Statens strålevern
Norwegian Radiation Protection Authority

NRPABulletin 26•09

The Norwegian Radiation Protection Authority's Environmental Unit - 10 years in the Polar Environmental Centre, Tromsø

The Norwegian Radiation Protection Authority (NRPA) established an Environmental Unit at the Polar Environmental Centre in Tromsø in the summer of 1999. The aim of establishing the unit in Tromsø was to further the monitoring programmes of the NRPA in the Arctic and to the promote collaboration within the Polar Environmental Centre. Over the last 10 years, the NRPA's Environmental Unit has undertaken a range of research and monitoring activities in close cooperation with other institutes in the Polar Environmental Centre that have helped to further understand the current radiological status of the Norwegian Arctic.

Examples of the activities carried out by the Environmental Unit in Tromsø. From left to right: Sampling sea water in Kongsfjord, Svalbard; Sampling below a seabird colony in Kongsfjord, Svalbard; Sampling for fish species in the Barents Sea; Soil core sampling in Øvre Dividalen, Troms.

The NRPA and the NRPA's Environmental Unit

The NRPA, based outside of Oslo, is organised under Norway's Ministry for Health and Care Services and is the competent national authority in the area of radiation protection and nuclear safety in Norway. The NRPA is also the expert authority for the Ministry of Environment on the issue of radioactive pollution of the environment. In February 1999, the NRPA decided to establish the Environmental Unit in the Polar Environmental Centre, to promote collaboration between the NRPA and the other participating institutions and to optimise the use of the Centre's resources. As of June 2009 the unit consists of three persons, with background and expertise in radioecology, oceanography and radiometric measurements. Important tasks include research, monitoring, impact assessments, and enhancing knowledge on sources, transport processes and uptake mechanisms of radioactive contamination in the Arctic.

The Polar Environmental Centre

The original vision for the Polar Environmental Centre was for the centre to become the national base and the leading international centre for imparting environmental knowledge on the Arctic, Antarctic and the Barents region. The Polar Environmental Centre was officially opened in 1998 and today includes the Norwegian Polar Institute, Akvaplan-Niva and departments of the

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The Polar Environmental Centre has a leading role in environmental research in the Arctic

Norwegian Institute for Nature Research (NINA), the Norwegian Institute for Air Research (NILU), the Geological Survey of Norway (NGU) and the Norwegian Mapping Authority, in addition to the Environmental Unit of the NRPA.

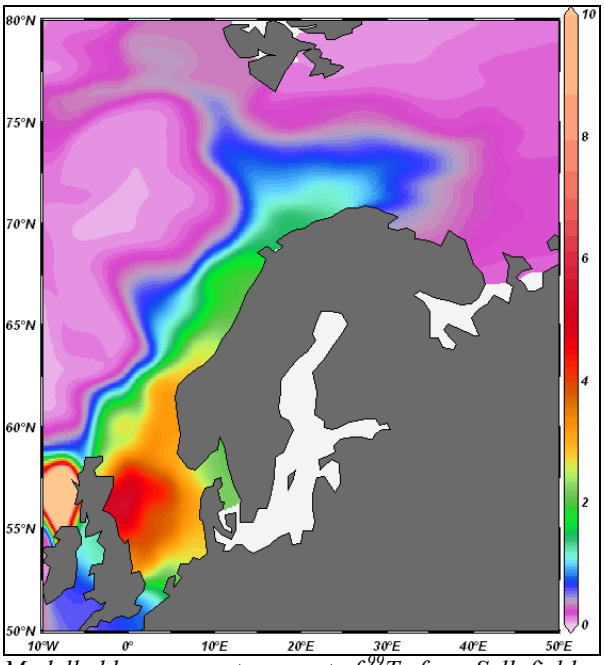
Under the next steps of the Norwegian government's strategy for the northern regions, a leading international centre for climate and environmental research in the northern regions will be developed in Tromsø around the existing Polar Environmental Centre in collaboration with the University of Tromsø and the Institute of Marine Research. The long term aim of the new centre for climate and the environment will be to strengthen Norway's role and impact in international cooperation in the north, ensuring that Norwegian interests in the northern regions are safeguarded.

Activities Undertaken by the Environmental Unit

The Environmental Unit's activities cover research, fieldwork, sample processing and measurements, together with analyses, publication and presentation of data and findings. The Environmental Unit actively collaborates with other institutes in the Polar Environmental Centre, as well as other national and international research institutes. Activities in the Arctic and Barents region involving staff from the Environmental Unit over the last 10 years have included:

- Marine and terrestrial radioecological research and mapping in Svalbard.
- Monitoring possible pollution from the Russian nuclear submarine Kursk that sank in the Barents Sea in 2000.
- Monitoring levels of technetium-99 (^{99}Tc) in the Arctic marine environment.
- Modelling the transport of ^{99}Tc in the Norwegian marine environment.
- Monitoring levels of caesium-137 (^{137}Cs) in Arctic marine and terrestrial biota.
- Understanding the contribution of polonium-210 (^{210}Po) to natural dose rates in Arctic environments.
- Establishment of terrestrial monitoring in the Øvre Dividalen national park.
- Research cruises in the Barents Sea.
- Emergency preparedness exercises.

Further afield, staff from the Environmental Unit have in recent years participated in field work in Kyrgyzstan and Tajikistan, investigating the environmental impact of Former Soviet Union uranium mining and tailing sites in Central Asia. In addition, staff from the Environmental Unit have contributed to the development of the Norwegian Sea and Barents Sea management plans and have represented Norwegian interests in the OSPAR Commission's Radioactive Substances Committee.



Modelled long range transport of ^{99}Tc from Sellafield to the Norwegian Arctic by ocean currents produced through collaboration with AWI/OASys, Germany.

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Current Radiological Status of the Norwegian Arctic - Main Findings

Overall, the level of radioactive contamination in the Norwegian Arctic is low, both in the marine and the terrestrial environments. However, enhanced levels of ^{99}Tc have been observed in the Norwegian Arctic marine environment due to the long range oceanic transport of discharges from reprocessing activities at Sellafield. Due to political pressure from the governments in Norway and Ireland, the discharges of ^{99}Tc from Sellafield were reduced significantly from 2004, and a similar reduction in contamination levels has now been observed in time series for sea water and seaweed in the Norwegian Arctic.

Levels of ^{137}Cs in arctic marine animal species are typically low or below the limits of detection. For marine mammal species, highest levels have been observed in polar bears. Although average values of ^{137}Cs in polar bears from Svalbard in the last decade were lower compared to values in animals from Svalbard in 1980, they were higher than those reported in polar bears from other Arctic regions in the 1990's. In seal species, levels of ^{137}Cs are typically higher than those of biota from lower trophic levels, suggesting that ^{137}Cs is biomagnified through arctic marine food chains.

Initial investigations of the Greenland shark, a less well known and rarely studied Arctic predator, revealed lower levels of ^{137}Cs than in polar bears.

Seabirds sampled in Svalbard show significant variations between species in levels of the naturally occurring radionuclide ^{210}Po that are probably linked to differences in diet.

Levels of ^{99}Tc in seawater and seaweed samples from the Norwegian Arctic increased following discharges of this radionuclide from Sellafield.

Levels of ^{137}Cs in seals suggest that this radionuclide is biomagnified through arctic marine food chains.

Levels of ^{137}Cs in arctic terrestrial mammals from Svalbard are also typically low, with higher and wider range in values observed in arctic foxes compared to Svalbard reindeer. The wider range in ^{137}Cs values observed in arctic foxes is likely due to the larger variation in feeding histories and diet of these animals prior to trapping.

The fact that levels of ^{137}Cs in these terrestrial mammal species are far lower than those observed in the same or similar species on the Norwegian mainland, reflects in part the far lower contamination of the Svalbard terrestrial environment with ^{137}Cs from fallout from atmospheric nuclear weapons testing and the Chernobyl accident.

In contrast, levels of ^{210}Po in Svalbard reindeer and Norwegian reindeer are much more similar than those observed for ^{137}Cs.

Svalbard reindeer show far lower levels of ^{137}Cs than species of Norwegian reindeer.

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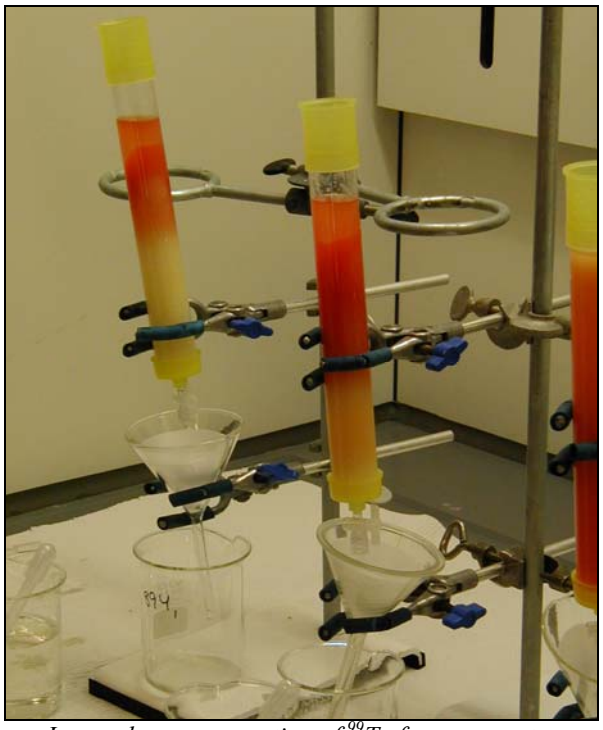
Laboratory facilities

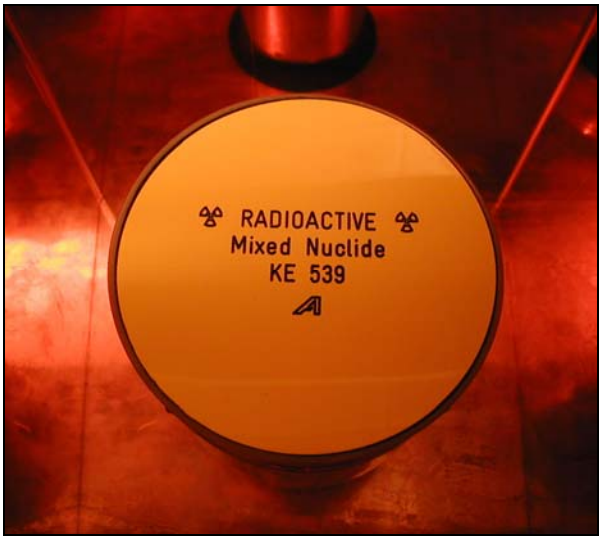
The laboratory of the Environmental Unit is designed and equipped to handle a range of radiometric analyses. Laboratory facilities comprise of a wet laboratory for the chemical separation of a range of radionuclides and sample preparation for gamma radiation analysis as well as a separate counting room. Instrumentation consists of advanced gamma-detectors, of both high and low resolution, together with beta-detectors for the detection of a range of radioactive materials in various types of environmental samples (e.g. soil, sediment, water, animal tissues and vegetation).

The Environmental Unit is also equipped to conduct radiometric measurements in the field and to provide technical support for emergency situations in the event of any nuclear/radiological accident.

All sample preparation, analyses and processing of data are conducted in accordance with established routines to assure quality and traceability in the activities that are carried out in the laboratory. To ensure competence in radiometric analysis, the Environmental Unit routinely participates in national and international intercomparison exercises.



Ion-exchange separation of ^{99}Tc from sea water samples collected in the Norwegian Arctic.



Gamma radiation analysis in the Environmental Unit's laboratory.

Further reading

Information on levels of radioactive contamination in the Arctic marine environment is reported in the annual series of NRPA reports 'Radioactivity in the Marine Environment'. In addition, the Environmental Unit has produced the following NRPA reports, which are available from the NRPA web page (www.nrpa.no):

- StrålevernRapport 2003:5: Monitoring of ^{99}Tc in the Norwegian Arctic marine environment.
- StrålevernRapport 2:2004: The radiological Environment of Svalbard.
- Strålevernrapport 7:2005: Radionuclides in Marine and Terrestrial Mammals of Svalbard.
- StrålevernRapport 2005:19: Geostatical Methods Applied to sampling Optimisation for the Temporal Monitoring of Tc-99 in the Arctic Marine Environment.
- StrålevernRapport 2006:10: Terrestrial Monitoring in Øvre Dividalen.
- StrålevernRapport 2008:15 Floating Nuclear Power Plants and Associated Technologies in the Northern Areas.

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