosed Seas, and Coastal Areas, and the Protection, Rational Use and Development of Their Living Resources" suggests several actions:

- "To consider establishing, or where necessary strengthening, appropriate coordinating mechanisms (such as a high-level policy planning body) for integrated management and sustainable development of coastal and marine areas and their resources, at both the local and national levels."

Table 37 Root causes and policy options for overexploitation of fish in the Barents Sea region.

Root cause	Policy option
Political: - Disagreements within the Joint Norwegian-Russian Fisheries Commission regarding the setting of annual TACs.	- To develop the joint Norwegian-Russian conception for the sustainable exploitation of fish in the Barents Sea and a long-term strategy to realise its conceptual provisions. - To improve the legislative and organisation base for cooperation between the two countries to create favourable conditions in the Barents Sea for sustainable exploitation of fish on the basis of the precautionary approach. - To ensure the transparency of the work of the Joint Norwegian-Russian Fisheries Commission when setting the TACs for public non-governmental organisation.
Legal: - Inappropriate legislation regulating the fisheries sector in Russia.	- To adopt the Law on the Protection and Exploitation of Marine Living Resources of the Russian Federation aimed at establishing the principles of sustainable fishery. - To form priorities of the policy aimed at sustainable exploitation of living resources and creation of a single state system to realise these priorities.
Economic: - Over-investment; - Unequal payments for the access to bioresources; - Price of vessels quota-right; - High taxes and fish price; - Failures of economic reforms in Russia; - Market failures; - Socio-economic problems in the fisheries sector.	- To develop long-term national programmes to realise the provisions of the Code of Conduct for Responsible Fisheries under the conditions of the Barents Sea. - To develop and realise financial mechanisms contributing to establishing the principles of responsible fisheries. - To create state funds to support the reduction in number of fishing vessels operating in the fisheries sector to decrease the overcapacity of the fishing fleet. - State support of alternative measures to decrease the fishing load on the natural fish stocks (e.g. artificial reproduction of fish stocks, development of aqua- and mariculture). - To develop and realise measures to increase socio-economic sustainability of the fisheries sector. - To adjust the taxation system to the specific character of the fisheries sector (increased risk due to instability of fish reserves), reinforcement of control over the increased prices for fuel. - To initiate the protection of interests of coastal fishery and coastal fishing settlements and communities. - For Russia: To develop and realise the state social strategy for the fisheries sector aimed at securing optimal employment and stable earnings of the employed in the fisheries sector. - State support of the development of coastal infrastructure of the fishing industry and aquaculture on the coast of the Barents Sea.
Technological: - Low selectivity of fishing gear; - Lack of alternative fishing gear; - Illegal fishing methods.	- To develop legislative and organisation measures to establish the system for ecologically safe fisheries (ecological certification of fisheries) (see Annex IV). - For Russia: To adapt to Russian conditions the positive Norwegian experience in the struggle against by-catches and discards. - To develop measures of state support to increase the selectivity of the fishing gear and re-equip the fishing fleet. - State support of the development of the system for processing of commercially less valuable fish, which is caught as by-catch.
Governance: - Imperfection of fishery control system; - Gaps in fishery statistics; - Fault of the fishery management system.	- To develop and realise measures to increase the effectiveness of the system of the state control over the exploitation and protection of marine living resources. - More stringent measures on enforcement and control. - More stringent control over vessel documentation and fishing statistics. - For Russia: To adjust the quotas to the vessels capacity (e.g. a quota should not be less than 70% of the vessel capacity as low quotas provoke increased illegal fishery). - More stringent control over the time of vessels at sea. - To increase the transparency and justice of the state system of quotas allocation, providing of free quotas for small-scale coastal fishery and coastal settlements. - Obligatory registration of all catches and all export transactions on land. - Reinforcement of state control over the export of fish.
Knowledge: - Scientific uncertainty; - Inappropriate assessment methods.	- Detailed analysis of the gaps in knowledge, development of long-term research programme for their elimination.

- “To undertake measures to maintain biological diversity and productivity of marine species and habitats under national jurisdiction.”
- “To improve their capacity to collect, analyse, assess and use information for sustainable use of resources, including environmental impacts of activities affecting the coastal and marine areas.”
- “To cooperate internationally.”

Code of Conduct for Responsible Fisheries

The Food and Agriculture Organization, FAO, has developed this code of conduct to set out principles and international standards of behaviour for responsible practices (FAO 1995). The objective is to prepare guidelines for the effective conservation, management and development of living aquatic resources, with due respect to the ecosystem and biodiversity. Here four fishing management measures relevant for overfishing in the Barents Sea Region are stated:

- States should ensure that the level of fishing permitted is commensurate with the state of fisheries resources.
- Where excess fishing capacity exists, mechanism should be established to reduce capacity to levels commensurate with the

sustainable use of fisheries resources so as to ensure that fisheries operate under economic conditions that promote responsible fisheries. Such mechanisms should include monitoring of the capacity of fishing fleets.

- The efficacy of conservation and management measures and their possible interactions should be kept under constant review.
- States and sub-regional and regional fisheries management organisations and arrangements, in the framework of their respective competences, should introduce measures for depleted resources and those resources threatened with depletion that facilitate the sustained recovery of such stocks. They should make every effort to ensure that resources and habitats critical to the well-being of such resources, which have been adversely affected by fishing or other human activities, are restored.

The policy options concerning elimination of gaps in knowledge and scientific uncertainty identified in this report are closely connected to the actions suggested by WSSD (2002) paragraph 36 such as: “improving the scientific understanding and assessment of marine and coastal ecosystems as a fundamental basis for sound decision

making..." and "building capacity in marine science, information and management, through, inter alia, promoting the use of environmental impact assessments and environmental evaluation and reporting techniques, for projects or activities that are potentially harmful to the coastal and marine environments and their living and non-living resources". The above-mentioned international agreements have formed a basis for the suggested policy options for the Barents Sea region.

Conclusions

In the course of the Causal chain analysis the GIWA Task team concluded that the root causes behind overexploitation of fish are difficult to change in a short-term period; time and considerable resources are required. In addition to compliance to international agreements, disagreements in the decision-making process within the Joint Norwegian-Russian Fisheries Commission should be eliminated. The elimination of root causes of overexploitation first of all relates to the development and implementation of measures to formulate compatible rules for all countries. Furthermore, measures to reduce unemployment among fisherman must be taken to establish a system of social protection for coastal settlements and coastal fishery. For Russia a matter of special concern is improving of standard of living of the population.

Modification of ecosystems

Problems

The following problems can be defined:

- Intentional introduction of commercial species into the Barents Sea by the former Soviet Union;
- Increased export volumes of oil shipped through the Barents Sea and a corresponding increase in volume of ballast water into the Barents Sea;
- Inadequate infrastructure; the absence of tank/hull cleansing facilities;
- Lack of national and regional regulations for farming and introduction of commercial species, as well as for treatment of ballast water.

Root causes

The root causes identified for modification of ecosystems were:

- Economic: increased oil and gas export from Russia through the Barents Sea.
- Technological: lack of tank- and hull cleansing facilities.

- Scientific: lack of knowledge on the acclimatisation of alien species in the Barents Sea. A large-scale biological experiment was initiated and conducted without scientific assessment of its consequences for the ecosystem as a whole.
- Legal: lack of regulations on treatment of ballast water and farming and introduction of commercial species at the regional, national and international levels.

Policy framework

The major international document on mitigation of the modification of ecosystems and maintenance of their biological diversity is the Convention on Biological Diversity (CBD 1992). At least 157 States, including Russia and Norway, signed the Convention. The objectives of this Convention, to be pursued in accordance with its relevant provisions, are the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources, including appropriate access to genetic resources and appropriate transfer of relevant technologies, taking into account all rights over those resources and technologies, and appropriate funding.

Article 6 "General Measures for Conservation and Sustainable Use" of the CBD (1992) suggests: "Each Contracting Party shall, in accordance with its particular conditions and capabilities; Develop national strategies, plans or programmes for the conservation and sustainable use of biological diversity or adapt for their purpose existing strategies, plans or programmes which shall reflect, inter alia, the measures set out in this Convention relevant to the Contracting Party concerned; and Integrate, as far as possible and as appropriate, the conservation and sustainable use of biological diversity into relevant sectoral and cross-sectoral plans, programmes and policies."

Article 8 "In-situ Conservation" of the CBD (1992), also suggests actions such as: "prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species" and to "develop or maintain necessary legislation and/or other regulatory provisions for the protection of threatened species and populations" (CBD 1992). According to article 10 (CBD 1992) it is important to "integrate consideration of the conservation and sustainable use of biological resources into national decision-making".

The policy to achieve sustainable use of biological resources and avoid or mitigate the modification of ecosystems was also defined in the WSSD (2002), paragraph 34: "Enhance maritime safety and the protection of the marine environment from pollution by actions at all levels to: Accelerate the development of measures to address

invasive alien species in ballast water. Urge the International Maritime Organization to finalise its draft International Convention on the Control and Management of Ship's Ballast Water and Sediments".

Other suggestions were to "effectively conserve and sustainably use biodiversity, promote and support initiatives for hot spot areas and other areas essential for biodiversity and promote the development of national and regional ecological networks and corridors" and to "strengthen national, regional and international efforts to control invasive alien species, which are one of the main causes of biodiversity loss, and encourage the development of effective work programme on invasive alien species at all levels" (WSSD 2002, paragraph 44).

Policy options

The above-mentioned international agreements have formed a basis for the suggested policy options, which are:

- Compliance to recommendations of scientific organisations when developing the policies, plans and programmes for the exploitation of the introduced species;
- Compliance to regulations for the transport of alien commercial species;
- Increased measures to control the introduction of invasive alien species, including the introduction through ballast water;
- Fines for non-compliance;
- Adoption of regulations at the international level, including those regulating the treatment of ballast water.

Radionuclides

Problems

The following problems can be defined in the field of ensuring nuclear and radioactive security in the region:

- Storage and treatment of spent nuclear fuel (SNF);
- Storage and treatment of liquid radioactive waste (LRW) and hard radioactive waste (HRW);
- Radiological safety of decommissioned nuclear powered submarines and coastal technical stations of the Russian Navy;
- Storage and transportation of radioactively dangerous materials, radioactive substances and isotope products;
- Radiation (radiological) terrorism.

Storage and treatment of spent nuclear fuel

Spent nuclear fuel (SNF) is a product of military and civil transport reactors. When unloaded from a reactor, SNF must be kept for about

three years in special depositories at coastal stations of the Northern Navy and on the floating bases Lotta and Imandra of the Murmansk Shipping Company. SNF is transported to the radioactive waste treatment plant Mayak in a special train. Accumulation of large amounts of SNF is a potential source for radioactive accidents.

In addition to the problem of storage and transportation of SNF, there is another problem of considerable importance for the Kola Peninsula: the treatment of SNF that cannot be reprocessed at Mayak. There are 642 heat-emitting constructions no longer in use, with an activity 28×10^{15} Bq, that are kept on the floating technical base Lepse; SNF not subjected to treatment that is kept on the floating technical base Lotta; and defective SNF at coastal stations of the Northern Navy (State Environmental Committee of the Murmansk Region 1999).

Handling radioactive waste

Liquid radioactive waste (LRW)

The Civil Atomic Fleet has not been discharging LRW into the sea since 1986, and the Northern Navy not since 1992. Accumulation and temporary storage of LRW is carried out in special coastal depositories or on special vessels, which are almost totally filled in the Northern Navy. LRW is not accumulated in the Civil Atomic Fleet as it is being entirely reprocessed at the Repairing and Technological Enterprise (RTE) ATOMFLOT. LRW from the Northern Navy is only partially reprocessed at this enterprise. The experimental radioactive waste treatment plant at RTE ATOMFLOT is being modernised at present. The purpose of the modernisation is to increase its capacity from 2 000 to 5 000 m³ per year and the possibility to reprocess LRW of all types. Realisation of this project will enable the problems of the treatment of LRW from the Civil Atomic Fleet and the Northern Navy based in the region to be solved.

Another vital problem for the Northern Navy is the technical state of special vessels used for the accumulation and storage of LRW. Their life (exploitation period) is over and their maintenance is highly expensive. Since the beginning of the exploitation of the Kola Nuclear Power Plant, more than 6 000 m³ of LRW have been accumulated, which are now kept in special reservoirs. The reservoirs are filled up to 80% (State Environmental Committee of the Murmansk Region 1999).

Hard radioactive waste (HRW)

Most of the HRW comes from the maintenance and repair of nuclear power plants. At present more than 16 000 m³ of HRW are kept in depositories of the Civil Atomic Fleet, Northern Navy and the Kola Nuclear Power Plant. The Kola Nuclear Power Plant reprocesses combustible HRW at a combustion installation. Other types of HRW are kept without treatment in depositories, which are now almost totally

filled up. HRW from the Civil Atomic Fleet is kept in special depositories at RTE ATOMFLOT and on special vessels for technical maintenance. Depositories for the storage of definite types of HRW are now filled up to 100%.

The Northern Navy has not enough depositories for its HRW. Those available do not correspond to standards, are exposed to precipitation, and are not being equipped with drainage systems, thus contaminating the surrounding soils with radioactive substances.

The total activity of the accumulated HRW is 37×10^{12} Bq. The total volume of HRW increases by 1 000 m³ each year. If the intensification of work on the treatment of decommissioned nuclear powered submarines is taken into account, the amount should be double that presently available. There is no equipment for environmental friendly conditioning of HRW in the Murmansk Region. All HRW is kept under unacceptable conditions (State Environmental Committee of the Murmansk Region 1999).

Radiation safety for decommissioned nuclear powered submarines and coastal technical stations of the Russian Navy

Since the end of the 1980s, many nuclear powered submarines have been decommissioned in Russia. The number of decommissioned submarines greatly exceeds those reprocessed. In total, by September 2003, 192 nuclear powered submarines have been decommissioned in Russia, of which only 89 have been reprocessed. The unsatisfactory technical state of decommissioned submarines may result in their accidental sinking, which may cause severe radio-ecological consequences for the environment.

Storage and transportation of radioactively dangerous materials, radioactive substances and isotope products

Each year about 1 800 transportations of radioactive waste are carried out. On average, six to seven special trains transport radioactive materials every day. However, the available number of special trains is unable to provide timely transport of radioactive materials from the Kola Peninsula. There is a Russian-Norwegian Agreement aiming at secure treatment of SNF, which may give the possibility of constructing new special carriages and vessels for the transport of SNF (State Environmental Committee of the Murmansk Region 1999).

Radio-ecological terrorism

Under the increasing threat of terrorism, the problem of security for nuclear and radioactively dangerous productions and objects is an issue of great concern. Radiological terrorism with the use of sources of ionising radiation, widely used in different spheres of life, is of considerable danger.

Root causes

The root causes identified for radionuclide pollution were:

- Geopolitical: creation of a powerful nuclear-powered navy and icebreaker fleet in the former Soviet Union, which has led to the Kola Peninsula being overcrowded with radioactively dangerous sites, objects and decommissioned submarines.
- Economic: lack of funding for timely reprocessing of spent nuclear fuel and radioactive waste and nuclear reactors from decommissioned nuclear powered submarines and for radiological protection activities.

Policy options

To decrease the possibility of radioactive contamination in the region, the activities of the State in the field of ensuring nuclear and radiation security should encompass the following:

- Intensification of safety measures on the exploitation of civil and military nuclear reactors;
- Timely reprocessing of SNF and decommissioned nuclear powered submarines;
- Timely reprocessing of fissile substances from different kinds of weapon;
- Timely transport of radioactive waste to reprocessing plants;
- Intensification of safety measures on the storage of radioactive materials;
- Modernisation of systems of protection and control over radioactively dangerous objects;
- Construction of new temporary storages for spent nuclear fuel and radioactive waste.

The immediate cause of radioactive pollution is the large amount of potential sources of radioactivity in the Russian part of the Barents Sea region. The economic causes are related to the radiological protection activities, the timely reprocessing of spent nuclear fuel and radioactive waste, and the accident-free exploitation of nuclear reactors of any kind and radioactive waste storages. This is hampered by the overall economic situation in Russia and lack of funding and to a certain degree it also depends on taking political initiatives and on improving the legislative base and eliminating bureaucratic obstacles. Thus, the root causes of the issue are difficult to change in the near future and will largely depend on the political and economic initiatives at both national and regional levels.

Oil spills

Problems

On the basis of the causal chain analysis, the following conclusions have been made:

- Oil spill accidents in the region are inevitable in the future. They will be caused by a number of factors such as: increased navigation activity, severe climatic conditions, lack of experience in tanker navigation, imperfection of information system, and lack of double-hull tankers.
- The possible scenarios for oil spill accidents are the following: in the open sea, in ice, and in the coastal zone with the possible discharge of oil to the coast (or in the coastal zone under ice conditions). The environmental and socio-economic impacts for these three scenarios will be different but the most severe consequences are likely for the third case. The possible damage will depend on a number of factors such as: season, geographical extent, abundance of bioresources in the contaminated area, duration in time, etc.

Root causes

The root causes identified for oil spills were:

- Economic and political (strategic): the overall direction of the Russian economy in the sphere of oil and gas exploitation to the increased export of, and prospecting for, oil and gas where the Russian Arctic shelf plays a significant role.
- Corporative and economic (tactical): absence of long-term, well-coordinated plans for the development of the arctic shelf, preventing oil companies from investing into ecological programmes and re-equipment of the tanker fleet.
- Legal: lack of legislative initiative, and insufficient legislative base.

Achievements and unsolved problems

Achievements

At present in the Murmansk Region, the following measures are realised to decrease the risk of oil spill accidents:

- A plan for the clean-up of the Murmansk Region coast in case of an oil spill has been developed and approved by the Governor of the Murmansk Region;
- On the initiative of the Murmansk Marine Shipping Company, a system has been arranged for informing the governors of the northern counties of Norway, Sør-Varanger and Finnmark, of the number of Russian tankers heading westward along the Norwegian coast, and of their navigation schedule;
- The Murmansk Basin Agency for Emergency Situations carries out regular joint training at sea together with Norwegian rescue services;

- Negotiations are being carried out to create an International Centre for rescue operations at sea (Russia and Norway).

Unsolved problems

- Lack of appropriate equipment for the treatment of oil spills under ice conditions (Pechora Sea);
- The technical equipment and facilities of the Murmansk Basin Agency for Emergency Situations is insufficient for the treatment of large or remote oil spills occurring in areas hundreds of kilometres distant from the place of the Agency's location (e.g. in the Pechora Sea);
- Lack of double-hull tankers;
- The general delay for five to seven years in the previously agreed timetable of the development of the Russian Arctic shelf is hampering the funding of ecological programmes by oil and gas companies on a long-term basis;
- Increased volumes of oil transport in the Barents Sea increase the risk of oil spill accidents under the conditions of under-development of coastal services;
- Russia still lacks a federal law regulating the responsibility for oil pollution like the Oil Pollution Act in the U.S.

The Oil Pollution Act (OPA) was prepared by the U.S. Congress and signed into law in August 1990, largely in response to rising public concern following the Exxon Valdez incident. The OPA improved the nation's ability to prevent and respond to oil spills by establishing provisions that expand the federal government's ability, and provide the money and people necessary, to respond to oil spills. The OPA also created the national Oil Spill Liability Trust Fund, which is available to provide up to 1 billion USD per spill incident.

The OPA increased penalties for regulatory non-compliance, broadened the response and enforcement authorities of the Federal government, and preserved State authority to establish law governing oil spill prevention and response. Russia has no similar law, while the existing legislation related to oil spills is discrepant and does not provide strict control over the responsibility for oil pollution or effective measures to prevent and respond to oil spills.

Policy framework

Measures to prevent oil spills accidents in the region are legislative and technical. The legislative measures include international conventions and agreements, national and regional legislation of the Russian Federation. At the international level, measures on the prevention and clean-up of oil spills are regulated by international conventions.

OSPAR Convention

The Convention for the protection of the marine environment of the North-East Atlantic (known as the OSPAR Convention) is the basis for national laws governing the discharge of off-shore drilling waste in the waters of the OSPAR signatory states: Belgium, Denmark (including, for these purposes, the self-governing provinces of the Faeroe Islands), Finland, France, Germany, Iceland, Ireland, the Netherlands, Norway, Portugal, Spain, Sweden and the United Kingdom of Great Britain and Northern Ireland. OSPAR regulations thus cover all the oil-producing states of Western Europe. The EU is also a signatory, as are Luxembourg and Switzerland. Russia has not yet joined this international agreement.

The International Convention for the prevention of pollution of ships, 1973 (MARPOL 73/78)

The Convention was adopted in 1973. This convention was subsequently modified by the Protocol 1978 relating thereto, which was adopted in 1978. The Protocol introduced stricter regulations for the survey and certification of ships. It is to be read as one instrument and is usually referred to as MARPOL 73/78.

This International Maritime Organization (IMO) Convention is the most important global treaty for the prevention of pollution from the operation of ships. It governs the design and equipment of ships; establishes the system of certificates and inspections; and requires states to provide reception facilities for the disposal of oily waste and chemicals. It covers all the technical aspects of pollution from ships, except the disposal of waste into the sea by dumping, and applies to ships of all types, although it does not apply to pollution arising out of the exploration and exploitation of sea-bed mineral resources.

The Regulations for the Prevention of Pollution by Oil

The Regulations entered into force 2 October 1983 and provide details on the discharge criteria and requirements for the prevention of pollution by oil and oily substances. They maintain predominantly the oil discharge criteria prescribed in the 1969 amendments to the 1954 Oil Pollution Convention. Besides technical guidelines they contain the concept of "special areas" which are considered to be vulnerable to pollution by oil. Discharges of oil within them have been completely prohibited, with minor well-defined exceptions.

Convention on Biological Diversity, 1992

The Convention is a key instrument for the conservation and sustainable use of biological diversity. The objectives of the Convention are the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising

out of the utilisation of genetic resources (CBD 1992). According to the Convention: "States have, in accordance with the Charter of the United Nations and the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction".

National level

At the national level in Russia, the measures to control oil spill accidents are regulated by:

- The Federal Law on environmental protection (adopted 27 December 2001);
- The Federal Law on the wild life;
- The Law on the protected territories;
- The Law on the ecological expertise;
- The Water Codex of the Russian Federation.

Local level

At the local level, control, treatment and remediation of oil spills are regulated by the Regional Plan for the Liquidation of Oil-spill Accidents. The link between the legislative base and concrete plans and programmes is the Resolution of the Government of the Russian Federation of 21 August 2000 "Urgent measures to minimise the risk of oil spill accidents" (the last wording of 15 April 2002). The Resolution approves "The general requirements for the development of plans on prevention and elimination of oil spill accidents". According to the Resolution, oil spills are classified as an emergency and are to be eliminated according to the legislation of the Russian Federation.

Depending on the size and volume, the oil spill accidents are classified as follows:

- Local - the volume of oil spill is up to 500 tonnes;
- Regional - from 500 to 5 000 tonnes;
- Federal - more than 5 000 tonnes.

Depending on the location of an oil spill and climatic conditions, the category of emergency may be increased. The plan on the prevention and elimination of oil spill accidents is developed on the basis of the existing regulations allowing for the maximum possible volume of an oil spill.

The plan encompasses:

- Monitoring of possible oil spill accidents;
- Number of forces and facilities needed for treatment and remediation following an oil spill accident and their correspondence to the tasks of treatment activities;

- Organisation of cooperation between forces;
- Composition and location of forces and facilities;
- System of control and warning;
- Securing of constant readiness of all forces, appointing the organisations responsible for their upkeep;
- System of information exchange;
- Immediate actions after an emergency alarm;
- Geographical, navigational, hydrographical, climatic and other features of the area of an oil spill accident, which should be taken into account when planning treatment and remediation activities;
- Safety of the population, provision of medical aid;
- Technical, engineering and financial provision.

When defining the number of facilities and forces needed for the liquidation of oil spill accidents, the following aspects should be taken into account:

- The maximum possible volume of leakage;
- The area where the damaged object was brought into operation and the year of the last overhaul of an oil spill;
- The maximum volume of oil kept at an object;
- Physical and chemical properties of the spilled oil;
- Climatic, hydrographical, geographical and other conditions influencing the spreading of an oil spill;
- The presence of terminals for the transport, storage and processing of oil waste;
- The transport infrastructure in the area of an oil spill accident;
- The time needed for the transport of treatment and remedial forces to the area of an oil spill accidents;
- The time of oil spill localisation, which should be less than 4 hours for an accident at sea and less than 6 hours for an accident on land.