DET KONGELIGE
MILJØVERNDEPARTEMENT

Royal Ministry of the Environment

Report No. 12 to the Storting

(2001–2002)

Protecting the Riches of the Seas

The Ocean

This was the ocean.
Earnestness itself,
enormous and grey.
But as the mind
in lonely moments
suddenly unfurls
floating reflections
in secret depths –
so also can the ocean
one blue morning
open itself
to sky and solitude.
See, the ocean gleams,
I too have stars
I too have blue depths.

Olav H. Hauge

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Recommendation of 15. March 2002 by the Ministry of the Environment, approved in the Council of State on the same date. (The Bondevik II Government)

1 Introduction

1.1 Protecting the riches of the seas

Norway has always been surrounded by a sea rich in resources. We have a long tradition of utilising these riches given to us by the sea. Fishing and harvesting of marine resources have been the basis for settlements along the coast. For a long time, the sea was the only way of transporting goods along the coast. The sea gave the coastal population a means of contact with the rest of the country and other countries and was a source of recreation and a better quality of life. The sea and the coastline have left their mark on our culture. The close contact with the sea was what led to the development of the Norwegian shipping industry. When oil was found in the North Sea around 1970, a completely new era in the utilisation of the riches of the sea began.

For a long time, the sea was also a clean sea and for a long time most people thought that the sea could stand anything: The sea could endure the dumping of waste and pollution from industry and other business activities, from settlements and from shipping without suffering any damage.

For a long time little was known about ocean currents carrying pollution from faraway countries to the Norwegian coast, and about the fact that discharges of hazardous substances on other continents could be transported all the way to Svalbard. Not until the last decade did we become aware that not only rivers, lakes and coastal areas can be seriously polluted. Only then did we realise that the environment on the high seas can be threatened by pollution.

This Government's vision is to safeguard a clean and rich sea, so that future generations can harvest the wealth of resources that the sea has to offer. The challenges are many and they are daunting, but the rewards will also be huge if we succeed. There are great opportunities for industrial and commercial development in the aquaculture and fishing industries in the future.

This Parliamentary Report is a prelude to a long-term, comprehensive policy for the protection of the marine and coastal environment. Long-term because many of the measures proposed will only demonstrate their full effects after some time has elapsed. Comprehensive, because the goal can only be achieved by assessing pressures and encroachments on this environment in their overall context.

Norway has legal rights to marine areas containing substantial amounts of oil and gas deposits. In the last few decades the petroleum industry has

Figure 1.1 Areas covered by corals, like this in the Saltstraumen, can be found along the Norwegian coast. Here you can find plumose anemone, dahlia squid, starfish, sponges and dead men's fingers.

Source: Erling Svensen

been the main element shoring up the Norwegian economy. Oil and gas will continue to be of great importance in the future, even though they are not renewable resources. In the future Norway's wealth and prosperity will have to be based on further development and growth in other industries as well. Our coastal and marine areas are among the most productive areas in the world in terms of living marine resources. The harvesting of these resources will not be limited in terms of time if they are managed in a long-term perspective. The aquaculture industry has huge potential for further industrial and commercial development along the coast of Norway.

Norwegian seafood must be competitive in a market where the consumers constantly are becoming more conscious regarding health and environmental issues. The consumers want to be confident that the food they are eating is healthy. Food from a clean ocean is a great competitive advantage for Norway, but we have to maintain the conviction among the consumers that our products really are clean and environmental friendly: That they don't contain poisonous substances, and that they are not harvested in ways that are exhausting the sea's resources.

A healthy marine environment is a condition for future industrial and commercial development and settlement based on living marine resources. There are many threats and trends that could put obstacles in the way of a healthy marine environment. To trigger off the potential for industrial and commercial development so that good conditions for habitation and a high standard of living along the coast can be maintained in the long run, a substantial effort must be made to secure clean and productive ecosystems along the coast and in the sea. Industrial and commercial development, human settlements and a good environment are mutually dependent on each other. It is therefore crucial for an overall policy on the marine environment to be developed in collaboration between the Government and trade and industry along the coast.

1.2 The purpose of this parliamentary report

The purpose of this Parliamentary Report is:
- to display overall goals for a comprehensive policy on the marine environment;
- to display tools and processes for how such a policy can be developed and implemented in the short and in the long-term, including ensuring a better co-ordination between the different sectors and industry; and
- to display proposals for a new policy in areas of major importance for the marine environment.

The overall goal is to provide the prerequisites for a clean and rich sea, *inter alia*, through the establishment of external conditions that allow us to strike a balance between the commercial interests connected with fisheries, aquaculture and the petroleum industry within the framework of a sustainable development.

This Government intends to develop tools and processes which help lay the foundations for an overall policy on the marine environment, *i.e.* a policy where the sum of all influences is assessed on the basis of what is known about the structure of the ecosystem, the way in which it functions and its condition. Up until now different kinds of pollution, exploitation of the different species and different kinds of interference have been assessed and managed in relative isolation. This Government is therefore preparing a future system of management that will be ecosystem-based and that will extend across all sectors.

Chapter 2 gives an overview of the state of the environment in our marine and coastal areas and of the challenges ahead. The chapter ends with a description of how this Government will work towards an overall and integrated policy on the marine environment.

The overall target can only be reached by strengthening today's policy for the areas of greatest importance for the environment and resource situation in the future. Many important players must contribute to this work; central, regional and local authorities, industry and other organisations such as industrial, environmental and other voluntary organisations.

Chapter 3 contains a report on measures that will be introduced by the Government for selected areas as part of the overall policy on the marine environment. Chapter 4 examines the international treaties and processes that have an influence on the environment and resources in the sea and coastal areas, while Chapter 5 looks at the economic and administrative consequences.

The marine environment is affected in many different ways and this Parliamentary Report does not deal with all areas of concern that might be relevant in a paper of this nature. Chapter 1.3 outlines the scope of the report and contains references to, *inter alia*, the Parliamentary Reports on the Government's Environmental Policy and State of the Environment.

1.3 Delimitations of the contents in the parliamentary report

In this Parliamentary Report the Government wishes to focus on some areas and sources where there is a need for new policies, and/or that are not been dealt with thoroughly enough in previous reports.

Discharges of nutrients from households, agriculture and industry are not addressed. The problem of eutrophication is addressed in Parliamentary Report No. 24 (2000–2001) on the Government's Environmental Policy and the State of the Environment (RM). The national target in this area is that discharges of the nutrients phosphorous and nitrogen into areas of the North Sea affected by eutrophication should be reduced by about 50 % between 1985 and 2005. The reduction target has been achieved for phosphorous, but Norway, like the other North Sea states, has not achieved the reduction target for nitrogen. The national target for discharges of nitrogen will be evaluated after the Fifth North Sea Conference in March 2002, where the ministers will discuss future goals in this area. The Government will get back to the Norwegian Parliament (Stortinget) concerning this issue in the next RM.

The marine environment is affected by hazardous substances from land-based sources, the petroleum industry and polluted sediments in coastal and fjord areas. Ambitious targets have been adopted for the work on reducing discharges and the use of chemicals harmful to health and the environment. The discharge of chemicals constituting a threat to health and the environment shall be phased out by 2020 (see Parliamentary Report No. 58 (1996–97) and No. 24 (2000–2001)); these Parliamentary Reports also outline strategies and measures adopted to achieve the targets in this area. The work on reducing the discharges of chemicals from land-based activities which are harmful to health and environment is not further addressed in this report. The discharge of chemicals harmful to health and the environment from the petroleum industry has taken on increased significance in terms of the state of the environment in the marine areas. This report therefore contains a description of measures and means for reducing this pressure on the marine environment.

Tidying up after hazardous substances discharged into the coastal and fjord areas in the past constitutes a particular challenge in the work to achieve a clean and rich sea. This is a problem area that offers substantial legal, technological and economic challenges. In this report the Government is therefore proposing an overall strategy for the future work on this area to ensure sufficient progress through cleanup operations.

When it comes to shipping, the Government has in this report, chosen to focus on preventive measures to reduce the danger of accidents that might lead to discharges of oil and subsequent damage to the environment. The discharge of ballast water will be treated as a source for introduction of alien species. Other kinds of pollution from shipping such as illegal discharges of oil and chemicals are, *inter alia*, described in Parliamentary Report No. 24 (2000–2001).

This report does not address the problem of marine litter. This issue will be discussed at the Fifth North Sea Conference in March, and the Government will return to this subject in the next RM. When it comes to outdoor life and recreation reference is made to Parliamentary Report No. 39 (2000–2001). Climate change that might be of significance for the state of the sea is not dealt with in this report. However, reference is made to Parliamentary Report No. 54 (2000–2001) on Norwegian climate policy and to the Government's supplementary report that will be put forward this spring.

2 Development of comprehensive management system for coastal and maritime areas

2.1 Current state of the environment and trends in the future

2.1.1 Present state of the environment

The global picture: The state of the environment in the world's coastal and maritime areas is deteriorating constantly as a result of land-based activities and activities close to the coasts. As a rule, the damage to the environment is greatest in coastal and shallow waters close to densely populated areas where the inputs of most pollutants are at their height and where physical intervention, disturbance and pressures on living resources are most extensive. It is also along the coasts and on the continental shelves that the most productive ecosystems and the most important harvestable stocks and petroleum deposits are to be found. This is why both fishing activities and oil operations are concentrated relatively close to the coast where shipping is also at its heaviest. The sea is also affected by land-based activities located far from the coast through input from watercourses, marine currents and airborne pollution. These effects are also greatest in waters close to the coast and in particular near the mouths of rivers, which

Box 2.1 The state of the environment

The North Sea

The state of the environment in the North Sea has improved as far as inputs of heavy metals from land-based activities, oil pollution from refineries and oil from drilling activities on the continental shelf are concerned. In addition, inputs of phosphorus have declined notably. However, the entire North Sea is still polluted with organic hazardous substances, mostly in the southern part, and no clear reduction has been noted in the amounts of polycyclic aromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCB). More synthetic compounds are constantly being discovered in the environment and the ecological effects of these are largely unknown. Eutrophication is primarily a problem in the southern part of the North Sea, but signs of eutrophication have also been found in fjords from the Swedish border and as far as Lindesnes. As to fish stocks in the North Sea, a number of benthic fish stocks are now outside safe biological limits. The cod stocks are in danger of collapse from the fisheries point of view due to historically low spawning stocks and poor renewal.

The Norwegian Sea and the Barents Sea

The pressure on the Norwegian Sea and the Barents Sea is less than it is further south. However, organic substances toxic to the environment have been found in fish and sea mammals as a result of long-range transport of pollutants. High levels of organic toxins have been measured in the Barents Sea in particular in animals at the top of the food chains. In the Barents Sea the capelin stocks are in good shape at the moment, although these stocks are subject to marked fluctuations. The stocks of Norwegian Arctic cod and blue whiting are outside biologically safe limits, while the stocks of Norwegian spring-spawning herring are good and continue to grow.

Source: OSPAR QSR 2000 Regions I and II, ICES 2001

flow through densely populated industrial and farming areas. The open oceans are far less productive and also far less exposed to human activity.

The UN Expert Group on the Marine Environment (GESAMP) has identified pollution from land-based sources, destruction of habitats of marine species, effects on fisheries and the introduction of non-indigenous species as the main threats to the marine environment in the global context. Climatic changes caused by human activity may also have serious consequences for the marine environment, *e.g.* via changes in temperature, shifts in the major ocean currents, effects on fisheries and rising sea levels.

The regional picture: The scenario of threats varies from one area to another. As far as the North Sea is concerned it is fishing, organic hazardous substances and nutrients which emerge as the main factors affecting the environment. But, oil spills, local discharges of heavy metals and organic hazardous substances such as tributyltin (TBT) from anti-fouling paints on ships, along with introduced species have been identified as significant factors influencing the environment. By and large the Norwegian Sea and the Barents Sea are less hard hit. Here it is fisheries and inputs of organic hazardous substances transported over long distances that affect the marine ecosystems the most. Local discharges of hazardous substances, such as

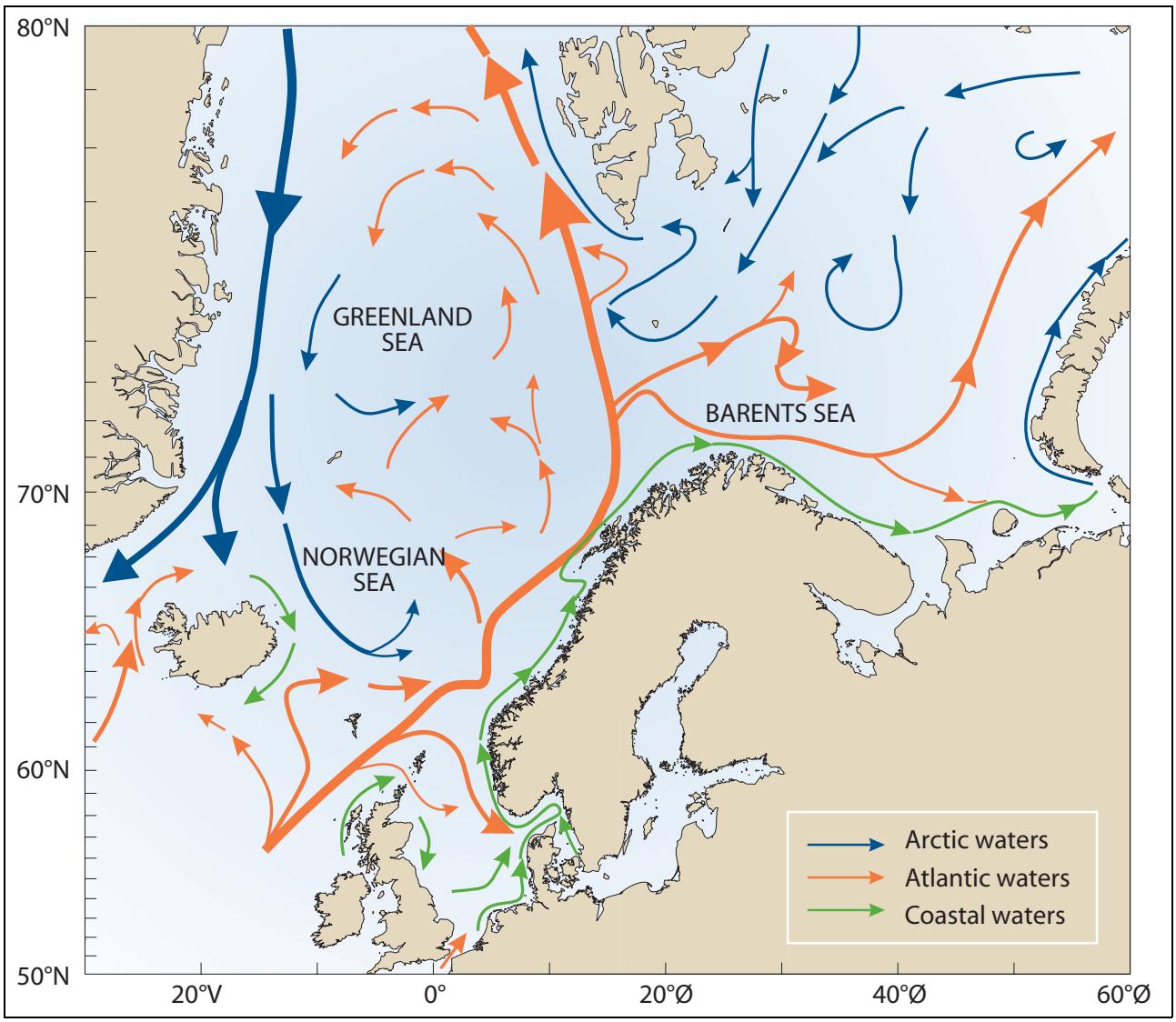

Figure 2.1 The map shows the systems of currents in the North Sea, the Norwegian Sea, the Greenland Sea and the Barents Sea. The Gulf Stream, which sweeps into the Norwegian Sea and onwards towards the north is responsible for the whole of the Norwegian Sea and large parts of the Barents Sea remaining free of ice and open for biological production.

Source: Havsforskningsinstituttet (Institute of Marine Research, Norway)

TBTs, and increasing aquaculture in coastal areas are also important factors, while oil spills are a potential hazard in general.

2.1.2 A complex interaction between different factors

A range of different activities and discharges affect the state of the marine environment in coastal waters and out to sea. The accumulated load on the marine ecosystems is therefore a result of a wide range of different factors such as eutrophication, discharges of chemicals, contaminated sediments, harvesting of living resources, introduction of non-indigenous species and the physical destruction of habitats. Added to all this are the pollutants which are carried into our areas from outside and activities in other countries which affect the ecosystems in our areas, *e.g.* through fishing of joint stocks.

Thus, the state of the environment in the Norwegian maritime areas is not merely a product of our own activities, but also a result of which pollutants are swept into Norwegian areas by sea currents or by the wind. It also depends on how we interact with other nations in respect of common resources.

The state of the marine environment is governed by a complex pattern of interaction between a natural interplay and variation in the ecosystems and effects caused by human activity. Impact on just one component will produce consequences in other parts of the ecosystem even though the actual effects may often be difficult to discern. If key species, *i.e.* species on which many links in the chain depend, are negatively affected, this can lead to changes in the entire system.

2.1.3 The individual industries and sectors are facing major challenges

The North Sea, the Norwegian Sea and the Barents Sea are among the most prolific marine areas in the world. Fishing and the catches of fish along with aquaculture are of vital importance as a source of income in the communities along the Norwegian coast. The fishing industry is dependent upon renewable, but not unlimited resources. This is why it is important to develop management strategies, which take account of the ecosystem as a whole and of how the fish stocks are influenced by a variety of environmental factors and by fishing activities. A clean sea and sustainable outtake of the living marine resources is a *sine qua non* if the generation of revenue in the fishing industry is to be maintained and increased and is thus an important part of the coastal population's basis for existence.

Outtake leads to a change in the dynamics of stocks and of the ecosystems. Most of the species, which are of importance to our economy, have the ability to adapt to difference types of effects. Productivity does in fact increase in the presence of a moderate load in that the individual fish grow more quickly and start reproducing at a younger age. But, when the pressure on the fish exceeds a certain level, the stocks are no longer in a position to adapt and the situation becomes one of overload. By-catches are a problem both in commercial fisheries and for individual populations of sea birds and marine mammals. In addition, there are effects on ecosystems in the form of damage to the seabed. Overfishing is regarded as a major problem in the global context and the UN Food and Agriculture Organisation, the FAO, has estimated that between 15 and 18 % of the world's fish stocks are being overfished. If something is not done to reduce the amount of overfishing, catches from these stocks will shrink considerably.

Present-day fisheries management is based on the main principle of sustainable fishing activity based on the best available scientific advice. One of the major problems is that the overall, global fishing capacity far exceeds available resources. This overcapacity is perhaps the main force driving overfishing. Overcapacity is a problem even in Norway. In general, the fishing fleet is too large in relation to the resources available.

As much as 90 % of Norway's fisheries involve stocks shared with other countries. This means that the Norwegian authorities cannot decree how these stocks are to be managed on their own and instead have to co-operate with other nations in this regard.

The central environmental challenges in terms of fisheries management are linked to improving our basic knowledge of management, implementation of ecosystem-based management, including application of the precautionary principle, limitations on by-catches and damage to important areas of the seabed and more effective enforcement of regulations.

Over the past 30 years farming of salmon and trout has grown into an industry with an export value of over 13 billion Norwegian kroner. Aquaculture is a growth industry in Norway and of vital importance to the development of the coastal areas. It is our long coastline and our clean waters which together with the wild salmon stocks form the basis for this branch of activity. Only by

maintaining our marine environment clean can we ensure the production of safe and good foodstuffs. It is therefore in the interests of Norwegian aquaculture to ensure good conditions for fish and shellfish to grow along the Norwegian coast. The industry has been faced with major environmental challenges which to a large extent have been dealt with through development of this branch. But, when it comes to the actual environment there are still quite a few challenges. Primarily, it is a question of managing the effects of the fish farms on their immediate environment, the run away of fish from the farms, and the occurrence and spread of salmon lice.

The world market for fish and other seafood is highly sensitive to rumours of pollution, for instance radioactive pollution. Even though the levels of radioactive pollution in Norwegian waters are low, it indicates the presence of unwanted substances. The nuclear reprocessing plant in Sellafield is the main source of radioactive pollution today, but there is also a risk of accidents which can lead to radioactive pollution from nuclear installations, nuclear-powered vessels and vessels carrying radioactive materials through waters close to Norway's coasts. At international level Norway is active in trying to get reductions in discharges of radioactive pollutants into the marine environment and in trying to limit the risks of nuclear accidents which could contaminate Norwegian maritime areas. The fishery authorities monitor the presence of alien substances in Norwegian fish and seafood on an ongoing basis as part of the important work being done on documenting the good quality of Norwegian seafood. Monitoring of the marine environment is of vital importance in this regard.

The spread of species to areas where they do not occur naturally has become much more common over the past decade. At the same time we are seeing more and more examples of how this can have major effects on ecosystems and on indigenous species along with serious consequences for the branches which use the living resources. Examples from Norwegian waters are the introduction of the harmful *Chatonella spp.* of plankton algae, which was probably introduced via ballast water from ships arriving from Asia, and the proliferation of American lobster which could supplant the indigenous stocks. Although we have been spared the most dramatic consequences in Norwegian waters so far, it is becoming increasingly clear that non-indigenous species are a major threat even in Norway. There is therefore an urgent need to develop means of reducing the negative effects.

Large amounts of numerous chemicals we know to be harmful to the environment and also potentially detrimental to health, are still being discharged into the environment and are a source of concern. Even though we have engineered considerable reductions in discharges of known hazardous substances into our seas and coastal areas, these substances will continue to be present in the natural environment in concentrations which represent a threat to the ecosystems. This is attributed to the fact that many of these hazardous substances are only marginally degradable and can easily be stored in food chains in our seas. This means that they will remain a threat to the ecosystems for many decades to come, even if discharges cease entirely. It is impossible to fix safe levels or limits of tolerance for hazardous substances in the natural environment. Discharges of these substances must therefore be stopped completely.

Discharges of toxic substances into Norwegian waters occur both from local, land-based sources, from petroleum exploitation operations and from vessels. However, they are also to a large extent brought to us by the wind and by marine currents after having been discharged in other parts of the world. If we are to succeed in stopping these inputs of environmental toxins into our marine areas, we will have to find solutions at international level, and we must therefore focus on international co-operation in this area.

In the case of most chemicals we lack basic knowledge of their effects on health and on the environment. We know even less about how they influence the environment either alone or when interacting with other substances. We need to know much more about this in order to be able to obtain a full picture of the challenges facing us. For the sake of the environment it is particularly important to establish which substances are only marginally degradable and are easily stored in the food chain since these properties give the substances the potential to inflict long-term damage on the environment of the type we have experienced from, for instance, PCBs. In addition, there are the endocrine disrupters, which can affect the reproductive capacity of fish and marine mammals, and we need to learn more about these.

Discharges over a long period of time have caused sediments in a number of coastal areas and fjords to currently exhibit extremely high concentrations of environmental toxins. This type of pollution damages the environment in the areas concerned and also limits the use of many areas for the purposes of fishing and aquaculture. Furthermore, contaminated sediments represent a threat to

other areas since environmental pollutants can spread and contaminate them as well. Up to now, high priority has been given to stopping fresh discharges of environmental pollutants. We must continue to give high priority to work on these issues, but at the same time it is important to get started on the extensive cleanup operations necessary to ensure that the environment is in an acceptable condition in all of Norway's coastal areas.

Oil pollution in Norwegian waters have their origins both in normal drilling operations and in accidental discharges from platforms, along with shipping and land-based sources. The oil industry is constantly expanding to cover new parts of our maritime areas and even to sensitive environments close to the coast. At the same time, operational discharges of oil and chemicals are on the increase without our knowing enough about their long-term effects on the environment. This can give rise to a growing conflict of interests between fisheries interests and those anxious to protect the environment. The big challenge is to reduce the operational discharges of oil and chemicals harmful to the environment and to improve our knowledge of the effects of these discharges. It is also important to limit territorial conflicts and the risk of damage to stocks and vulnerable areas.

Shipping is an important source of major oil spills via accidents and through illegal discharges. Major oil spills from shipping often occur close to land in vulnerable areas, and in the future tankers will be carrying large amounts of crude oil from North-western Russia and travelling close to the Norwegian coast. Together with increased interest in petroleum exploitation in the Barents Sea, this calls for preventive measures and preparedness for emergencies in order to limit damage. This demands close co-operation with the Russian authorities. But, in the Barents Sea region there is limited scope for effective protection against oil spills during the dark part of the year. There is also a great deal of tanker traffic connected with our oil refineries and oil terminals in Southern Norway. A considerable increase in shipping from Russia and the Baltic States is also expected through the straits of Øresund and Store Belt. In the light of the recent spate of shipwrecks and the expected increase in transports of environmentally hazardous cargoes, for instance cargoes of oil, along the Norwegian coast, it is clearly necessary to improve the safety and response systems in place along the coast.

Thanks to our long coastline and in places low population density we still have areas along our coasts, which have been little affected by human activity. But, in Norway too there is still considerable pressure on areas in the coastal zone near to the most densely populated areas. Conflicts between different users are also increasing. We have also left our mark on the seabed. It is estimated that between one third and half of the deep-water coral reefs to be found along the Norwegian coast have been either damaged or destroyed as a result of bottom trawling.

Important results have been achieved both nationally and internationally to protect the maritime and coastal areas from environmental damage. Substantial reductions have been made in our own discharges of substances hazardous to the environment and of nutrients, and at international level work has been started on drawing up global and regional regulations designed to reduce discharges of pollutants into the sea. Similarly, progress has been made at both national and international level in providing better protection for living marine resources. But, even though much has been achieved there are still major problems which need to be solved, problems linked to pollution, physical intervention and management of living resources.

More details are given in Chapter 3 of the challenges we face in different areas and how the Government intends to deal with them in the future.

2.2 Need for more comprehensive management

The above shows how important it is to carry out a thorough assessment of how we manage our coastal and maritime areas, if we want to achieve the goal of having clean waters full of marine life.

2.2.1 Need for better co-ordination of different areas of interests

More and more use is being made of coastal and maritime areas throughout the world and this applies to Norway too. The range of activities affecting the environment is increasing and measures to counter their influence are often introduced without sufficient knowledge of the correlations between loads and their effects on the ecosystems. Given the growth in fish farming activities the demand for space will also increase. We are witnessing a generalised increase in activities in the coastal and maritime areas and there is thus an increased risk of conflicts over use of space availa-

ble. The oil industry is moving closer to shore and more vulnerable areas. Shipping along the Norwegian coast is on the increase, thus increasing the risk of accidents. We now also know more about the vulnerability of our marine and coastal environment. All this means that conflicts between different user interests will increase in the years to come.

Traditionally, various forms of pollution, outtake of different species and different types of intervention have been assessed and managed in a fairly isolated way and without taking account of the fact that the existing ecosystems and species are prey to a range of other environmental effects. At national level each sector draws up its own policy for the coastal and maritime areas, and this policy is very much influenced by sectoral and industrial interests. What the different policies have in common is that they influence the environment in a way that is of significance to many other legitimate interests. Most users do nevertheless consider the environment to a greater or lesser degree, but there is little co-ordination of measures introduced in the different sectors. Taken together, the implementation of these plans can lead to overload on the environment and overexploitation of resources.

It is neither possible nor practical for all sectors and users to have a comprehensive picture of how their activities influence other sectors and activities or ecosystems in the broader sense. This is why it is important for the authorities to put things right and ensure that activities and interventions in the coastal and maritime areas are governed by an overall plan whereby every operation is not assessed isolatedly, but as part of the whole range of impacts and interactions.

The increasing level of conflict and the need for better co-ordination is also a typical problem at the international level. The EU has adopted a framework directive on water, which focuses on the need for more co-ordinated management of water resources. The different countries are to develop integrated management plans accompanied by specific programmes of action for each individual water district based on environmental quality objectives. Norwegian compliance with the directive is described in Chapter 2.3.2.

Many of the marine resources in the maritime areas under Norwegian jurisdiction are shared with other countries. The international agreements set out overall objectives for how the resources are to be managed. The principle of sustainable use and a precautionary approach are of central importance. More precise objectives as to how the fish stocks are to be managed are, however, not set out in international agreements.

It is important to establish an overall system for co-ordination of activities to ensure integrated management of our seas and coastal areas. All sectoral authorities and other interested parties must co-operate in co-ordinating the management exercise. Integrated environmental protection policy must face up to both national and international challenges and ensure that international environment protection efforts tally with national.

Furthermore, organisation of work in individual target areas needs to be reviewed in order to improve its effect. An obvious example is organisation of safety and emergency routines along the coast. The way in which things are organised today is fragmented and not effective. A number of authorities are responsible for different preventive measures, while measures to repair damage are in the hands of other authorities. Better co-ordination between the different sectors and levels of the administration is needed.

2.2.2 A lot at stake …

The abundant biological diversity and production capacity of our coastal and marine areas must be managed in a manner which preserves them for future generations. Lost diversity can seldom be restored and lost production capacity can only be built up again slowly or if at all. This should be a principal consideration when setting the basic conditions for all forms of activity, which may have a negative effect on maritime and coastal areas.

The value of marine and coastal areas has traditionally been estimated on the basis of the scope they offer for utilization of resources, whether this be in terms of extraction of oil or catches of fish. It is possible to calculate such values, but Box 2.2 shows that biological diversity is associated with a range of other values which cannot so easily be calculated in monetary terms. For instance, it is difficult to put a price on what may be termed «ecological services».

2.2.3 The ecosystem approach to management of maritime and coastal areas

The Government takes the view that co-ordination between different authorities must be increased if we are to achieve our goal of having clean seas rich in marine life. The Government is therefore preparing a plan for total and integrated management of our maritime and coastal areas based on the eco-

Box 2.2 Values linked to biological diversity

- *Direct utility value*: Value realised through the use of biological resources for the purposes of nutrition, medicines, stimulants, art, clothing, building and fuel, plus the use of the natural environment for play, recreation, open air activities, tourism, education and research.
- *Indirect utility value*: Value in the form of life-supporting processes and ecological services such as biological production, soil improvement, purification of water and air, water management, local and global climate, the circulation of carbon, nitrogen and other substances, ecological stability and the capacity of nature to attenuate the effects of overload from pollutants, floods and drought. These values are an absolute prerequisite for human existence and economic activity.
- *Potential value*: Value which has not been exploited or which is not known. Such values comprise both direct and indirect values listed above and are, *inter alia*, associated with the use of unexploited genetic resources both for the purpose of traditional types of processing and for genetic engineering to produce new products with a direct utility value.
- *Intellectual value*: A value which has an ethical or moral origin, *e.g.* linked to the desire to know that a species actually exists, to the opportunities and quality of life of future generations and to the desire to conserve the landscape and natural surroundings as part of our cultural heritage and memories.

Box 2.3 Ecosystem approach

The ecosystem approach to management of the seas involves integrated management of human activities based on the dynamics of the ecosystems. The goal is to achieve sustainable use of resources and goods derived from the ecosystems and to preserve their structure, modus operandi and productivity.

system approach. This is necessary in order to ensure that the accumulated effect on the environment in the long term is not greater than what the structure of the ecosystems, the way in which they function and their biological diversity can tolerate.

Ecosystem-based management of the marine environment means management which takes account of the basic conditions set by the ecosystem itself in order to maintain production and conserve biological diversity. The concept of the «ecosystem approach» has been developed and integrated into a number of international agreements over the past 10 years and is, for instance, a central element in complying with the convention on biological diversity. General criteria have also been developed in connection with this convention for the implementation of ecosystem-based management (the Malawi principles), which Norway has endorsed.

In 1997 the Ministers responsible for fisheries and environmental protection meeting in Bergen reached agreement on further integration of measures within the area of fisheries management and environmental protection through the development and use of the ecosystem approach. They also agreed that any such ecosystem approach would be based on co-operation between the authorities in different sectors, on getting the necessary research started, on assessing the effects of human influence on the ecosystems and on organising the integration of these various aspects. The authorities in the countries around the North Sea were asked to analyse progress and remaining problems for the implementation of this type of management and to report to the Fifth North Sea Conference to be held in Bergen in March 2002.

Subsequently, the principle of ecosystem-based management was integrated into work being done within the framework of the OSPAR Convention on the Protection of the Marine Environment in the Northeast Atlantic and the EU's new water framework directive.

The Government intends to build on what has already been done in this area and on other global and regional conventions and agreements designed to establish frameworks for ecosystem-based management of the Norwegian coastal and maritime areas.

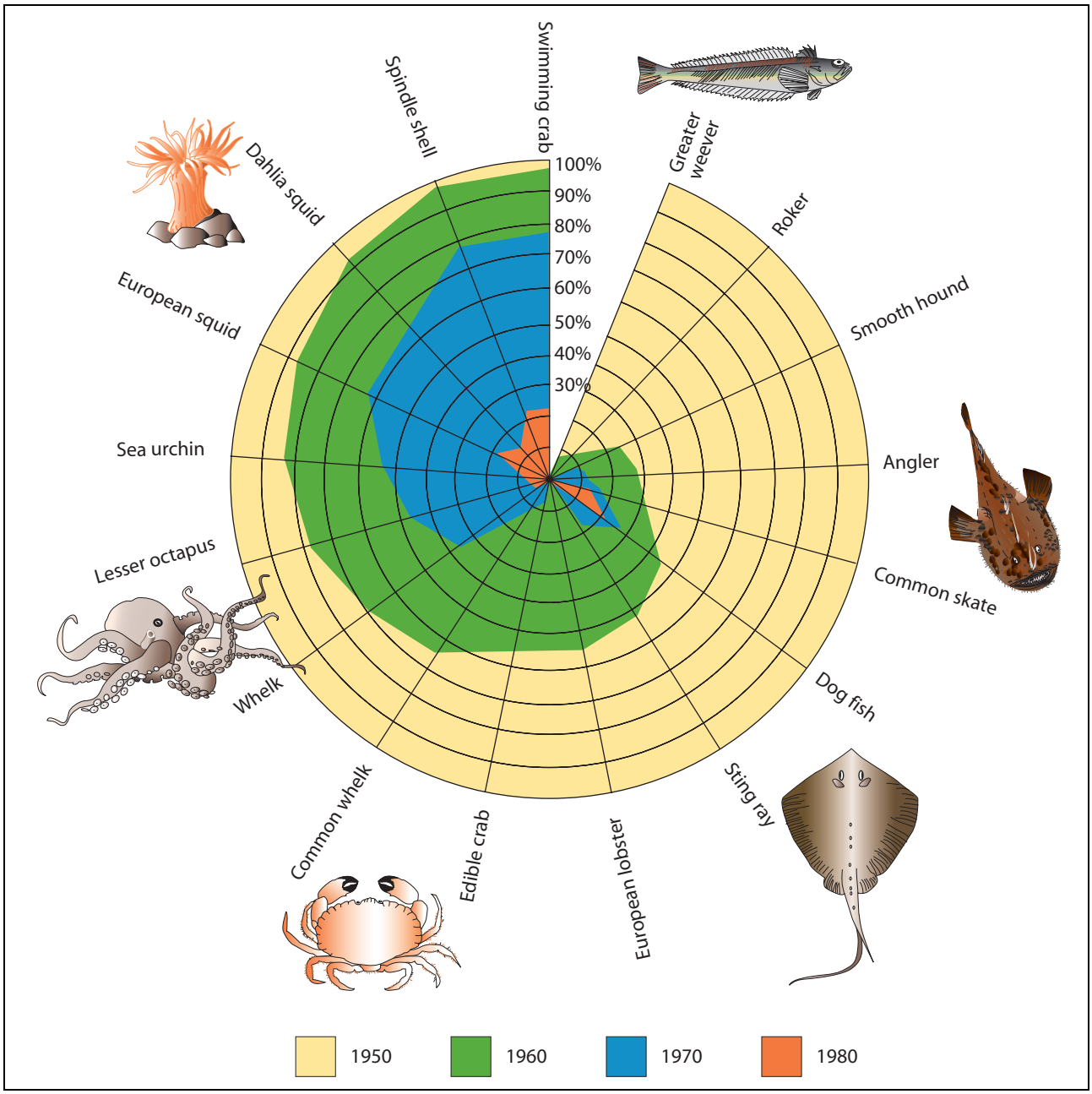

Figure 2.2 Biological diversity in the southeastern part of the North Sea. The figure shows the relative decline in the incidence of different species of fish and seabed organisms from 1950 (outer circle) up until 1980 (inner circle)

Source: Rumohr et al., 1998

2.2.4 Sectoral responsibility and the need for co-ordination

We still have a long way to go in terms of being able to implement the ecosystem approach to management as an overall principle across all sectors and different factors affecting the environment. A central element in the Government's policy of environmental protection is sectoral responsibility and trade and industry's own responsibility. Chapter 2 in Parliamentary Report No. 24 (2000–2001) «Government Environmental Policy and the State of the Environment» contains a general outline of the system chosen to steer the course of the country's environmental protection policy.

Sectoral responsibility means that sectoral authorities and the different branches of trade and industry are independently responsible for including environmental considerations in the organisation of activities which affect the environment in

maritime and coastal areas and that they therefore must integrate environmental factors into their own management. The Ministry of Fisheries, the Ministry of Petroleum and Energy and the Ministry of Trade and Industry are pivotal ministries in this respect and have a special responsibility for central measures and policies within important sectors such as fishing, aquaculture, petroleum exploitation and shipping. A prerequisite if sectoral responsibility is to work in practice is for there to be common, national goals and a distinct division of responsibility between the different authorities.

The Ministry of the Environment has the main responsibility for national goals, steering systems and follow-up of results in the field of environmental protection policy. This Ministry also has an important co-ordinating function vis-à-vis the ministries responsible for the different sectors. Implementation of co-ordinated environmental protection policy for the maritime and coastal areas must be firmly anchored in this system.

2.3 The Government's plan for total management

The Government intends:
- to establish an integrated plan for management of the Barents Sea;
- to develop integrated plans for management of waters close to the coast and in the fjords pursuant to the EU water framework directive; and
- to introduce a long-term policy focussed on ecosystem-based management of coastal and maritime areas which is based, *inter alia*, on environmental quality goals for the ecosystems.

This chapter deals with the overall policy that the Government wants to initiate to develop a more integrated and ecosystem-based form of management. The Government takes the view that the general pool of knowledge on Norway's marine and coastal environment is sufficient to allow us to start the processes necessary to carry out comprehensive analyses and develop management plans as a tool for more integrated and comprehensive management. With regard to the maritime areas, the Government wants to start with an initiative aimed at drawing up an integrated management plan for the Barents Sea. In the case of the coastal areas the work will be carried out as part of complying with the new EU water framework directive. The framework directive, which will be part of the EEA Agreement, requires the development of total management plans, including for the coastal areas. Parallel to this, the Government will be speeding up work on improving the basic reserve of information available, through, *inter alia*, monitoring and research with a view to developing a more comprehensive and long-term system for ecosystem-based management of human activities affecting the marine and coastal environment. Norway will be placing great emphasis on international co-operation in this area.

2.3.1 An integrated management plan for the Barents Sea

The Government aims to have integrated management plans established for the Norwegian waters which fix clear basic conditions for the use and protection of the coastal and maritime areas. These plans must have sustainable development as a central objective, and management of the ecosystems must be based on the precautionary principle and be implemented with respect for the limits that nature can tolerate. An important element will be the ecosystem approach including the establishment of environment quality objectives. A general description of the structure of such plans is given in Chapter 2.3.3.

Work on drawing up ecosystem-based management plans for maritime areas is a necessary step in order to ensure a more co-ordinated management of the maritime areas and the resources there. This is why it is necessary to move forward step by step and to learn from experience along the way. As a first step the Government envisages drawing up an integrated management plan for the Barents Sea where overall account is to be taken of the environment, fishing activities, oil operations and shipping. Experience gained from this work can then be used as a basis for a decision to develop similar, integrated management plans for the Norwegian Sea and the North Sea.

There are many reasons why the Government wants to start with the Barents Sea and to establish frameworks for future activities in this area which ensure the preservation of the quality of the environment. This is a maritime area, which is exposed to human activities to a relatively small extent. It is one of the areas in the world, which has the most abundant populations of fish, sea birds and marine mammals that it is important to preserve for future generations. Many of the stocks merit international protection. The main characteristics of the ecosystems are known, but we know very little about how pollutants affect species and systems. Low temperatures and drift ice mean a lengthy degrada-

tion period for oil and chemicals discharged into the environment. These factors, along with high waves at times during the dark season of the year considerably reduce the scope for effective systems to deal with acute oil pollution. A weaker infrastructure in the provinces of Nord-Troms and Finnmark than that found in other parts of the country also makes it more difficult to deal with emergencies.

Before the southern part of the Barents Sea was opened up for petroleum exploitation in 1989 a survey was carried out to assess what the consequences of this would be. This was the first area-specific investigation of possible consequences of petroleum exploitation on the Norwegian continental shelf since the advent of the Oil Act of 1985 and led to time limits being fixed for prospecting drilling operations out of consideration for vulnerable natural resources. Pursuant to legislation this survey only covered the consequences of prospecting for oil and not the consequences of any extraction operations.

The Government takes the view that better tools need to be developed to make it possible to strike the right balance between the different areas of interests linked to the Barents Sea. This can best be achieved by drawing up an integrated management plan based on the impact assessments for the different sectors. As far as the oil industry is concerned this will involve an impact assessment of year-round oil operations for the area stretching from the Lofoten Islands and northwards from there. Parallel to this, work is to be started on impact assessments, for instance, shipping, fishing and fish farming activities. These surveys will identify and assess problems caused by the overall effect of human activities on the maritime area. Each sector will have to describe its own field of activity and expected development and map out the consequences for the ecosystems and for other stakeholders in society. In that context it will also be important to establish where we need to know more, which areas are vulnerable *etc*.

The management plan is to cover the entire Barents Sea and the analysis of the consequences of the petroleum exploitation is to include a reassessment of existing knowledge of the whole Barents Sea area. However, it is not the intention of the Government to trigger a process which opens up the North Barents Sea for petroleum exploitation.

The main aim of the plan is to help achieve consensus among different trade and industry interests, local, regional and central authorities, environment protection organisations and other stakeholders on the management of this maritime area in accordance with the principle of sustainable development. The integrated management plan drawn up by the authorities will create an overall framework, but will need to be supplemented by more detailed plans for the individual sectors, *e.g.* for the oil industry, fisheries, shipping and so on.

Close co-operation with Russia will be necessary and also important when carrying out surveys to chart the consequences since this maritime area is shared with Russia. The issue has already been raised bilaterally in connection with co-operation between Norway and Russia on the environment and will also be raised in the context of the Norwegian-Russian Fisheries Commission and the Norwegian-Russian Forum on Energy and the Environment.

The Government plans to set up a steering group comprising representatives of the ministries concerned under the leadership of the Ministry of the Environment which is to co-ordinate the drawing up of the integrated management plan. It is essential that authorities and other interested parties in this part of the country become involved in the work, and the Government intends to make sure that procedures are established that take account of this requirement in an appropriate manner. Fishing is part of the basic way of life of the Same people (Lapps) in the areas they occupy along the coast and fjords adjacent to the Barents Sea. The Lapp Parliament (Sametinget) will therefore be involved in the work.

Drawing up the management plan will be a big and demanding job. First, there must be a thorough assessment of the different interests to be taken into account via the sectoral impact assessments. This process will obviously take some time, but the Government aims to give this work high priority to ensure that an integrated management plan is in place as soon as possible. The Government will report to Stortinget on the work via the Parliamentary Reports on the Government's environment protection policy and the state of the environment throughout the country.

A follow-up system will be established for the management plan to ensure that it is up-dated as needed, *e.g.* in the light of new findings emerging through monitoring and research. The plan will fix the basic conditions for activities in the area, and it is important that these conditions are as predictable as possible for the individual branches.

The total management plan for the Barents Sea will thus be the first integrated management plan for the Norwegian maritime areas. The plan now about to be drawn up must therefore be viewed as

a first-generation plan which will also help us to gain useful experience which can be called upon in future work on similar plans (cf. Chapter 2.3.3).

2.3.2 Integrated management of the maritime areas and parts of fjords close to the coast

An obligation to carry out more comprehensive and integrated management of the maritime areas and parts of fjords close to the coast is already enshrined in the European Parliament and Council Directive 2000/60/EC on the establishment of a framework for the Community's water policy (the water framework directive). The directive is designed to conserve, protect and improve existing water resources and the aquatic environment, while also ensuring sustainable aquaculture. A series of directives and international conventions exist whose purpose it is to protect water resources and the aquatic environment. The framework directive creates a superstructure for all these directives and provides guidance on how water should be managed within the European Community. The directive is viewed as one of the most important parts of the community legislation on protection of the environment. The directive came into force on 22 December 2000 and must be transposed into Norwegian legislation by virtue of the EEA Agreement by the end of 2003.

Watercourses, groundwater and coastal waters up to one nautical mile outside the baseline fall within the scope of the directive. Implementation of the directive will therefore be an important element in the management of waters close to the coast. The main objective of the directive is to protect and where necessary improve the quality of the water by 2015. All forms of use must be sustainable over time. Each country must divide its water resources into districts to be responsible for the total rainfall area including the adjoining coastal area; they will be known as catchment areas. The directive requires that water resources be charted and monitored. Specific environmental goals must be fixed for water, and by 2009 a management plan for each catchment area must have been drawn up. The management plans must be accompanied by a program of action setting out the measures which must be introduced in order to meet the objectives. The management must be based on environment goals defined in the light of both chemical and biological factors in the watercourses and in sea areas. The directive presupposes that plans will be drawn up via a broad-based process involving authorities and professional and industrial bodies. The work on trying to achieve the objectives fixed in the directive will also indirectly affect the rights and obligations of private individuals. Management plans, trends in water quality, organisational solutions *etc.* must be reported to the EFTA supervisory authority, the ESA.

The directive also aims at increasing protection of the aquatic environment from pollution by substances toxic to the environment. In the case of priority substances present on a list adopted by the European Parliament and the Council, harmonised standards for water quality, necessary limitations on discharges and product-specific measures will apply at community level. The first version of this list comprising 33 priority substances and groups of substances was adopted in November 2001. Discharges of the substances with the highest priority must be phased out within 20 years following their inclusion on the list. Discharges of the other substances on the list are to be progressively reduced to bring concentrations below the levels in the quality standards currently being drawn up for water, sediments and biota.

The Government regards the EU water framework directive as an important instrument for achieving a more comprehensive and integrated type of ecosystem-based management of areas close to the coast in that management of watercourses and land and sea areas in the coastal zone is seen in an overall context and based on environmental objectives. The Government is at present considering how the directive can best be applied in Norway. The Ministry of the Environment, the Ministry of Petroleum and Energy, the Ministry of Fisheries, the Ministry of Agriculture and the Ministry of Health are now together assessing how to divide up responsibility, tasks and duties. An inter-directorate group has been set up to helping the ministries in this work. It is made up of representatives of the Norwegian Pollution Control Authority, the Directorate for Nature Management, the Norwegian Watercourses and Energy Directorate, the Norwegian Food Control Authority, the Norwegian Institute of Public Health, the Directorate of Fisheries, the National Coastal Administration and the agricultural authorities under the auspices of the Ministry of Agriculture. The Government plans to circulate a presentation of the consequences for Norway of implementing the directive for public comment this year. In addition, the authorities concerned, professional circles and organisations have been asked to comment on issues with administrative and professional connotations in connection with implementation of the framework directive.

In asking for comments the Government is anxious to focus in particular on the requirements the directive makes of authorities to implement in the short term. By 2003 Norway must have divided its territory into catchment areas, designated competent authorities and transposed the provisions of the directive into Norwegian legislation. By 2004 Norway must have established a register of all the areas in each catchment area, which require special protection, and produced a description of the characteristics of each catchment area. The hearing document will also refer to the requirements the directive makes of the authorities in the longer term up until 2015, but here a number of issues still need to be clarified; for instance, shaping of environmental objectives, establishing management plans, programmes of action and monitoring plans.

The directive requires the introduction of total water management on the basis of catchment areas, and this is something which will have consequences for the current system of water management in Norway. The system of water management in place today is the product of specifically Norwegian circumstances. This system works well in many areas, but can seem fragmented and not up to optimum standard in other areas. Compliance with the directive will help generate more comprehensive and planned management of water resources and a much better basis for decisions.

In seeking to achieve the environmental objectives the point of reference has to be the catchment areas, and the directive requires administrative units which coincide with the boundaries of the catchment areas, thus cutting across current municipal and country boundaries. The directive means that management by the authorities will cut across established lines of demarcation between authorities and administrative services at regional and national level. The authorities responsible at district and local levels will be given a number of important responsibilities; for example in connection with describing, monitoring, planning and implementing measures. The directive imposes a division into districts, which are also responsible for total rainfall in the adjoining coastal zone.

This directive is a minimum directive and the individual countries are at liberty to introduce more stringent provisions or a higher level of ambition than the directive itself requires. It specifies a high level of ambition in terms of development of water resources, while at the same time containing provision for exceptions. The authorities in the individual countries have considerable room for manoeuvre. Initially compliance with the directive may call for measures and restrictions in a number of areas. The detailed specification of the environmental objectives will come towards 2009, the deadline for having the management plans in place, along with the specific basis for decisions in the form of measures, benefits and costs.

2.3.3 More about the work on ecosystem-based management of our maritime and coastal areas

As has already been pointed out in the above, the Government's long-term objective is to develop integrated management plans for our coastal and maritime areas based on the present state of the ecosystems and with the focus on the ecosystems' capacity for self-renewal in order to avoid damage. Management plans drawn up to comply with the water directive (cf. Chapter 2.3.2) will be of a different nature and involve a different procedure than the management plans to be drawn up for the maritime areas. This is mainly due to the fact that the plans drawn up for compliance with the water directive must follow the systems laid down in the directive.

The technical basis must be improved via research into different loads and the establishment of environment quality objectives, which can be verified a posteriori. Monitoring of the environment must be co-ordinated so as to produce the best possible overview of environmental status and changes in the condition of the environment.

The Government presupposes that the integrated management plans for the maritime areas will be drawn up as an open procedure, as is also the case with the plans pursuant to the water directive, and will involve co-operation between all the sectors, branches of trade and industry and other stakeholders concerned. This will ensure consensus on the general direction and reduce the scope for conflicts between different areas of interests.

International co-operation will be of central significance both with regard to the management of common maritime areas like the North Sea in terms of exchange of experience and joint further development of tools for steering the process.

The integrated management plans for the maritime areas will use the sectoral surveys of consequences to provide a basis for the establishment of protected areas and offer general guidelines for activities in the maritime areas. The plans should also co-ordinate follow-up of activities and measures and provide guidelines for monitoring of the marine environment. It should, however, be the ministries responsible for the different sectors, which have responsibility for drawing up specific

management plans for how to achieve the objectives in the total plan and follow up activities in their sector. The ministries' environmental action plans will be of central importance here. Similarly, authorities and branches of trade and industry at local level must also be involved. In this way the management plans will provide a total, overall system involving all operators and where the latter assume responsibility of achieving objectives and results in their respective areas.

Even though it is not expected that the plans will have legislative repercussions, it is essential that they should be able to fix predictable basic conditions for activities and initiatives. At the same time, there must be nothing to prevent the conditions being changed subsequently, if this is necessary in order to ensure that there is no serious damage to the environment. A central feature of the plans will be that they must divulge gaps in knowledge and highlight areas where research and initiatives are needed.

2.3.3.1 Basic know-how

There are still many gaps in what we know about the structure of the marine ecosystems and the way in which they work. We need to learn more if we are to be able to strike the right balances and make the right choices.

The Government intends:

- to ensure better national co-ordination of work being done by state institutions and private operators in the field of regular stocktaking and reporting on status, including assessing whether one institution should be given specific responsibility for co-ordinating and viewing living marine resources and the marine environment in an overall context;
- to increase, compile and improve access to data on the marine ecosystems:
  - by considering the implementation of the project entitled «Marine mapping and development of an area database for the Norwegian coastal and maritime areas «(MAREANO);
  - by introducing a requirement whereby all relevant environmental data obtained from publicly funded research projects and from monitoring activities imposed by the public sector must be made accessible; and
  - by establishing national programmes for charting and monitoring biological diversity, including setting up a national species database;
- to arrange for co-ordinated collection of data and investigate the setting up of common databases for the purposes of monitoring and research;
- to intensify and co-ordinate monitoring efforts in the maritime and coastal areas within the existing budgetary framework via better co-ordination of available staff and vessels resources, including assessment of common shipping pool covering all Norwegian vessels used for marine and fisheries research;
- to carry out research work in Norwegian maritime areas in order to learn more about the structure and workings of these ecosystems and the effect of human activities on them; and
- to support the implementation of a research programme on the ecosystems in the North Sea in collaboration with the EU and the other riverine states around the North Sea with the aim of improving basic knowledge on which to found an ecosystem approach to management.

Research provides knowledge of and insight into the structure of the ecosystems, their modus operandi and the correlations with human activities and their effects. Monitoring provides up-to-date information on the current situation in the physical, chemical and biological marine environment. Over time, monitoring provides time series of data which document changes in the marine environment, both natural changes and changes caused by man. What we learn from research and the information obtained from monitoring lays the foundations for assessments of status, trends and forecasts of future developments in our seas.

Knowing more about our marine species and habitats is a vital prerequisite for differentiated area management. In the international sphere a great deal of attention is being directed towards this field, and countries such as Australia, Canada and the USA are running major national programmes designed to chart marine habitats in their maritime areas.

Norway has large maritime areas within its territory. There are, however, serious gaps in what we know about their status, while we also have great expectations in terms of possibilities for use. This is why it is important to increase our general knowledge of these areas while also obtaining a more detailed picture of the correlations between the physical environment, the abundance of species and the biological resources. It will also be important for Norway to learn more about the potential for use of our biological diversity.

A group made up of a wide range of state directorates and research institutions has developed the MAREANO project. This project entails essential studies and charting of depths, seabed types, geological conditions, pollution, types of environment, biological diversity and marine biology resources in selected areas. The information is to be made available via an internet-based marine area database (GIS). The database will also contain information on other sources of data and links to them. The Government will be carrying out an assessment of the MAREANO project with a view to making it a central component in the pool of data to be used for the management of our coastal and maritime areas.

The Norwegian Marine Data Centre (Norsk Marint Datasenter – NMD) is attached to the Institute of Marine Research (Havforskningsinstituttet – HI) and plays a role in co-ordinating surveys and storing data on the marine environment. It is important for data on the marine environment and living resources obtained via research projects to be made available for use in overall assessments of the status of the marine ecosystems. In the case of research projects financed by public funds it will be a requirement that relevant environmental data obtained through the projects be made available for this type of assessment of status.

A species database is to be established in Norway in the course of 2002. This species database will be attached to the University of Trondheim. It will interact with existing databases and constitute a generally available database of assured quality drawing on the other databases. For the first few years the species database will concentrate on data access and will put forward proposals for revised, national red lists of species to the Directorate for Nature Management.

There is a need for better co-ordination of the work and use of the results of monitoring of the marine environment. A number of bodies are at present engaged in significant monitoring of the marine environment and living marine resources, while only co-ordinating that work to a limited extent and without this being part of an overall, common national plan.

Work on co-ordination of monitoring the environment and its resources by different institutions has already been started:

- In the autumn of 2001 the Institute of Marine Research (HI) initiated collaboration on monitoring of the marine environment with the Norwegian Meteorological Institute (DNMI), the Norwegian Institute for Water Research (NIVA), the Norwegian Polar Institute, the Norwegian Radiation Protection Authority and the Nansen Centre for the Environment and Remote Sensing (NERSC). This collaboration will help co-ordinate monitoring of the marine environment at national level across the different parts of the Civil Service.
- As part of the work on the national programme for surveying and monitoring biological diversity there will also be a co-ordinated plan in place by 2003 for charting and monitoring which will also comprise criteria for classification of marine environment types on the basis of their value.
- The various institutions compiling data in the northern areas have agreed to work together with the aim to produce an overall picture and multidisciplinary interpretation of environmental data in the northern region under the heading of MONA. This is one of several tools, which can lay the foundations for a total management plan for the Barents Sea.

The Norwegian vessels used for marine and fisheries research are today managed by a number of different institutions. There is considerable potential for more cost-effective operations via better co-ordination of the research work done by the vessels and use of periods at sea *etc*. The Government therefore wants to evaluate how co-ordinated use of all of the Norwegian marine and fisheries research vessels can be arranged. The aim of this organisational change is to promote a higher level of activities within the same cost frame. The investigatory work will be carried out by the Ministry of Fisheries in co-operation with other ministries concerned.

The quality of the marine environment influences the ecosystems in different ways and assessments must take account of natural fluctuations and effects caused by human activities. It may be appropriate for a single state advisory institution to be given specific responsibility for co-ordinating the work and assessing the living marine resources and the marine environment in the overall context. This is the subject of further discussion at the moment.

In 2001 Norway and Iceland co-financed the UN Responsible Fisheries in the Marine Ecosystems conference. The declaration adopted by the conference highlights the need for a more ecosystem-oriented management of living marine resources. The International Council for the Exploration of the Seas (ICES) has established an advisory committee on ecosystems (ACE) and in so doing has created a scientific advisory mechanism for ecosystem-based management.

The Government wishes to stress that the different sectors and branches of trade and industry have a responsibility of their own to ensure an adequate pool of basic know-how. It also wishes to stress the importance of research on environmental consequences being integrated as a central theme into national research strategies for development of marine sources of nutrition.

A number of institutes in the field of environmental and fisheries research have submitted proposals for a programme for generating value and sustainable development in the Norwegian coastal zone. This programme may clarify the basic requirements for generating worth. The Government will be assessing these proposals and will then decide how these initiatives can be followed up.

Co-ordination of the work being done in Norway on status assessment and status reports on the marine environment will be an important contribution to making a cost-effective contribution to international work. At the same time international co-operation will give us a broader-based and better description and assessment which increases our understanding of the environmental situation in our own maritime areas. Our large marine ecosystems, the North Sea, the Norwegian Sea and the Barents Sea, are shared with other countries. Joint assessment and understanding of the state of the marine environment will be pivotal to good co-operation based on the ecosystem approach to management of these ecosystems.

2.3.3.2 *Development of environmental quality objectives*

The goal of integrated management of the coastal and maritime areas assumes the establishment of goals for the state we want to achieve for the ecosystems. This will make it possible to control effects and to plan initiatives to ensure clean and abundant seas.

We need a thorough knowledge of the structure, workings and state of the ecosystems to be able to fix environmental quality objectives for the coastal and maritime areas. The objectives for the different areas and ecosystems have to be fixed in relation to the quality of the environment in a corresponding ecosystem as unaffected as possible by outside factors. In fixing the objectives for the requisite environmental quality we must first know about the state of the environment in nearly unaffected areas. Integrated management involving assessment of different effects in the overall context demands a great deal of knowledge of the interplay between different forms of human influence and variations in natural factors.

Box 2.4 Environmental quality and environmental quality objectives

The quality of the environment in an ecosystem is an expression of the state of the system. It comprises the biological, physical and chemical circumstances, including the results of human influence.

Environmental quality objectives for an ecosystem indicate the condition we would like the system to be in as compared to the reference level. The reference level indicates the quality of the environment in a corresponding ecosystem, which has been affected to the least possible extent by outside factors.

Norway has along with the Netherlands been lead country for OSPAR work on developing criteria and methods for establishing marine environmental quality objectives. Initially such objectives are to be developed for the North Sea in collaboration with the international Council for the Exploration of the Seas (ICES). It has been proposed that objectives be fixed for a number of components in the ecosystem which together will contribute to conserving the productivity of the ecosystems along with their diversity. The first proposals for concrete environmental quality objectives will be presented at the Fifth North Sea Conference.

2.3.3.3 *Local commitment and sectoral responsibility*

The Government will aim at active participation by all parties concerned in the management of the maritime and coastal areas, while at the same time attributing the responsibility for management to the lowest appropriate level. The Government will fix the framework for management of the parts of the environment, which are of national significance, in the overall management plans, while activities and resources of primarily local significance to the environment should be managed locally.

The Government intends to continue the work on developing an environmental protection policy which spans all sectors and which aims at harmonized use of means available across the board. At the same time the Government attaches great importance to dissemination of information and to clarifi-

cation of national objectives and priorities for local authorities and trade and industry.

2.3.3.4 International co-operation on ecosystem-based management

A vital ingredient of ecosystem-based management of coastal and maritime areas is extensive co-operation with other countries and in particular with coastal states in our immediate vicinity. The Government therefore sets great store by international co-operation and negotiations. Chapter 4 refers in general terms to international work in the field of the marine environment.

In conjunction with co-operation in the North Sea area and within the context of the OSPAR Convention, Norway plans to work to promote the initiatives necessary to establish and meet environmental quality criteria for the North Sea and other maritime areas and to establish an internationally co-ordinated management based on the ecosystem approach. Norway will therefore continue to set its sights high in the context of the OSPAR Convention, North Sea co-operation and promotion of the ecosystem approach based on common environmental quality objectives. International co-operation in the management of living resources is also an area where Norway is anxious to promote the ecosystem approach based on scientific advice. Negotiations on fishing quotas with the EU and Russia among others represent a considerable challenge in terms of maintaining the total catches at a defensible level.

Joint research projects to support an ecosystem approach to the management of the North Sea will be given priority in co-operation with the EU and other countries around the North Sea.

ICES offers advice on the fixing of quotas in the area of fisheries management. With ecosystem-based management we will need to make more use of ICES as a scientific advisor and as a neutral body basing itself on scientific findings.

2.3.3.5 Follow up of results

On the basis of experience gained from an integrated management plan for the Barents Sea the Government plans to carry out frequent assessments of trends in the marine ecosystems and the management of these systems. Any such status report will have to include proposals for initiatives, changes in priorities and a possible revision of the objectives. The process must involve experts from all relevant scientific areas and on the basis of the assessments and recommendations made the Government will undertake a review of the status and the need for initiatives. A report of the results will then be presented and proposals for the necessary initiatives will be put before the Norwegian Parliament in the appropriate way; for instance through the Parliamentary Report on the Government's Environmental Policy and the State of the Environment. The review will be in line with the reporting requirements linked to compliance with the water framework directive and the OSPAR Convention.

3 Trends and initiatives in selected areas

3.1 Introduction

This chapter discusses a number of areas and sources for which a new policy is needed and/or which have not been dealt with thoroughly in previous proposals to the Norwegian Parliament.

3.2 Petroleum exploitation

Introduction

For a long time the oil industry has been a major contributor to the Treasury and to general prosperity. In the nineteen nineties this sector of activity made up 14 % of the Gross National Product (GNP) and 34 % of the total value of exports. In 2000 and 2001 this proportion was considerably larger, namely 23 % and 47 %, although this is largely attributed to higher prices of oil.

Ever since oil exploitation activities started on the Norwegian part of the continental shelf 30 years ago the authorities have been anxious to ensure that this industry co-exists peacefully with other branches operating in the maritime areas. Furthermore, since the very beginning of the oil industry in Norway an important requirement has been that it should operate within defensible environmental limits. Petroleum exploitation operations are gradually moving northwards, closer to the coast and vulnerable areas. In confronting the challenges associated with this trend it is important to build on experience already gained and to use the tools already developed. It is also important to ensure a solid basis for decisions relating to

Figure 3.1 The Sleipner platform in the North Sea.
Photo: Statoil

petroleum exploitation in the maritime areas stretching from the Lofoten Islands and northwards. The Government wants to achieve this through, *inter alia*, carrying out an impact assessment of year-round petroleum exploitation in these areas.

Technological development will also play an important part in terms of future challenges facing the oil industry with regard to profitability, co-existence with other branches of activity and future operations in the more vulnerable areas. There has been significant technological progress since oil production began in the Ekofisk field in 1971 and up until the present day. There are now safer and more environmentally friendly solutions for development. Continued focus on the environment when developing new, more cost-effective solutions will also mean reduced emissions into the air and reduced discharges into our waters.

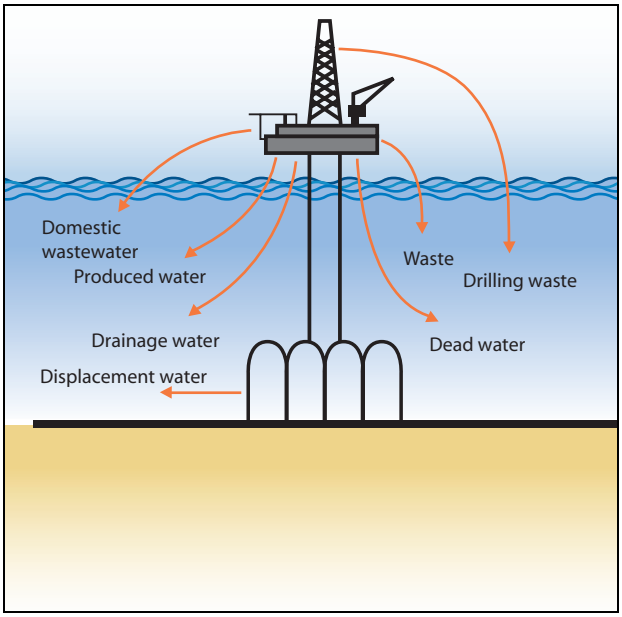

Figure 3.2 The figure illustrates discharges into the sea from an oil installation.

Source: Oljeindustriens Landsforening (Norwegian Oil Industry Association)

3.2.1 Discharges into the sea

The Norwegian maritime areas are exposed to pollution from operational discharges and accidental spills of oil and chemicals from land-based sources, shipping and petroleum exploitation. It has, however, been estimated that petroleum operations are only responsible for a small percentage of the inputs of oil from all the countries around the North Sea; the biggest source of pollution is discharges via the major European rivers and run-off from the soil. Natural leakage of oil from below the seabed is a significant source. Inputs from land-based sources mainly affect the areas close to the coast, while oil spills from shipping and petroleum exploitation are of greater significance out to sea.

Discharges of oil-based drilling fluids were previously the most important source of oil pollution from the petroleum industry. Drilling fluids adhered to the rock masses displaced from the boreholes (drill cuttings) and discharged onto the seabed around the drilling installations. This had a significant impact on the seabed and led to major changes in the populations of benthic species. Changes were registered over up to 100 km^2 around some of these installations. The marked changes in animal life was primarily blamed on the oil in the drill cuttings and a ban on the discharge of drill cuttings containing oil was therefore introduced on the Norwegian continental shelf in 1991. The old heaps of cuttings predating that ban will, however, continue to have an impact on the seabed for a long time to come and the industry is now engaged in extensive investigations of what should be done in this regard.

The biggest discharges from the petroleum industry today come from produced water. The oilfields contain both oil and water and as the oil deposits shrink the voids are filled with increasing amounts of water. Most of the older fields therefore produce considerably more water than oil. This water is separated from the oil and discharged after treatment. With the treatment techniques currently available it is mainly the dispersed fraction (drops of oil) of the oil which is treated, achieving an average level of 23 milligrams of oil per litre of produced water. The treatment techniques used today only remove the most hazardous compounds in the oil such as phenols and polycyclic aromatic hydrocarbons (PAHs) to a small degree.

Most substances hazardous to the environment, which are discharged during the operational stage, are discharged in conjunction with produced water. In addition to the chemicals that have been added, produced water contains a wide range of natural components originating from the deposits, including naturally occurring radioactive substances, heavy metals and other hazardous substances. A large number of chemicals are in use today during the different phases of petroleum exploitation activities. Approximately 98 % of the substances discharged are, however, regarded as non-toxic or only slightly toxic to the environment. Chemicals are discharged in connection with drilling operations and in produced water. In addition, smaller amounts of chemicals are discharged

Box 3.1 Alkylated phenols in produced water

Alkylated phenols are aromatic components found in oil, which partly dissolve in produced water. Laboratory experiments at the Institute of Marine Research in 2000/20001 showed that a range of alkylated phenols present in produced water can have serious endocrine disrupting effects on cod even in low concentrations. Their presence led to a change in the hormonal balance of the fish and a reduction in the amounts of milt and spawn. If we extrapolate these results to apply to natural conditions and other fish species, we can see that such discharges can have long-term effects on ecosystems and fisheries in the maritime areas where they occur.

when cleaning pipes. As the age of the fields increases so does the need to add more types of chemicals and in larger quantities as a result of the growing production of water.

It is difficult to phase out hazardous substances which are present as contaminants in drilling components otherwise fairly harmless to the environment (such as barite) and of course in produced water. In the case of drilling fluids, weighting chemicals can be replaced to a certain degree by substances containing fewer elements harmful to the environment. As far as produced water is concerned both better treatment technologies and new techniques for the evacuation of discharges of produced water may be on the agenda for the future. With the exception of copper, the objectives fixed for discharge of hazardous substances on the priority list (see Parliamentary Report No. 58 (1996–97) pp. 62–63) will be achieved for chemicals added to products in the oil sector.

Today relatively small amounts of environmentally hazardous drilling fluids are used if drill cuttings (rock mass displaced by the drilling operation) need to be discharged. However, these discharges are not entirely without harmful effects, and in areas with coral reefs the discharge of rock masses as such can be a problem because the coral can be damaged through smothering. The commonest weighting chemical in drilling fluids, barite, can be found today in bottom sediment right inside the Skagerrak and in the outer part of the Oslo Fjord. This gives an indication of how fine particulate material from oil drilling operations can spread in maritime areas.

Very little is known about the possible long-term effects of the chronic impact of discharges. The Government is therefore anxious to step up research and monitoring associated with the long-term effects of discharges and one of the ways it intends to do this is by launching a research programme to study the long-term effects of discharges from the oil industry into the sea.

As a number of fields on the Norwegian continental shelf are closed down the question arises as to how decommissioned offshore installations are to be disposed of. This is also an area with a lot of attention at international level. In 1998 the OSPAR Commission adopted a decision imposing a general ban on disposal of installations at sea (simply abandoning them there or dumping them). Waivers may be granted for the chassis of large steel platforms, large concrete installations and in exceptional cases when the overall assessment is that there are compelling reasons for disposal at sea. In such instances consultations must first take place with the other contracting parties (see Parliamentary Proposition No. 8 (1998–99) for further details of the decision). In accordance with the OSPAR decision most of the decommissioned installations in the Norwegian sector will be towed ashore for re-use or recycling. The Government takes the view that it is important to show consideration for the environment and for other users of the seas when it comes to disposal, and that having a rule whereby installations must be towed ashore, helps to return the maritime areas in question to their original state.

3.2.2 Trends

Environmental challenges in and among the different oil producing areas, *i.e.* the North Sea, the Norwegian Sea and the Barents Sea, vary.

The North Sea and the Norwegian Sea

The North Sea is the oldest and most mature of the oil-producing areas on the Norwegian continental shelf. With the exception of the Skagerrak the whole of the North Sea is open for oil exploitation. The oil industry has been present in this area for over 30 years and in 2000 oil and gas production in the North Sea represented a good 80 % of the total petroleum production in the Norwegian sector. The potential for finding large new deposits is, however, declining in this sector.

In the case of the Norwegian Sea the challenges are linked in particular to fisheries, sea birds and coral reefs. The areas off the Lofoten Islands and the area off the coast of Møre are judged to be particularly vulnerable in this regard. To tackle these challenges the Government will be introducing a range of different initiatives, including block-specific conditions in connection with awarding of concessions, along with surveys and research of a more general nature.

A number of block-specific environmental and fisheries conditions were set in connection with the seventeenth round of awarding concessions. Stringent limitations have been set in a number of the areas concerned with regard to seismic surveys and prospecting drilling. This has been done out of consideration for the sea birds and fish stocks. At the same time it is true to say that very strict limits have been fixed for the prospecting and production phases with regard to discharges of produced water (zero discharges of produced water). Limits have also been set for the number of test drillings that may take place simultaneously. In addition, the Government, still in connection with the seventeenth round of awards of concessions, will be extending the existing biological monitoring of living marine resources in the Norwegian Sea in order to chart the possible effects of petroleum operations. A dedicated monitoring programme has been proposed and further details of this are to be given in the parliamentary report on petroleum operations coming soon. The authorities also want the concessionaires to make suggestions for a programme to chart the presence of sea birds in connection with any plans for extension or new operations.

The Barents Sea

The southern part of the Barents Sea was opened up in 1989, cf. Parliamentary Report No. 40 (1988–89) on opening up the Barents Sea for oil prospection. Up to now 59 test wells have been drilled and according to the Norwegian Petroleum Directorate it is no more complicated to drill in the Barents Sea than in other parts of the Norwegian continental shelf. However, the areas around the Lofoten Islands and northwards from there contain some of the world's most important resources in terms of fish, sea birds and marine mammals. The physical and climatic conditions make the ecosystems very vulnerable to any impact, and the Government is

Figure 3.3 Sea birds are vulnerable in the presence of oil spills. The areas off the Lofoten islands and the Møre coast are judged to be particularly vulnerable. Puffins on Værøy Island.

Photo: Bård Løken/NN/Samfoto

therefore of the opinion that an impact assessment of year-round petroleum exploitation should be carried out for the areas stretching from the Lofoten Islands and northwards.

The Barents Sea (North of 74° 30') is not open for prospecting operations. An investigatory programme for the area was drawn up by the Ministry of Petroleum and Energy in 1991, but no impact assessment of the consequences of petroleum exploitation for the area has been undertaken. Many of the surveys planned pursuant to the investigatory programme were, however, carried out and the results of these are presented in a synthesis report.

3.2.3 Measures

The Government intends:

- to ensure that the objective of zero discharges into the sea is achieved;
- to start a research programme in co-operation with the industry to study the long-term effects of discharges into the sea from petroleum exploitation operations;
- to maintain a high level of safety and emergency services in the petroleum exploitation sector;
- to carry out an impact assessment of year-round petroleum exploitation operations in the maritime areas stretching from the Lofoten Islands and northwards. Until a plan is in place the Barents Sea will not be opened up further for petroleum exploitation; and
- to carry out an assessment of possible petroleum-free fisheries zones in the area from Lofoten and northwards from there.

The authorities' objective is to strike a good balance between petroleum operations and environmental and fisheries-related considerations and to ensure that the oil industry is integrated into an overall model for co-existence with other branches and areas of interest even in the northern maritime areas. Another goal has been to ensure that discharges into the sea from petroleum exploitation damage the marine environment to the least possible extent. These are challenges, which will also be confronting the oil industry in the context of future operations and are particularly pertinent in the northern maritime areas.

Zero discharges of potentially hazardous substances into the sea

Over the past 15–20 years Norway has introduced increasingly stringent rules regarding the discharge of oil and chemicals by the petroleum industry. These days there are strict requirements regarding documentation on the content of environmentally hazardous substances present in the chemicals operators plan to use. There are also strict requirements relating to which and what quantities of chemicals may be used and discharged from each and every offshore installation and in each area of operations. The operators have an obligation to reduce discharges in accordance with specific requirements drawn up by the authorities and in accordance with the plans they have filed. However, these requirements do not cover discharges of naturally occurring environmentally hazardous substances in produced water.

Parliamentary Report No. 58 (1996–97) on environment protection policy for sustainable development fixes the objective of zero discharges of oil and chemicals potentially hazardous to the environment into the sea. This objective became immediately applicable for all new developments, while for existing fields a step-by-step plan was established for achieving the objectives. In 2000 operators reported the results of a survey of existing installations and suggested further measures designed to achieve the goal. By 2003 all companies operating in this branch must have at least provisionally achieved the objective with regard to all their discharge activities and definitive measures must be implemented by 2005. The Government is anxious to ensure that the goal of zero discharges of environmentally hazardous substances into the sea is achieved. The goal applies to oil and chemicals in produced water, both those added and those occurring naturally. The objective requires the development of new technology and initiatives to make this possible. The Government presumes that companies with operations in the Norwegian sector of the continental shelf will give priority to the development of technology capable of avoiding or reducing discharges. Further efforts will be made on the part of the Government in the field of environmental research; for instance, improving capacity to deal with the challenges that exist at the interface between petroleum exploitation activities, fisheries and the environment will also be an important contribution towards achieving the goal of zero discharges.

The OSPAR Commission has adopted a recommendation (which is not legally binding) in respect

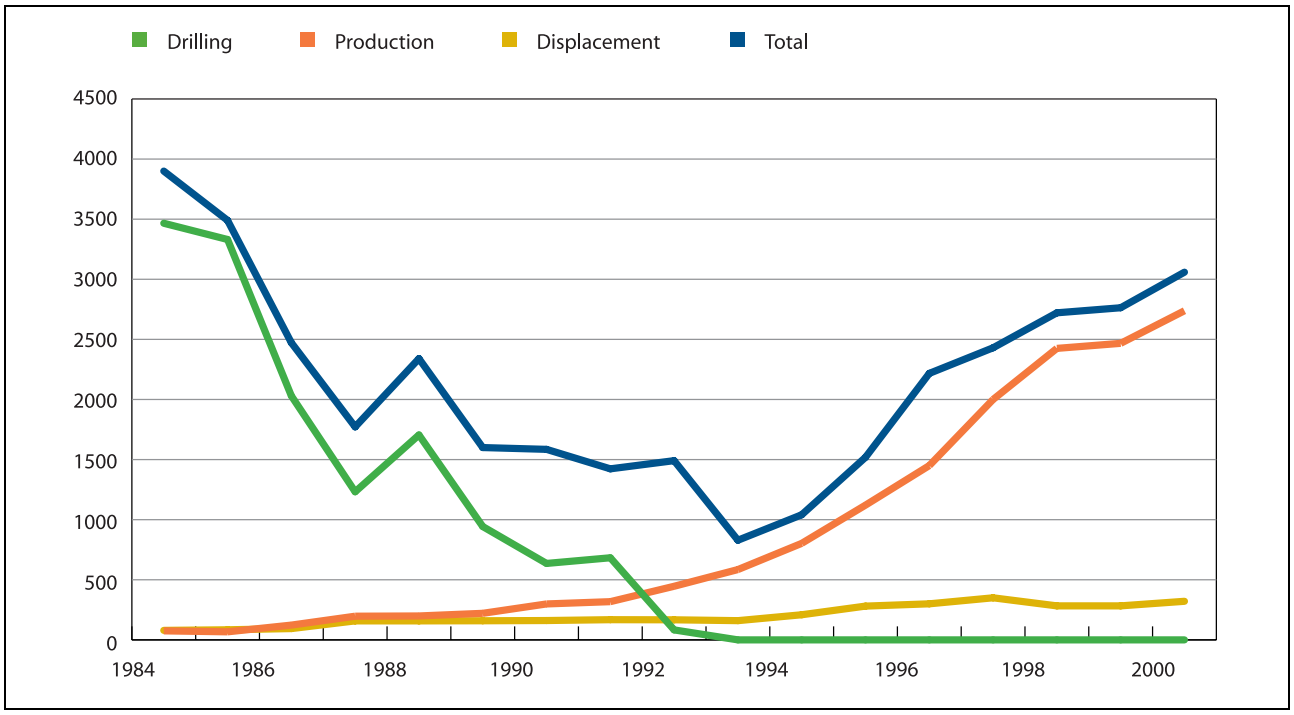

Figure 3.4 Operational discharges of oil from petroleum exploitation activities in the Norwegian sector of the continental shelf.

Source: Norwegian Pollution Control Authority

of produced water. This recommendation states that the oil content in this water must not exceed 40 mg/l and that it may not exceed 30 mg/l as of 2006. The average content of dispersed oil in produced water discharged in the Norwegian sector is today less than 25 mg/l. The recommendation also suggests that the goal regarding the total amounts of oil discharged via produced water should be to reduced by 15 % for the countries concerned by 2006 (the year 2000 being the reference year). Given the technology currently available it will be a major challenge for Norway to achieve this objective.

New technologies that can help further reduce the potential loads on the environment generated by discharges from petroleum exploitation operations are being developed; both new technologies to enable better treatment of produced water and new technologies which reduce water production or remove the need to discharge produced water. The technologies used in the different oilfields will depend on a number of parameters specific to the individual fields. As a rule, there is greater scope for choice of new technologies in the case of new installations than in existing fields.

Reinjection of produced water may prove to be a cost-effective measure in fields where the water can be used as a water drive, but at the moment only about 9 % (figure for 2000) of the produced water is reinjected. According to forecasts this percentage will increase, but hardly enough to put a stop to the increases in discharges, which amount to around 20 % per year. Separation of oil and produced water on the seabed is a new technique now being successfully tested in the Troll field. This may prove to be an important new means of reducing discharges of produced water. Separation inside the borehole is also being tested and may possibly prove to be the most effective means of dealing with the problem, if a reliable technique can be found to do this. A pilot project, which will be needed for further developing and using the technology, will probably be launched in the Norwegian sector in 2002/2003. This will involve separating the oil from the water and only extracting the oil, while the water is returned to below the seabed whence it came. But even with such technologies on hand there will still be water needing to be treated and then discharged because the technologies selected seldom are 100 % effective. Work on better treatment techniques will therefore need to continue in parallel with the development of other approaches.

Long-term effects of discharges into the sea from the petroleum industry

There is broad agreement as to the fact that there are gaps in what is known about the long-term effects of discharges into the sea and that work in this area should be organised in a more suitable way. Parliamentary Report No. 39 (1999–2000) on the oil and gas industry announced a bigger and more co-ordinated effort to improve fundamental knowledge of the long-term effects of discharges into the sea. A working party comprising representatives of the research community, the authorities concerned and industry has been looking at where there is the most acute need to find out more and at how co-operation can be organised in a more rational way than was previously the case.

This broad-based working party identified research subjects associated with the problem of the long-term effects of discharges into the sea from the offshore sector and came to the conclusion that the need for research is particularly acute in this area. The following areas were listed in a note to the Research Council of Norway in order of priority:

- Effects in the water column (water masses)
- Relationship between research and monitoring
- Special research projects in the Arctic
- Ongoing discharges of drill cuttings
- Long-term effects of acute discharges

A number of particularly important research areas were listed under each focal point.

The Government feels that it is particularly important to learn more about the consequences of discharges into the sea from petroleum exploitation activities in the longer term and now wants on the basis of recommendations made by the working party to launch a research programme on the long-term effects of petroleum exploitation activities in collaboration with the industry under the auspices of the Research Council of Norway. This will help improve the basis for decisions on the part of the authorities.

Acute discharges

In recent years we have recorded a decline in the number of acute oil spills both from shipping and petroleum exploitation activities. 203 acute oil spills from the petroleum industry were recorded in 2000, corresponding to 35 m^3 of oil. The figures for shipping were 65 oil spills corresponding to 272 m^3 of oil. Acute discharges of chemicals from petroleum exploitation activities have shown a slight increase over the last few years and number just over 100. However, the quantities involved rose from 403 m^3 in 1997 to 956 m^3 in 2000, but most of the spills involved compounds which represent a relatively minor hazard to the environment.

Most of the serious oil spills in Norway have occurred in conjunction with shipping accidents near to the coast. No major, acute discharges from petroleum exploitation activities have occurred since the Bravo accident in 1977. This is attributed among other things to the strict safety requirements and better monitoring both by the authorities and the operators. New regulations on health, environment and safety aspects of petroleum exploitation activities came into force in January 2002. These provide the supervisory authorities with a better basis for total control and regulation, for instance when it comes to assessing the different interests linked to the external environment and to the lives and health of workers.

As was noted earlier in this Parliamentary Report, petroleum exploitation activities are on the move and are to be found closer to the coast and further to the north. In the Barents Sea a combination of a long season in darkness, low temperatures and at times bad weather could make it difficult to take effective action in the case of oil spills even though weather conditions seen in isolation are not much different from those prevailing in the Norwegian Sea. Natural breakdown of oil and chemicals will also be slower than further south. The Government considers it essential to maintain a high level of safety and preparedness in the petroleum exploitation industry in order to avoid acute spills and to be prepared to deal with any acute spills from that source.

Impact assessment of year-round petroleum exploitation activities in the maritime areas stretching north from Lofoten

Investigations of consequences are carried out to ensure that the authorities and concessionaires have the best possible basis for decisions when assessing whether petroleum exploitation should be attempted and, if so, how best to go about it, while also consulting the different stakeholders and circles involved before a decision is made. In investigating consequences an assessment is made of the effect the initiative envisaged will have on society, the natural surroundings, the environment both out to sea and on land and on relations with other branches of trade and industry. The authorities concerned, professional and industrial bodies

and the general public are also involved in the exercise. The Government takes the view that it is vital to conduct an assessment and to weigh up the interests of different stakeholders in the areas where petroleum exploitation may collide with important environmental interests. This applies, *inter alia*, to the Barents Sea.

Before opening up an area for petroleum exploitation activities the authorities investigate what the consequences of prospecting activities will be. First, they draw up a survey programme which any other authorities concerned are given the opportunity of commenting on along with professional and industrial bodies. Once this has been done, the Ministry of Petroleum and Energy adopts the survey programme and as soon as an investigation has been conducted into the consequences the results are sent to a broad circle of interested parties for comment. This is a central component in the basis for deciding whether to open up an area or not. Once the survey of the consequences is complete a further decision is made specifying special measures or limitations on prospecting activities to apply in given areas, *e.g.* limitations on drilling, limitations on discharges, requirements to use a special technology *etc*.

Parts of the Norwegian sector of the continental shelf were opened up for petroleum exploitation activities at an early stage without any assessment having made of the potential effects of such activities and of discharges on the environment. The Petroleum Act of 1985 contains rules stating that the consequences of prospecting activities must first be investigated before any new areas may be opened up. Further, the consequences of installations and their operation must be studied in connection with any plans for expansion or operation of individual fields. Later, it has become possible for operators to carry out regional studies of possible consequences of existing and planned operations.

The first survey of consequences of opening up new areas following the passing of the Petroleum Act of 1985 was carried out on prospecting activities in the southern part of the Barents Sea and the results of this were presented in 1989. However, parts of the area had already been opened up back in 1980 including the segments where the Snow White field was discovered in 1984. Now, in addition to the surveys of specific oilfields which concessionaires must carry out prior to development, the Government now wants to conduct an impact assessment of year-round petroleum exploitation activities in the maritime areas from Lofoten and northwards with a view to establishing a better and more comprehensive basis for decisions. This should be seen in the overall context of other activities in the area and of the work being done on producing an integrated management plan for the Barents Sea.

Up to the present day a total of 25 extraction permits have been issued in the Barents Sea including seven permits for the area covered by the Snow White field. Most of the test wells have been sunk in or very close to the Hammerfest Basin. Prospecting in the Barents Sea has cost a total of NOK 28 billion and has led to important finds; the Snow White field in 1984 (gas, condensate and oil) and the Goliath field in 2000 (oil).

It is only natural that the impact assessment for the northern maritime areas should be based on extensive mapping and on available information. At the same time it is important for the process to be transparent and for all interested parties to have an opportunity to express their views. This needs to be done to ensure, *inter alia*, that all subjects of importance are included in the impact assessment.

The purpose of this assessment is to look at the consequences of existing petroleum exploitation activities and of any expected operations in the future in the northern maritime areas in the overall context. This review will lay the foundations for assessing the framework conditions for further petroleum exploitation activities in the area.

No new permits for petroleum exploitation in the northern maritime areas will be granted until the impact assessment has been completed. As far as areas where permits have already been awarded are concerned, the Government is assuming that the work on investigating the consequences of oil exploration and on the integrated management plan will not affect the legal rights of concessionaires who have already been awarded permits.

Petroleum-free fisheries zones

As far as possible the authorities are anxious to base future petroleum exploitation activities in the maritime areas from Lofoten and northwards on the co-existence model which has been the point of departure up to now for the joint use made of the maritime areas by different branches. The Government's aim is for petroleum and fishing resources in these areas to contribute to the long-term prosperity of Norwegian society. A further objective is to ensure that consideration is shown towards vulnerable resources to ensure that all industrial activity takes place within a sustainable framework. We have long experience of a smooth co-existence between the petroleum exploitation industry and

the fishing industry, and the authorities assume that this will continue to be the case when new areas are opened up for petroleum exploration. Insofar as situations should arise whereby it appears impossible for the two branches to co-exist peacefully, the Government will consider establishing petroleum-free fishing zones. This will be one of the central components of the integrated management plan for the Barents Sea. The impact assessment of year-round petroleum exploitation activities planned for the areas from Lofoten and northwards will provide important background material for the integrated management plan in this regard, along with the impact assessment conducted in the other sectors.

3.3 Shipping/safety and emergency services along the coast

3.3.1 Threats and trends

Transport by ship is generally a safe and environment-friendly form of transport. The use of the sea and the coast as a transport artery is of great importance to trade and industry and communities the length of the coast. Shipping is, however, a potential source of major oil spills. This is why it is important to ensure that the environment is safe when planning to use shipping as a means of transport.

Spills, which are a result of shipping accidents, often occur close to the shore. Up to now Norway has been spared major pollution disasters, but in other parts of the world there have been accidents, which have had major consequences for the environment. The last major accident occurred when the tanker the «Erika» sank off Brittany in France in December 1999. This accident led to 20 000 tons of oil leaking into the sea. Clean-up costs amounted to the equivalent of almost 2 billion kroner.

The wrecks of the vessels the «Green Ålesund» off Haugesund and the «John R» to the north of Tromsø last winter showed that there is a major risk of shipping accidents even along the Norwegian coast, and it is a fact that if shipping increases so will the risk of shipping accidents. As to the transport of oil, we may expect more of this category of traffic in the northern areas as a result of plans to increase petroleum exploitation activities in the Barents Sea and in Northwest Russia. A report by the Norwegian Pollution Control Authority (SFT) and a Russian research institute relates that there are plans for weekly transports of crude oil as of 2005. The activity is expected to increase

Figure 3.5 50 % of all grey seal pups born in Froan outside Fosen in the district of Trøndelag get oil on their coats in the course of their first three weeks of life. Froan is breeding site for grey seal.

Photo: Morten Ekker

gradually over the next few years and it is forecast that by 2010 there will be 2–3 large tankers steaming along our coast every day.

It is reasonable to assume that the increase in petroleum activity will also lead to a considerable increase in the transport by sea of prospecting and production equipment to the northern region. Norwegian supply bases and ports along our coast may be given a role to play in connection with this shipping activity. Initiatives have also been started to develop sea transport as an attractive form of transport to and from Northwest Russia on a more general basis via what is known as the «Northern Maritime Corridor» (NMC). Altogether this may lead to more shipping traffic – and not just coastal, but also to and from the ports in Northern Norway.

There is also a possibility of imports of spent nuclear fuel from countries in western Europe to reprocessing plants in Russia and in this case transport by sea along the coast of Norway would be one alternative.

The increased risk must be countered by introducing preventive measures and by being prepared for emergencies so that damage to the environment can be limited if an accident does occur.

3.3.2 Measures to improve safety and preparedness for emergencies along the coast

The Government intends:

- to investigate the consequences of increasing the territorial waters from 4 to 12 nautical miles with a view to putting a Parliamentary Proposition before the Storting as soon as possible;
- to establish mandatory lanes for shipping representing a risk to the environment;
- to press for international rules involving an obligation to give prior warning of cargoes representing a risk. Pending agreement on international rules the Government intends to raise the issue of prior warning agreements for such cargoes with Russia;
- to step up maritime traffic control and monitoring;
- to assess how tugboat capacity in northern Norway can be increased;
- to enhance preparedness for dealing with oil spills along the coast by ensuring better use and co-ordination of private and state emergency resources in the event of major cases of acute pollution; and
- to arrange for transfer of the Norwegian Pollution Control Authority's responsibility for the state-run emergency systems for handling acute pollution to the National Coastal Administration.

The Government takes the view that it is important to give priority to implementation of preventive measures so as to be able to avoid accidents with serious consequences for the environment.

Extending territorial waters and establishing obligatory shipping lanes

International law now contains provisions enabling coastal states to rule that their maritime territory shall extend to 12 nautical miles from the coast and the great majority of coastal states now have territorial waters extending 12 nautical miles or more from the coast. In Europe it is only Greece in addition to Norway whose territorial waters only extend to the 4 nautical mile limit.

Coastal states have greater scope for introducing provisions designed to avoid accidents inside their territorial waters than outside them. Extending Norway's territorial waters from 4 to 12 nautical miles would, *inter alia,* provide greater scope for checking on foreign vessels. Extending the limit of territorial waters also offers opportunities for establishing obligatory shipping lanes further out from the coast than is possible today.

An assessment is under way under the auspices of the Ministry of Foreign Affairs of what the consequences of extending the territorial waters to 12 nautical miles would be. The survey covers the legal and economic implications plus a number of technical issues. If this survey does not reveal circumstances which call for more detailed consideration, the Government will place a Parliamentary Proposition before the Storting as soon as the work has been completed.

Pursuant to legislation on ports and navigable waters the Government wants to establish obligatory shipping lanes for traffic representing a risk to the environment. The Ministry of Fisheries is to conduct a more detailed assessment of the level of risk along the coast and establish shipping lanes, initially for the areas where it is judged they will have the greatest impact in reducing risk. Shipping lanes for traffic off the coast of northern Norway should be viewed in the context of monitoring traffic in the area (cf. below).

Concluding early warning agreements for cargoes representing risks to the environment

The possibility of the transport by sea of nuclear waste along the coast of Norway on route to Russia

is worthy of special attention. If we are to have a better level of preparedness on the Norwegian side of the border with regard to such cargoes, we need to have early warning of individual shipments. A good coastguard system alone will not be sufficient to deal with this type of scenario. The same applies, *inter alia*, for towing of vessels from Russia for scrapping.

The Government intends to press for international rules involving an obligation to give early warning of cargoes representing a risk to the environment. Pending the advent of international rules and regulations the Government intends to raise the issue of an early warning agreement on such shipments with Russia possibly by extending existing early warning agreements.

Stricter control of maritime traffic

The National Coastal Administration is responsible for control of civilian maritime traffic. These duties along with its other duties make the National Coastal Administration the national contact point for information to and from shipping and it has a large pool of information on shipping to and from Norway and along the coast.

The National Coastal Administration is, *inter alia*, the co-ordination authority as far as the EU Directive 93/75 on the registration, storing and dissemination of all notifications of hazardous or polluting cargoes in Norwegian waters on vessels are concerned. The National Coastal Administration is also the national co-ordinator for navigation alerts (NAVCO) and thus a part of an international notification and communications system for warning of obstacles in navigable waters that can be a danger to shipping. Through its own notification and information system for shipping, ShipRep, the National Coastal Administration has access to a number of databases such as ships registers comprising more than 100 000 vessels, registers of dangerous or polluting types and classes of cargoes, Norwegian ports, boarding points for pilots, pilots *etc*. The National Coastal Administration has also concluded an agreement with the Ministry of Defence on cross-service co-ordination of the notification and information system on pilot requirements and arrival regulations.

Control of maritime traffic via the National Coastal Administration traffic control centres has up to now been concentrated on waters close to shore where the risk has proven to be higher. The traffic control centres control shipping traffic, enforce the shipping regulations and provide necessary information and guidance for vessels using the waters covered by the centres. As of 2003 Rogaland, the last of the four areas along the coast most exposed to risk and with the heaviest traffic, will fall within the National Coastal Administration's maritime monitoring and traffic control area. The Oslo Fjord, the Grenland area and North Hordaland are already covered by traffic control centres. The National Coastal Administration is also considering extending the area of responsibility of the Fedje traffic control centre in North Hordaland so that it would also cover the Port of Bergen area and the southern approaches via the Kors Fjord.

The National Coastal Administration has been given responsibility for developing and starting up a network in 2002 along the entire coastline for receiving AIS (Automatic Identification System for ships). This will also strengthen controls and monitoring of maritime traffic in territorial waters. The AIS will offer better monitoring of shipping in the areas now monitored by the traffic control centres and will enable monitoring of vessels sailing along the coast with hazardous or polluting cargoes on board. With AIS the National Coastal Administration will be able to monitor shipping which may be required to use the obligatory shipping lanes along the coast.

The Government will be giving high priority to the establishment of the National Coastal Administration network for receiving AIS signals. Once the National Coastal Administration has set up this AIS the Norwegian Defence and other parts of the Civil Service will have access where necessary to information from the network.

Monitoring of the coastal and maritime areas touches on the areas of responsibility of many parts of the Civil Service. The Norwegian Defence also play a significant role in maritime monitoring. A working party under the auspices of the Ministry of Defence is at present investigating how better co-ordination can be achieved and how it might be possible to develop the country's total monitoring resources with a view to meeting the needs of different parts of the Administration along with those of the Norwegian Defence more efficiently. In addition to monitoring it is essential for the authorities to have the means to intervene and to take the appropriate steps for instance in connection with shipping accidents involving hazardous cargo. Given the way in which the Norwegian Defence are organised and present along the coast they can provide valuable assistance to the civilian community in terms of emergency services in the coastal zone. The Government will be assessing monitoring needs on the basis of the report from the working party.

About traffic control in northern Norway

The Barents Sea and the Norwegian Sea are among the world's most productive maritime areas. At the same time the climatic conditions and the season of Polar night in these areas are extra elements of risk to shipping during a large part of the year. It has already been pointed out that there are particular challenges linked to future transports by sea off the coast of northern Norway. Being prepared for this development is important. Control and monitoring of traffic are important tools in the context of accident prevention.

At the moment the National Coastal Administration is studying the possibilities for establishing a traffic control centre for northern Norway. Possible use of the existing monitoring infrastructure established as part of the Norwegian Defence's chain of coastal radar stations in northern Norway will be one of a number of elements covered by the study. It still remains to be seen how the chain of radar stations could be used for control of civilian traffic. This is a significant point in respect of whether a decision is made to establish a traffic control centre and if so, where.

The Government takes the view that a control centre for maritime traffic for northern Norway should be established in a way which ensures a good basis for co-operation with the Russian authorities on safety issues and caring for the environment in northern waters. The traffic centres set up by the National Coastal Administration will be obvious, operational units and contact points for co-operation in the area of traffic control. The Government will therefore continue the assessment on whether to set up a traffic centre for northern Norway.

Figure 3.6 KV Svalbard, seen here at the quayside in Molde, is the Coastguard's newest and most modern vessel. It is to be put into service in the northern areas, i.e. in the Barents Sea and areas around Svalbard.

Photo: Lars Petter Skillestad, Forsvarets Mediesenter

About tugboat capacity in northern Norway

It has been pointed out in many different quarters that tugboat capacity is a weak link in chain of contingency arrangements in place for fighting acute cases of pollution in northern Norway. The best solution may be to link a certain tugboat capacity to the National Coastal Administration's traffic control system.

As of the summer of 2002 the coastguard vessel the KV Svalbard will be in regular service. This ship will operate in northern waters in particular and is capable of towing large vessels. Developments in petroleum exploitation in the Barents Sea may be expected to lead to supply ships with towing capacity also being stationed in that part of the country. This will help improve preparedness for emergencies.

The Government is to commission a more detailed assessment of how tugboat capacity in northern Norway can be improved.

Safety in the waters around Svalbard

In addition to the challenges associated with safe shipping traffic off the coast of northern Norway, safety at sea around Svalbard has been the subject of much attention. As this group of islands has its own legislation and infrastructure, initiatives in Svalbard require a separate assessment. The interministerial Polar Commission has therefore appointed a working party, which will report back to the Ministry of Justice on a future co-ordinated plan relating to maritime safety in the waters around Svalbard. The terms of reference for the working party are to assess all aspects of safety at sea, including possible initiatives in waters used by shipping. The group has been asked to produce an overview of the status of work already done or in progress in different parts of the area, to assess the need for further steps and to possibly make suggestions as to what they should be.

State contingency plans for combating serious pollution

Better organisation and co-ordination of work relating to safety and preparedness is important. As a first step the Ministry of the Environment has enshrined powers and state responsibility for contingency measures in the Pollution Act. Previously these powers and responsibility were shared bet-

ween the Norwegian Maritime Directorate and the Norwegian Pollution Control Authority (SFT). Now all these powers have been transferred to SFT with the Norwegian Maritime Directorate being part of SFT's action force as a maritime adviser.

The Government believes that there should be better co-ordination of contingency arrangements for fighting pollution disasters and of the preventive work being done by the National Coastal Administration, which has significant operational resources in this area.

An agreement on co-operation already exists between the National Coastal Administration and SFT. SFT's anti-oil pollution vessels are operated by the National Coastal Administration and are used on an everyday basis by the National Coastal Administration's lighthouse and beacons units. In the event of state action to fight serious pollution SFT takes over operational responsibility for the vessels. Nevertheless, the National Coastal Administration is responsible for a number of preventive functions in addition to the traffic centres referred to earlier. This is why the Government feels that it is only natural to view the SFT Department of Control and Emergency Response's operative responsibility in an organisational context together with the National Coastal Administration (cf. the description above of the role played by the National Coastal Administration in the field of traffic control and information).

The Government therefore takes the view that it is right to transfer SFT's responsibility for state contingency plans for fighting pollution accidents to the National Coastal Administration. SFT's Department of Control and Emergency Response is today based with the National Coastal Administration's District 1 Maritime Traffic Division for the Oslo Fjord in Horten. The reorganisation proposed will therefore not involve relocating SFT's Department of Control and Emergency Response and can take place without injection of fresh resources. SFT will continue to have the power to order local authorities and private enterprises to draw up contingency plans and will remain responsible for supervising that this is done.

The Government wants to strengthen state contingency plans for fighting oil pollution and to make them more efficient in the years to come. SFT is looking into how better use can be made of private and public emergency resources in major instances of acute pollution and how they can be co-ordinated better. SFT is also in the process of analysing the need for contingency plans in the northern part of the country in the light of the changes in the risk scenario.

3.4 Radioactive pollution

3.4.1 The threats

The levels of radioactive pollution in Norwegian waters are influenced both by present-day activities and by earlier discharges. Most of the input stems from nuclear testing in the nineteen fifties and sixties, the Chernobyl accident in 1986 and discharges from reprocessing plants for spent nuclear fuel. In addition, various naturally occurring radioactive substances have found their way into Norwegian waters as a result of petroleum exploitation activities and mining.

Just as important as the actual level of pollution is the risk of accidents, which could lead to extensive discharges and pollution of Norwegian areas. The most serious risk of discharges is associated with nuclear installations and stockpiles of waste in areas on Norway's doorstep, although nuclear-powered vessels and transport by sea of radioactive materials also represent a risk of radioactive pollution in Norwegian waters. The nuclear reprocessing plant in Sellafield is the most important source of discharges affecting Norwegian waters today. The large quantities of liquid, radioactive waste stored at the facility, also represent huge potential for leaks.

Of the different radioactive substances being discharged from Sellafield it is the discharges of technetium-99, which affect Norwegian interests most. These discharges rose sharply in the mid-nineties; they follow the marine currents in the North Sea and are swept up along the Norwegian coast. The discharges are measured along the West Coast of Svalbard and in the Barents Sea. The levels of technetium in seawater along the Norwegian coast and in marine organisms such as shellfish and sea weed have increased sharply since 1996. The British authorities plan to continue the discharges at the present level up until 2006 and the possibility of further rises in technetium levels along the coast of Norway cannot be excluded.

Even if technetium levels in Norwegian waters have increased many-fold since the mid-nineties, they are still very low and do not represent an immediate danger for the environment or health. However, no one is certain what the trends in these levels in marine organisms are likely to be over time.

The danger of major discharges as a result of accidents or terrorist acts directed towards nuclear installations is thought to represent a more serious threat to health and the environment than regular discharges. The main focus in recent years has

been on the risk associated with nuclear power plants, stockpiles of waste and decommissioned, nuclear-powered vessels in the former Soviet Union and in the Kola Peninsula in particular. Following the events of 11 September last year it has become clear that the stockpiles of liquid, highly radioactive waste from the reprocessing plant at Sellafield probably represent a greater threat.

Like the discharges from Sellafield possible shipments of nuclear waste through waters off the Norwegian coast is also a major source of concern. Such shipments may occur in connection with the import of spent nuclear fuel to Russia and as a result of plans to ship nuclear fuel from Japan to reprocessing plants in Western Europe via the Northeast Passage. These shipments between Europe and Japan today follow the southerly routes and have given rise to vehement protests from coastal states along the way. This is probably the main reason why those involved are now considering an alternative shipping route. With regard to import of spent fuel into Russia, it is for the moment unclear whether this will be transported by sea from the west via Norwegian waters. Russian imports of spent nuclear fuel from western European countries will generate huge political controversy and there is therefore little probability of it happening. Overland transport from former Soviet republics and Asian countries is thought to be more likely.

Shipments of nuclear fuel and highly radioactive waste by sea contain large amounts of radioactivity. There are nevertheless strict safety requirements for such transports and the danger of major discharges in the event of an accident is probably small. This is linked to the fact that the radioactive material is present in solid form and packed in special safety containers capable of standing up to extreme stresses. Over the 20 years during which this type of freight has been transported by sea no accidents have occurred. Nevertheless, the risk of shipwrecks and accidents is still present. But,

Figure 3.7 The Norwegian Pollution Control Authority's emergency services for combating oil spills at work with bilge pumps in Bleivika near Haugesund after the sinking of the vessel "Green Ålesund" in December 2000.

Photo: Statens Foruensningstilsyn (Norwegian Pollution Control Authority)

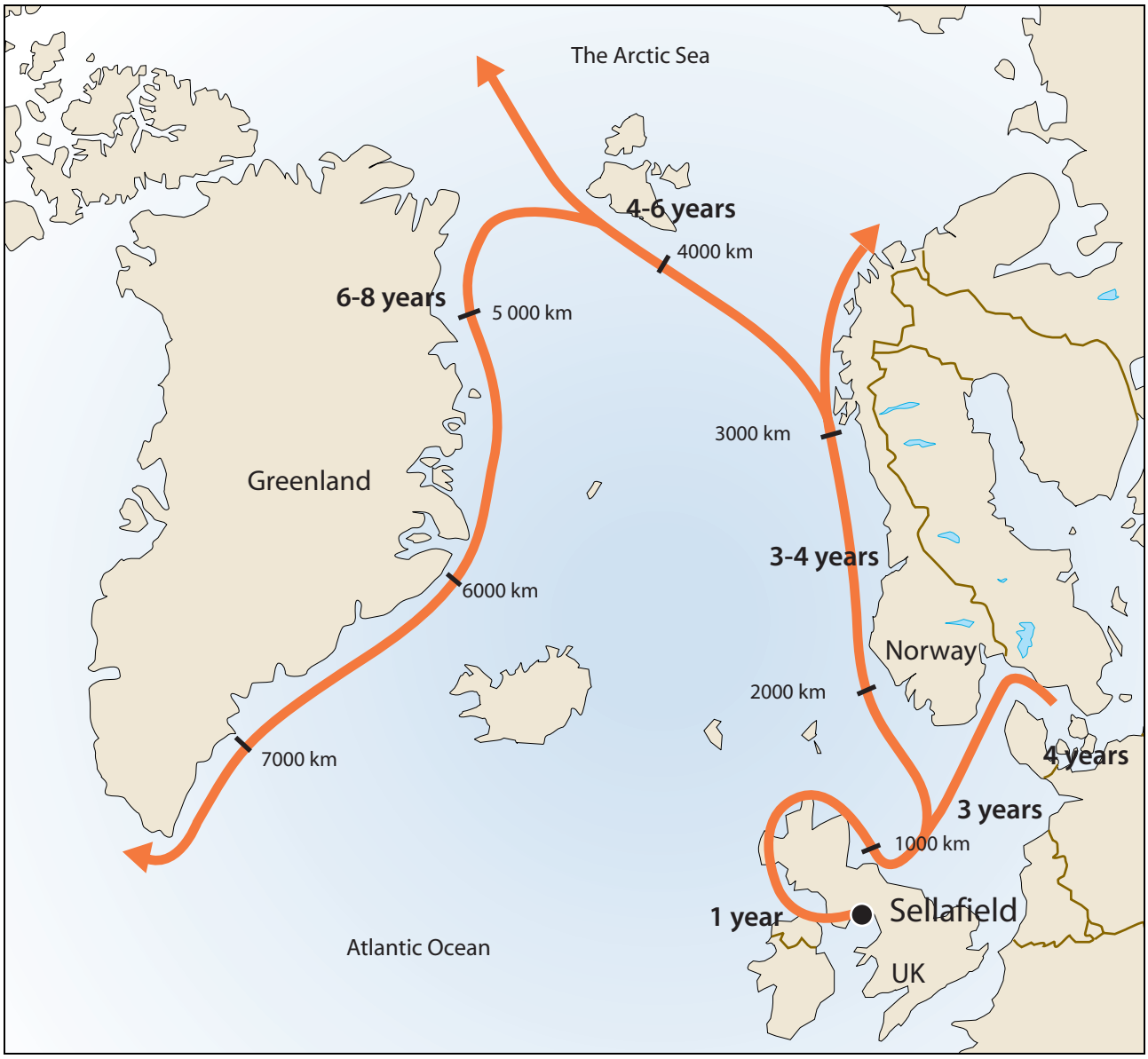

Figure 3.8 The map shows how caesium is carried from Sellafield by ocean currents. The route followed is the same as that followed by technetium. The map also shows how long it takes the caesium to reach the different areas once it has been discharged from the Sellafield facility.

Source: Arctic Monitoring and Assessment Programme

regardless of the actual risk of pollution, transport of nuclear materials along the Norwegian coast will still be capable of generating fear of marine pollution and uncertainty in coastal communities and consumers of seafood.

Even if the levels of radioactive pollution in the Norwegian maritime areas are low and do not represent any danger to the environment or health, it is still very important to achieve reductions soon. Little is known about the long-term effects and the discharges constitute a potential problem for the marketing of Norwegian seafood. The world market for fish and other products of the sea is extremely sensitive to real radioactive pollution and rumours of the same. Consumers are also increasingly focusing on «clean» food. Radioactive pollution of the sea is therefore highly undesirable and in conflict with vital Norwegian interests.

The main concern relating to possible major discharges resulting from an accident or terrorist attack on nuclear installations in areas adjacent to Norway is atmospheric fallout and the consequences for public health and the environment on land, although this could also cause serious pollution of the marine environment.

In the international context Norway is pressing for reductions in discharges of radioactive materials into the marine environment and for measures

to limit the danger of nuclear accidents, which could pollute Norwegian areas.

3.4.2 Measures

The Government intends:

- to maintain the pressure on the British authorities until the discharges of technetium-99 are finally stopped;
- to continue efforts in relation to the plan of action on nuclear issues;
- to press for better international agreements and legislation on the transport of radioactive materials;
- to step up monitoring of radioactive pollution in Norwegian waters; and
- to prevent radioactive pollution from national sources.

Pressure on the British authorities regarding the Sellafield case

The Government has put considerable pressure on the British Government in an attempt to persuade it to revise the Department of the Environment's decision to continue discharges of technetium-99 up until 2006. This pressure will continue until the discharges are stopped. The Government is also making an assessment of the scope Norway has for instituting proceedings against the British under the terms of international conventions. The Government has been in touch with Ireland in this regard. Ireland has sued the United Kingdom over the Sellafield case both under the terms of the Convention on the Law of the Sea and the OSPAR Convention. The Government also intends to continue to use the co-operation between the Nordic Environment Ministers to co-ordinate Nordic pressure on the British over the Sellafield case. In addition, the Government will be making use of the North Sea co-operation and co-operation within the framework of the OSPAR Convention and other relevant fora to put political pressure on the British authorities and to strengthen the arsenal of international agreements on radioactive pollution.

Plan of action for safety at nuclear installations in Northwest Russia

Norway contributes to the work on improving nuclear safety and reducing the danger of radioactive pollution from Russia and the countries of Central Europe via the plan of action on nuclear issues. Projects linked to the plan of action concern subjects such as management of radioactive waste originating from the scrapping of decommissioned nuclear submarines and improvement of safety at nuclear power plants in the Kola Peninsula, St Petersburg and Lithuania. A project entailing the modernisation and extension of a treatment plant for liquid radioactive waste in Murmansk was completed in June 2001. This project will make it possible for Russia to adhere to the London Convention ban on dumping of all types of radioactive waste at sea. The plan of action also involves projects designed to help the Russian environment protection and radiation protection authorities. The Government intends to continue the work in the context of the plan of action on nuclear issues with particular emphasis on safety at nuclear installations and management of radioactive waste and spent nuclear fuel.

Preventing discharges from sea transports of nuclear waste

The United Nations Convention on the Law of the Sea puts obstacles in the way of national legislation designed to stop shipping in its economic area, even if this involves the transport of substances hazardous to the environment. In addition to political and diplomatic efforts to avoid such transports being routed through Norwegian waters, the Government therefore aims to strengthen international agreements and legislation of relevance to the safety of such shipments, while also improving safety in shipping channels and national contingency plans. Norway has raised the question introducing international requirements on early warning and liability to pay compensation in connection with the transport of nuclear materials with the UN Commission for Sustainable Development and the general conference of the International Atomic Energy Agency (IAEA). The Government is also planning to raise the issue at the North Sea Conference in March 2002. It further intends to raise the matter of extending early warning agreements to cover the transport of crude oil and nuclear waste with Russia.

As to measures designed to improve safety at sea and contingency arrangements along the coast readers are referred to Chapter 3.3. A series of measures in this areas will help improve safety, if the transport of nuclear waste through Norwegian waters becomes a reality.

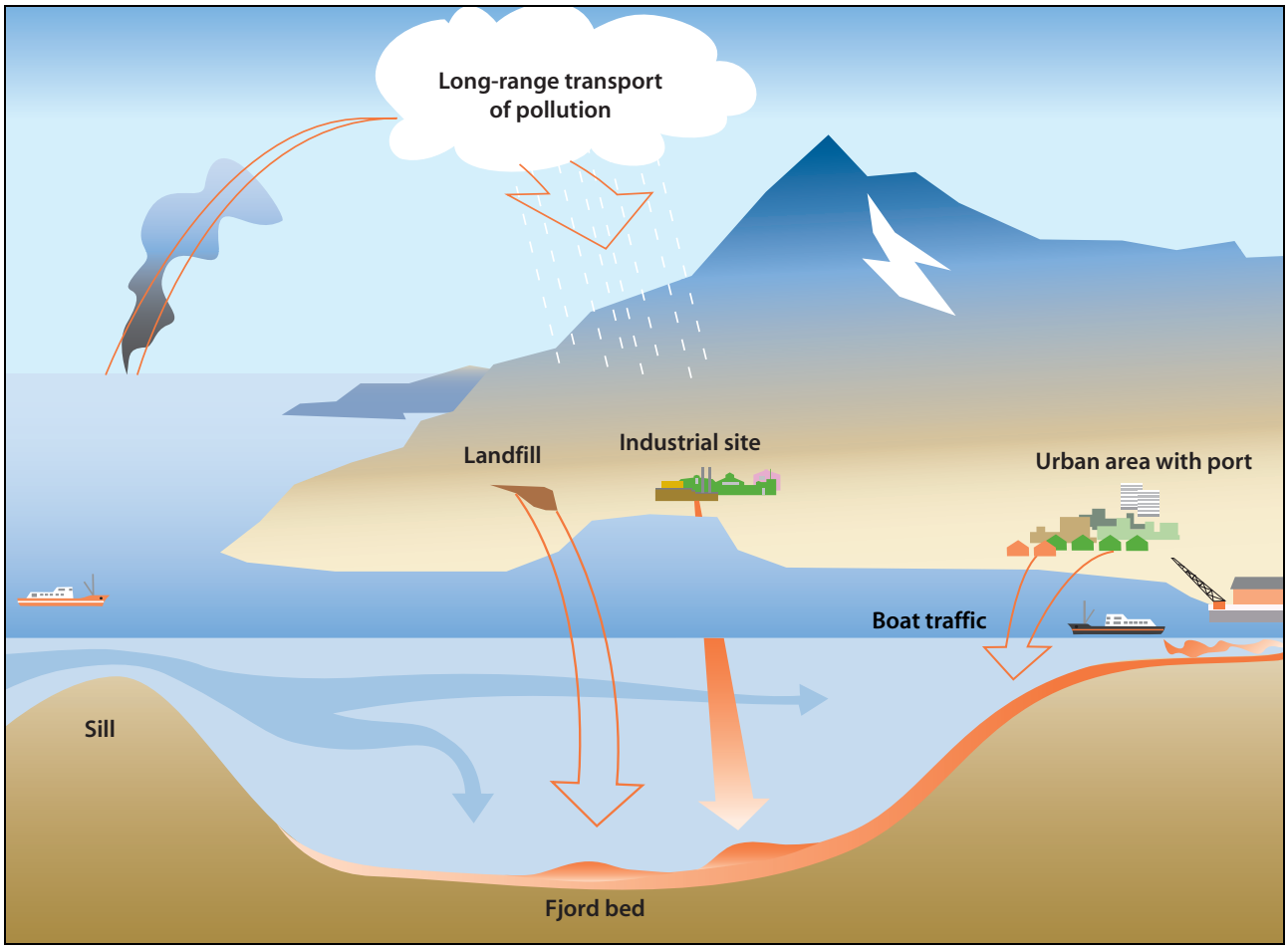

Figure 3.9 A sill fjord with sources of pollution for sediments. In fjords with submarine sills and thus a slow rate of water exchange discharges of ecotoxins will be retained and remain for a long time to come. Many of Norway's fjords fall into this category and this is something that makes pollution of sediments a particular problem for Norway.

Monitoring and documentation of pollution

An extensive monitoring programme has been established under the auspices of the Norwegian Radiation Protection Authority to document trends in radioactive pollution in Norwegian waters. The maritime component of the programme is being implemented in close collaboration between the Norwegian Radiation Protection Authority and the Institute of Marine Research. This monitoring is important for the purpose of being able to document trends in levels of pollution and identify sources of radioactive pollution of Norwegian areas. The monitoring also provides basic data for assessment of the possible significance of the pollutants for health and the environment. Having constantly updated and credible documentation on pollution levels is essential when it comes to preventing the circulation of unfounded rumours and speculation which leads to reactions on the markets for fish and other seafood. The monitoring programme is under constant review and is due for further improvements.

The Directorate of Fisheries' Food Institute conducts constant analyses of the presence of alien substances in seafood, including radioactive substances. The results of these analyses are entered in the institute's environment database. The number of species of fish and other seafood and the parameters covered by the analyses is being constantly increased. Documentation on the presence of xenobiotic substances in seafood is an important area for the fisheries sector and a priority issue for the fisheries administration. Seafood must be safe food. Over the past few years the institute has therefore injected substantial funds into increasing analytical capacity and improve competence in this field.

National sources

The programme for monitoring radioactive pollution is also designed to identify national sources; *e.g.* discharges from research reactors, isotope production and hospitals. As already explained in Chapter 3.2 produced water discharged from petroleum exploitation activities also contains some radioactive substances (radium) which occur naturally. These discharges have not been charted sufficiently well on the Norwegian continental shelf. The Norwegian Radiation Protection Authority has said that there is no reason to believe that naturally occurring radioactivity in produced water represents any significant danger for health and the environment. Even so, this remains a problem and serves to confirm the need to develop new technology to reduce total discharges of produced water from the Norwegian sector of the continental shelf. Oil production also generates deposits in pipes and other equipment, which can contain naturally occurring radionuclides in concentrations, which cause the deposits to be classified as low-radioactive scale. Until a permanent disposal solution is found between 200 and 300 tons of such waste is safely but provisionally stored in oil terminals along the coast of Norway. The Government is, however, anxious to find a viable means of permanent storage for this waste on land.

Priority given to work on developing criteria for the protection of the environment from radioactive pollution

Up to now, criteria for what are acceptable levels of radioactive pollution have been unilaterally focused on preventing damage to public health. It has been assumed that this indirectly would provide sufficient protection for other parts of the ecosystems. However, in recent years there has been a growing international awareness of the fact that it is wrong to make this assumption. A number of international bodies have therefore taken the initiative in drawing up criteria for the protection of the environment from radioactive pollution. These criteria will form an important basis for an ecosystem-based approach to radioactive pollution of the marine environment. The Norwegian authorities are a driving force in this work.

3.5 Contaminated sediments in coastal areas and fjords

Substances toxic to the environment have been discharged along the coast over a very long period of time and sediments (loose material on the seabed) are therefore heavily contaminated in a number of areas. This type of pollution is a source of health-related, environmental and social problems. High concentrations of hazardous substances put significant pressure on individual organisms and ecosystems and may thus have harmful effects on biological diversity. People who consume fish and shellfish from polluted areas are exposed to a risk of health damage in the form of cancer, weakening of the immune system, reproductive problems and damage to the nervous system. In addition, contaminated sediments are a potential source of pollution in that environmentally hazardous substances can migrate and pollute new areas.

Pollution of the seabed limits the scope for using areas for fishing and fish farming activities. Hazardous substances are today blamed for the fact that dietary advice is being given to an area covering over 800 km^2 of the Norwegian coast. Pollution also lowers the value of areas as destinations for leisure activities and tourism and may place limitations on the development of port facilities or make this more expensive.

3.5.1 How did this problem arise?

Substances hazardous to the environment have been discharged over a long period of time, although most of the discharges have taken place in the past 50 years. In recent times discharges of the substances most toxic to the environment have been reduced considerably, but discharges of other chemicals harmful to health and the environment are still extensive.

Industry has been by far the biggest source of discharges and large quantities of hazardous substances are discharged into Norway's fjords from smelting plants, the chemicals industry, mines and the mechanical engineering branch, to mention just a few. These discharges have been reduced in recent years, but industry is nevertheless still a significant source of chemicals dangerous to health and to the environment. Products, sewage, landfill sites and public transport have all helped contaminate sediments and these diffuse sources of discharge constitute an ever-increasing proportion of total discharges. Norway also receives large inputs of environmental pollutants from other countries carried on the wind or by ocean currents.

Figure 3.10 Areas which are the subject of dietary advice or restrictions. These are areas where the content of environmental pollutants is so high that the food authorities have introduced bans on the sale of fish and shellfish and/or given advice on the upper consumption limit.

Source: Statens næringsmiddeltilsyn/Statens forurensningstilsyn (Norwegian Food Control Authority/Norwegian Pollution Control Authority)

Companies, both private and state-owned, local authorities, shipping and other public transport, plus private households are thus responsible for the high concentrations of substances toxic to the environment found in sediments today.

3.5.2 Which areas are polluted? Classification of different types of areas

A number of surveys of the levels of pollution in sediments have been carried out in Norway (cf. Report 98:11 from the Norwegian Pollution Control

Box 3.2 Dietary advice and restrictions on sales

In areas where fish and shellfish contain high concentrations of hazardous substances the Norwegian Food Control Authority has provided advice on limiting intake of fish and shellfish (dietary advice) and has introduced restrictions on the sale of fish from the area. Dietary advice is today being provided in 26 ports and fjord areas in Norway. The extent of the advice varies from area to area. In most of the areas it simply amounts to advising against the consumption of fish liver and/or mussels, but in a few areas the advice is to avoid eating fish at all. People in a number of these areas are further advised to avoid eating shellfish. In one of the areas people are advised not to eat it more than once a week, while in the other areas they are advised not to eat it at all. Sales restrictions have also been introduced in five of the areas. The total area for which dietary advice is provided was reduced from 1 008 km^2 in 1991 to around 840 km^2 in 2001 mainly as a consequence of reduced discharges from industry. Nevertheless, dietary advice was introduced in three new areas in 2001 on the basis of results from surveys carried out in areas, which had not previously been the subject of study. It is expected that the number of areas for which dietary advice is given will increase since more areas are now under investigation.

Box 3.3 Categories of problem areas

- High-risk areas: Smaller areas, high concentrations of environmental pollutants, often with a risk of migration and a small number of bodies responsible.
- Ports: Medium-sized areas, relatively high concentrations, risk of migration, large number of polluters, but a single body responsible for the area (the port authority).
- Entire areas of coast or fjords: Large areas, varying concentrations (including areas with high-risk zones and ports), minor risk of migration out of the area, large number of polluters.
- Industrial fjords: Special cases in fjords. Large areas, high concentrations, small number of polluters.

Authority). These surveys have revealed high concentrations of environmental pollutants in sediments more or less everywhere in the vicinity of industrial sites and densely populated areas. Altogether, the Norwegian Pollution Control Authority's surveys have revealed high concentrations of hazardous substances in more than 100 areas.

Different types of areas require different remedies and initiatives depending upon the size of the polluted area, the damage being done by the hazardous substances in the area, the degree to which the pollutants are migrating to other areas, the technical solutions most suitable for the area and whether the liability picture is clear. This report therefore attempts a breakdown into four categories (cf. Box 3.3). The purpose of the subdivision is to simplify assessment of the different measures and means described in this report, but the categories are not sufficiently precise to constitute a new tool for use in further work on contaminated sediments.

A characteristic of *high-risk areas* is very high concentrations of environmental pollutants within a fairly small, restricted area. Often just one or a small number of activities are responsible for the pollution and therefore the sources of the problems are more often known in such areas than in larger problem areas. The high concentrations of environmental pollutants mean that there is a considerable danger of them spreading to new areas, even though the risk of migration varies from one area to another depending on natural conditions and the degree of human influence. Surveys conducted have revealed about 35 high-risk areas, 15–20 of which are believed to entail a danger of migration, although it is emphasised that the figures are not certain. The large number of point sources which can be assumed to have possibly caused this type of pollution indicates that the number of high-risk areas may be significantly higher than the surveys conducted to date have been able to uncover.

Port areas often suffer from extremely high concentrations of environmental pollutants, but are often larger than the areas classified as «high risk». Further, pollution problems are often more complex. In addition to actual port activities and shipping, industrial discharges and more diffuse dis-

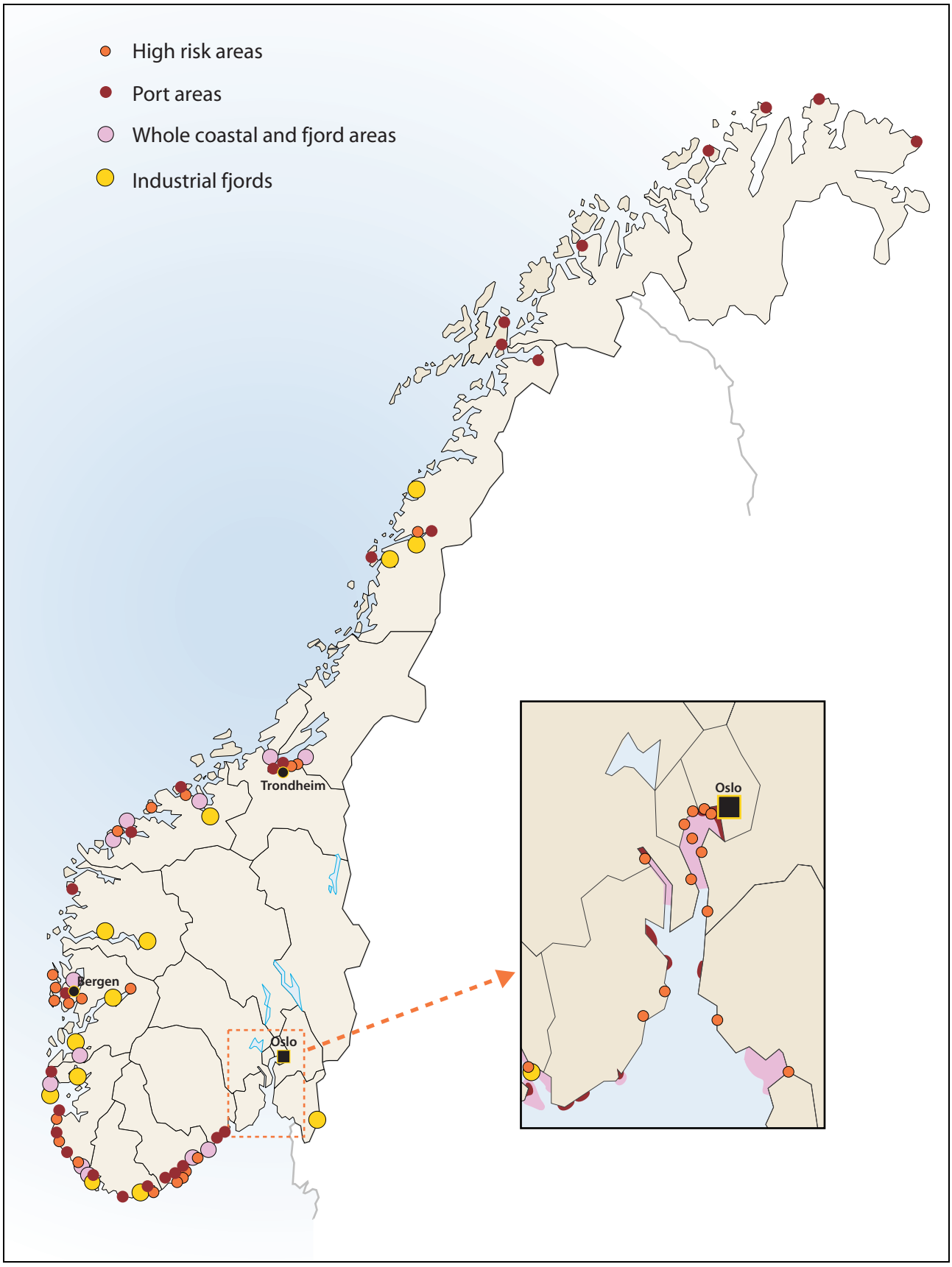

Figure 3.11 Areas with contaminated sediments already mapped. Areas with contaminated sediments are divided into categories high-risk areas, port areas, whole coastal and fjord areas and industrial fjords, on the basis of the size of the areas, the pollution concentrations, the risk of migration and the number of polluters. (cf. Box 3.3 Categories of problem areas). The information on the areas is very approximate.

Source: Statens forurensningstilsyn (Norwegian Pollution Control Authority)

charges from towns or other densely populated areas certainly add to the high pollution levels. Ports constitute a special problem because port traffic leads to the spread of environmental pollutants as a result of eddies in sediments caused by propellers. Streams and rivers often carry sediments to the port area. Quite apart from the need for clean up operations because of pollution, many ports need continuous dredging (removal of masses of loose material from the seabed) in order to keep the shipping lanes open. Up to now, heavily contaminated sediments have been recorded in approximately 36 port areas in Norway, 15–20 of which are judged to entail a risk of migration. Dietary advice has been given in 14 of these areas.

A number of *fjords and coastal areas* have high levels of environmental pollutants in sediments across their entire area. These areas feature a complex pollution picture involving many types of pollution and sources. Concentrations of environmental pollutants vary both between and within areas. A fjord can contain both what are classified as high-risk areas, ports and areas with lower levels of environmental pollutants. The inner fjords close to towns and other densely populated areas typically show a more complex pattern of pollution from a wider range of sources than the outer fjord areas where pollution problems are more often associated with a single source. Surveys already conducted have revealed heavily contaminated sediments in approximately 20 coastal and fjord areas

Box 3.4 Current cleanup measures

When all discharges have been stopped *natural sedimentation* will cause pollutants to be covered with clean material. However, under Norwegian conditions it will take 50–100 years to establish sufficient new cover and eddies or biological activity can also disrupt the process. This is therefore not considered sufficient in most areas.

Covering up creates a physical barrier, which prevents environmentally hazardous substances from leaking out and organisms from coming into contact with the contaminants. This is an approach, which has been pursued in Eitremsvågen and may be used in other places. However, this procedure is not suitable for shallow areas where the seabed is affected by shipping or physical intervention. Covering over is a fairly acceptable solution, but reuires supervision during and after the work.

Contaminated sediments can be treated in situ whereby the hazardous substances are converted into less harmful substances and the toxic materials rendered less accessible. Experience of this treatment is meagre and the methods available are considered to have major limitations given the technologies on offer today.

Removal of the contaminated material on the seabed may solve the problem in the area concerned, but in this case the large quantities of material must either be treated or disposed of in an acceptable manner.

Untreated, contaminated material requires *special disposal measures*. Up to now dumping of such sediments has been rare, mainly because it is difficult to find suitable landfill areas for it. Dumping of large amounts of material in landfills is also costly.

Disposal in shoreline landfills involves dumping the contaminated material in a closed area of sea close to land. A number of such dumps have been established in Norway, one of them being in Haakonsvern. These dumps have to be monitored and restrictions have to be introduced with regard to use of the area. The scope for creating such dumps depends on local conditions. Costs also vary depending on the barriers that need to be used and on the quality we want to achieve in the area being used.

In Norway we have many fjords which contain relatively *deep basins* often with oxygen-free water at the bottom and absence of life on the bed and in the masses of water closest to it. These basins may be suitable for dumping of contaminated materials. The disadvantage is that they may be difficult to check on and will need to be monitored for a long time to come. Further, renewal of the water and changes in the water quality can mean that the environmentally toxic substances become more accessible to marine organisms.

Treating contaminated sediments is a laborious and costly process. Such material requires special measures because the contaminants contain many different particle sizes and therefore need several stages of treatment.

in addition to the port areas and high-risk areas referred to above.

Features of the *fjords described as «industrial»* are that they have one or more industries as the main source of pollution problems throughout the fjord and that the pollution picture is relatively uniform. In these areas the activity responsible for the pollution is often known. Today there are 14 industrial fjords, which are seriously affected by environmental pollutants.

3.5.3 Special challenges associated with cleanup operations

Surveys carried out to date have revealed a real need for initiatives in polluted fjords and coastal areas. Steps have already been taken in a number of places, while in others cleanup operations are about to start. As a rule the cleanup operations face a number of challenges; for instance, gaps in knowledge, technological challenges, elevated costs and lack of clarity as to who is liable for conducting and financing the operations. In addition a particular challenge is making sure that the cleanup operations will have a lasting effect by preventing fresh discharges of environmental pollutants.

Gaps in knowledge associated with different technical solutions, the effects of such solutions and the effects of hazardous substances on the environment represent a big challenge in the context of cleanup efforts. Future work will need to focus on gaining further practical experience from different types of projects and on learning more about the biological effects of pollution. The reason is that few major cleanup operations have been carried out in Norway and experience from other countries cannot always be successfully transposed and used in the very specific conditions prevailing in Norway. At the same time we know too little about the effects a given reduction in the quantities of environmental pollutants in water and sediments will have on the contents of hazardous substances in fish and shellfish. In the Frier Fjord, for example, discharges of dioxins from the largest source in the area have been cut by over 99 %, while the content of dioxins in the upper strata of bottom sediments has been reduced by around 50 % since 1989. Nevertheless, the contents of hazardous substances in fish and shellfish in the area are still too high to permit removal of the sales restrictions.

Extensive surveys have been carried out in recent years and these have revealed serious pollution in a number of areas. However, there is still a considerable need for *further charting* of the amounts of environmental pollutants in sediments, fish and shellfish along the Norwegian coast. No comprehensive surveys have for instance been conducted to find out how much need there is for dietary advice in areas stretching from Hordaland to Nordland. More detailed investigations are also needed in most places before cleanup measures can be started. Further, studies already carried out have covered a limited number of environmental pollutants. We have recently become aware that the numbers of hazardous substances, which can have serious consequences for health and the environment, are constantly increasing.

Carrying out cleanup operations in large areas with contaminated sediments is *very expensive*, something which is a challenge in itself. It has been calculated that it will cost a few billion to over ten billion kroner to clean up the entire coastal area of Norway, the precise cost depending on how clean sediments are required to become. Estimates are also very uncertain not least because we do not yet know enough to be able to say what steps need to be taken in the different areas.

Apart from the high cost, *the situation in terms of liability is often far from clear*, which means that dividing costs between those responsible also represents a challenge. In addition to that, there are many instances where the sources originally responsible for the pollution no longer exist.

One of the biggest challenges when conducting cleanup projects involves dealing with *the large amounts of polluted material* on the seabed. A limited cleanup operation in the Port of Oslo will involve removing 780 000 m^3 of material. If this were to be dumped on a football pitch the resulting «landfill» would be some 110 metres high. When carrying out such projects it has often proved difficult to find suitable areas for disposal of these materials and treating the material is also very demanding in technical terms.

Hazardous substances and other chemicals harmful to health and the environment *are still being discharged* by Norwegian industry, from products, landfills, waste incineration plants and a series of other sources. This means both that sediments in new areas can become polluted and that the benefits of any cleanup operations may be limited in some areas. Parallel to cleanup projects it is therefore important to cut down fresh discharges with the help of both national initiatives and international efforts.

3.5.4 Objectives: How clean, how quickly?

Work on contaminated sediments is part of the overall effort being made by the authorities respon-

sible for environmental protection to prevent hazardous substances and other harmful chemicals from damaging health and the environment. A long-term strategic objective aimed at «bringing the concentrations of the most dangerous chemicals in the environment down to the background level for naturally occurring substances and close to zero for man-made compounds» has been adopted for this work and also for work on contaminated sediments (cf. Parliamentary Report No. 24 (2000–2001)). A series of targets relating to *new* discharges of chemicals harmful to health and the environment have also been adopted aimed at ensuring progress towards achieving this long-term objective. In addition, a separate target has been fixed for work on pollution stemming from *previous eras* which is that «pollution of the seabed, water and sediments caused by past activities, wrongful disposal of waste *etc.* shall not involve a risk of serious pollution problems». This target refers to polluted areas on land, freshwater areas and the seabed. In the case of contaminated sediments, the Government's aim with this target is to bring concentrations of environmentally hazardous substances from discharges in bygone times down to a level which will not have serious biological effects or serious effects on the ecosystem.

The view of the Government is that it is neither right nor possible to establish a more precise environmental quality objective for all sediments along the Norwegian coast. In the *long term* concentrations of hazardous substances in all areas must be brought down to zero (cf. the strategic objective). But how much the concentrations of environmentally hazardous substances need to be reduced in the *short term* will have to vary from area to area. Everything will depend on how polluted the area is today, how complex the pollution situation is, whether the hazardous substances are accessible to the organisms in the area, whether the hazardous substances can migrate to new areas, what demands the ecosystems in the area make on the environment and how much it will cost to introduce measures in the area. Further, the need for clean areas for fishing and other commercial activity varies from area to area.

The EU Water Framework Directive (cf. Chapter 2.3.2) will also involve requirements relating to cleanup of contaminated sediments, even though the directive does not for the moment specify which measures are to be applied to individual areas.

The Government intends to draw up a strategy to ensure sufficient progress with cleanup operations in relation to the strategic objective and the national result objective already adopted and to the requirements set out in the water framework directive. In this strategy the Government will specify the reasons and the principles to form the basis for assessments of the need for initiatives in individual areas.

3.5.5 Strategy for work on cleanup of contaminated sediments

The Government intends:
- to prevent the spread of environmentally hazardous substances by commissioning cleanup operations in sediments wherever possible with today's technologies in
  - restricted areas which distinguish themselves by exhibiting high levels of concentrations of environmentally hazardous substances (referred to as «high-risk areas»); and
  - ports where there is a danger of migration of environmentally hazardous substances;
- to ensure a comprehensive regional approach to large fjord and coastal areas by developing county action plans; and
- to increase what is known via
  - pilot projects;
  - research and monitoring; and
  - setting up a national council.

Extensive surveys of environmentally hazardous substances in sediments have been carried out on long stretches of the Norwegian coast. The surveys have revealed a marked need for cleanup operations in a number of places. Individual cleanup projects have already been implemented and have given us valuable experience, even though there is still much uncertainty regarding technical solutions, costs and the effects of measures. The Government has adopted the precautionary principle as a basis for work on further cleanup of contaminated sediments. This means that initiatives cannot be postponed simply because we do not have complete scientific certainty regarding the effects of the current level of pollution or regarding steps that can be taken. What we already know should thus be put to use. At the same time further work must also ensure that we learn more. A strategy is needed both for the implementation of steps that can be taken on the basis of existing knowledge and for acquiring the know-how necessary for the long-term cleanup work.

Migration of environmentally hazardous substances from contaminated sediments to new areas is an unacceptable form of pollution and the

Government's basic view is that steps must be taken relatively quickly to prevent this from happening. The Government therefore attaches particular importance to finding the ways of taking the necessary steps in the short term to prevent spread from areas where we already have sufficient know-how to be able to do something. This requires taking initiatives in restricted areas with high concentrations of environmentally hazardous substances where we already have sufficient control over existing inputs of hazardous substances.

The Government is also anxious to ensure that sufficient progress is also made with cleanup operations in areas presenting no risk of migration of contaminants and in discovering polluted areas hitherto unknown to us. The need for cleanup operations in such areas will vary and will depend primarily on local considerations such as outdoor activities, fishing, fish farming and other uses of the area in addition to the need to ensure that the environment is in an acceptable state. Local knowledge is necessary in order to find hitherto unknown areas of contamination and the Government sets great store by getting a total grip on the problem, which ensures that new areas of pollution can be revealed via work at local and regional level. The basis of the Government's approach is that there should be scope for assessments conducted locally and regionally when giving priority to various measures in these areas. However, at local level priorities must be fixed within the framework set out and according to the principles described in this paper.

While existing knowledge is being put to good use, the Government attaches great importance to finding out more via research, surveys and monitoring and also via the use of approaches which ensure that new technologies are developed and tested.

In the light of this the Government is basing itself on a strategy designed to ensure that the cleanup work is actually started using what we already know and that hitherto unknown areas of pollution are identified. It is also anxious for us to learn more about the effects of pollution and to develop methods for implementing measures and new technological solutions further. What is basically being proposed is a combination of classic state control and initiatives from local and regional bodies. On the basis of the above principles the Government will use the strategy for three parallel lines of action:

1. Preventing the migration of environmentally hazardous substances from contaminated sediments by ordering initiatives where such are possible with the technologies available today in areas where there is a danger of hazardous substances migrating; these include the so-called high-risk areas and ports where current operations cause the spread of hazardous substances.
2. Ensuring a total regional approach to large fjords and coastal areas by drawing up county action plans.
3. Learning more through pilot projects, research, monitoring and the setting up of a national council to deal with sediment issues.

The general means for implementing this strategy are described in Chapter 3.5.6, while those for implementation of the three-part strategy (see above) are described in Chapters 3.5.7, 3.5.8 and 3.5.9.

3.5.6 General approaches

The Government intends:

– to, where possible, impose an obligation on polluters to conduct the necessary cleanup operations;
– to make public funds available for cleanup operations in areas where it is impossible to identify those responsible for pollution or where it is not reasonable to demand that those responsible foot the entire bill; and
– to assess the possibilities for introducing different payment schemes, including funds, which collect financial contributions from different polluters, and any state grants made available.

Attributing responsibility and use of injunctions pursuant to the Pollution Act

The «polluter pays» principle is the basis for dealing with pollution in general and will also be the basis for work on cleanup of contaminated sediments. Responsibility for preventing, identifying and repairing damage caused by pollution is a direct consequence of the Pollution Act. Anyone owning, doing or using something which causes pollution, or which is in any way associated with pollution, is to be regarded as responsible. This also applies for contaminated sediments. As far as possible injunctions pursuant to the Pollution Act are to be used to ensure cleanup of areas containing contaminated sediments.

Those behind the original input of pollutants to an area, those who own or in some other way possess something which can cause pollution and those causing the pollution today may be required to conduct cleanup operations. In places where the

sources of contamination of sediments can be identified and where the activities causing that contamination still exist, the main rule will be that the perpetrator of the pollution will be required to deal with it. This is the main rule even though the discharges may have been known in the past and were legal.

The use of injunctions pursuant to the Pollution Act on cleanup operations for contaminated sediments does, however, give rise to a few specific problems. This is attributed to the fact that inputs of contaminants into sediments have taken place over a long period of time and have originated from many different sources; often, too, there will be many different polluters, some of whom no longer exist or whom it is difficult to identify and hold liable for other reasons. The huge costs associated with cleanup operations for contaminated sediments also represent a particular challenge when resorting to injunctions under the Pollution Act. When issuing injunctions ordering cleanup operations the pollution authorities make sure that the measures called for are in reasonable proportion to the damage and inconvenience caused by the pollution. When considering whom an injunction may be issued against, account will be taken of the financial viability of those held liable and of the degree of blame the different operators bear for pollution in a given area.

Funding arrangements

Private, municipal, state-run operations and the civil service can be ordered to carry out and/or fund all or parts of the cleanup because they are responsible for the pollution under the terms of the Pollution Act. In cases where it is not possible to identify anyone who can be held responsible and who could reasonably be required to conduct a cleanup, the State will have to carry out and finance the necessary cleanup operations.

In some areas it is possible to locate one polluter responsible under the terms of the Pollution Act. The general rule will then be that that this polluter will either voluntarily or pursuant to an injunction conduct and finance the necessary cleanup operations in the area. A public injunction will not prevent the polluter or polluters against whom the injunction has been issued from demanding at a later stage that parts of the costs incurred be covered by others who it was subsequently possible to identify as responsible for the pollution. For example, the City of Oslo has in collaboration with the Norwegian Society for the Preservation of the Nature been considering bringing a case for compensation against the producers of the substances polluting the Port of Oslo. In a few exceptional cases it may be unreasonable to order those responsible to foot the entire bill for measures. In such cases state grants will be necessary to carry out the cleanup.

In large polluted areas there will be more than one polluter in a majority of cases. In such instances all the polluters should make a financial contribution to the cost of the work necessary in the area. This can be achieved either by the different polluters voluntarily co-operating and dividing the costs among themselves or by the pollution control authority ordering the different polluters to contribute financially. When polluters co-operate it may also be appropriate for the State to contribute to the funding.

The Government therefore takes it for granted that state grants will be necessary in cases where it is not reasonable to order the polluter or polluters to foot the entire bill for the necessary cleanup operations, in cases where it is not possible to identify a polluter and in cases where it is reasonable to expect the state to contribute in order to conduct comprehensive cleanup operations covering a large area. The Government will be returning with specific proposals on the granting of subsidies via the national budgets for the years to come.

Organising payment schemes – funds

In Recommendation to the Storting No. 295 (2000–2001) containing recommendations from the standing Committee on Energy and the Environment on the Government's environmental policy and the state of the environment a majority of the Committee's members say they believe that «the ways in which trade and industry can contribute either directly or indirectly to establishing a cleanup fund to deal with past environmental sins should be investigated. A fund of this type should be established as a joint project involving the authorities and trade and industry with the objective of removing environmentally hazardous substances from the natural surroundings or of limiting harmful effects». In the light of this the Government has asked for «studies of various models and proposals for the establishment of a cleanup fund by the authorities in collaboration with trade and industry. The fund would be used for tackling sins committed against the environment in the past and for removing environmentally hazardous substances from our natural surroundings».

The Government assumes that polluters will cover most of the costs involved in cleanup opera-

tions, although there will be cases where it may be necessary to make state grants available (cf. above). In cases where a single company has to foot the entire bill for cleanup operations the Government feels that the best solution is for that company to finance the cleanup directly. Usually, however, there will be more than one polluter expected to contribute to major cleanup operations and some form of payment system will have to be established for such cases. The Government therefore intends to give further thought to the possibilities of establishing different payment schemes, including a fund, which would collect financial contributions from different polluters and possibly state grants in the most appropriate way.

A number of payment schemes are to be considered. One possibility is to set up a fund. One might for instance create a national fund into which all polluters following an injunction from the pollution control authority and possibly others would pay financial contributions. The fund would then be used to finance all types of cleanup operations in connection with contaminated sediments. Another possibility would be to set up a separate fund for each area and then those responsible for pollution in that area would pay into the fund, which would then be used for cleanup in the area. If such a fund were to be set up it should be linked to the county action plans (cf. Chapter 3.5.8).

The Government also wants to look into alternative systems for financing cleanup in cases where it is either impossible to identify those responsible for pollution or where those identified are unable to pay. In the USA for instance a «Superfund» has been set up and is used to finance cases where it is either impossible to identify the polluter responsible or where the polluter is insolvent. The fund's revenue comes from a levy on petroleum and individual chemicals and from an environmental levy on corporate profits. The Government is basically sceptical about the idea of earmarking revenue from various taxes and levies for specific purposes.

State grants for cleanup operations can either be made as a once-for-all grant via the national budget whereby the dividends are used to finance measures or in the form of annual grants. A one-off grant where the dividends are used to finance cleanup operations would reduce the scope for annual decisions on priorities and for using the national budget as part of overall economic policy. The setting up of this type of fund could also come into conflict with the basic principles on which the national budget rests.

Consequently, further study is needed of a number of issues bound up with the setting up of payment schemes. The Government will be looking into these issues in greater detail and will return to the Storting with an assessment and possible proposals.

3.5.7 How to prevent migration

Preventing the spread of environmentally hazardous substances in high-risk areas

Anxious to make progress in this area the Government takes the view that given what we already know it should fairly soon be possible to undertake measures in «high-risk» areas where a risk of migration is present. The prerequisite throughout is to have existing discharges of environmentally hazardous substances under sufficient control so that any cleanup attempted will not be a waste of money within a short time. For the moment only three areas have been found where there is a risk of migration and where new inputs are judged to be under sufficient control. Extensive surveys are also planned in connection with the drawing up of county action plans (cf. Chapter 3.5.8) and these will probably reveal further such areas. The Government wants to start cleanup operations in high-risk areas where there is a risk of migration as soon as possible and preferably within five years of the areas being discovered. Precise deadlines for cleanup in these areas are to be fixed on the basis of the extensive surveys to be carried out, *e.g.* in connection with drawing up the county action plans (cf. Chapter 3.5.8).

Injunctions pursuant to the Pollution Act will be the main means of ensuring sufficient progress with the work on stopping the spread of pollutants from high-risk areas. Sources in high-risk areas are often fewer and easier to locate than sources of pollution in larger areas. But, there will be cases where the activities responsible for pollution no longer exist. In such cases the Government takes the view that the environment protection authorities shall ensure that the necessary cleanup is carried out.

The State is also a polluter or an owner of polluted areas and therefore responsible for cleanup in the areas concerned. The Government takes it for granted that the State will proceed with cleanup operations to put its own environmental sins to rights. The Government further takes it for granted that the State will take the necessary steps to prevent the spread of pollutants in high-risk areas owned by the State as soon as possible and preferably within a five-year period of their being disco-

vered. An important prerequisite is also that inputs to the area be under sufficient control and that the cleanup fits into the overall context of other measures planned via the county plans.

Shipyards and large pleasure boat marinas are areas where problems associated with pollution of the seabed may be expected. The Government therefore considers it important to chart the extent of the problem of contaminated sediments linked to these activities and to undertake cleanup operations as quickly as possible. The Government is therefore planning a special drive in this type of area the aim being that surveys of pollution and studies of the need for measures linked to shipyards and large pleasure boat marinas will have been undertaken by the end of 2005. In the areas where the polluters are known cleanup injunctions pursuant to the Pollution Act will be the main instrument.

Preventing the spread of environmentally hazardous substances from port areas

Contaminated sediments in ports are mainly a problem in that environmentally hazardous substances spread when shipping churns up the sediments. Since port areas are often very busy and are therefore exposed to certain inputs of environmentally hazardous substances for some time to come it will not always be practical to remove all pollutants in the short term. It is, however, important to prevent port activities and shipping from helping environmentally hazardous substances spread to other areas. The Government will therefore be pressing in the relatively short term for measures to prevent contaminated sediments in the most polluted ports from being churned up and preferably within a period of ten years. It is planned that the need for measures in all ports will have been dealt with by 2010 and that the necessary measures to prevent migration will be implemented within relatively short time, preferably within a period of five years. This will, for example, involve dredging to ensure sufficient draught for shipping and to prevent sediments being churned up by ships propellers. It will also require regulation of port traffic and possible other restrictions on activities in ports. Many of the ports would have needed dredging anyway during this period to ensure sufficient draught for shipping in the port area.

As in the high-risk areas, the spread of environmentally hazardous substances from ports is regarded as active and acute pollution. The Government therefore intends to make the Pollution Act applicable to this type of pollution so that injunctions can be issued against port operators. As outlined in Chapter 3.5.6, when issuing injunctions the pollution control authority will base itself on assessment of the viability of the measures required and the financial ability of the polluters to pay. If it is not reasonable to order ports to pay the full cost of cleanup operations because of their financial situation, the possibility of state grants for the necessary measures will be considered.

3.5.8 A total approach to ensuring local involvement: County action plans

Need to draw up county action plans

While it is necessary to make a concerted effort in limited, high-risk areas and ports to prevent the spread of environmentally hazardous substances, large fjord areas with less concentrated pollution need a different approach.

Achieving good results though measures taken regarding sediments in part of an area will often depend on land-based sources or work on sediments in adjacent areas. It will not prove very cost-effective to carry out cleanup operations in one part of a large fjord if environmentally hazardous substances are still being discharged into another part of the same area. Similarly, it would not be appropriate to conduct a cleanup operation in any part of a fjord until all areas of the same fjord presenting a risk of migration have been secured against further spread. The Government therefore sees a need for a tool which ensures a total approach whereby the whole of the fjord is regarded as a single entity.

The need to clean up contaminated sediments should be assessed locally or regionally. In some places the most important thing will be to reduce the load on the environment, while in others it will be the significant economic interests associated with fishing and fish farming that have the decisive influence. Which issues are most important at local level will be significant when deciding on the measures to be introduced and in what order. It will therefore be a good idea to have the work tied to local level, as this can encourage active participation by local stakeholders with an interest in the cleanup. We also need detailed knowledge of the level of pollution, ongoing discharges and historical information about past discharges in the individual areas when undertaking this work. Central authorities do not have this information nor is it considered appropriate that such information should be compiled by the central authorities in the future. We therefore very much need to get the local level involved in this work.

In the light of this, the Government feels that the best way to organise the work is via county action plans.

Drawing up county action plans

To ensure a total approach and local involvement the Government intends to have county action plans drawn up which will provide a total approach to cleanup operations in individual fjords and coastal areas and lay the necessary foundations for decisions on what is to be done. The idea is that county action plans will in time become part of the programmes of action referred to in the EU water framework directive (cf. Chapter 2.3.2). The plan is for counties with several polluted fjord areas to have an overall programme of action for the county made up of a number of subsidiary plans for the different fjord areas and any polluted coastal areas.

The Government intends county action plans to be drawn up for the most polluted areas in the course of 2005 and by 2009 for the remaining coastal and fjord areas. The Norwegian Pollution Control Authority is to draw up an overview of fjord areas due for county action plans in order of priority during 2002. Work on charting the extent of pollution and its significance for organisms and ecosystems is to be largely completed by the end of 2004.

The county action plans are to contain proposals as to what environmental quality level should be achieved for the fjord area as whole, possibly distinguishing between different parts of the fjords on the basis of an assessment of the scope for and cost of cleanup. Plans must contain an overview of the degree and extent of pollution in the fjord and of the problems it creates for the environment and for consumer interests such as fish farming, fishing and catches. Plans must also provide an overview of sources of discharge in the catchment area and their significance in the overall pollution context. The significance of the sediments as a source of pollution must also be described. In addition the plans must describe the effects and costs of different measures to deal with the sources of pollution, along with current solutions to dealing with contaminated sediments, if these have to be removed. The plans must establish a correlation between cleanup of sediments and measures on land, stipulate who is responsible for ensuring that the measures are implemented and contain a schedule for financing of the measures.

The Norwegian Pollution Control Authority will draw up guidance for use in the work on the county action plans on the basis, *inter alia*, of experience gained from implementation of comprehensive cleanup operations during pilot projects.

Organisation of environment protection management at regional level is under consideration. This clarification is essential when deciding who is to be responsible for developing the county action plans. The Government will therefore be returning to the subject of the detailed organisation of this work. However, it is important to have a transparent process in which as many players as possible can participate.

We still do not know enough at local and regional levels about which areas are polluted, which the significant sources are or were and who is responsible for the pollution. The Government will therefore be assessing the need for state subsidies for the work on charting, investigating and studying which forms the basis for the county action plans.

The county action plans will constitute a tool for the concrete cleanup work in the individual fjord and coastal areas. The plans will form the basis for industries, local authorities and other bodies responsible for cleanup measures and for the assessing when to use public funds and injunctions. The Norwegian Pollution Control Authority will remain responsible for issuing injunctions for cleanup operations under the terms of the Pollution Act.

3.5.9 How to gain experience and learn more

Pilot projects

There are few examples of cleanup operations in polluted fjords or large fjord areas and this means that there is little empirical material and knowledge of the implementation of comprehensive cleanup projects. We need to learn more, increase our experience and produce guidance on how to manage the whole process from the planning stage to implementation.

We need to define methods and develop tools when working on identification of sources, assessment of risks, fixing of criteria and deciding on the most cost-effective cleanup measures. This also means that we need to develop methods and tools for assessing the consequences. We need to develop criteria for establishing when to implement cleanup operations and gain experience from using different technical solutions. We also need to gain experience with putting the environmental problems in a fjord area in an overall context to enable us to address them systematically – for instance, by looking at the correlations between land-based sources and contaminated sediments.

The Government proposes therefore that pilot projects being carried out with the aim of increasing knowledge and experience concerning planning, organisation and implementation of measures in the fjord areas containing contaminated sediments.

Pilot projects will consist of several phases; first the necessary studies and decision-making processes leading to action must be started, then the cleanup operations must be carried out and finally an assessment must be made as to whether the measures have had the desired effect. In the light of experience gained and results achieved from the pilot projects in terms of methods, criteria for measures and organisation of the work, reports will then be worked out and guidance produced for the authorities and others with pollution problems in different areas. This should enable them to address the environmental problems in a rational manner, both in technical and economic terms. The pilot projects will also provide experience and know-how, which can be used as a basis for implementing the county action plans. A pilot project is expected to cover a period of five years.

The Government plans to contribute public funds to finance parts of the pilot projects because these projects are designed to provide fresh knowledge and promote technological development with a high transfer value for other projects. In accordance with the «polluter pays principle» it is a condition that those responsible for the pollution in the pilot areas also contribute to the cost of the cleanup.

The Government is proposing the implementation of pilot projects linked to fjord areas where work on the fundamental problems has already made considerable headway, where the time is ripe for an early and focused effort to reduce the inputs from contaminated sediments and remaining land-based sources, and where measures will have a high transfer value for other areas.

State subsidies have already been granted for a cleanup project in the Sandefjord Fjord. The justification of the use of public funds in this area is that the project is to contribute to gaining new knowledge and gathering new experience of planning and implementing cleanup operations and that this will be very valuable when applied to other areas. The purpose of this project is to gain experience of planning and implementation of cleanup operations, including being able to assess the impact of the treatment method applied to the contaminated sediments.

Research, surveys and monitoring. Establishing a national council for sediment issues

We have already highlighted the need for more basic information on, for instance, migration, absorption and the effects of environmentally hazardous substances on ecosystems and organisms in order to ensure cost-effective implementation of cleanup operations on contaminated sediments. The Government will therefore be giving priority to funding research, surveys and monitoring in this field and will be returning with specific proposals in the budget for 2003.

Knowledge of and the competence to deal with the effects of contaminated sediments and possible cleanup are today scattered across different parts of the administration, research institutes, universities, environment protection organisations, consultant firms and industry. It is essential to bring all these skills together and to make full use of them. The Government is therefore proposing to establish a special council to compile data on this area and provide advice on conducting investigations and implementing measures.

It will be the job of this council to keep up with developments and new findings on the incidence and effects of environmentally hazardous substances in sediments and to monitor possible technical solutions for reducing the problems that this pollution causes to health and the environment. The council will make recommendations to the pollution authorities on issues covered by its remit or which it raises itself. The council will not, however, be given the power to order cleanup operations. Nor is it felt appropriate that a council of this type should administer funds for grants or major surveys.

This council should comprise representatives of research institutes, universities, environment protection organisations, firms of consultants and industry. It should also co-operate closely with those responsible for drawing up the county action plans.

The Government intends to return to the question of the composition, terms of reference and budget of such a council.

3.6 Spread of non-indigenous organisms and genetically modified organisms (GMOs)

3.6.1 The threats

The spread of species to areas where they do not occur naturally has increased markedly over the

last decade. At the same time we have been seeing more and more examples of how this can have significant effects on ecosystems and on species occurring naturally. We have also seen reports of serious consequences for branches, which use the living resources. Examples from Norwegian waters are the spread of the harmful plankton algae, *Chatonella spp.*, which was probably introduced with ballast water from ships from the Far East and American lobster which was implanted illegally and which is now threatening to supplant our own Norwegian lobster stocks. The spread of the king crab following implantation on the Russian side of the border has caused problems for net fishing in the areas affected and may also have serious consequences for the ecosystems (cf. Box 3.5).

The introduction of non-indigenous species into the marine environment is a very serious threat to species and habitats. Knowledge of communities of marine organisms and habitats is,

Box 3.5 Effects of the introduction of non-indigenous species into marine environments

Serious effects of the introduction of non-indigenous species have been documented. In the Black Sea, for instance, the stocks of a comb jellies introduced from the USA exhibited astronomical growth and at one point in time represented as much as some 900 million tons! This caused the previously abundant fisheries to almost die out. Now, even though the stocks of this jellyfish have declined somewhat, fisheries in the zone are still affected by the introduction of this species.

In Norwegian waters we have experienced a number of introductions of non-indigenous species. In 1999, American lobster was found in the Oslo Fjord. It is probable that it had escaped from an import consignment of live lobster. The species has also been observed near Ålesund. The American lobster is capable of reproducing in our waters and can also cross-fertilise with our own European lobster. If such hybrids materialise the males will be sterile in addition to growing faster and becoming larger and stronger than the males of the European species of lobster. In the longer term this could devastate the Norwegian lobster stocks. It has not yet been proven whether any such hybrids have been generated. American lobster can also be the carriers of a disease caused by a parasite, which is 100% fatal in European lobster. So far, though, the specimens of American lobster found have not been infected. Research projects have been started to investigate the spread of this species and its possible ecological consequences.

Another species introduced, which has attracted much attention, is the king crab. This species was implanted at the mouth of the Murmansk Fjord on the Kola Peninsula in the nineteen sixties. Since then the stocks have grown and spread to Norwegian waters. Since it was first seen in the Varanger Fjord in 1976 the stocks have grown on the Norwegian side of the border and spread westwards. Little is known about the effects of the king crab on the ecosystems, but the species seems to feed off queen (*chlamys opercularis*), sea urchins and other benthic species. This can cause significant changes in the ecosystems and competition with benthic fish.

Japanese sea weed was first observed in Norway on the Sørland in 1984. It has now spread northwards as far as Sogn and Fjordane. This sea weed was probably brought to Europe by French oyster farmers who imported and implanted Japanese oysters. It lives in the top few metres of seawater and can grow to several metres in length. It spreads easily in that branches of it break off and drift away. The foothold gained by this sea weed has caused shallow bays to become almost entirely clogged in the summer. This stops the light reaching the bottom and leads to indigenous species of sea weed becoming supplanted. The Japanese sea weed can also be a scourge to fishing gear and outboard engines.

The plankton algae *Chatonella spp.*, whose abundant blooms appeared along the Sørland coast in the spring of 2001, was very probably introduced into Norwegian waters via ballast water from the Far East. Under specific conditions the algae can become toxic, but there is no evidence of this in Norwegian waters. Nevertheless, fish mortality has been recorded in fish farms and wild stocks. Extensive blooms of the algae seem to require a surplus of nitrates, something which is common in the Skagerrak where man-made inputs are considerable. This species is particularly competitive because it can start blooming earlier in the spring than other species.

however, limited and marine ecosystems are often very cohesive with few natural barriers against invasion. This means that if a species is introduced in one site it is easy for it spread to others and have harmful effects. Non-indigenous species and stocks are either spread deliberately by implantation or as stowaways in consignments of commercial goods, species implanted or means of transport, *e.g.* through fouling of ships' hulls or through changing of their ballast water. Once non-indigenous species have been introduced into the marine environment it is more or less impossible to get rid of them.

Even though we have been spared the most dramatic consequences of non-indigenous species in Norwegian waters, it is becoming increasingly clear that these species represent a serious threat to us, too. This is why it is essential to develop means of preventing further implantations quickly and get to grips with the harmful effects in both the short and the long term.

The introduction and the spread of non-indigenous species is now considered to be one of the most serious threats to biological diversity. The Convention on Biological Diversity has led to the drafting of guidelines on how to avoid the harmful effects of the introduction of non-indigenous species, while other international fora have produced protocols and agreements *etc.* Parliamentary Report No. 42 (2000–2001) on biological diversity contains a description of general policy in this area.

In addition to non-indigenous species, genetically modified organisms may also become a significant threat to the marine ecosystems. Genetically modified organisms are microorganisms, plants, animals and fungi which have had their genetic codes changed using genetic engineering or cell techniques. By making such changes it is possible to give the organism new characteristics; for example, better tolerance to cold, faster growth or production of useful substances. The technology therefore has the potential to generate useful products in the fields of medicine, food production, industry and the like. At the same time the use of genetic engineering and cell techniques can cause serious damage to species in the wild and to natural ecosystems, if the genetically modified organisms spread to the natural surroundings. For example, fish with better tolerance to cold can migrate to new areas and disrupt the species mix and the structure of the ecosystems concerned, while faster growth can cause wild stocks to be supplanted. The risks bound up with genetic modification can be difficult to evaluate, particularly in the long term. Further, it is important to emphasise that there is a big potential for migration in marine ecosystems and that the scope for getting rid of non-indigenous species is small.

Figure 3.12 American lobster was found in the Oslo Fjord in 1999. It is probable that it had escaped from an import consignment of live lobster (Photograph taken at the Aquarium in Bergen).

Photo: Gro van den Meeren, Institute of Marine Research

Norway has strict rules regarding the testing and use of genetically modified organisms and attaches great importance to ensuring that the use of such organisms will not have harmful effects on the environment. Legislation in place requires, for instance, step-by-step testing and investigation of the environmental consequences of genetically modified organisms before they may be transplanted or used, for example in the pens of fish farms. Up to now market-related considerations have prevented any interest being generated in this country in using genetically modified marine organisms for fish farming purposes. But, in recent years Norwegian researchers have been involved in the development of genetically modified farmed fish abroad.

DNA vaccines represent an area where genetic engineering is expected to spread quickly. DNA vaccination and other means of injecting genetic make-up (gene therapy) can be regulated under

the terms of the Genetic Engineering Act. The Ministry of the Environment has asked the Biotechnology Council for a more in-depth assessment of how DNA vaccines and gene therapy should be regulated and what status DNA-injected organisms should have in the eyes of the law.

3.6.2 Measures

The Government intends

- to limit the use of genetically modified marine organisms to migration-proof, closed facilities on land;
- to continue to give the very highest priority to international work on developing rules and regulations governing the use of genetically modified organisms which focus ethical values, health and the environment;
- to work on completing binding international legislation on the treatment of ballast water under the auspices of the UN's maritime organisation, the IMO, in 2003;
- to take steps at national level in line with the voluntary IMO guidelines as soon as possible and, insofar as the contents are known, with the future IMO regulations on ballast water, while at the same time preparing for implementation of the future IMO rules;
- to press for co-ordinated joint measures to deal with ballast water in all of the North Sea countries pending the advent of the new IMO legislation;
- to establish a programme for the monitoring of non-indigenous species on the priority list with a view to keeping tabs on migration and proliferation;
- to draw up an overview of non-indigenous species in the neighbouring countries which may be expected to survive in Norwegian maritime and coastal areas as a basis for future measures;
- to develop a risk analysis system for different sections of the community and branches of commercial activity; and
- to attach particular importance to avoiding harmful effects from the spread of king crab in ecosystems along the coast.

Intake and discharge of ballast water are today the operations, which involve the greatest risk of unsupervised introduction and spread of non-indigenous species of marine organisms. The organisms, once introduced, spread easily in the water and when they have established themselves it is virtually impossible to eradicate them. The Government therefore wants to give priority to measures to address the introduction and spread of non-indigenous species via ballast water.

International shipping is mainly to blame for the introduction and spread of non-indigenous species via ballast water and the risk level will vary depending on the area. The problem must therefore be solved by agreeing on a set of internationally binding regulations. Such regulations on intake, discharge and treatment of ballast water are at present being drafted, the aim being to have a dedicated convention on this issue under the auspices of the UN maritime organisation, the IMO, by 2003. Completion of the work may, however, be delayed and we know from experience that it will be some years before the convention comes into force and is implemented by the contracting parties. The Government will be pressing for the convention to come into force as soon as possible.

The Government also intends to launch national measures in line with IMO regulations currently in force. Plans are afoot to introduce requirements for ships which discharge their ballast water into Norwegian waters to report this to the authorities; the aim here is to be able to issue injunctions against them, thus forcing them to deal with their ballast water and sediments in the safest possible way. The Government is also going to consider introducing requirements regarding changing of ballast water and establishing reception facilities on land. There is also a need to monitor non-indigenous species and harmful organisms and to exchange information with other countries in the region.

In the light of the natural spread of species via ocean currents and of the competition situation between ports, regional measures in the North Sea region will have a much greater impact than unilateral initiatives on the part of Norway. On the occasion of the Fifth North Sea Conference in March 2002 Norway will therefore be proposing that the North Sea countries take immediate steps to tackle the problem of introduction of species via ballast water. The idea is that the North Sea countries shall adopt national and regional measures in the course of 2004. Norway will also suggest that the North Sea countries should consider introducing particularly strict rules for the North Sea when the convention comes into force.

Appropriate measures are also to be studied and implemented to stop the spread of non-indigenous marine organisms via other routes; directly or indirectly via the hulls of ships, trade in imported live species, illegal transplanting, sea ranching or aquaculture.

The migration of the king crab westwards along the coast of Finnmark has accelerated in recent years (cf. Box 3.5), something which has laid the foundations for a certain degree of commercial exploitation. A working party has put forward proposals with a view to improving what is known about the ecological effects of this species. Pending the availability of this information the Government assumes continued commercial exploitation in the areas where the stocks are most abundant, while attaching particular importance to avoiding harmful effects along the coast.

The Committee which is to table proposals for new basic legislation on management of biological diversity (Committee on Biological Diversity) has been asked to examine the general rules and regulations on non-indigenous species in existence. The Committee is to submit its opinion in the autumn of 2003 and on the basis of its advice the Government will assess how to strengthen the rules and regulations.

The Government will stress that developments in the field of genetic engineering should take account of environmental, safety and ethical issues and stay in line with signals from the international markets. The development of marine genetic engineering must comply with the provisions of the Law on Genetic Engineering whereby specific environmental assessments must be undertaken of individual projects and of the application of the precautionary principle in relation to the environment and health. If used within these limits, genetic engineering will offer new solutions and new commercial opportunities, for example in the field of production of vaccines. Up to now it has been unclear whether «DNA-vaccinated» animals should be regarded as genetically modified organisms. This issue will now be studied by the Biotechnology Committee, which will also be examining the need for regulations in this field. In respect of genetically modified organisms the Government stresses that implantation in the sea or in fish farm pens will not be authorised because of the potential for migration and because it is impossible to predict the consequences. In the future, therefore, it will only be possible to use them in migration-proof, closed facilities on land.

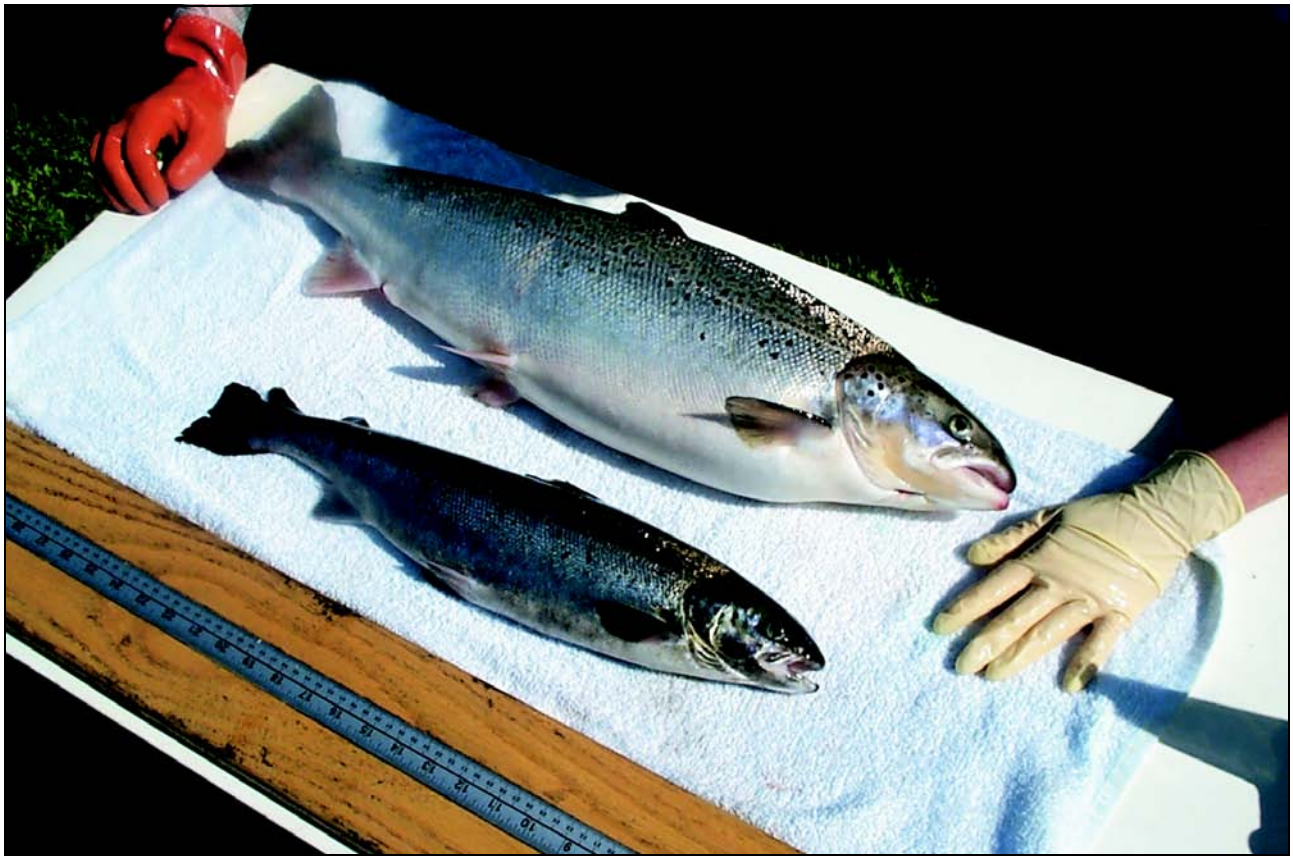

Figure 3.13 Genetically modified salmon grow twice as fast as ordinary farmed salmon. The Norwegian authorities have expressed misgivings to the USA regarding possible approval of so-called "Supersalmon", one of the reasons being concern for the marine environment and our wild salmon stocks.

Photo: Aqua Bounty Farms/Scanpix

Norway has participated actively in international work on drafting rules to govern the use of and trade in live, genetically modified organisms (the Cartagena Protocol). In addition, the Norwegian authorities have been active in regional fora for the protection of marine ecosystems from the possible harmful effects of genetically modified organisms. The Norwegian authorities have therefore turned to the USA among others to express their concern over the possible approval of what has been dubbed the «supersalmon» because of what this could mean for our marine environment and our wild salmon stocks.

3.6.3 Protection, use and distribution of marine, genetic resources

The Government intends

- to investigate the general principles and conditions applying for use of marine genetic resources as part of the work of the Committee on Biological Diversity on a new legal basis for co-ordinated management of biological diversity; and
- to develop and implement legislation to regulate use of marine genetic resources, which takes account of Norwegian interests and international agreements in this field.

The gene pool constitutes the biological basis for variation involving different species and for variation of the characteristics of individual species. It is genes that are the basis for how species adapt to different habitats and for developing different varieties or stocks. They offer scope for breeding tame species and stocks. Genes are also codes for the production of different proteins with specific and potentially commercially interesting properties. Both species living in the wild and farmed varieties therefore represent valuable resources for further breeding, manipulation and biotechnological production. At the same time, genetic variety provides a basis for mastering changes in the vital necessities for life and is thus an assurance of future survival.

The growth of the fish farming industry in Norway is a striking illustration of the economic value of genetic resources. By farming some 20 of the most attractive wild stocks of Norwegian salmon it has laid the foundations for exports which generate revenue to the tune of billions of Norwegian kroner. In addition, there is keen interest in the marine sector in further charting and utilisation of genetic resources. This has also attracted attention at international level to the potential for development in this field and over the past few years there has been growing interest in the survey work along the Norwegian coast where the main focus is on the coral reefs. It is believed that the coral reefs with their abundance of species may contain genetic resources with significant commercial potential. If active biological substances can be isolated or another biotechnological use found this could provide a basis for industrial use in the pharmaceuticals, cosmetics and food industries to a degree that far exceeds the value added of marine biotechnology in Norway today. However, legislation is urgently needed to regulate prospecting for marine biological resources and the Committee on Biological Diversity will therefore be looking at the principles and conditions applying for the extraction of genetic resources, including the marine variety, in close contact with the committee preparing a proposal for a new law on marine resources (cf. Chapter 3.9).

In addition to being used in connection with crops and traditional areas of biotechnology, genetic resources offer scope for changing the hereditary characteristics of plants and animals by modifying their genes. Genetic modification of marine organisms in the wild has so far not attracted much commercial interest from Norwegian firms both because of the possible harmful effects on the environment and because of considerations connected with acceptance and also their reputation among the consumers (cf. description in Chapter 3.6.1).

Management of marine genetic resources has not been the focus of much development work and is primarily based on the Continental Shelf Act, which reflects the provisions set out in the Treaty on the Law of the Sea. Other pieces of our legislation, however, contain provisions, which may be relevant to the extraction and utilisation of these resources. The Committee on Biological Diversity (cf. Chapter 3.6.2) is to study the general principles and conditions applying for the extraction of genetic resources, including marine genetic resources. The terms of reference of this committee also stress that current legislation covering individual sectors, such as a new law on marine resources, will facilitate implementation of the main principles.

3.7 Protecting marine areas and sustainable spatial management of the maritime and coastal areas

3.7.1 The threats

Thanks to our long coastline and in some places low population density Norway still has areas of natural beauty left which have been little affected by human activities. Nevertheless, pressure on areas in the coastal region is increasing. Examples of operations which can often cause damage are landfills, building of ports and roads, dredging and dumping, earthworks, smothering and laying of pipes.

Humans have also left clear traces of their passage on the seabed off the coast. It is estimated, for example, that 33–50% of the deep-water coral reefs, which are found along the Norwegian coast, have been wholly or partially destroyed, largely as a result of bottom trawling. Petroleum exploitation activities are also in part responsible for major physical encroachment on the seabed and in the future the extraction of minerals and gas from the seabed may prove to be real threats.

There are gaps in our knowledge of the marine ecosystems and of how vulnerable they are to various stresses. A good example is sea urchins who graze on and destroy the underwater forests of sea weed along large stretches of the coast from Trøndelag and northwards as far as West Finnmark. The situation has remained relatively stable since the end of the nineteen seventies and results of research indicate that it may remain this way for a long time. We do not know, however, whether the situation is due to natural fluctuations or to human activity, in the form of overload on species which live on sea urchins.

3.7.2 Enhanced spatial management of the marine environment

The Government intends:

- to establish a network of marine protected areas to conserve representative, singular, vulnerable and threatened types of marine environments and natural assets along the Norwegian coastal and maritime areas;
- to protect remaining coral reefs in Norwegian waters; and
- to establish a comprehensive, long-term plan for sustainable management of reserves of sea weed and initiate the necessary research and measures to restore the sea weed forest.

Figure 3.14 These types of coral are to be found along stretches of the Norwegian coast. Here we find sea porcupines and sea anemones at a depth of 15 m off Bodø.

Photo: Erling Svendsen

Some marine areas are particularly important because they play a vital role as, for instance, spawning grounds. Some areas also may represent huge biological diversity or be important habitats; these include coral reefs, forests of sea weed and colonies of eelgrass. Other areas may be regarded as valuable because they have representative or singular natural qualities, which we wish to conserve for the future. Still others may be habitats of rare or threatened species.

But, all human activity affects the environment to differing degrees and the question really is which of the negative consequences are we able or willing to accept in the light of what these activities offer society in return. Sustainable management must be based on the principle that the total volume of operations within a given area may not exceed what the ecosystems can stand.

Establishing environmental quality objectives will prove important in this context (cf. Chapter 2.4.3). Such objectives will set a standard as to what degree of pressure on the environment can be accepted in the different areas.

The expected increase in the exploitation of coastal and maritime areas not least by fisheries and aquaculture will mean that striking the right balances between different user interests and environmental considerations will be very important. Spatial planning out to sea will be an important tool in this context. If we want to ensure sustainable use and strike the right balance between the different areas of interests we must have the requisite know-

ledge of the ecosystem and of the effects different uses have on it. The Government therefore intends to increase charting of maritime areas and to put more effort into compiling and processing data to lay the foundations for a knowledge-based, differentiated management system (cf. Parliamentary Report No. 42 (2000–2001) on biological diversity and Chapter 2.3.3).

Differentiated, sustainable spatial management must be based on knowledge of the ecosystem and of the consequences of different types of use. We have different means for protecting nature from negative effects. These are reflected in environmental legislation and in legislation on individual sectors. Examples of protected marine areas are trawl-free zones in respect of fishing and trawling for sea weed, areas closed to drilling for oil for parts of the year and areas protected under the terms of the Nature Conservation Act.

The Planning and Building Act will also be a pivotal tool for the purposes of spatial planning in sea areas within the Norwegian baseline. A committee is at present working on a revision of the law. A first interim report has already been submitted and a second one will be forthcoming in the New Year. This will be followed by proposals for amendments to legislation.

3.7.3 Marine protected areas

Today approximately 1% of the sea area within the confines of our territorial waters is protected pursuant to the Nature Conservation Act. This zone by and large covers areas where the wish to protect them is associated with natural assets on land – *e.g.* scenery, sea birds or wetlands.

Two marine protected areas have been established; these comprise the Sularevet and Iverryggen coral reefs off the coast of Trøndelag which are protected under the terms of the regulation on coral reefs founded on the law on saltwater fisheries and the law governing Norway's economic zone. A marine conservation area has also been established pursuant to the Nature Conservation Act covering the Selligrunnen coral reef in the Trondheim Fjord. Establishing specific conservation areas under the terms of the Nature Conservation Act will continue to play an important role in work on assuring biological diversity in Norway.

Box 3.6 Definition

Marine protected areas are areas where the seabed and/or the whole of the appurtenant water column or parts thereof are protected under the terms of the Nature Conservation Act or which have been given specific protection pursuant to other laws. A marine protected area may also comprise a land area in the tidal zone. Marine protected areas covered by the Nature Conservation Act are known as «marine conservation areas».

Work has now been started on a national marine conservation plan (cf. Parliamentary Report No. 43 (1998–99) on conservation and use of the coastal zone and Recommendation to the Storting No. 168 (1999–2000)). The purpose of the plan is to ensure that a range of representative, singular, vulnerable or threatened underwater types of marine environments and natural assets are preserved for the future to provide, *inter alia*, reference areas for research and monitoring. The areas are to include a representative selection of types of marine environments in each of the three biogeographical regions along the Norwegian coast.

The intention is that the plan, which will comprise areas conserved under the terms of the Nature Conservation Act and areas protected pursuant to other legislation, should be completed some time during 2004. This first phase will be followed by a second phase of marine conservation work covering the period 2004–2010. During this second phase the existing network of protected areas will be updated on the basis of new findings, national objectives and relevant international processes and agreements. Both the waters close to the coast, territorial waters and the economic zone will be assessed. Where appropriate, management plans will be drawn up to ensure that the areas are managed in a way commensurate with the conservation objective.

According to the UN Convention on the Law of the Sea the International Maritime Organization (the IMO) may establish its own clearly defined areas known as PSSAs where special measures can be taken vis-à-vis shipping with a view to preventing pollution. It is up to individual countries to apply for such status for relevant coastal areas on the basis of those areas' vulnerability and the risk of damage caused by shipping.

Long stretches of the Norwegian coast are extremely vulnerable in the face of shipping accidents and the environmental consequences of such accidents can be very grave. The Government therefore wants to assess the possible use of PSSAs as a tool. At present there are only two areas which have been given the status of PSSAs by the IMO, one of them being the Great Barrier Reef in Austra-

lia, but a number of applications are pending, one of which comprises the Wadden Sea in the North Sea.

3.7.4 Better protection for particularly precious or threatened types of natural environment

In addition to general approaches to protection used in spatial and industrial management the Government intends to intensify efforts to protect the coral reefs and to promote more work on conservation and sustainable use of the forests of sea weed.

Coral reefs

Coral reefs are probably the most vulnerable type of marine environment that we have. It has been estimated that between 30 and 50% of all coral reefs in Norwegian waters have been damaged or crushed and as far as we can judge it is bottom-trawling activities that are to blame. The Institute of Marine Research is still receiving reports from fishermen about continued devastation. This is serious because the coral reefs are precious ecosystems with a particularly rich biological diversity. The coral reefs are of major importance for fisheries, research and also as a source of marine genetic resources. It is uncertain whether destroyed reefs will regenerate and, even if they do, this will take a very long time; the oldest parts of the reefs are between hundreds and thousands of years old.

It is only in recent years that Norwegian authorities have taken steps to protect the coral reefs and they have done this via a provision for the protection of coral reefs in the law on saltwater fisheries and in the law governing Norway's economic zone. This provision prohibits conscious destruction of coral reefs and requires care when fishing in the vicinity of known coral reefs. The use of bottom trawls on two specified and particularly precious coral reefs has also been banned. In addition, a coral reef in a shallow area of the Trondheim Fjord has become the subject of a temporary conservation order pursuant to the Nature Conservation Act.

Figure 3.15 In recent years the authorities have taken steps to protect the coral reefs. Catfish does not eat coral, but lives close to reefs.

Photo: Erling Svendsen

To ensure that the regulation regarding coral reefs is respected a survey of all known coral reefs in Norwegian waters is planned in the course of 2002. The needs for further conservation of coral reefs will be assessed in connection with the marine conservation plan. More research is to be carried out on the incidence of coral reefs in Norwegian waters, their condition and the way in which their ecosystem functions.

Terms of reference are to be established for a task force comprising representatives of the authorities responsible for management. This task force is to identify what needs to be done and to suggest measures, which may offer better protection of remaining coral reefs.

Forests of sea weed

The forests of sea weed along significant stretches of the coast from Trøndelag to West Finnmark have been heavily grazed by sea urchins. This situation has been relatively stable since the end of the nineteen seventies and the scope for fishing in the local areas has been markedly reduced. The cause of this situation is not known. Over the past 10–15 years the authorities have contributed in various contexts to studies of the spread of sea urchins and to research into the relationship between sea weed and sea urchins; one example is through the MARE NOR research programme.

The problem of the depletion of forests of sea weed through heavy grazing has been raised in a number of contexts and a working party has now been appointed to review the whole complex of problems. Assessments and advice submitted by the working party will then be scrutinised with a view to rapid follow-up.

The forests of sea weed from Rogaland to Southern Trøndelag are being used today by the alginate industry. Up to now harvesting has been regulated at county level by opening up areas at 5-year intervals. To ensure that the forests of sea weed are conserved and used sustainably the

Figure 3.16 Along lengthy stretches of coast from Trøndelag to West Finnmark sea weed is heavily grazed by sea urchins.

Photo: Erling Svendsen

Government intends to establish a comprehensive, long-term management plan for sea weed resources in the course of 2003 (cf. Parliamentary Report No. 43 (1998–99)). The goal is that this plan should be co-ordinated with the conservation plans at county level. Particularly valuable and representative areas of sea weed forest will also probably become the objects of protection under the terms of the marine conservation plan.

3.8 Adapting aquaculture to the needs of the environment

Norway's fish farming industry has developed astronomically since its modest beginnings with salmon farms in the nineteen seventies. Today, fish farming is one of our most important sources of exports and also vital to district revenue. In the space of 30 years salmon and trout farming has grown into an export industry worth over 13 billion Norwegian kroner. 460 000 tons of salmon and trout were produced in 2000. Salmon and trout farming constitute the very foundations of the Norwegian fish farming industry and represent the lion's share of the production potential for many years to come. Work is also ongoing on developing other forms of aquaculture. In 2000, for instance, 400 tons of halibut were produced, 100 tons of cod and 1000 tons of shellfish of various types. Obviously, a prerequisite for producing safe seafood is to have a clean and abundant sea.

Pursuant to the law on fish farming, the Ministry of Fisheries has the overall responsibility for management of the fish farming industry and also for co-ordination in this area. A number of other authorities and pieces of legislation are also implicated in the management effort; the law on fish diseases, the Pollution Control Act, the law on Ports and Shipping routes and the Planning and Building Act are of central importance in this regard.

The Ministry of Fisheries has established environmental policy objectives for the fish farming industry in its environmental plan of action for 2000–2004. The aim is through the development of rules and regulations and basic research to contribute to:

- operating methods which place the emphasis on disease prevention;
- effective, environment-friendly methods of combating of salmon lice; and
- techniques and methods which minimise discharges and escapes of farmed fish and which do not involve negative effects for the marine biological diversity and the marine environment.

Conditions of importance to the development of fish farming in Norway have been – in addition to our stocks of wild salmon – the natural advantages offered by the country through its long coastline and clean seas with good scope for production. This branch has therefore been developed using a technique involving open pens, something which ensures that the fish are produced in direct contact with the marine ecosystem. In addition to expecting further growth in the salmon farming industry other types of aquaculture such as farming of saltwater fish, shellfish and sea ranching are also being developed. There are high hopes that different branches of aquaculture along with fisheries may become cornerstones of the Norwegian economy in the future. However, a condition for further growth is that these branches of activity must adapt much more to the needs of the environment. The biggest challenge today is to find solutions to the problems of salmon lice and escaped farmed salmon.

The industry itself has made a commitment to contribute to the effort to reduce the environmental effects of fish farming. An important step in this regard was an initiative taken by the Association of Norwegian Fish Farmers in collaboration with the relevant authorities to draw up a national action plan to prevent escapes. The plan was submitted in the spring of 2000 and contains a number of proposals, which require follow-up via changes to legislation, other administrative measures and initiatives that would have to be taken by the industry itself. The fish farming industry has taken an active part in the development and implementation of the national anti-salmon lice action plan drawn up in 1999 under the auspices of the Norwegian Animal Health Authority. This plan has already been the subject of several revisions.

3.8.1 Challenges

At the end of the nineteen eighties as the fish farming industry continued to grow it became clear that fish farming was associated with consequences for the environment in form of spread of diseases, antibiotics and use of other pharmaceuticals, discharge of substances hazardous to the environment and escapes of farmed fish. Several of the earlier environmental problems are now well on the way to being solved or at least significantly reduced. Not least, the use of antibacterial agents has

been massively reduced and today the fish farming business in Norway is responsible for less than 2% of the total volume of antibiotics used, while around 18% were used on farm animals and pets.

It is true that this branch has come a long way in a number of areas in terms of measures to protect the environment and fish health. Nevertheless, important environmental challenges still remain. The major challenges today are connected with the consequences on wild salmon stocks of escaped farmed fish and the spread of salmon lice. Farmed salmon which escape represent a real risk factor for wild salmon in terms of genetic interference, competition and other effects. Salmon lice are a particular threat to the migrating smolt, which will not survive if the level of infestation with the lice is too high. A survey carried out in the Sogne Fjord in the summer of 2001 showed that around 90% of the smolt from all the watercourses in the fjord catchment area died as a result of this one factor. Furthermore, escaped farmed salmon represent an increase in the number of potential hosts for salmon lice. A report on the state of the stocks in Western Norway clearly indicates that the influence of fish farming in these fish farming-intensive areas has had a negative effect on the stocks of wild salmon.

Environmental challenges still exist also in other areas. These are connected in particular with discharges of chemicals used to treat seines and with the anti-parasitic agents used to combat salmon lice. There is still room for improvement in respect of discharges of chemicals, pharmaceuticals and organic materials. Discharges of nutrients and organic materials can cause regional eutrophication as fish farming activities continue to expand. Access to primary marine raw materials for fodder and competition for space are other major challenges facing the aquaculture branch.

Further growth and development of aquaculture are expected to generate fresh environmental challenges; *e.g.* in the form of new diseases. A particular headache has to do with the fact that many of the problems are increasing in order of magnitude as the industry expands. Many areas therefore need ever better and more effective measures to reduce the overall load generated by fish farming activities. Farming of new species creates new challenges and is an area where we need to learn more about the possible consequences for marine species living in the wild and for the marine ecosystem. In the case of marine species, for instance, we do not want to see an environmental separation between the growth phase and the reproduction phase.

The public infrastructure and support apparatus associated with the industry must be adapted to its needs and must be strengthened to face up to the new challenges represented by food safety, the environment and fish health. The growth of aquaculture during the nineteen nineties was not accompanied by a corresponding focus on the management apparatus. In 2002, the first step in the necessary upgrading of aquaculture management and the concerted effort to ensure safe seafood is taken, both at central and regional levels.

3.8.2 Measures

The Government intends:

- to ensure that consideration for the environment is established as a prerequisite for the further development and growth of aquaculture;
- to increase efforts to reduce problems connected with the escape of farmed fish and salmon lice; and
- to draw up guidelines for environmental testing of pharmaceuticals designed for use in fish farming.

Concern for the environment – a fundamental prerequisite for further development of this branch of activity.

The Government wants to emphasise the enormous potential offered by further development of aquaculture and the importance this branch will have for the Norwegian economy and for regional policy in the future. One of the most important aims of this Parliamentary Report is to help secure the advantages Norway has for this type of growth by establishing a comprehensive, integrated, long-term policy to maintain and ensure a clean marine environment. At the same time, we must also make sure that the branch develops along sustainable lines.

It is important that the industry adjust better to the needs of the environment both for the sake of the environment as such and for the sake of the branch itself. Increasing attention is being directed towards the environmental consequences of fish farming both nationally and on the markets where the products of Norwegian fish farms are sold. If we wish to secure market shares in the longer term we will have to ensure that environmental considerations become an integral part of a long-term development strategy for the industry. The Government therefore intends to target better

environmental adaptation of this branch of activity and to make priorities. This will be part of work in progress in the Government's Aquaculture Committee, whose job it is to establish the long-term strategies for the development of aquaculture.

Special emphasis is also to be placed on giving priority to environment aspects in management, when drawing up rules and regulations, establishing basic conditions and in aquaculture research. Co-operation with the industry is essential if we want to achieve real environmental improvements.

Management. The Government is investing in further enhancement and upgrading of aquaculture management. This will also be an important step if we want to be able to introduce vital initiatives on the environmental side. In addition to increased resources it will also be important to examine possibilities of rendering the present management systems more effective.

Working out legislation and establishing basic conditions. The Government will be giving priority to making sure that the basic conditions applying for the branch stimulate a greater degree of sustainable development. New environment clauses are in the offing and the environmental consequences of the regulations and initiatives to develop the industry will be investigated more thoroughly and attributed greater importance. The Ministry of Fisheries is also preparing to carry out a thorough review of the law on fish farming with a view to presenting proposals for a new law on aquaculture. A new law on aquaculture would provide a basis for active management designed to promote the type of development in the aquaculture sector which also takes account of the environment, biological diversity, sustainable spatial use in the coastal zone and food safety.

In 2002 a new regulation will be drawn for the attribution of marine species which will provide for the need to make facilities and localities infection-proof, to separate generations *etc*. Research will also be started into developing location criteria to guarantee optimum use of the coast, while at the same time preventing the spread of infection and genetic interaction between the farmed organisms and the wild stocks.

Research. Learning more is an absolute prerequisite for sustainable development of existing and new areas of aquaculture. Research on environmental effects is therefore important and must be included in all aquaculture research. Thanks to the industry's own R&D resources financial support is now being provided for the necessary research into interactions between wild fish and farmed fish.

Figure 3.17 The photograph depicts a salmon farm in Jarbotnfjord in Finnmark.

Photo: Stein Johnsen/Samfoto

Special measures to reduce escapes and combat salmon lice

The Government intends to launch a 3-year drive to implement effective measures to combat salmon lice and fish escapes. A mandatory implementation plan setting out measures to be taken over the next three years will be finalized by the autumn of 2002. This plan will be based on the existing action plans addressing the problems of escapes and salmon lice. The first thing which needs to be done is to implement measures already identified in the current action plans, but new measures in the light of fresh findings in recent years must also be considered. This is a field where the effect of the measures introduced will depend on the growth of this branch. This is something which requires a constant focus on research and on development of new approaches and new technologies. This work must be a collaborative effort on the part of the competent authorities and the industry.

In the case of salmon lice, co-operation has been established between the operators and the veterinary and fisheries authorities in the Trøndelag region and jointly conducted delousing of farmed salmon has considerably reduced the salmon lice problem. A similar concerted offensive is now planned for the other regions as part of more intensive implementation of the anti-salmon lice action plan. More emphasis is to be placed on information on the legislation in place and compliance with it. Stricter penalties are to be introduced for violations of the regulations including withdrawal of concessions in the case of serious or repeated infringements.

The action plan drawn up to counter escapes of farmed fish contains a number of measures. Important measures which it has already been decided to implement involve the introduction of a system of technical, type approval for fish farming facilities (TYGUT) and internal checks pursuant to the law on fish farming and fish diseases. New regulations are being drafted with a view to entry into force some time in 2003. Further, the rules on operation of fish farms and on diseases are to be amended and the following additional measures will then apply: Better routines during risk-operations on the pens, propeller protection requirements, better monitoring of the enclosures, better routines for towing the pens and better regulations in respect of holding pens and handling of fish in association with slaughterhouses. These measures will help us achieve the political objective already adopted whereby escaped farmed fish shall no longer represent a threat to wild salmon by 2005.

Part of adapting the aquaculture industry to the needs of the environment will involve giving consideration to the possibility of marking farmed salmon. The Government wishes to follow up this idea and to learn more about marking of farmed salmon, while also investigating the economic and other consequences of such a system. This inquiry will be carried out as a collaborative effort by the fish farming and environment protection authorities in consultation with the branches concerned. Important elements of this work will involve looking at the possibilities of marking in the light of a number of objectives, such as being able to identify farmed fish which has escaped, commercial traceability *etc*. Another important aspect involves producing a social cost-benefit assessment. The aim is for the work to be completed in good time so that a basis for decisions is available in the course of 2003.

Adapting medicines to the needs of the environment

If we want to protect the marine biological diversity, the use of pharmaceuticals in this industry must be adapted as far as possible to the needs of the environment. Pharmaceuticals used in fish farming are discharged into the marine environment and may affect wild organisms living there. The Government therefore aims to draw up guidelines for environmental testing of pharmaceutical products used in fish farming. This will help ensure that the pharmaceuticals of the future are adapted to the needs of the marine environment and also that effects of different pharmaceutical preparation are comparable. In addition, importance is attached to developing alternative methods, which are more environmentally friendly, *e.g.* use of wrasses for delousing where possible.

Other measures

Substances hazardous to the environment. Discharges of copper used in the treating of seines represent a pollution problem and this area of use is one of the two main sources of copper discharges into water in Norway. Norway has not yet achieved the objective regarding reduction of copper discharges into water set out in the previous North Sea Declaration and, given current fishing methods and the expected growth of fish farming, this problem may be expected to increase in the future. In 2002, the pollution control authorities will be introducing a ban on discharge of copper and other hazardous substances from plants which treat and wash sei-

nes used by fish farms. This will help encourage the development and use of more environmentally friendly alternatives. Mechanical methods involving rinsing and drying of seines are an alternative to proofing of seines. A few fish farms have started experimenting with using what is termed an «environment drum» on a voluntary basis. This can be used in rectangular pens in steel facilities and experience so far has been positive. The drum also offers better scope for checking on holes in the seines.

The policy of substitution whereby a more environmentally friendly product shall be used where possible is also to be used in connection with other chemicals used in fish farming.

Discharges of organic substances from fish farms. The Government is anxious that the basic conditions applying for the fish farming industry should stimulate better adaptation to the needs of the environment. In a possible new system for regulation of production, operators may be required to take responsibility for environmental monitoring of their own plants using approved methods. Information generated by this type of monitoring will provide a basis for forecasting and assessing the capacity of the different sites and will be useful in preparing for further growth in this industry, coastal zone planning and so on. For example, priority may be given to the farming of shellfish in areas with high concentrations of nutrients.

Spatial use. More growth in aquaculture will mean more demand for suitable space. Good cross-sector processes are to be established to avoid disputes over environmental considerations and other areas of industrial and consumer interests such as transport and open air activities. If we want to achieve the most efficient and sustainable use of space available, we must assess the possibilities of combining the farming of a number of species on the same site. This is the reason why a project has now been started in the Trøndelag region involving trial farming of salmon and shellfish and of salmon and cod on the same site to find out what effects this may have. The project will therefore be followed up with a monitoring programme to establish the possible operational and contagion-related consequences. If this is shown to be a viable approach it will also increase the basis for value-added in that optimisation of operations can save on costs.

3.9 Sustainable fisheries management

3.9.1 Fishing resources and fisheries

Fishing and landings of fish along with fish farming are of vital importance to the scope of communities along the Norwegian coast to make a living. The total turnover of the fisheries sector in 2001 was 11.4 billion Norwegian kroner (primary value), while the export value amounted to around 20 billion Norwegian kroner.

The fisheries sector depends on renewable, although not unlimited resources. This is why it is important to develop management strategies which take account of the ecosystem as a whole and of how the fish stocks are affected by a variety of environmental factors and fishing activity. A clean sea and a sustainable load on fishing resources are absolute musts if the value-added in the fisheries sector is to be maintained and further developed. They are thus of vital importance to the very basis for existence of the coastal population. Fishing is also part of the material prosperity of Lapp culture in the coastal region and fjord areas.

Every year Norway records landings from around 80 different stocks of fish species. Of these 28 species are of economic significance. The average catch for Norwegian fisheries from around 1960 and up until the present day is around 2.5 million tons per annum. The actual catches have always varied from year to year and also show periodical variations which reflect fluctuations in the size of the fish stocks and their accessibility. The Norwegian fisheries are mainly in the North Sea, the Norwegian Sea, the Barents Sea and along the entire coastline. Fishing activities in the North Sea are dominated by herring and sprat, plus mackerel, cod, haddock, whiting, Norway pout and sandeel. In the Norwegian Sea the most important species are Norwegian spring spawning herring, blue whiting, mackerel, saithe, ling, blue ling and tusk. In addition to fishing for shrimp and capelin, fishing in the Barents Sea is dominated by demersal species such as cod, saithe and haddock.

Scientific advice is provided on management of catches based on the size of the individual stocks for all the most important fish stocks. This advice comes from the International Council for the Exploration of the Sea (ICES). Both advice and management must be based on the precautionary principle in order to ensure balanced and sustainable commercial operation, which also protects the basic resources and the biological diversity. Such management must also be based on an ecosystem approach.

Figure 3.18 Capelin is fished using a purse seine or a trawl, as shown here in the Barents Sea.

Photo: Kjell Karlsen/NN/Samfoto

Learning more about the diversity of marine organisms and about how the individual species and stocks at different levels in the food chain interact can lay the foundations for increased value-added and strengthened management of all marine resources in a way which, *inter alia*, takes account of the biological diversity. Today we are reaping just a few species in this diversity. Future value-added based on marine resources may take many forms and will very probably also include species which are not being used today. Work on assessing how the stocks interact with each other at different levels in the food chain and how this affects potential for harvesting of individual stocks will provide a basis for optimum harvesting strategies for different fish stocks, marine mammals and so on. Increased interest in using all parts of the raw materials, off-cuts *etc.* as fodder on fish farms and other animal production units, and increased use of biotechnology to derive advantage from the singular properties of marine raw materials has yielded results and it will be possible in the near future to make use of the raw materials harvested to a level of 100%. Increased pressure from a growing market for food, fodder and specialist products makes greater demands on management of resources, and outtake must be based on the principle of sustainable, ecology-based management. The Government will use this as a basis for further development of harvesting of all types of live marine resources.

3.9.2 Measures

The central environmental challenges in terms of fisheries management are associated with improving the knowledge base for management, implementation of new principles in resources management (ecosystem-based management and implementation of the precautionary principle), regulation of fisheries, reductions of by-catches and more effective enforcement of the regulatory provisions. It is also important to reduce catch capacity in order to bring it more in line with the resources available and what can be expected to be available in the years to come. During the spring of 2002 the Government will be presenting to the Storting specific proposals regarding the setting up of a structural fund. This, coupled with establishing means of adapting fleet sizes to resources available across the fisheries sector, will improve the balance between resources and the outtake of them.

In the light of this the Government intends:

- to improve on what we know about sustainable fisheries management by
  - stimulating the development of new, more effective monitoring methods using modern technologies to accommodate the increasing demands for monitoring of resources and ecosystems; and
  - conducting estimation of the specific relations between consumption and population size at different trophic levels of the marine food webs so as to learn more about these interactions in the marine ecosystem;
- to strengthen fisheries regulations by
  - establishing management objectives (target reference points) for the different stocks;
  - developing a precautionary approach to regulation further;
  - continuing the implementation of ecosystem-based management; and
  - implementing technological and catch-strategy approaches to further reduce unwanted by-catches;
- to improve supervision of catches by
  - intensifying the work done by the coastguard and field controls;
  - stepping up dissemination of information on the importance of adhering to regulatory provisions;
  - working harder on establishing reliable measurements for total outtake from stocks being harvested (including discards and by-catches); and
  - considering the introduction of a general ban on discards; and
- to introduce institutional measures by
  - starting work on a new law on marine resources;
  - doing more in the context of ICES on developing a precautionary approach to management of resources; and
  - clarifying areas of responsibility in terms of providing expert advice on the status of the maritime and coastal environment and appropriate measures.

3.9.3 The influence of fishing activities on resources and on the biological diversity

In the global context overload on fisheries resources represents a problem. The UN Food and Agriculture Organisation, the FAO, has estimated that between 15 and 18% of the world's fisheries resources are being overfished and that if no steps are taken to reduce overfishing, yield from these

stocks will be drastically reduced. Between 47 and 50% are already fully utilised, *i.e.* it is not possible to extract more fish without this having negative effects. Approximately 25–27% of the fisheries resources are either under-utilised or under moderate pressure and it is here that there is potential for increasing the fishing effort in the years to come.

In global terms a major problem for fisheries management is that catch capacity far exceeds the resources available. This overcapacity is perhaps the main force driving overfishing of the stocks. This is a problem in Norway, too. The fishing fleet is generally too big if compared to the fish stocks available.

Outtake of stocks and ecosystems leads to changes in their dynamics. Most of the species of importance to our economy are quite good at adapting to different types of influence. Under moderate pressure productivity will actually increase through the fish growing faster and reproducing at a younger age. But, when the fishing outtake exceeds a certain level the stocks lose their ability to adjust and become subject to overload.

Most fish stocks exhibit marked natural fluctuations associated with natural phenomena such as temperature, currents, climatic factors, interactions between species *etc*. Outtake causes stocks to shrink and leads to the age composition and growth of the species changing. Relations between the species in the ecosystems are also affected. It is difficult to distinguish between the effects of human activities and the effects of natural phenomena when fish stocks increase or decrease. We need to know more about such factors if we want to achieve sustainable resources management. Good, sustainable management depends on being able to adjust outtake of the stocks to natural fluctuations in phenomena affecting them.

Many of the most important stocks in our waters are vulnerable for a variety of reasons; some species are long lived and mature late, others renew themselves at varying speeds and are affected by fluctuations in the maritime climate.

Excessive pressure on a fish stock can cause it to shrink so drastically that it cannot be fished at all for a long time. New generations of fish produced each year are very small in number and the spawning stocks remain stable at a low level over a very long period. In our waters we have experienced the collapse of Norwegian spring spawning herring, North Sea herring and North Sea mackerel. Collapses such as these occur quickly in stocks under heavy pressure and can have long-term consequences for the stocks. The collapse of the Norwegian spring spawning herring stock at the end of the nineteen sixties led to a change in migratory patterns and this stock was not available in quantities permitting catches for 20 years. In addition, supplies of nutrition for other species in the ecosystems (*e.g.* cod, saithe, minke whale and sea birds) have undergone radical change. A concerted effort to build up the stock again produced good results and today the stocks of Norwegian spring spawning herring are in a healthy state and provide for good fishing. At the same time, the pressure on North Sea cod, blue whiting and Greenland halibut are now giving cause for concern.

Many fisheries exhibit pockets of other species or unwanted size categories of the target species, *i.e.* by-catches. Some of these have an economic value, while others simply constitute a nuisance to commercial fishing. The problem of by-catches is multi-facetted; it comprises catches of fry and small fish, threatened species or heavily overfished species, plus birds and marine mammals.

Catches of fry and fish below the minimum size are a problem for many fisheries. Area closures, grading techniques and mesh size regulations have been introduced to lessen the harmful effects of the by-catch problem. Fishing for shrimp in the Barents Sea and in the Norwegian fjords has been regulated for a long time with the aim of avoiding large by-catches of cod, haddock and redfish. These problems have been central to reductions of demersal fish stocks in the North Sea. Work is now in progress on establishing solutions to finding the right gear so as to reduce by-catches of fry; this is, for example, the case in the industrial fisheries in the North Sea, which concentrate on tusk and Norway pout and where catches at certain times contain large numbers of recruits from species such as haddock, whiting and blue whiting. Dynamic, knowledge-based regulation of seasons and areas based on the results of monitoring is important. Despite clear and effective measures introduced by Norway there are still unknown numbers of mortalities in many of the stocks as a result of fishing gear, slip of live fish in seine fisheries *etc*. Discarding by-catches of economically important species is prohibited in Norway. Now the Government intends to study whether this ban should be extended to cover all species in order to tighten controls and monitoring of the by-catch problem. In that case all catches must be landed and reported.

By-catches of marine mammals and sea birds are a considerable problem in some fisheries. In net fisheries on the coast seals and porpoises become tangled up in the fishing gear. Sea birds such as auks, puffins, great cormorants, shag and

common guillemots are also at risk. This causes suffering for the animals and losses for the fishermen. By-catches of sea birds are also a problem for line fishing, but here some progress has been made in developing techniques which reduce the problem. An effective and cheap remedy is to use a «scarecrow». This is a product developed jointly by research circles and the industry. It is, however, taking time to persuade all the operators to tow this device behind them.

In recent years a lot of research has been done to try to find out how different types of fishing gear and fishing methods affect species and the habitats of species. In areas with a high frequency of trawling habitats risk permanent change. Trawling in areas with coral reefs has been seen to cause considerable damage to the reefs. Coral reefs evolve over hundreds of years and are an important habitat for many species of fish and other organisms. Norway has taken steps to protect these habitats. The most important thing is to protect areas along the coast where such reefs have been detected. The reefs are probably of major ecological significance and it is important to continue to chart them and to be constantly considering measures to protect them.

Lost fishing nets have both practical and economic consequences for fishermen, are a hidden danger to fisheries resources and constitute litter. For some years now we have undertaken clean-up operations to remove lost nets and a working parity comprising representatives of the fisheries authorities and the industry is to make proposals as to how to reduce the problem. High priority will be given to following up its proposals.

3.9.4 The international framework for management of resources

As much as 90% of all fishing in Norway involves stocks which are shared with other countries. The Norwegian authorities cannot therefore decide on how these stocks are to be managed in isolation. They have to co-operate with the other countries.

The overall, global framework for the management of marine resources and the environment is laid down in the UN Convention on the Law of the Sea from 1982. This convention gives the coastal states the right to establish economic zones extending to a maximum of 200 nautical miles (370 kilometres) from the coast and invests them with sovereign rights over the natural resources in those zones. The Convention on the Law of the Sea sets out principles as to how regional and national regimes are to be organised and what they are to take into account. A distinction is made between management inside and outside these economic zones. Inside its economic zone the coastal state has an obligation to manage and conserve fishing resources based on the best available scientific data and to ensure that the stocks do not risk being overfished. This requires a considerable effort in terms of learning more about the marine environment and in terms of managing and using it.

The UN conference on the environment and development held in Rio in 1992 put maritime issues on the agenda and led to the introduction of a system for better management of stocks located both within national zones and in international waters. This was achieved via the UN agreement on fishing on the high seas (1995). The agreement adds more detail to the contents of the Convention on the Law of the Sea on a number of important points. The agreement gives the precautionary principle a firm foundation in international law in respect of fisheries management and rules regarding compliance. The agreement also establishes an obligation for countries to engage in regional co-operation in the field of fisheries management and on the terms for enforcement of fisheries regulations. The agreement came into force in December 2001 and has proved important to the establishment of more modern principles for the management of marine resources and to the implementation of these principles in practical policy. The agreement has also been important to the development of regional co-operation on fisheries.

The FAO's fisheries committee (COFI) plays an important global role in the development of standards for good fisheries management. Parallel to developing international agreements in the area the FAO has also been instrumental in developing an International Code of Conduct for Responsible Fisheries, which was adopted in 1995. This establishes a number of principles for modern fisheries management, including consideration for the ecosystems where fisheries operate.

Various action plans have been drawn up to launch the code. An international action plan to combat illegal, unregulated and unrecorded fishing (known as IUU fisheries) was adopted in March 2001. Following pressure from Norway the action plan included a mechanism for blacklisting vessels which have engaged in IUU fishing and a ban on selling catches obtained by illegal means. International action plans were earlier adopted on by-catches of sea birds through line fishing, protection and management of shark stocks and on reducing overcapacity in the fishing fleet.

Commercial and environment issues are becoming more and more closely connected and this in itself is not without problems in respect of the WTO rules or international agreements on the environment. A number of cases concerning use of trade measures to protect environmental assets have been heard by the WTO panels for the settlement of disputes. In this area Norway will be focusing on obtaining further clarification of the positive and negative effects of increased liberalisation of trade on the environment and on examining subsidies which may be harmful to the environment more closely.

It is important that the trade rules promote production and use of environmentally friendly goods and services. The use of environmental labelling can influence patterns of production and consumption in a sustainable direction. Transparency is important if we want to avoid environmental labelling being used for protectionist purposes. Environmental labelling of products and the need for global guidelines for this were discussed at the global summit on the environment and development in Rio in 1992. The use of environmental labelling can also be justified from the point of view of the consumer's right to environmental information (cf. the Århus Convention). The UN Environment Programme (UNEP) is in the process of developing technical guidelines for environmental labelling and Norway supports this effort.

Assessments of the life span of products are a useful tool for documenting the environment-friendly properties of a product and can also help identify good environmental labelling criteria. The UN's Environment Programme is trying to reach agreement on the methods to be used in life-cycle assessments. Norway will be giving its support to this work and will also promote the development of criteria for life-span assessments of seafood products at the FAO. National authorities responsible for the different sectors along with trade and industry have an important responsibility here.

Co-operation under the terms of the Convention on International Trade in Threatened Plants and Animal Species (CITES) is of central importance in respect of dealing in threatened species of animals. Animals and plants can be placed on three lists (appendices) depending on the degree to which they are under threat and the degree to which they are traded. CITES has placed a number of species of whale on these lists. The minke whale, for instance, is listed in Appendix 1. Norway has entered a reservation in this regard since there is scientific evidence to show that this listing is not justified. Work is now in progress in the context of CITES on establishing a basis for listing commercial fish stocks believed to be under threat. Norway has adopted a sceptical stance on this, one of the reasons being that the dynamics of the marine ecosystems imply large, frequent fluctuations in the stocks which are different to those observed among animals living on land. There are therefore serious doubts as to whether the criteria and processes used by CITES are suitable for such stocks. In addition management schemes already exist for live marine resources which take account of the conservation aspect. CITES is now reviewing existing criteria and Norway is taking an active part in this work both via the FAO and via CITES to ensure that the criteria selected are appropriate.

3.9.5 The management regime for stocks in Norwegian maritime areas

Fisheries management in Norway is based on the main principle of sustainable harvesting using the best possible scientific advice. Our objective is to manage the marine ecosystems in a manner that ensures a balanced and sustainable growth in the sector and takes account of need for protection.

A number of bilateral agreements have been concluded on co-operation in respect of management of resources. Here the agreement with Russia on management of the resources in the Barents Sea and the agreement with the EU on management of the resources in the North Sea are the most important. Annual reports are presented to the Storting on activities under the terms of these bilateral co-operation arrangements.

Annual negotiations take place on the fixing of quotas on the basis of advice from ICES. ICES contributed to the work on developing a precautionary approach into operational advice in connection with the UN agreement of 1995, and since 1998 it has been providing advice on management on that basis (see Box 3.7). Limit values have been fixed regarding the size of spawning stocks and fish mortality. These are designed to ensure that the stocks are kept within safe biological limits. These reference limit values are based on statistical calculations using historical observations. Account is taken of the elements of uncertainty in these calculations by applying the so-called «precautionary reference limits». A system for reducing outtake from stocks when the spawning stocks approach the critical limit has been developed on the basis of these values.

ICES is working on drafting «target reference values» for the respective fish stocks. Target reference values will help establish good economic

Box 3.7 Implementation of a precautionary approach

In 1998 ICES began using new reference points to accommodate the need for a *precautionary approach* when giving advice on levels for catches. These new reference points are being used to establish whether fish stocks are within or outside safe biological limits. Reference points have also been developed to assess whether the catches can be considered to be in compliance with the precautionary principle or not.

The precautionary reference points must take account of the elements of uncertainty in the calculations of stock sizes and of the effect that fishing has on fish stocks.

The following reference points are being used.

Spawning stocks: The limit value (B_{lim}) is the size of the spawning stock where renewal is assumed to be weak or where the dynamics of the stock are unknown if the spawning stock is below the limit value. The precautionary reference point (B_{pa}) represents a level of spawning stock which implies little risk of it falling below the limit value (B_{lim}).

Fishing effort: The «F_{lim}» limit value indicates fish mortality whereby stocks will be reduced in the long/medium term to a level which can be expected to entail renewal problems. Fish mortality under «F_{pa}» means a low risk of the actual fish mortality being higher than the «F_{lim}» limit value.

If according to these guidelines a stock is defined as being outside safe biological limits, the advice given will usually indicate alternative levels of pressure (F) in order to bring the spawning stocks up to above the precautionary level (B_{pa}) over a shorter or longer period of time.

If a stock is outside safe biological limits it means that the size of the spawning stock, and thus growth and harvesting potential, is below the production potential of the stock. This will, for instance, have economic repercussions for fisheries.

ICES is now working on developing target reference points. These will indicate the optimum level of pressure on stocks to stabilise the long-term yield and help ensure that sizes of stocks do not fall to levels close to the limits. Fixing a target reference point for individual stocks should be regarded in the context of multi-stock management.

strategies regarding pressure on stocks and avoid situations where the size of stocks approaches the limit values.

A number of fish stocks cover an area involving the jurisdiction of several countries. The mandate of the Northeast Atlantic Fisheries Commission (NEAFC) covers the ocean maritime areas in the Northeast Atlantic. A regional arrangement has been negotiated by the coastal states concerned for Norwegian spring spawning herring, blue whiting and mackerel, while the international component of the stocks is managed by NEAFC. With the advent of the UN agreement on ocean fishing in 1995 regional agreements have become more important not least in connection with enforcement of the regulations. NEAFC has launched system of satellite monitoring of the fisheries in the Northeast Atlantic. The north Atlantic area is the responsibility of a similar organisation (NAFO). Norway also takes part in work under the terms of the Convention for the Conservation of Live Marine Resources in Antarctica (CCAMLR). It is also active in the International Whaling Commission (IWC), the North Atlantic Marine Mammals Commission (NAMMCO), the South Atlantic Fisheries Organisation (SEAFO) and the International Convention for the Conservation of Atlantic Tuna (ICCAT).

Negotiations with other countries on management of common stocks are often very difficult because it is a question of dividing up scanty and valuable resources. In the case of specific stocks – for example, blue whiting – the parties have not managed to agree on the distribution of the recommended fishing effort. The lack of agreement has led to the total amount of fish caught being greater than recommended. This has led to greater pressure than is desirable on a number of stocks. This also means that the economic yield from fisheries is lower than it might have been.

Once the level of fishing effort has been fixed via international negotiations, it is the job of the national authorities to distribute the amounts available to Norwegian fisheries.

Overcapacity in the fishing fleet is a multi-dimensional challenge. Unit quota arrangements[1] have been introduced for a number of fisheries important to the ocean-going fishing fleet to help reduce the haul capacity of the fishing fleet. On 3 May 2001 the Storting gave the Ministry of Fisheries the authority to introduce «special quota arrangements», *i.e.* voluntary operational and structural arrangements for the coastal fleet as well. The Ministry of Fisheries is now busy drawing up provisions for the implementation of these arrangements which could provide a basis for reduction of overcapacity and better economic conditions for all parts of the Norwegian fishing fleet.

The Ministry of Fisheries intends to develop new legislation to replace the law on saltwater fisheries currently in force. This new legislation will focus more specifically than in the past on the ministry's sectoral responsibility for marine environmental issues. A committee is to be appointed for this purpose and that committee will be asked to consider the possibility of broadening the focus of the legislation to cover not just fishing operations, but also other live marine resources, including kelp and sea tangle, plus organisms which are today not commercially exploited such as plankton, demersal organisms *etc*. The idea here is to have legislation in the future which is better equipped than that of today for preserving the marine biological diversity. The committee will also be asked to consider the inclusion of the commitments made by Norway via environmental legislation. The UN Convention on the Law of the Sea of 1982 will be of central importance. The committee will review the application regulations and other instruments which are today covered by the law on saltwater fisheries. The work of this committee will be conducted in close co-operation with the Committee on Biological Diversity.

3.9.6 Control of fishing effort

Responsible fisheries management requires effective control of resources. Extensive fishing activity and the fact that Norway's fisheries jurisdiction covers huge maritime areas leave us facing an enormous workload in terms of control. The main aim of controls on resources is to provide information on actual total amounts of fish caught and on catches within the areas covered by Norwegian fisheries jurisdiction using registration systems and checks, and to make sure that fishing regulations in force are respected. The environmental significance of resources control is thus mainly associated with providing reliable information on annual catches which, together with the research community's analyses of stocks, helps provide a basis for estimating the sizes of fish stocks and fixing the total annual quotas for the stocks.

Satellite tracking of fishing vessels began as far as Norwegian fishing vessels are concerned in July 2000. This is part of the resources control system and gives the fisheries authorities information on the position of the fishing vessels, their speed and their course. Agreements have been concluded on satellite tracking with all the countries with access to fishing in Norwegian waters.

Checks on catches from common stocks require close collaboration among the countries concerned. Agreements have been concluded on co-operation in control areas with Russia, the EU, individual member states of the EU and a number of other countries. Foreign vessels wanting to fish in areas under Norway's fisheries jurisdiction must first apply for permits and have an obligation to report their catches to the Norwegian authorities.

Norway is active in the international organisations and bilaterally in trying to get to grips with the problem of unregulated fishing on the high seas.

The main challenge is establishing a system of resources control which is effective enough to prevent illegal practices in the form of circumvention of quotas, fishing in closed areas and illegal discards. Another challenge is obtaining reliable information with the help of marine research bodies on the volume of catches dumped at sea or sold outside the legal channels and thus not covered by statistics on fishing and catches.

On 3 May 2001 a report was submitted to the Storting on irregularities, controls and measures introduced in the fisheries sector. A description was given of the resources control apparatus, the extent of irregularities and the steps taken to strengthen controls. Resources controls have been strengthened through a concerted effort to increase manning of the system, better access to controls and more stringent penalties for violations of fisheries legislation. Much emphasis is put on the need to address conduct and ethics in the sector. It was noted that more work is still needed on these aspects of fisheries management.

[1] A system financed with own funds and designed to reduce the number of vessels in an access-regulated part of the fleet where the fishing capacity will exceed the available quotas for the foreseeable future. By withdrawing a vessel from fishing operations the quotas attributed to that vessel can be transferred to another vessel for a limited period of time. The second vessel will thus enjoy an increase in its quota without this affecting the total catch.

4 International cross-sector co-operation on the marine environment

Norway has a vested interest in how maritime areas and ocean resources are managed. Norway has jurisdiction over and responsibility for a maritime area, which is six times larger than its land area. Norway is also a net recipient of pollution from other countries, which is carried to its shores by ocean currents and on the wind. Our long and exposed coastline causes concern in the light of a possible increase in the transport of environmentally harmful substances by sea off the Norwegian coast; *e.g.* oil and nuclear waste. Norway must therefore make a strong commitment to establishing framework conditions governing the management of maritime areas and natural resources at international level. International work on the marine environment is of great importance to Norway.

International agreements entail a number of obligations. The Government believes it is extremely important for Norway to live up to its obligations pursuant to the international agreements to which it is a party; this is important both out of consideration for the environment and because of the need to maintain Norway's credibility. The Government also wants to strengthen the compliance mechanisms set out in international conventions on the environment, including mechanisms providing for sanctions and liability/compensation.

Issues relating to marine environment issues are discussed in a number of international fora both at the global and regional level. Norway's positions in various fora in connection with all the ongoing processes of significance to the marine environment need to be co-ordinated and based on a thoroughly thought out and comprehensive and integrated national policy on the marine environment. This chapter gives an overview of the most important (general) international agreements and processes of significance to the marine environment and Norway's priorities in respect of this work.

4.1 Global co-operation

The Government intends:
- to continue to use the UN Convention on the Law of the Sea as the overall legal framework for all measures in the marine sector;
- to submit proposals to step up debate on maritime issues and questions relating to maritime law in United Nations;
- to pass on information on experience and objectives relating to co-operation between the North Sea states as input for global co-operation in connection with the World Summit in Johannesburg;
- to help improve implementation of UNEP's global plan of action (GPA) for the protection of the marine environment from land-based activities; and
- to continue to be active in the IMO in pressing for better environmental legislation in relation to shipping.

The UN Convention on the Law of the Sea of 1982 provides the overall legal framework for all national, regional and international measures in the marine sector. Part XII of the convention deals with protection and conservation of the marine environment in the presence of pollution, while Parts V-VII address conservation and management of natural resources, including biological diversity. The Convention on the Law of the Sea contains a number of provisions designed to combat pollution of the seas and oceans by different sources and to promote international co-operation in this area. It contains obligations to adopt national legislation to counter marine pollution and to participate in the drawing up of regional and global rules to this end. Contracting states must also fulfil their obligations under the terms of other environmental agreements in a way which is compatible with the principles and objectives set out in the Convention. Norway attaches great importance to strengthening and developing the system provided for under the Convention in future work relating to international maritime law.

The Convention on the Law of the Sea came into force in 1994 and since then discussions have taken place every year in the UN General Assembly to assess the degree of implementation of the convention along with new trends in the area of maritime law. The debate takes place on the basis of an annual report by the Secretary-General. The United Nations General Assembly is the most important forum for the development of global policy in the field of the law of the sea and is for the moment the only forum with such broad terms of reference. It has been suggested that more co-ordination is needed between various international bodies and negotiators responsible for maritime issues and questions relating to the law of the sea. In 1999 the General Assembly adopted a resolution on the creation of an informal consultation procedure for a trial period of three years. This consultation procedure would lay the foundations for debate in the General Assembly and would in particular aim at identifying areas in which co-operation and co-ordination could be improved. The final meeting under this consultation procedure will take place in April 2002 and the 57th session of the General Assembly in the autumn of 2002 will then assess the outcome of the procedure along with its future. Norway is at present considering different alternatives for addressing maritime issues in the best possible way within the UN system; these include the possibility of referring these issues to one of the principal committees reporting to the General Assembly or of setting up a select committee for maritime issues and issues relating to the law of the sea.

The UN conference on the environment and development held in Rio in 1992 placed maritime issues on the agenda via, for instance, the adoption of Chapter 17 in Agenda 21, which deals with the management of maritime and coastal areas. In August/September 2002 the World Summit on Sustainable Development will be held in Johannesburg, South Africa on the occasion of the tenth anniversary of the «Earth Summit» in Rio. In the run-up to the summit a review will be conducted of developments since 1992 and results achieved, including those relating to Chapter 17 in Agenda 21, and new challenges will be identified. Norway takes the view that much has been achieved since 1992, pointing out at the same time that much better implementation of the agreements and programmes adopted is still needed, along with better co-ordination of different international processes. The Government is anxious to ensure that the outcome of the North Sea Conference is taken into account in preparations for the summit in Johannesburg. This applies in particular to rendering the ecosystem approach operational (this approach is described earlier on in this Parliamentary Report, cf. Chapter 2.2.3), to addressing the problem of ballast water and to bans on transplanting GMOs in the marine environment and radioactive discharges. Norway will, furthermore, be stressing the need to ensure the application of the Convention on the Law of the Sea and of generating more debate on maritime law in the UN as part of the preparations for the summit in Johannesburg.

One of the most important outcomes of Agenda 21 on the marine environment front was the adoption of a global programme of action on the protection of the marine environment from the effects of land-based activities (GPA) which are responsible for around 80% of pollution in the marine environment. This plan, which was drafted under the auspices of UNEP, is not legally binding. What it does is specify objectives and measures at global, regional and national level. The first conference to discuss implementation of the plan was held in Montreal, Canada in November 2001. At this conference a ministerial declaration was adopted whereby countries commit themselves to stepping up implementation of the plan of action. The conference also endorsed the idea of drawing up a separate Strategic Action Plan on Municipal Wastewater as an area where there are major health and environmental problems in a number of developing countries.

The Government regards the GPA as a balanced and practical programme for the implementation of measures to address land-based activities and does not therefore see any need for a global convention in this area. Norway will continue to play an active part in the implementation of the GPA, will try to channel aid towards projects which help fulfil the aims of the plan and will also contribute to strengthening scope for funding at international level. Norway has already spoken out in favour of general enhancement of the role played by UNEP, its powers and its funding. Giving UNEP more muscle in this way will prove valuable when implementing the GPA and the UNEP Regional Seas Programme

The UN's maritime organisation, the IMO, has adopted a number of global conventions, which help protect the marine environment. Much of the work in this area is done in the IMO's environment committee (the MEPC) in connection with follow-up to the MARPOL Convention on pollution from shipping. In October 2001 the IMO adopted a new convention on control of harmful anti-fouling agents used on the hulls of ships. The convention

entails a ban on the use of the ecotoxin tributyl tin (TBT) on ships as of 1 January 2003 and a total ban on the presence of TBT on ships' hulls as of 1 January 2008. It is vital that the convention come into force quickly and the Government intends to ratify it as soon as possible. Work taking place in the IMO on a new convention on ballast water is referred to in Chapter 3.6.2.

4.2 Priority issues for regional co-operation and bilateral co-operation with Russia

The Government intends:
- to continue to be a driving force in regional work on the marine environment;
- to focus on ecosystem-based management of the marine environment, discharges of ballast water and radioactive discharges in its capacity as host of the North Sea Conference in March 2002;
- to encourage Russia to become a party to the OSPAR Convention and to accede to the global ban on dumping of all types of radioactive waste pursuant to the London Convention;
- to demand that the British Government take immediate steps to significantly reduce discharges of technetium-99 into the sea; and
- to work towards strengthening international legislation on the transport of radioactive waste, while trying to get bilateral agreements on notification of countries concerned about these cargoes.

The most important regional fora for this area of work is the OSPAR Convention (the Convention on the Protection of the Marine Environment in the Northeast Atlantic), the North Sea Conferences, co-operation within the context of the Arctic Council and bilateral co-operation with Russia. The Nordic Council of Ministers (the group responsible for maritime and atmospheric issues) also has maritime issues on its agenda and in addition these problems are addressed in the context of co-operation regarding the Barents Sea. In 2002 Norway has the Presidency of the Nordic Council of Ministers and Norway's programme for the presidency highlights the need to protect our seas, coastline and sources of freshwater. Norway will be focusing on how joint Nordic action and initiatives can back up work in the field of the marine environment.

In the context of regional co-operation the Government will be giving priority to measures to combat discharges of pollutants, pollution from shipping and other activities which affect Norwegian maritime areas. Agreements on hazardous substances and radioactive substances will be given special attention.

Work within the framework of the OSPAR Convention is of major importance to Norwegian maritime areas since co-operation in this context covers land-based sources, dumping of waste at sea, discharges from offshore installations and protection and conservation of ecosystems and biological diversity. The OSPAR Commission has adopted ambitious strategies on environmental pollutants, radioactive substances, combating eutrophication, conservation of the ecosystems, biological diversity and environmental objectives for offshore activities.

As the country hosting the Fifth North Sea Conference in Bergen in March 2002 Norway has a particular responsibility for the agenda of this conference. One of the main challenges will be making the principle of ecosystem-based management of the North Sea operational and concrete, which would be in line with the approach at national level. The fixing of environmental quality objectives in a number of areas (*e.g.* for sea birds and threatened species and habitats) and good management principles will be important. The conference will also provide an opportunity of focusing on topical issues such as the transport of environmentally harmful substances in the North Sea area, discharges from Sellafield and regulation of discharges of ballast water. At the same time, the conference can be used as a round of regional preparations for the summit in Johannesburg.

Norway has repeatedly raised the issue of discharges from Sellafield with the British authorities. The Government will be demanding through OSPAR and the North Sea Conferences that the British Government take immediate steps to significantly reduce the discharges of technetium-99 into the sea. As mentioned in Chapter 3.4.2 the Government is also undertaking an assessment of the grounds Norway may have under the terms of international conventions for instituting legal proceedings against the British.

Another important issue for the northerly maritime areas will be future developments in the utilisation of natural resources in Russian territorial waters and on the Russian continental shelf. Extraction of marine resources and increased petroleum exploitation activities, along with their accompanying requirements in terms of transport, will have an effect on the marine environment. The joint Norwegian-Russian Environment Protection

Commission, which has been operational since 1988 therefore attributes high priority to marine environment issues in general and contingency plans to combat oil pollution in particular. The commission's Marine Environment Group has conducted projects involving assessments of consequences, assistance to the Russians in the context of implementation of the OSPAR rules and regulations and co-operation on criteria for the monitoring of the northern maritime areas. Norway has had an agreement with Russia on contingency plans to combat oil pollution since 1994. This agreement provides a framework for co-operation on conducting joint exercises on combating oil pollution, and for assessing the risks associated with increased petroleum exploitation activities and their effects on the environment in the North. Norwegian support for measures to improve the Russian oil pollution contingency plans will be assessed on an ongoing basis. Work on an integrated management plan for the Barents Sea will be an important part of co-operation with Russia.

Marine environment issues have been a focus of interest in the Arctic Council, too. It was Norway who took the initiative in setting up the working group for the protection of the Arctic marine environment (PAME). This working group has drawn up guidelines for offshore oil and gas extraction in the Arctic and a regional plan of action for the protection of the marine environment based on the global plan (GPA). Norway is the lead country for work on shipping issues in PAME and in 2000 worked out a report on the environmental consequences of shipping in the Arctic. AMAP, the environment monitoring programme, has been of importance in fixing priorities in respect of measures to fight pollution in the northern areas. The Government will continue to give priority to research on the Arctic and monitoring of the region and will encourage Russia to become a signatory to international environmental agreements, in particular the protocol of 1998 on persistent organic compounds (*e.g.* PCBs) established under the auspices of the UN-ECE.

Co-operation on environmental issues in the Euro-Arctic Barents region (the Barents co-operation) has up to now only addressed the marine environment to a modest degree. The Barents co-operation does, however, present an opportunity for compiling more material than would be possible through bilateral co-operation alone. The Government will be pressing for a survey of plans and measures in place to combat pollution in the Barents Sea in order to find out how much co-operation is needed.

Norway will encourage Russia to become a contracting party to the OSPAR Convention since its geographical coverage includes maritime area off Northwest Russia. This could be useful in connection with land-based sources on the Russian side of the border and with offshore activities in the Barents Sea. Russia has drawn up a national plan of action to protect the maritime areas in the north from pollution from land-based sources based on recommendations in the global plan (GPA). Measures provided for under the plan should help Russia participate in the work of OSPAR.

Russia has not associated itself with the global ban on dumping of all types of radioactive waste under the terms of the London Convention (on dumping of waste at sea); this convention dates back to 1972, a protocol having been added in 1996. Norway together with the United States has been helping Russia build a reprocessing plant for liquid radioactive waste in Murmansk to put the country in a position to sign up to the ban on ocean dumping. Japan has provided financial assistance for the construction of a similar plant in the Vladivostock area. The technical conditions for Russia's accession to the ban on dumping should now have been met and the Government wants to use the bilateral co-operation with Russia to try to make progress in this direction. The Russians said that they would be willing to do this in conjunction with the inauguration of the plant in Murmansk in June 2001.

Plans to transport nuclear waste by sea off the Norwegian coast are a source of major concern in the coastal regions of Norway, particularly up north. These shipments may be on the agenda in two connections. Firstly, opening the way for imports of spent nuclear fuel to Russia could lead to shipments of such fuel from Europe to Northwest Russia for transshipment and reprocessing in, for instance, Mayak. Secondly, shipments of highly active waste (HLW) and MOX fuel by sea have already been taking place between Japan and the reprocessing plants in Sellafield and La Hague for many years. These shipments could be re-routed to follow the northern passage and would thus pass close to the Norwegian coast. The Government in collaboration with other countries concerned therefore intends to make it clear to the countries involved in these shipments that the transport of radioactive waste and nuclear fuel close to the Norwegian coast is something we do not want to see. Norway will also be pressing for stricter international regulations, including an effective system of compensation and a requirement for advance warning of shipments of radioactive materials by sea.

Figure 4.1 Predominant transport routes in the atmosphere for chemicals input to the Arctic. The main source of environmentally hazardous substances in the northern areas is long-range pollution, although local sources also play a part. Svalbard and the maritime areas around it are particularly exposed due to atmospheric conditions and the fact that the Gulf Stream carries pollution from the large industrial sites in Central Europe and the east coast of North America to this area.

Source: Norsk Polarinstitutt (Norwegian Polar Institute)

Pending the adoption of international regulations the Government will try to conclude bilateral agreements on notification of such shipments.

Establishing marine protected areas is an increasingly topical issue in international and regional fora. Many of the threats to natural marine resources represent common international challenges, while the natural assets in the marine environment constitute a large cross-border complex. The Government therefore feels it is important to increase international co-operation in the relevant international fora in this area, too. The OSPAR Convention is of particular importance since the contracting parties adopted a dedicated work pro-

gramme for the development of a series of marine protected areas in 2000. Norway is anxious to make an active contribution to work in this regard. In the areas in the far north co-operation with the Arctic Council on setting up a network of protected areas (CPAN) is particularly relevant. It has been decided that this work will focus on protection of the marine environment. Norway has been a main contributor to this work, which is followed up at national level via protective measures on Bjørnøya and in adjacent territorial waters and there are also plans for new protected areas on Svalbard.

5 Economic, administrative and district-related consequences

5.1 Economic consequences

General

The basis for the Government's proposals for a comprehensive policy on the marine environment is that the social and economic benefits of measures to ensure a clean sea with abundant resources exceed the cost. In the short term it plans to institute measures which will involve direct, additional expenditure for the State, local authorities and trade and industry. However, in the longer term this expenditure will help secure the environmental qualities of our maritime and coastal areas. A good marine environment is a condition for commercial activities and settlements based on the utilisation of live marine resources in the future.

Learning more

Learning more is an important component in the Government's plan for ecosystem-based management of maritime and coastal areas, as are better monitoring, charting and research. Work in this area is to be intensified and will become more focused and steps will be taken to improve co-ordination of existing efforts. The Government will revisit this subject in connection with the annual budget proposals.

A research programme is to be launched in collaboration with the oil industry with a view to clarifying the long-term effects of discharges from oil exploitation operations into the sea. The programme will have a budget of between 90–120 million Norwegian kroner over a period of six years and industry is expected to contribute two thirds. The remaining costs will be shared between the Ministry of Petroleum and Energy, the Ministry of Fisheries and the Ministry of the Environment.

EU Water Framework Directive

For the moment, it is difficult to judge how much additional expenditure will be necessary to implement the measures required under the terms of the directive. Extensive work has been started at national level on assessing the social consequences of the directive and Norway is participating actively in working groups set up by the EU Commission in connection with implementation of the directive by individual countries. The Government will be returning to this in connection with the Ministry of the Environment's budgets in the years to come.

Contaminated sediments in coastal areas and fjords

The basic principle is that cleanup operations are to be financed by the polluters themselves. This strategy will therefore primarily entail financial consequences for state agencies, municipal departments, companies and private enterprise, which have helped pollute coastal areas and fjords. State grants will be needed in instances where no polluter can be identified and also to make sure that comprehensive cleanup operations do take place in large fjords.

Very tentative estimates indicate that it will cost between a few billion and a few tens of billions of kroner to carry out a total cleanup along the entire coastline. But, the costs will depend on how large the areas requiring cleanup operations are. An estimate of the social and economic benefits should be included in assessments of the need for cleanup operations in each individual area. No estimates have been made of the total benefits of cleanup operations along the whole of the Norwegian coast. However, cleanup operations are expected to offer major benefits in the form of fewer environmental problems and less pressure on public health thanks to lower exposure to environmental pollutants via fish and crustaceans. In the long term, it will be possible to use areas where cleanup operations are conducted for fishing and fish farming activities. Clean fjords will help secure Norwegian export interests on this field.

Assessments of the social and economic benefits will be crucial in connection with ordering cleanup operations and launching state-financed cleanup measures to ensure that the social and economic benefits of the measures exceed the cost of the cleanup.

All in all it is expected that measures triggered by the strategy will be socially and economically beneficial.

5.2 Administrative resources/ consequences

The State

Work on developing a long-term policy to promote ecosystem-based management of coastal and maritime areas will involve a number of ministries and parts of the civil service. In the shorter term, resources will be required in particular for the development of an integrated management plan for the Barents Sea and for management plans covering areas close to the coast pursuant to the EU water framework directive.

The proposal to transfer responsibility for state contingency plans to combat acute pollution from the Norwegian Pollution Control Authority to the National Coastal Administration means that responsibility for cleanup operations in the case of severe pollution would be in the hands of the agency with the principle responsibility for preventing shipping accidents. It is thought that this will prove to be administratively more efficient and that it will encourage more joint assessment of the needs for preventive measures and repairs.

Regional level

The drawing up of county plans of action for cleanup of contaminated sediments will require some administrative resources at regional level. The same applies for the drafting of action plans for the individual catchment areas under the terms of the water framework directive. The goal is to achieve the greatest possible degree of co-ordination when drawing up these plans so as to ensure that the action plans for cleanup of sediments can be integrated into the plans established to meet the requirements of the framework directive.

Local authorities

Local authorities in coastal communities may gradually be given responsibilities in connection with implementation of management plans insofar as management concerns resources and activities, which are largely of local significance.

5.3 District-related consequences

A clean marine environment with abundant resources is one of the most important prerequisites for the fisheries and aquaculture industries and thus also for settlements and jobs in Norway's coastal regions. The district-related consequences of more demanding environmental policy for the coastal and maritime regions will therefore be positive.

The Ministry of the Environment

h e r e b y r e c o m m e n d s :

the Recommendation from the Ministry of the Environment concerning Protecting the Riches of the Seas dated 15 March 2002 be submitted to the Storting.