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Environmental impact assessment of the research activities in Ny-Ålesund 2006





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The Norwegian Polar Institute is Norway's main institution for research, monitoring and topographic mapping in the Norwegian polar regions. The institute also advises Norwegian authorities on matters concerning polar environmental management.

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1 Preface

Ny-Ålesund is an old mining town in Svalbard which has been transformed into a research station. The first Norwegian scientific activities started in the 1960ies. From 1990, there has been a considerable growth in the international scientific activities, following an active Norwegian policy to invite foreign institutions to establish research stations. The aim is to develop Ny-Ålesund into a leading international research and monitoring station in the Arctic.

A prerequisite for Ny-Ålesund is that the local human impacts on the environment are kept at the lowest possible level to maintain the area as a near pristine environment, suitable as a reference site. This has been clearly stated as a goal from the Norwegian government. It has also been adopted by the Ny-Ålesund Science Managers Committee (NySMAC) in their Mission Statement for Ny-Ålesund.

In 1995 there was a growing concern that the rapid expansion might cause significant local environmental effects and conflicts with scientific activities. A thorough Environmental Impact Assessment (EIA), based on ten technical studies and a consultation process with involved parties, was finished in 1998 (Shears et al. 1998, referred to as “EIA98” in this report). The analysis concluded with an Environmental Action Plan.

At its meeting in Kunming in China in April 2005, NySMAC approved an initiative from the Norwegian Polar Institute (NPI) to review and update the EIA98. This should also include an assessment of how the recommendations from EIA98 had been implemented, and suggestions for new remedial actions. An EIA update project team was established by NPI in June 2005, consisting of:

- Gunnar Sander, NPI (user)
- Aina Holst, Kings Bay AS (KB) (operator and owner of the infrastructure)
- John Shears, British Antarctic Survey (BAS) (user)

The team has not had a budget to initiate new studies and has retrieved information from several existing sources. We are thankful for valuable comments and contributions from: Maarten Loonen (UG), Øystein Overrein (NPI), Birgit Njåstad (NPI), Eva Fuglei (NPI), Ronny Aanes (NPI), Christian Lydersen (NPI), Bjørn Krafft (NPI), Kim Holmén (NPI), Jon Børre Ørbæk (NPI), Johan Strøm (SU), Nick Cox (BAS), Chris Lunder (NILU), Franck Delbart (IPEV), Roland Neuber (AWI), Bjarne Otnes (SMS), Ian Gjertz (SMS) and Monica Sund (SSF). We are also grateful to Nick Cox (BAS) for correcting the final version of the document for “NorwEnglish” expressions. All opinions, views and expressions in the document still are the responsibility of the authors.

Drafts of the report have been presented to NySMAC at its meetings in October 2005 and in March 2006. We recommend that this final version should be treated at the next NySMAC meeting in order to get approval of the recommendations.

Gunnar Sander

Aina Holst

John Shears

2 Summary

This report is an update of the Environmental Impact Assessment of the research activities in Ny-Ålesund from 1998 (EIA98). The assessment has been conducted almost without systematic data about the state of the local environment in Ny-Ålesund due to a lack of a systematic monitoring programme aimed at documenting environmental impacts. Still it is possible to indicate the direction of changes since EIA98 by looking at the measures implemented in recent years and the changes in the activities.

The Environmental Action Plan from EIA98 has to a large extent been followed up. Major achievements are the employment of an environmental officer at Kings Bay AS, the land-use plan, no open burning, cleaning of polluted ground, improved garbage treatment and a better regime to guide the behaviour of tourists. No measures have been taken to reduce the local discharges from the energy production, or to reduce the number or size of tourist ships.

Though an upper precautionary limit has not been set, the number of people staying in Ny-Ålesund in 2005 is lower than in 1998. The air traffic is reduced, whereas the local energy consumption has been fairly stable, though expected to rise with the new marine laboratory. The number of passengers from cruise ships has tripled since 1996 due to larger vessels. The increase in the number of buildings has caused further habitat loss, though channelled to less sensitive areas designated in the land use plan.

Without data about the state of the local environment and disturbances in the scientific measurements, it is hard to assess whether the high environmental standards for Ny-Ålesund are met or not and whether the implemented measures have had the intended impacts. In two areas, both evaluated to have “very high significance” in EIA98, there is a need to initiate new studies soon: There is still a lack of data about local emissions to the air and their effects on the measurements at the Zeppelin station and the Corbel station. The dominating sources are emissions from the power plant and the cruise ships. A follow up of previous monitoring of the state of the tundra also needs to be undertaken. Decisions which enable to initiate these studies should be taken soon in order to have them conducted during 2006 and 2007.

Ny-Ålesund needs to work in a more systematic way with the environmental performance of the station. It is paramount to initiate a monitoring programme that can document the local activities and their effects. This should be put in place and lead to an updated assessment in 2009. The assessment should be an important and integrated part of an Environmental Plan for the station, which should conclude with an Environmental Action Plan. The plan should be updated every five year.

Here it is proposed an Environmental Action Plan for the next three years until the first version of the Environmental Plan is elaborated. New measures are needed to reduce emissions to air and protect the tundra. There is also an increased need to focus on the environmental effects of the scientific activities themselves, not only the infrastructure. A project directory linked to a GIS system is necessary to get a better overview of the activities and plan for reduced impacts.

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Appendix: Statistics from Kings Bay AS.

This is available in a separate document on the Kings Bay and NySMAC web sites.
www.kingsbay.no/ and www.npolar.no/nysmac.

4 Introduction

4.1 EIA 1998

In early 1996, Ny-Ålesund Science Managers Committee (NySMAC) agreed that an Environmental Impact Assessment (EIA) of Ny-Ålesund was to be undertaken by the Norwegian Polar Institute (NPI), on behalf of NySMAC. The reason for the initiative was the concern that the rapid expansion of human activity and facilities might cause significant local environmental effects and also disturb important scientific research. NySMAC was aware that such environmental effects and disturbance would be in conflict with the political goal for the development of Ny-Ålesund as a “green” research station where local human impacts on the environment must be kept at a very low level.



Figure 4.1. Ny-Ålesund. Photo: Tor Ivan Karlsen.

As part of the EIA, a total of ten technical studies were undertaken in 1996-97. NySMAC regularly reviewed the process and organised a workshop in August 1997 to examine the results and preliminary recommendations. The process was completed in 1998 with the report *Environmental Impact Assessment: Ny-Ålesund international scientific research and monitoring station, Svalbard* (Shears et al. 1998 – hereafter referred to as EIA98). The EIA98 describes the scientific and logistical activities in Ny-Ålesund, the local environment and analyses sensitive resources. The main analysis is the examination of environmental impacts from human activities and conflicts between various activities. The results showed that the activities were having significant local environmental impacts. To mitigate these impacts, the EIA recommended a 12 point Environmental Action Plan (EAP) to be implemented in the Ny-Ålesund area. NySMAC and Kings Bay AS (KB) agreed upon the EAP in 1998, and many of the recommended actions have been implemented.

The Norwegian Government White Paper No.9 (1999-2000) to the Parliament made the following comment about EIA98: “The report points out a series of measures that can be effected to reduce the environmental impacts of the activity in the Ny-Ålesund area to a minimum, and to prevent such activity from lowering the quality of the area as a reference area for climate- and environment related research. The Government assumes that Kings Bay will take the necessary steps in cooperation with the research communities and other interested parties” (p. 103 in the English edition).

4.2 The review: the mandate

In NySMAC, the question was raised whether there was a need to conduct a new EIA. At its meeting in Kunming in China, April 2005, NySMAC approved an initiative from Norwegian

Polar Institute for a review and update of the EIA98 (Njåstad 2005). NySMAC agreed that it was not necessary to initiate a new full-scale impact assessment. However, it was recognized that the lack of collection of systematic environmental monitoring data since the EIA98 would be an obstacle to providing new and useful information.

The following focus of the EIA review was proposed by NPI and agreed by NySMAC:

- 1) Assess the level of Environmental Action Plan implementation.
- 2) Consider whether new impacts and conflicts have occurred over the last 10 years, and if so, their level of significance.
- 3) Assess whether the level of impacts and conflicts identified in the EIA98 have changed status with regard to significance, focusing primarily on those impacts identified as having the highest significance in 1998.
- 4) Suggest further mitigation actions, if necessary.

NySMAC agreed that a small project team from NPI, KB and the British Antarctic Survey (BAS) should undertake the review and update of the EIA98. The team members were asked to provide a draft report for NySMAC to consider by December 2005.

4.3 The review process

The project team was established in June 2005, consisting of:

- Gunnar Sander, NPI (user)
- Aina Holst, KB (operator)
- John Shears, BAS (user)

NySMAC was presented with a work plan by the project team on 27 June 2005. The plan discussed the problem of the lack of data about the environment and how best to overcome this obstacle. Without a budget and with a strict schedule for the work, the project team concluded that they would not have time to initiate new studies during summer 2005. Such studies can instead be a recommendation from the work.

Instead, the team decided to carry out a questionnaire survey of the base managers and scientists in Ny-Ålesund in order to get opinions and data on the current situation. The questionnaire was distributed to all the stations in June with 10 August 2005 as deadline.

They asked for a (subjective) judgement of the environmental impacts and conflicts identified by EIA98, with an invitation to list new ones. The respondents were similarly asked to judge the implementation of the EAP and list new measures and actions they considered necessary, and finally, to list relevant scientific studies which the project team could use. Only three stations answered (NILU - Norway, AWI - Germany and NERC/BAS - UK). Almost no new information about relevant scientific data was reported.

The members communicated through e-mail and telephone. A meeting was held in Ny-Ålesund 29 August - 1 September 2005, with excursions to the near environment of the station.

After the field visit, the project team contacted the Governor of Svalbard (SMS) and some individual scientists with in-depth local knowledge of the environment in Ny-Ålesund. This has enabled us to present some environmental data. Nevertheless, the lack of an integrated environmental monitoring programme in Ny-Ålesund is a major obstacle to any systematic assessment of the impacts of the activities and the measures implemented.

At the NySMAC meeting on Andøya in October, a preliminary version of the report was presented. The draft was afterwards circulated to all NySMAC members with the request to:

- Discuss the approach chosen by the EIA project team.

- Contribute to the collection of better data for the assessment since the lack of a monitoring programme had complicated the task (see Section 8).
- Make decisions on the future of the report.
- Discuss and agree upon the recommendations (see Section 9).

Comments were received from NILU and AWI. No additional data were provided.

NySMAC also received a draft version at its meeting in Potsdam in March 2006. A decision to initiate the elaboration of an environmental monitoring programme was made. The authors recommend that this final version should be treated at the next NySMAC meeting in order to get approval of the report and its recommendations.

5 Approach

Environmental impacts from research in Ny-Ålesund can be looked upon from many points of departures:

- Legally: There are requirements in the Svalbard Environmental Protection Act concerning how activities in Svalbard shall be conducted.
- Politically: Both the Norwegian government and the scientific community in Ny-Ålesund have proclaimed high environmental ambitions.
- Ethically: The scientific community does not tolerate unacceptable impacts from research.
- Scientifically: The study objects of the scientists can be affected by the infrastructure and the scientists' own behaviour, thus leading to flawed scientific results.



Figure 5.1: Researcher holding a gosling. Photo: Linda Bakken.

All these approaches are valuable in future discussions. In this report, however, we mostly focus on the legal and political aspects.

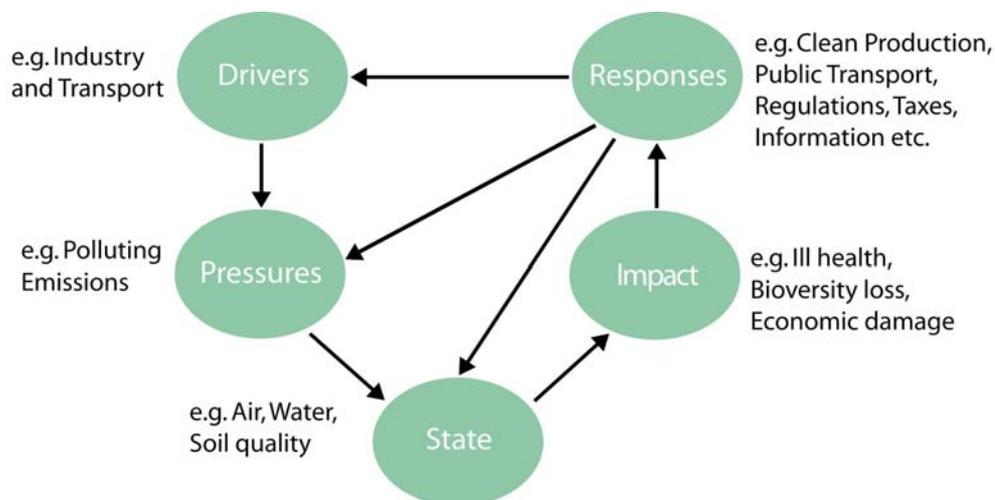


Figure 5.2: The DPSIR framework – often simplified to PSR – is a frequently used model for reporting on environmental issues. Illustration: European Environmental Agency.

The project team decided to use the Pressure/state/response (PSR) model to help organize this report. Given the lack of data about the local environment (“state”), we have been forced to evaluate the situation indirectly by:

- Summarizing the responses taken by various stakeholders that might affect the pressure on the environment in Ny-Ålesund: the implementation of the EAP from EIA98, changes in legislation in Svalbard and other relevant initiatives (Section 6).
- Summarizing the changes in the pressures on the environment in Ny-Ålesund caused by local activities (Section 7).

In Section 8, the environmental impacts and conflicts identified in EIA98 are reassessed. Here we look for observed environmental changes that directly or indirectly can be attributed to human activities. This is not easy as we have to be able to distinguish between natural factors and variability, and the pressure from humans – a research issue in itself. Because of the lack of data, the analysis has not been detailed and is more like that done in a screening prior to an EIA: the initial overview of the situation used to decide on which themes should be looked at in-depth in the EIA itself.

The final section (9) includes recommendations for future action. It summarizes the results from the previous three chapters to recommend further studies and a more formalized environmental management system in Ny-Ålesund, but also a revised and updated Environmental Action Plan.

Since the EIA 98 contained a thorough description of the situation in Ny-Ålesund up till then, we have focused on changes in the subsequent years. The geographical focus of the update and review will mostly be the research station itself and its close vicinity.

6 Changes in measures and institutional framework since 1998

6.1 Environmental Action Plan 1998 – what has been accomplished?

Table 6.1: Overview of the accomplishment of the actions proposed in EIA98.

	Recommendation	Action taken
1.	Prepare a “mission statement” for Ny-Ålesund.	<ul style="list-style-type: none"> • Mission statement completed in 1998 and published on the NySMAC and KB websites.
2.	Set a precautionary upper limit on the total activity/numbers of people at the station.	<ul style="list-style-type: none"> • According to the Kings Bay strategy plan for 2004- 2007, there is a goal to increase the activity from 10 000 to 14 000 research days. Discussions on setting an upper limit on the total activity have so far led to no conclusions.
3.	Stabilize and reduce local emissions, and stop any open burning.	<ul style="list-style-type: none"> • Open burning is only carried out on a very minor scale (e.g. for fire drills, midsummer parties and occasional barbecues). These events are reported to NPI. • Development of the station infrastructure with focus on energy efficiency and economy.
4.	Protect flora and fauna, and re-vegetate degraded tundra areas.	<ul style="list-style-type: none"> • Re-vegetation projects with seeds from local species initiated in 2000. The project has not been extended. • Today local compost from food waste is used to fertilize ground disturbed by construction work.
5.	Increase and improve the information to all visitors and residents of Ny-Ålesund, guiding them as to how they can reduce environmental impacts and minimize conflicts.	<ul style="list-style-type: none"> • Brochure is made available to all people staying overnight. • Information campaigns for tourist vessels. • Nature, cultural heritage and research information trail for visitors. • Environmental seminars given by KB on request from the scientists. • New KB employees get environmental information provided during their first week in Ny-Ålesund.
6.	Incorporate the key results of the EIA into the Land Use Plan for Ny-Ålesund.	<ul style="list-style-type: none"> • Key results from EIA98 were implemented in the land-use plan for Ny-Ålesund, made in 1998. • EIA98 will also be used as a basis for the revision of the land-use plan in 2005/06 .
7.	Prevent fuel spills and establish a station fuel spill contingency and clean-up plan.	<ul style="list-style-type: none"> • Emergency plan for pollution incidents and spills completed in 2003. • A revision of the plan will most likely be undertaken in 2006 in accordance with expected new instructions from the Norwegian Pollution Control Authority (SFT). • In 2002/2003, detailed investigation of several localities with possible polluted ground were undertaken at Ny-Ålesund by the Norwegian Geotechnical Institute. In 2003, KB was instructed by the Governor of Svalbard to secure five localities where polluted ground was found. This is done.
8.	Improve waste management by closing the rubbish dump at Thiisbukta, and reducing contamination from this dump and others in the Ny-Ålesund local area.	<ul style="list-style-type: none"> • Rubbish dump in Thiisbukta was closed in 2001/2002. Procedures for waste management have been improved and implemented across the settlement. There is now no disposal of wastes in Ny-Ålesund except for composting of food waste, and reuse of glass and wooden materials.
9.	Reduce the number and size of tour ships calling at the station.	No action taken to reduce the number of or size of cruise ships visiting Ny-Ålesund. The cruise ship passengers are only allowed to stay in Ny-Ålesund for a few hours.

10.	Establish the Kongsfjorden area, including Brøggerhalvøya, as a combined terrestrial and marine “scientific research area”.	<ul style="list-style-type: none"> • The Parliament has approved an amendment to the Svalbard Act which gives a general opportunity to limit activities in certain areas that can be harmful to research activities. A proposal for a concrete revision to the act, banning fishing and hunting in Kongsfjorden, is however still not approved by the Ministry of Justice. (see Section 6.4).
11.	Employ a senior scientific/environmental manager at the station.	<ul style="list-style-type: none"> • In 2004, KB employed a scientific adviser. The scientific adviser is also responsible for running the marine lab. • A second adviser in KB, employed in 2002, is responsible for the overall environmental protection and management of the settlement. • Responsibility for effecting different parts of the KB environmental policy is delegated to different parts of the company.
12.	Introduce stricter controls over activities.	<ul style="list-style-type: none"> • Revitalisation of Svalbard Science Forum (SSF). • NPI elaborating a science plan for Ny-Ålesund.
13.	A wide-ranging environmental monitoring programme to judge the effectiveness of the EAP. Include key ecosystem indicators and performance indicators.	<ul style="list-style-type: none"> • Some relevant measurements are carried out by the different scientific institutions located in Ny-Ålesund. However, the measurements are often difficult to access and are not coordinated within a station wide environmental monitoring programme.

In Table 6.1, we summarize the actions taken since 1998 to implement the EAP. In general, the majority of the recommendations have been followed and put into place. The major recommendations not accomplished, are the establishment of a limit on number of people at the station, stabilisation and reduction of local emissions, reduction of the number/size of cruise ships and the failure to introduce a wide-ranging environmental monitoring programme.

The stakeholder with the key responsibility for the implementation of this EAP was KB since most of the measures addressed the infrastructure – sometimes in cooperation and at the direction of the Norwegian Government environmental authorities. NySMAC and the Ny-Ålesund scientific community have had a smaller, role, especially on the development of a monitoring programme. New measures focusing more on the scientific activities will need more involvement from the scientific community.

6.2 Clean up in the old mining area

The Windstad committee

In 1997, a committee was formed with the mandate to identify what should remain as documentation of the history and what should be classified as waste and therefore removed in the old mining area in Ny-Ålesund. The Windstad committee presented a series of recommendations for the Governor of Svalbard. Based on these recommendations, the Governor made its conclusions and recommendations in a report called “Helhetlig plan for miljøtiltak i gruveområdet Ny-Ålesund (Kings Bay)” (SMS, 1999).

Side by side with the work of the Windstad committee, the Norwegian Geotechnical Institute (NGI) on behalf of the Norwegian Pollution Control Authorities (SFT), mapped old dump sites and polluted ground in Svalbard (SFT, 1998). In total, NGI identified 20 locations where polluted ground might be present. Within the old mining area, eight possible polluted sites were found, which needed further investigation. In summer 1998, seven of the eight sites were examined in detail. At some of them polluted ground or wastes were found that could be a threat to the environment. The results from the investigation were included in the work of the Windstad committee and in the recommendations from the Governor.

In summer 2003, the Governor, KB and the Commissioner of Mines assessed the old mining area and decided how to execute the recommendations in the Governor's report. The main principle, they decided, was to leave things as they were. The exceptions were an area just outside the mining area that was to be cleared for aesthetic reasons, removal of possible sources for pollution and removal of items that could be a danger to animals. KB took the recommended remedial action that year. In addition, the Governor in both 2003 and 2004 carried out some repairs to the remaining infrastructure as recommended by the Winstad report. What has not yet been followed up, is to make better information about the old mining area available to visitors to Ny-Ålesund. Here different solutions are under discussions. Except for this, the old mining area will now be left as it is.

Cleaning up polluted ground in Ny-Ålesund

In 2002-2003, NGI on commission of KB carried out more detailed investigations on 14 of the 20 localities previously encountered (see figure 6.1). On five of the localities, polluted ground were found (see table 6.2), and the Governor gave KB instructions to prevent spreading of pollution from them. The work was concluded in 2003-2004. The Governor has approved the clean-up works undertaken by KB at all the sites where remediation was necessary.

Table 6.2. Overview of the five sites with polluted ground in Ny-Ålesund where clean-up works were undertaken in 2003

Locality No*	Name of the locality	Recommended action	Recommendation followed
003	Rubbish dump at Thiisbukta.	Cover with 1 metre of clean soils to be capsulated into the permafrost, and after that monitored.	Yes
004	Old rubbish dump near shaft 1.	Draining of the dam behind the old rubbish dump with 80-100 cm to reduce scouring from the dump.	Yes
006 and 009	Breakage on the oil pipeline.	Prevent further spread of oil components by emptying the small pond and the ditch south of the oil tanks, fill it with oil absorbing materials and leave it as it is.	Yes
008	Rubbish dump at Solvatnet.	Prevent further spread of oil components from site 006 and 009 (see above).	Yes
012	Shaft 3 and 4.	Clearing and removal of oil barrels.	Yes

* The locality number co-responds with map in figure 6.1

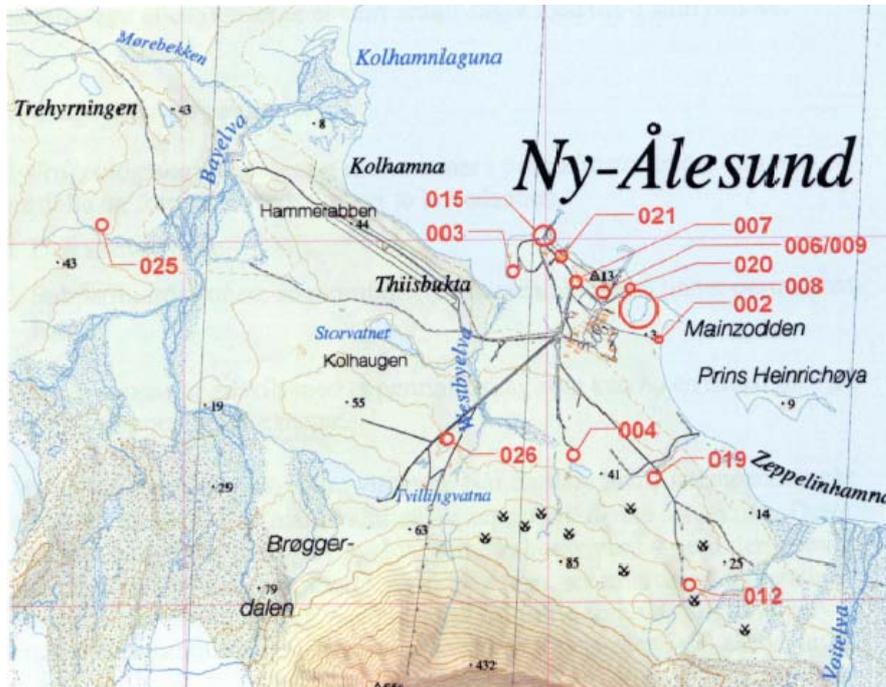


Figure 6.1: The circles with numbers indicate the sites in Ny-Ålesund where NGI has carried out detailed investigations of possible polluted ground. (Source: NGI 2003). Norwegian speaking readers can find more info at <http://www.sft.no/grunn/>



Figure 6.2: Closure of the ditch below the fuel tanks. The brown colour is from an oil absorbant. Photo: Kjell Tore Hansen.

6.3 Changes in laws and regulations

Svalbard Environmental Protection Act

On 1 July 2002 the Svalbard Environmental Protection Act was implemented. The act updates the environmental legislation for Svalbard. Its purpose is to preserve the virtually untouched environment in Svalbard with respect to large, continuous areas of wilderness, landscape elements, flora, fauna and cultural heritage. Within this framework, the Act allows for environmentally sound human settlement, research, tourism and commercial activities.

A key feature of the Act is that it requires any person who stays in Svalbard, or operates an undertaking there, to show due consideration and exercise necessary caution to avoid unnecessary damage or disturbance to the natural environment or cultural heritage. Before undertaking any permitted activity in Svalbard, every person involved must be aware of the provisions set out in or pursuant to the Act. The Act further stresses the application of the precautionary principle to any new activity, and also that the overall pressure on the natural environment and the cultural heritage caused by a planned activity must be taken into account. The Act also has provisions concerning “the polluter pays principle” and the use of environmentally sound technology. The Act and regulations made pursuant to the Act means that there is now a much greater focus on the effects of and control of commercial activities in Ny-Ålesund. The regulation of scientific research projects is nevertheless very much the same as before 2002.

Regulations concerning camping activities in connection with projects outside Ny-Ålesund say that anyone planning to establish a camp for one week or more must inform the Governor. The regulations dealing with motorized traffic state that projects that want to use snowmobiles outside a 20 km radius of Ny-Ålesund, must apply to the Governor for permission. Special permission is also required to land a helicopter outside the airport at Ny-Ålesund. In Ossian Sars nature reserve, motorized traffic by snowmobiles and landing by helicopter are prohibited. The Governor may give permission if this does not affect the environment and the reserve in a negative way.

Areas protected by law in Kongsfjorden

There are four areas in Kongsfjorden which have been protected by the Norwegian environmental authorities. Kongsfjorden and Blomstrandhamna are bird sanctuaries protecting nesting birds on islands in the fjord. The Northwest Spitsbergen National Park has its southern boundary in the outer part of Kongsfjorden. Both the bird sanctuaries and the national park have existed since 1973. One new nature reserve has been established in Kongsfjorden since the EIA98, when the former plant reserve at Ossian-Sars (established in 1984) became a nature reserve in 2003.

Visiting fee and the Svalbard Environmental Protection Fund

As a part of the follow up of the Svalbard Environmental Protection Act (§ 98), the Ministry of the Environment in 2005 proposed the collection of a fee of NOK 150 for all visitors coming to Svalbard for other purposes than work or studies. Inhabitants of Svalbard will not be charged. After public consultations, the proposal will be modified and sought implemented from 1 January 2007. The money will go to the Svalbard Environmental Protection Fund. The fund's proceeds may only be used for measures in Svalbard for protection of the environment. In the future, it will be possible to apply for money from the fund to restore the environment, but also to investigate and monitor the state of the environment.

Strategy document for management of tourism and outdoor activities in Svalbard

In October 2005, the Governor of Svalbard finished a strategy document for the future management of tourism and outdoor activities. The strategy document outlines the history and development of tourism and outdoor activity in Svalbard. It summarizes the political goals and initiatives and describes current challenges and strategies for the management of tourism and outdoor activities.



Figure 6.3. “The World” – a sailing apartment complex – in Ny-Ålesund 2005. The environmental disadvantages of receiving cruise ships in a settlement like Ny-Ålesund must be compared to landings outside the settlements in Svalbard. Photo: Gunnar Sander.

The Interdepartmental Polar Committee of the Norwegian Government has also appointed a working group focusing on how to deal with the expanding cruise ship tourism in Svalbard in general.

6.4 Reservation of Kongsfjorden for research activities

In White Paper No. 9 to the Norwegian Parliament (1999-2000), the Norwegian Government emphasized the importance of protecting the area around Ny-Ålesund, including the entire Brøggerhalvøya Peninsula for research. It also recommended that limits should be established on other activities, which may harm or hinder research work in the area. In 2003, KB sent a letter to the Ministry of Justice and the Police asking them to initiate a process to reserve the Ny-Ålesund area for research activities. The Norwegian Government in June 2005 proposed an amendment to §4 in the Svalbard Act that opens up a legal opportunity to limit activities that may damage research activities in certain areas. This was approved by the Norwegian Parliament in December 2005.¹

Parallel to the proposal for the amendment, the Ministry of Justice and the Police also proposed a revision to the act, which concretely would ban all fishing activities in Kongsfjorden (Justis- og politidepartementet, 2005). In the hearing process, objections were raised from fisheries organizations.² The revision is still not passed.

¹ The approved amendment to §4 says: ”Kongen kan også utferdige forskrift om begrensninger i virksomhet som vil kunne være til skade for forskningsaktivitet i bestemte områder av spesiell verdi for forskningen.”

² Organizations representing fisheries around Svalbard are arguing to allow hunting of whales in Kongsfjorden and to limit the outer delimitations of the marine reserve area to a line between Kongsfjordneset and Kapp Guisseez.

6.5 Co-ordination of research in Svalbard

NySMAC

The Ny-Ålesund Science Managers Committee (NySMAC) was established in 1994 to facilitate exchange of information among the research institutions. Among its objectives are to avoid negative impacts on research programmes – including from scientific activities themselves, and to minimize and mitigate environmental activities of the research. NySMAC also gives advice to KB on infrastructure development and development of the station. NySMAC includes representatives from all the scientific organizations with research stations or other major interests in Ny-Ålesund, and meets twice a year.

Revitalized SSF

Svalbard Science Forum (SSF) coordinates scientific research in Svalbard and provides research information. The objective of SSF is to contribute to the development of Svalbard as a research platform in accordance with strategy documents. SSF promotes cooperation between the institutions in Svalbard, but does not deal with their internal affairs. SSF was revitalized in 2005 as a result of an initiative from the Norwegian Government to improve the overall coordination of research activities in Svalbard.

SSF is funded and chaired by the Research Council of Norway (RCN) and the following institutions form the board: NPI, UNIS, KB and NySMAC. A full-time research coordinator who is employed to carry out the daily activities started in March 2006. A new web portal was launched in May³. One of the main tasks in the future is to incorporate operational databases for both overview of existing and planned datasets and for simplification of project registrations and applications.

Ny-Ålesund Science Plan

The NPI, on request of the Research Council of Norway, has prepared a Science Plan for Ny-Ålesund. The plan declares overarching scientific goals for Ny-Ålesund. It establishes tools for better planning, communication and coordination of all international research activities, and outlines a set of management principles and codes of conduct. The NPI and SSF will have overall scientific responsibilities for its coordination and implementation. A draft was presented to NySMAC at its meeting in April 2006 (NPI 2006). A final version will be approved by the Research Council.

6.6 Research without traces

The report “Research without traces” (TemaNord 2005:547) gives a number of examples on how research institutions and infrastructures in Greenland, Iceland and Svalbard have worked actively to integrate environmental practices into their activities. The report highlights a number of issues where initiatives can be taken to improve environmental aspects of research activities. The conclusions that are particularly relevant for Ny-Ålesund are:

- Co-ordination of projects and planning for reuse of data are important ways of reducing the impact of heavy logistics and the need for parallel activities. Databases featuring all the research projects in the region are a key tool.
- The impact of research installations can be significantly reduced by integrating environmental evaluations into the planning phase so that new initiatives are built up around an impact reduction strategy.

³ Link: <http://www.ssf.npolar.no/>

- Sufficient, relevant information about the local environment must be made easily accessible in databases so that research planners are able to integrate damage limitation into their projects.
- An understanding of the overall impact on the natural environment is critical in order to develop standards which must be met by researchers. The collation and input of relevant information about field activities should be organized better. Information should be based on a geographical information system (GIS).
- Research projects often depend on heavy transport. Transport can have a significant impact on the environment but there are also large gaps in our knowledge about these effects. Efforts must, therefore, be made to ensure that transport causes the least possible damage. The best technology available should be used.
- The disposal of sewage, waste products and environmentally hazardous materials is a challenge faced by all field activity. Even though awareness of waste management issues is high nowadays and the regulations are unambiguous, attention still needs to be paid to this problem in order to minimise the level of pollution caused by research and educational activities.

These issues are detailed in the report, and are followed by a number of concrete and relevant recommendations.

6.7 Local regulation of activities in Ny-Ålesund

Kings Bay AS Strategy Plan 2004 - 2007

In 2004, KB presented the company's first strategic plan. The plan will run from 2004 to 2007 and focuses on developing KB in order to make Ny-Ålesund "a strong and attractive international Arctic research station". The company's primary ambition is to maintain and develop good infrastructure and services for the scientific community. But the company also wants to contribute to the better co-ordination of the research activities in Ny-Ålesund. The plan further focuses on the development of Ny-Ålesund as a "green" scientific station where both the natural environment and the numerous cultural heritages is taken care of. Finally, it sets out that the company's working budget has to balance each year, and to be able to do so the company wishes to increase the number of research days in Ny-Ålesund, especially outside the peak season.

Land-use plan for Ny-Ålesund

In 1998, the Governor of Svalbard approved the first land-use plan for Ny-Ålesund. The plan identified where different activities should take place in the settlement, including the preferred locations for new buildings. This built on recommendations from the EIA98.

In autumn 2005 KB started working on a revision of the land-use plan. The main focus is to ensure that the plan corresponds with current land uses and today's legislation, consider the need for new building areas and defines protection zones around designated cultural heritage monuments. In KB's strategic plan, the company states as an ambition to take care of the existing cultural landscape of Ny-Ålesund. One of the ways to reach this goal is to use existing buildings instead of constructing new buildings for new purposes. This will also mean a reduction in habitat loss. In conjunction with this, there is a need to find a good compromise between taking care of existing buildings and the development of Ny-Ålesund as a modern research station. In the process of finding some guidelines for this, the Ministry of the Environment, the Directorate for Cultural Heritage as well as the Governor of Svalbard are involved.



Figure 6.4. Just after closure of a ditch dug for repair of pipelines south of Mellageret, August 2005. Photo: Gunnar Sander.

KB has established two local bird protection areas within the settlement (EIA 1998). These will be kept as they are. In the new land-use plan they will be protected from new construction work, although some maintenance on existing infrastructure will be allowed.

NILU and NPI in cooperation with KB have established a restriction area around the Zeppelin atmospheric monitoring station (EIA1998, p.26). The area is defined by a circle with a radius of 100 meter around the station. In addition to this, any need for establishing new restriction zones in the Ny-Ålesund area should be discussed as an element of the revision of the land-use plan.

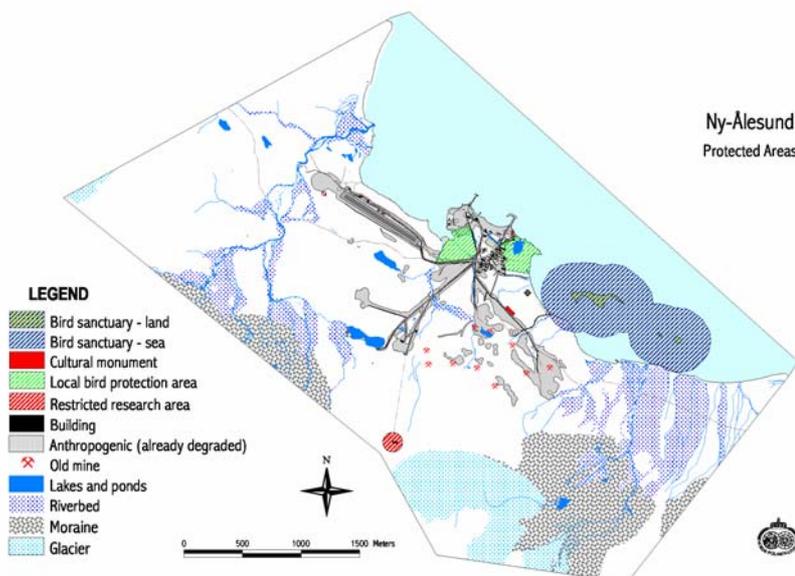


Figure 6.5: Protection areas in and around Kongsfjorden. (Source: EIA 1998 p. 27)

Local area where hunting is prohibited

KB has, on the advice of NySMAC, prohibited any hunting and trapping on the company's property in a radius of 10 km around the centre of Ny-Ålesund (see Figure 6.5). This is the area where KB has the hunting rights according to the Svalbard Act of 1925. (see also sec 8.8 and 8.9)

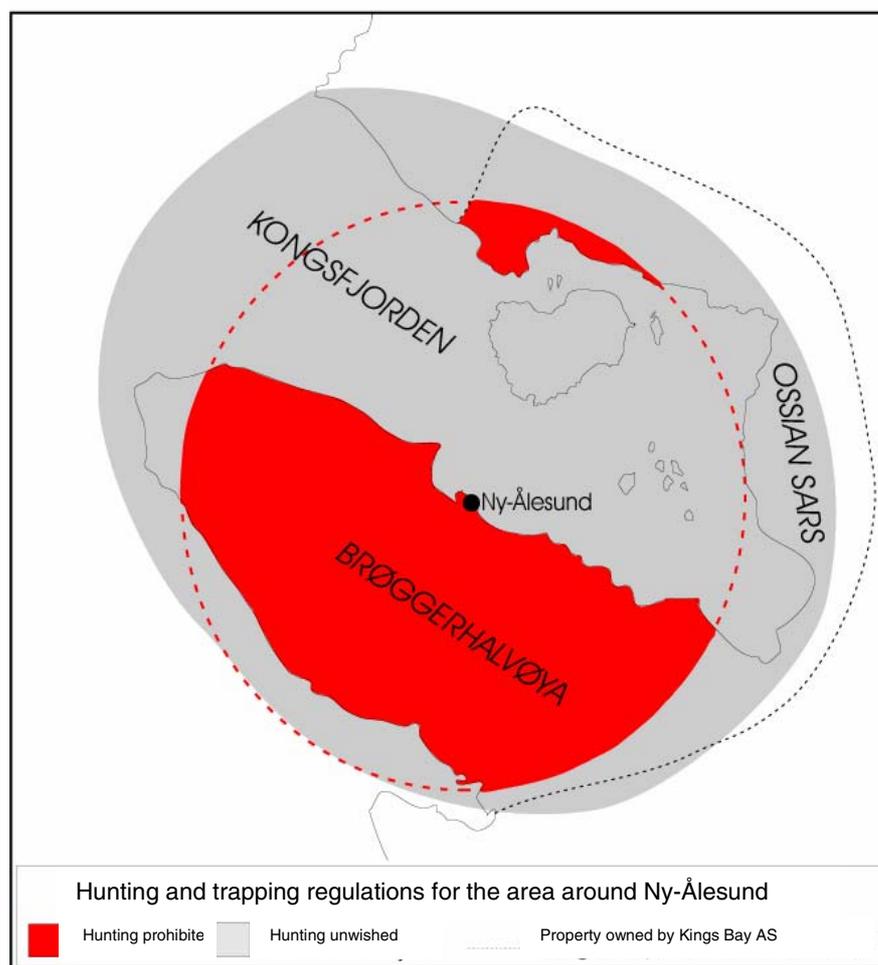


Figure 6.6. Areas where hunting and trapping are not allowed or unwanted (Source: Kings Bay AS)

7 Development of activities with potential for environmental impact in Ny-Ålesund

7.1 Infrastructure

There are several new buildings and larger construction works that have been carried out in Ny-Ålesund since 1998. The main ones are:

- SvalRak – new office building at Hamnerabben – 1998-99
- Sverdrupstasjonen – new station building for NPI – 1998-1999
- Balloon house – launching house for scientific balloons for AWI – 1999
- Service building – extensive rebuilding – 1999-2000

- Champ-antennas – satellite receiving antenna for GFZ – 2000 and 2005
- Harbour warehouse – 2000-2001
- Extension of the station building of NERC – 2001-2002
- The Kings Bay Marine Laboratory – 2003-2005
- Evenstad – accommodation building run by KB – 2004-2005
- Construction of a new central heating net for the settlement – 1998
- Reconstruction of the air monitoring station at the Zeppelin mountain – 2000
- Maintenance of the airstrip – 2002 and 2005
- Enlargement of the water reservoir at Tvillingvatn – 2005

Almost all construction and building work is carried out in accordance with the land-use plan for Ny-Ålesund. Only a couple of the projects have not been in accordance with the plan. In these cases, KB has been given special permission for the works from the Governor of Svalbard.



Figure 7.1. Even upgrading of existing houses lead to some wear and tear of the surrounding tundra. Here from Evenstad, August 2005. Photo: Gunnar Sander.

From 1917 until 1997, 116 ha of tundra were destroyed or severely damaged around Ny-Ålesund (Theisen et al. 1997, referred in EIA98 p. 40). The degraded land was 78 ha in 1986 (Krzyszowska, 1989). This shows that the rate of degradation increased significantly from 1986 till 1997. In the period from 1998 to 2005, approximately 3230 m² land were covered with new buildings, all of this in the area already classified as degraded before 1989 by Krzyszowska, 1989 (The calculations are shown in Appendix). This does not include the enlargement of Lake Tvillingvatn or extension of the airstrip. There exists no exact measurement of new land degraded by these works.

7.2 Visitors to Ny-Ålesund

Visitors to Ny-Ålesund staying over night are registered in KB's booking system. Tourists using the camping site just outside the settlement or visitors travelling by aircraft who do not stay over night are not included in the statistics. Scientists going out in to the field are registered as long as they stay on KB property and the company provides them with food.

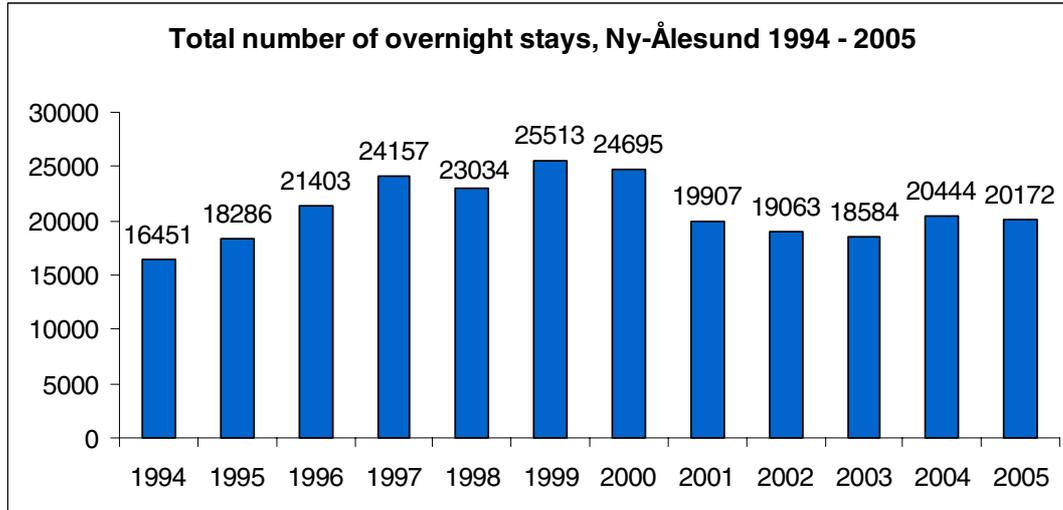


Figure 7.2. Total overnight stays in Ny-Ålesund. (Source: Kings Bay AS' statistics)

The total numbers of overnight stays were at their highest level in the late 1990s and at their lowest in 2003 (Figure 7.2). 2004 showed an increase mostly because of the contractors working on the marine laboratory. The fluctuation has depended on whether or not large construction projects have taken place. The number of people employed by KB has to a certain degree followed the number of contractors. The number of guests/conference participants has decreased since its maximum in 2002.

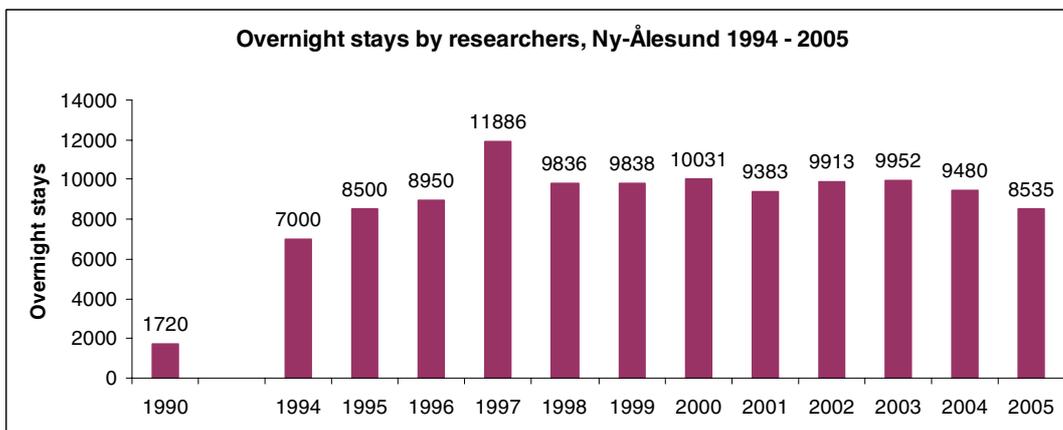


Figure 7.3. Overnight stays in Ny-Ålesund by researchers. (Source: Kings Bay AS' statistics)

Figure 7.3 shows how the number of scientist in Ny-Ålesund has kept fairly stable at just below 10,000 from 1998 to 2003. After that, the number of scientist overnight stays has decreased to 8535 (2005). The primary reason for this has been the reduction in number of scientists working at the Norwegian research stations in Ny-Ålesund (see figure 7.4).

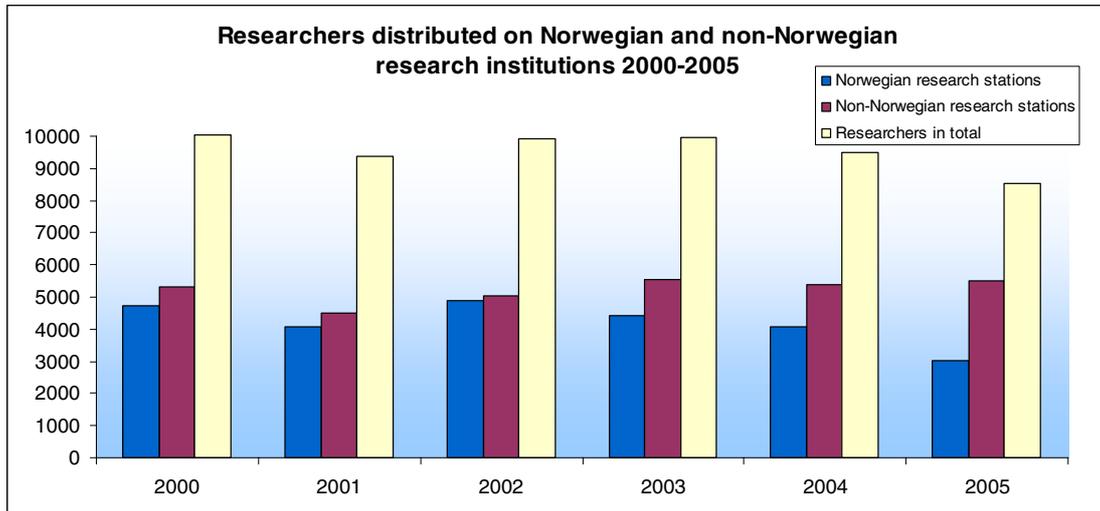


Figure 7.4. Distribution of Norwegian and non-Norwegian scientist in Ny-Ålesund. (Source: Kings Bay AS' statistics)

7.3 Traffic from airplane/helicopters and number of vehicles

Airplanes and helicopters

All landings with fixed wing aircraft and helicopters in Ny-Ålesund are registered by KB. Figure 7.5 shows that the number of landings by both planes and helicopters has decreased significantly from 1997 to 2004. In 2005, there was a three-fold increase in the number of helicopter landings compared to the previous year.

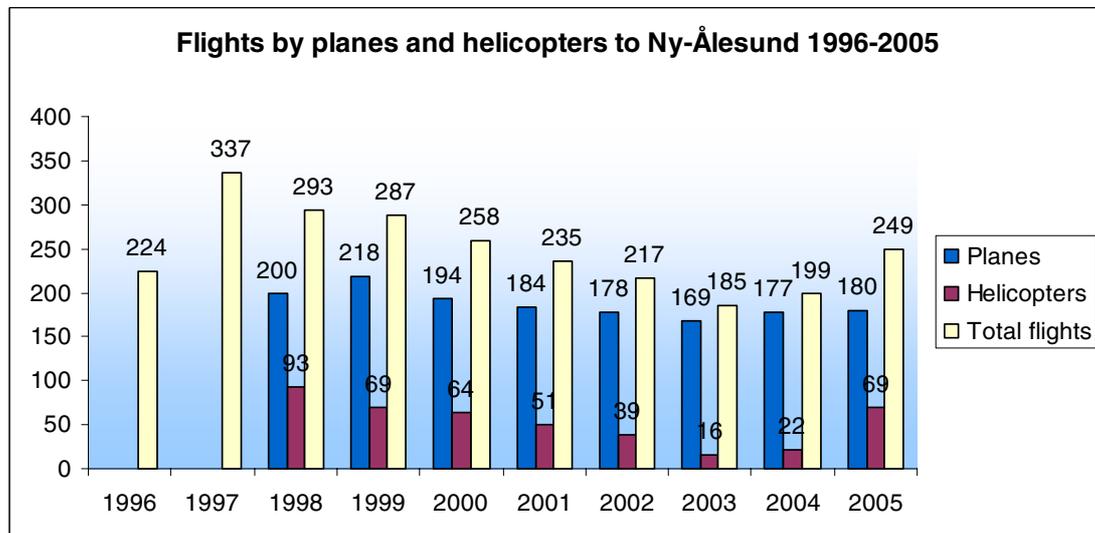


Figure 7.5. Registered landings in Ny-Ålesund by fixed winged planes and helicopters 1997-2005. (Source: Kings Bay AS' statistics)

The air transport company Luftrtransport AS operates all fixed wing flights to Ny-Ålesund. Luftrtransport AS operates two Dornier D228 with a maximum capacity of 16 passengers. The Dornier D228 has been used since 1994, when they replaced a smaller plane.

Number of vehicles – cars, machines, snowscooters and boats

There are currently not regularly made statistics about the number and types of vehicles operated in Ny-Ålesund. Table 7.1 is a status counted in December 2005.

Table 7.1 Vehicles in Ny-Ålesund winter 2005.
(Source: counting carried out by Aina Holst December 2005).

Owner institutions	Cars	Machines	Motor-boats	Snow scooters	4 wheeled motorbikes
Kings Bay (KB)	9	6	1	5	0
Norwegian Polar Institute (NPI)	2	0	4	Ap. 8	0
Norwegian Mapping Authorities (SK)	2	1	1	2	0
Alfred-Wegener- Institute (AWI)	1	0	2	2	0
Korean Polar Research Institute (KOPRI)	1	0	0	0	0
National Institute for Polar Research, Japan (NIPR)	1	0	0	2	0
Institute Polaire Francais IPEV)	0	0	3	1	0
Chinese Arctic and Antarctic Administration (CAA)	1	0	1	2	2
Natural Environment Research Council, Great Britain (NERC)	0	0	1	1	0
NySMAC	1*	0	0	0	0
The Welfare in Ny-Ålesund	0	0	4	0	0
Private	0	0	5	Ap. 26	0
TOTAL	17	9	19	Ap. 49	2

* electrical car shared by all researchers.

** approximately 90% of the permanent inhabitants have a private snowmobile.

In 1996, there were ten vehicles, five lorries, eight pick-ups, seven vans, three motorbikes and 21 snowmobiles in Ny-Ålesund (Krzyszowska-Waitkus, 1997 in EIA98 p.16). In general there has been an increase in the number of vehicles after that, except from cars/machines and motorbikes. Most striking is the increase in the number of snowmobiles, where almost all the permanent inhabitants have their private one.

KB has not increased the number of small cars since 1997. Most cars owned by KB are older than 1997, and new ones have only replaced old ones that have been condemned. In 2004, KOPRI bought a new car, which they allow CAA-scientists to borrow. CAA has now bought their own car. NySMAC's electrical car can only be used in the warmer summer months due to the battery capacity. It seems to be a trend that an increasing number of the stations want to have their own car.

All boats in Ny-Ålesund are small, open motorboats. The number of boats has increased over the last few years, so much that KB had to construct a second small boat harbour in 2005, but no statistics exist on how large the increase has been. It seems that more stations want to have their own motorboats. Several have bought new boats in recent years. Management of cruise ships necessitated purchase of a boat by KB in 2005. The number of private owned motorboats varies between the years from zero to five.

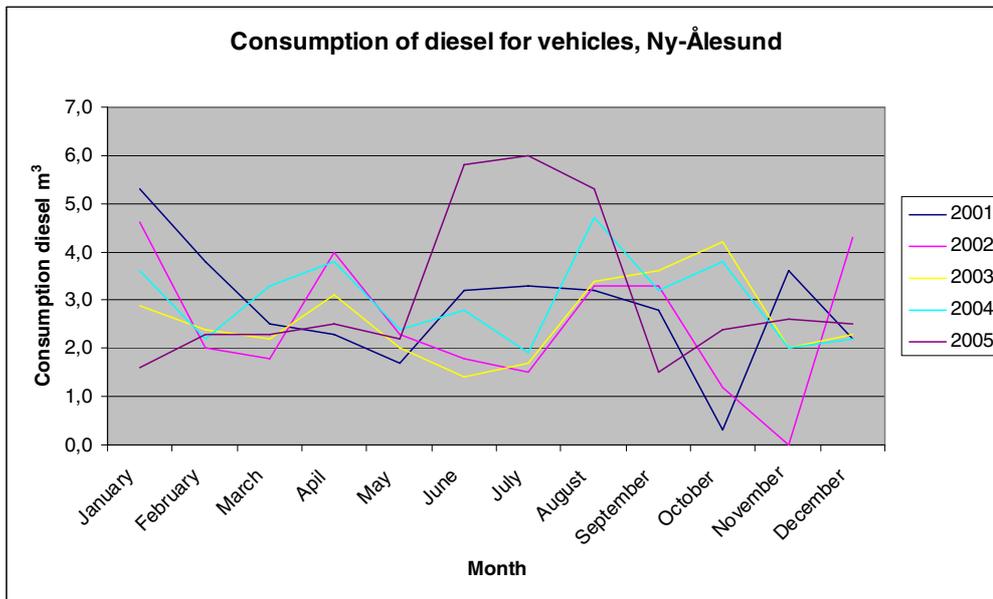


Figure 7.6. Consumption of diesel in vehicles in Ny-Ålesund 2001-2005. (Source: Kings Bay AS' statistics).

Diesel is used for vehicles. The consumption (see Figure 7.6) fluctuates significantly depending on whether only normal activities take place or if there are large construction works with heavy use of machines. The figures for summer 2005 are examples on how construction work influences consumption.

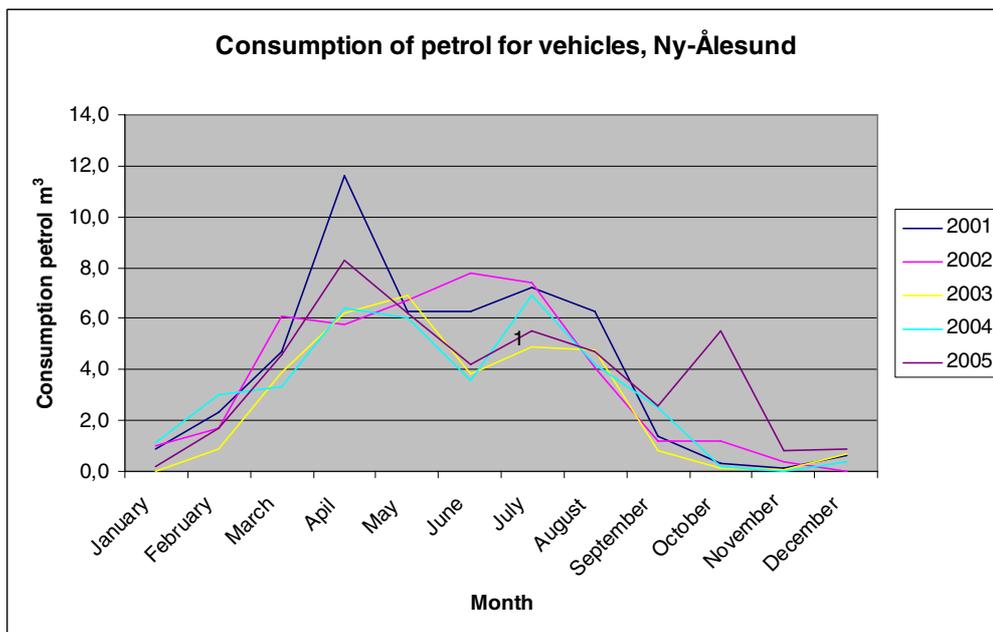


Figure 7.7. Consumption of petrol by vehicles in Ny-Ålesund 2001-2005 (Source: Kings Bay AS' statistics)

Petrol is primarily used by snowmobiles and motor boats in Ny-Ålesund. Only a small amount of petrol is sold to people from outside Ny-Ålesund. There is a peak in consumption in spring during the snowmobile season, and a lower peak in the summer when the boats are frequently in use. Figure 7.7 shows that the overall consumption has been fairly stable over the period 2001-2005.

7.4 Ship calls

The number of ship calls to Ny-Ålesund increased slightly from 1996 to 2005 (see Figure 7.8). The most obvious change is that the number of large cruise ships (vessels taking more than 200 passengers) has tripled. This has resulted in a significant increase in the total number of visiting passengers. The number of cruise ship passengers has also tripled from 1996 (see Figure 7.9). No action has been taken to reduce the number of ship calls and no environmental initiative has been taken to reduce the environmental impacts made by the ships. More positively, information and management routines have been revised and improved to minimize the disturbance caused by the tourists.

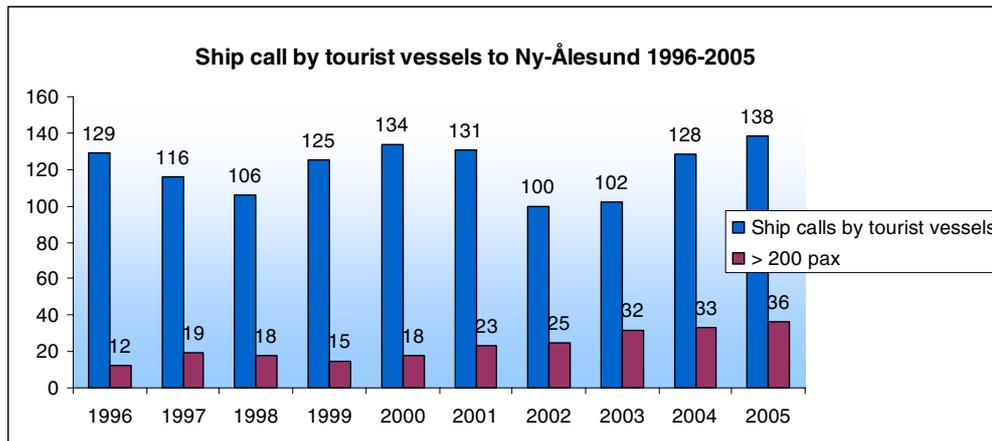


Figure 7.8. Registered ship calls in Ny-Ålesund 1996– 2005.
(Source: Kings Bay AS' statistics)

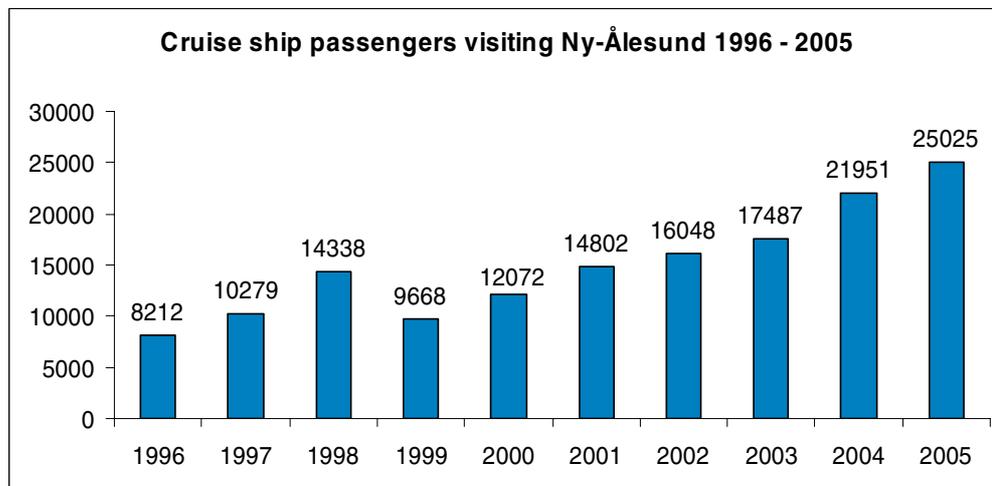


Figure 7.9. Number of cruise ship passengers visiting Ny-Ålesund 1996– 2005.
(Source: Kings Bay AS' statistics).

7.5 Fishing

From the beginning of the 1980s, Norwegian fisheries authorities have controlled the fishing of shrimps in Kongsfjorden. The regulations for shrimp fishing are not based on quotas, but on the size of the catch and bycatch of other species. In Kongsfjorden, the catches often have been undersized. Hence Kongsfjorden has been closed for shrimp trawling for long periods. This is a continuous regulation mechanism that also opens up the fjord when conditions are more favourable for trawling.

There is little data easily accessible about the fisheries in Kongsfjorden. In the peak year 1999, catches are reported to have reached 5,5 mill. NoK, or 9% of total catches around Svalbard. (Justis- og politidepartementet 2005). In EIA98, it is reported that up to five fishing boats trawling for the deep-water shrimps were active in Kongsfjorden at the same time in 1996. In 2003 and 2004, no commercial trawling was reported in the inner part of the fjord. In 2005, one boat was seen, but not reported fishing (Holst, pers. comm.2005).

7.6 Energy consumption

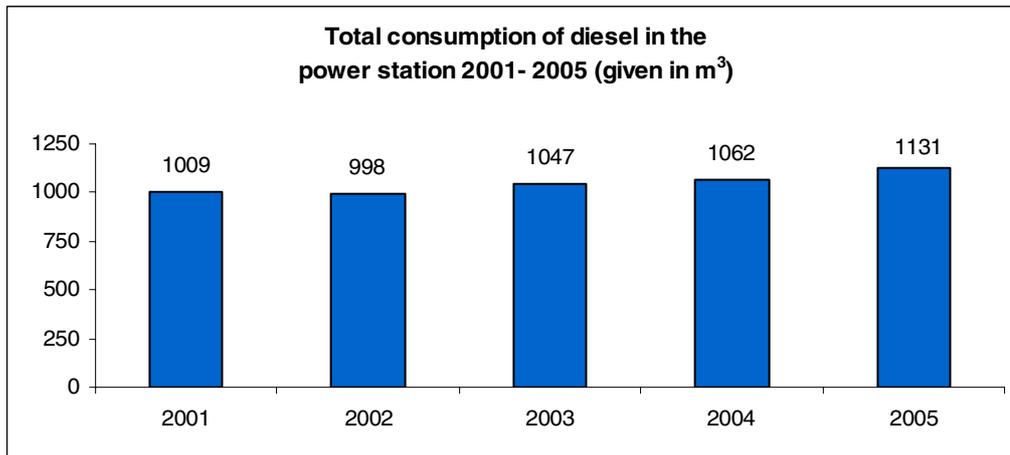


Figure 7.10. Total consumption of diesel in the power station in Ny-Ålesund 2001-2005. (Source: Kings Bay AS' statistics).

In EIA 1998 it was reported that the consumption of gas oil for power generation in 1996 was approximately 100 m³ per month in the winter and about 60 m³ per month in the summer (Shears, 1996 in EIA98 p. 32).

Figure 7.10 shows that the fuel consumption in the power station in Ny-Ålesund has been fairly stable over the period 2001-2005. The changes between 1996 and 2005 could not be referred to as large.

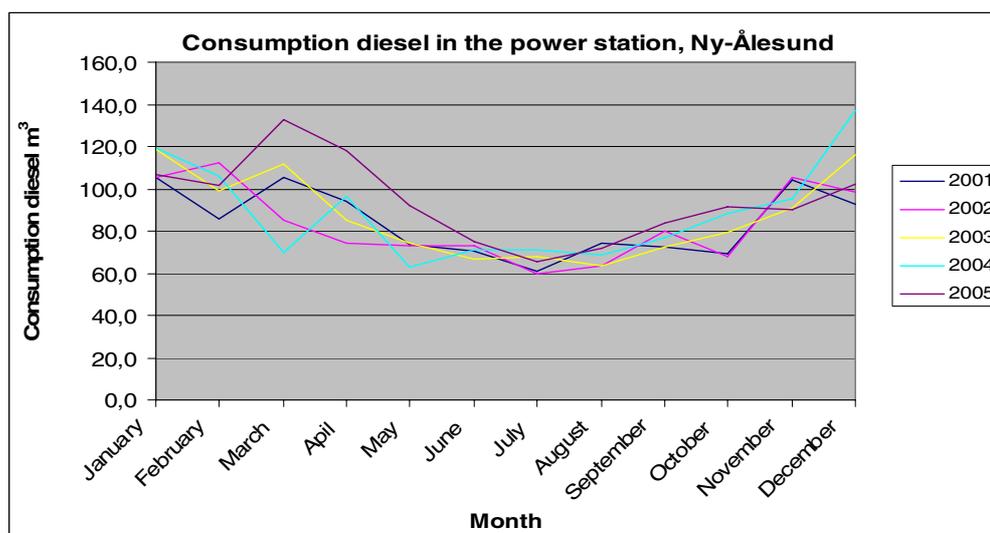


Figure 7.11. Consumption of gas oil in the power station in Ny-Ålesund by month, 2001-2005. (Source: Kings Bay AS' statistics).

Between February 2005 and May 2005 there was a peak in consumption due to testing of the new marine laboratory (Figure 7.11). When the research activity in the laboratory grows and the water treatment system is in full use, it will cause an increase in the energy consumption. When the marine lab runs on its maximum in winter, measurements from the test period show:

- Central heating: Max 168 kWh (Varied between 150 and 168 kWh).
- Electricity: 68 kWh.

Energy consumption in the lab when the lab is closed down:

- Central heating: ca 70Kwh (November 2005). With no activities in the lab in summer time, Kings Bay estimated it to be about 50 kWh.
- Electricity: 40 kWh.

Because of the extra energy consumption in the new marine lab, the generators in the power station will in periods of the year run on a level above what is recommended to have the right margins for supplying sufficient energy to the settlement. KB, in cooperation with the Norwegian oil company Statoil, have done a pre-study for a bigger, cleaner and more stable electricity and heat supply in Ny-Ålesund. Hopefully a new energy production unit will be in place in 2007-08. Until then, KB will invest in maintenance of the existing infrastructure that focuses on energy saving (i.e. changing old windows, insulating houses and inclusion of more houses in the central heating system).

7.7 Waste generation and treatment

In late 1995 a waste management plan was adopted for Ny-Ålesund (EIA98 p. 35). In the following years, KB started to introduce a more advanced waste management system in Ny-Ålesund by sorting waste into different categories. In 2002, the rubbish dump in Thiisbukta in central Ny-Ålesund was closed. Since then, all waste in Ny-Ålesund has been sorted and sent to mainland Norway for further treatment, except for wastes which are reused in Ny-Ålesund itself. Today, more than 25 different categories of waste are either being recycled or reused. Food waste is composted and has sometimes been used as fertilizer on land destroyed by construction work. KB has also bought a grinder which will be used to macerate some of the organic waste from the kitchen and sent out with the sewage. Wood waste is used as fuel in stoves in the huts outside Ny-Ålesund and for fire drills and the midsummer bonfire. Glass bottles are smashed and used as filling materials in roads, which is a legal and common way to reuse glass. Since the glass used as filling material is covered with rocks, it does not disturb the natural environment. In 2002, KB was awarded an environmental prize from "Avfallsforum-Nord" for its achievements in improving waste management.



Figure 7.12 Instructions for sorting of garbage in the recycling centre (left), and waste containers (right). Photo: Gunnar Sander.

KB has recently established routines for collecting data on the waste production. In 2005, 57 tonnes of waste were shipped to Tromsø for further treatment. Of this, 32 tons were sorted waste and 25 tons unsorted waste from construction work.

KB offers waste management seminars on request from the scientific stations. All stations in summer 2005 received a CD with a presentation of the waste management system. New KB staff receives information about the waste management system and local environmental regulations during the first week they are in Ny-Ålesund. Staff receives update seminars once a year.

7.8 Water consumption and sewage production

Water consumption

The Norwegian Water Resource and Energy Directorate carries out measurements of the fresh-water pumped from Lake Tvillingvatn to Ny-Ålesund. For the period 1997-2004, the average consumption has been calculated to 8278 m³ per year (Table 7.2).

Table 7.2. Consumption of fresh water in Ny-Ålesund. (Source: Kings Bay statistics).

1998	1999	2000	2001	2002	2003	2004
9013,2	8383,7	8625,5	8618,1	7794,7	6863,7	8646,3

Sewage production and handling

All buildings in the central parts of Ny-Ålesund are connected to the central sewage system. Sewage is discharged into Kongsfjorden from a pipeline at Palm Beach, approximately 20 metres offshore and at 1-2 metres depth. Sewage is not treated before disposal.

The sewage from the buildings at Rabben, beside the airstrip, is collected in a 6 m³ septic tank and emptied by a vehicle wagon about four times a year. The sewage is then pumped directly into the fjord from the new pier in the harbour. The septic tank at Rabben has existed since 1995. The total production of sewage, including grey water, is estimated by KB to be approximately 8800 m³ per year, based on the number of inhabitants in Ny-Ålesund in 2004.

7.9 Conclusions on environmental pressure from the activities

The development of the activities in Ny-Ålesund since 1998 allows us to draw some conclusions about the changes in the pressure on the local environment:

- The increase in the number of buildings in the settlement has caused further habitat loss. However, most building projects have been in accordance with the land use plan. This has directed construction work into areas dedicated for this purpose, while more environmentally sensitive areas are protected.
- The significant increase in the numbers of cruise ship passengers could also have caused further degradation of the tundra, but it would seem that the improved visitor management regime has avoided this.
- Garbage is no longer a local source of pollution.
- The energy consumption in Ny-Ålesund has been fairly stable from 2000 until 2005. But fuel consumption now increases, mostly due to the new marine laboratory.
- Several factors contribute to air emissions. The increase in traffic of big cruise vessels and further increase in energy production without emission controls are especially problematic. Reduction in air traffic represents a positive development, whereas numbers of cars, snowmobiles and especially small boats have all increased.

8 Human impacts on the environment in Ny-Ålesund

In EIA 98, there was a thorough description of the environment of Ny-Ålesund which serves as a baseline for later assessments (chapter 5). In this chapter, we will explore what we know systematically about changes in the state of the environment since 1998. The overall question is whether any of these changes can be referred to human impacts from the local activities. This discussion is followed by recommendations for further studies – especially where there is a lack of data – and proposals for remedial actions that will be summarized in the Environmental Action Plan in chapter 9.4.

8.1 Air

Emissions

In 1996, NILU estimated emissions of atmospheric components per hour from the various activities in Ny-Ålesund (EIA98, p 32). Annual emissions were not calculated. There has been no systematic update later. The closest is the NySMAC calculation of monthly fuel consumption during the debate about gold mining in Svansen (Fig 8.1). This demonstrates that the power station is the dominating local fuel consumer, which – contrary to the recommendations in EIA98 – was built without cleaning equipment. The second largest consumer is shipping.

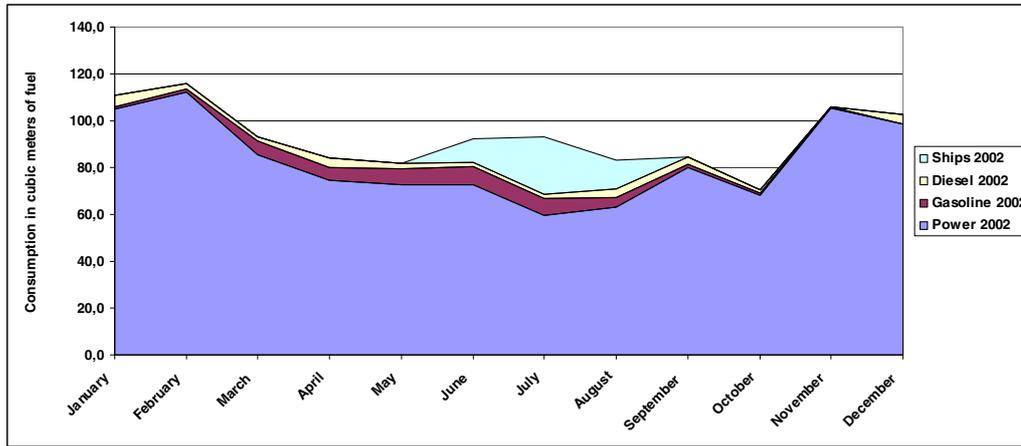


Figure 8.1. Calculation of fuel consumption in Ny-Ålesund 2002. Air traffic is not included. (Holmén 2003)

Air quality

The measurements at the Zeppelin station comprise of climate gases, particles, inorganic and organic pollutants in the air and measurements in precipitation. The station has been moved to the mountain to avoid local air masses as far as possible in order to measure the general air quality and long range transport of pollutants. In general, the levels are low compared to standards for acceptable air quality.

Impacts on nature

According to EIA98, the local emissions are not likely to have any impact on vegetation.

Impacts on science

EIA98 presented calculations from 1995, indicating that measurements of SO₂, NO_x and black carbon at the Zeppelin station could be heavily influenced by local sources, especially cruise ships. It was concluded that at least 5% of the data, maybe as much as 20%, were affected (EIA98, p 41). No new evaluation of the problem has been done.



Figure 8.2 Fire drill in Ny-Ålesund 28 July 2005. Photo: Kim Holmén.

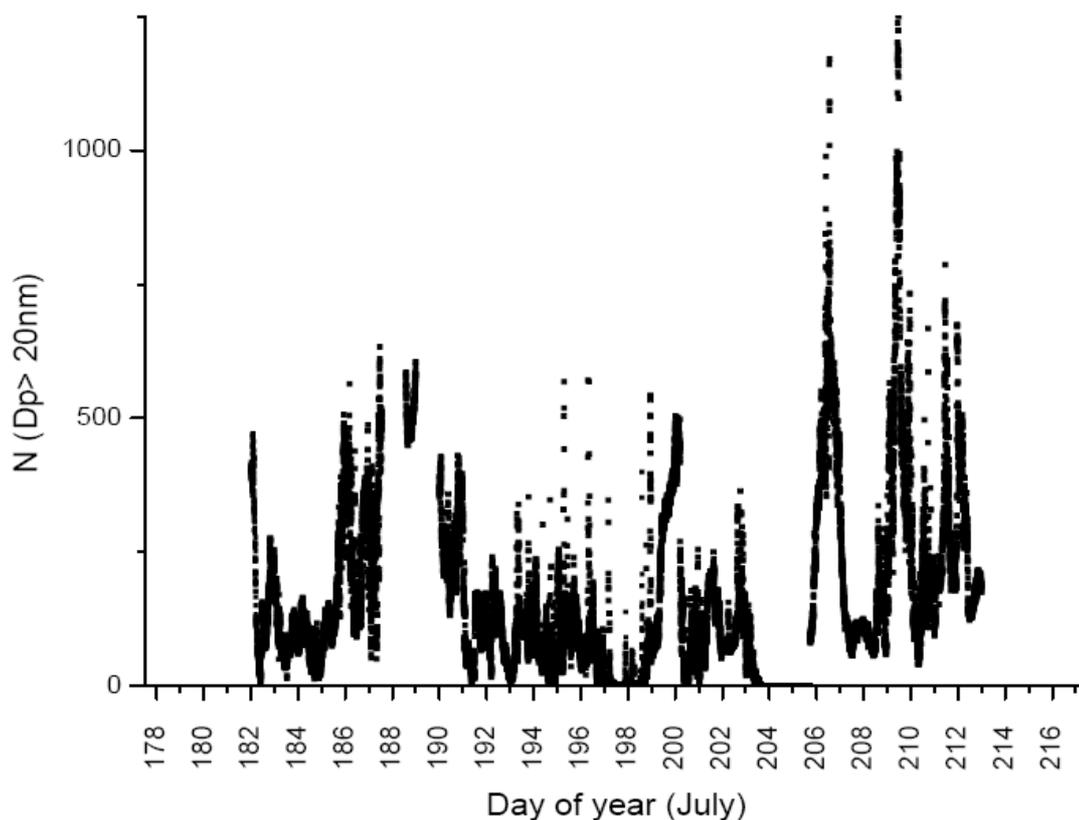


Figure 8.3. Total number of particles measured at Zeppelin, July 2005.
The peak on day 209 (28 July) has been identified to be caused by the fire drill shown in fig 8.2.

Figures 8.2 and 8.3 can illustrate the problem. In this case, an easily identified local activity has caused a peak in the measurements. As long as such episodes are reported, peaks can in principle be omitted from the dataset. However, the graph also illustrates that there is a great natural variability in the data. The question is how many of the other peaks – e.g. day 206 – that may be caused by local activities, and not variability in the concentrations in long transported air masses? Starting to omit some peaks and not others due to more or less well documented local episodes, introduces extra work and an arbitrary element in the data which limits the possibility to detect trends. If there e.g. is a 10% positive or negative trend – which is lower than the natural variance in the data – it will be very hard to determine whether it is caused by a natural development or by changes in local activities. The only solution is to ensure that the measured air masses are not influenced by local sources.

Recommendations for further studies

The careful management and control of activities is essential to ensure that local air pollution is minimized. There is a need for further studies to assess the situation in detail. This should lead to new measures to ensure that the Zeppelin monitoring station continues as a world-leader in measuring background atmospheric components and long range transport of pollutants relevant to the most important international treaties controlling global air pollution.



Figure 8.4. Zeppelin Station. Photo: Tor Ivan Karlsen.

The lack of local air pollution data should be met by a study of the local air masses in Ny-Ålesund:

- Construct data for monthly emissions of the most important atmospheric components for at least 1990, 1995, 2000 and 2005 (or annually).
- Measure local air quality in Ny-Ålesund (initiated summer 2005 by NILU).
- Establish a comparative monitoring programme for atmospheric parameters at the Corbel station further in Kongsfjorden to help to assess local influence to the Zeppelin station.
- Use NILU's computer model to simulate atmospheric conditions, concentrations of atmospheric components and contribution from local sources at Zeppelin under different release scenarios, both today and in the future with increased activities.
- Evaluate the quality of data on Zeppelin historically (measured data) and in the future as a result of model simulations.
- Give recommendations for future controls and development of local activities, especially the settlement power supply and cruise ships.

This work should be closely linked to further studies of the energy system in Ny-Ålesund:

- Future energy consumption.
- Potential for energy saving: electricity (critical in summer) and heat (critical in winter).
- Potential for the introduction of less polluting energy sources: gas or ethanol (convert the whole power station or introduce a supplement to it), solar and/or wind energy, heat pumps and incineration of clean wastes.
- Cleaning equipment at the power station.

Parts of this proposed study of the energy supply was done by Statoil in 2005-06 (see chapter 7.6.). The proposed studies of air quality have not been initiated.

Remedial action

EIA98 suggested a wide range of measures to control and reduce local emissions (See Box 5 in EIA98, p. 49). It should be differentiated between:

- Smaller efforts that should be done anyhow and straight away. For example, energy awareness and energy saving campaigns, bicycles, strict emission standards on new vehicles etc.
- Larger measures that will have significant economic consequences, like change in energy system, cleaning equipment at the power station and stop or regulation of cruise ships in Kongsfjorden. Here more thorough studies must be done to support decisions (see previous page).

The amendment to the Svalbard Act opening up the possibility to limit activities which conflict with science (see 6.4), can be a legal way for KB to regulate the numbers and types of cruise vessels entering Kongsfjorden *if the conflicts documented are serious*. The Norwegian Government's work on improved ship safety (see chapter 6.3) should also be followed in order to see if regulations can reduce the risk of the activities and the more continuous discharges to air and sea in Kongsfjorden.

8.2 Electromagnetic radiation

Ny-Ålesund is designated a "radio silent" area by The Norwegian Post and Telecommunications Authorities to permit the effective use of passive radio receiving equipment. This implies that in a 20 km radius from the research station, it is necessary to apply for a special permission to send signals at the frequencies between 2400-2483,3 MHz. These frequencies are available for free use on mainland Norway.

Impacts on nature

Visible light and other electromagnetic radiation do not appear to cause environmental impact (EIA98, p33).

Impacts on science

There is from time to time some disturbance to scientific instruments in Ny-Ålesund from local sources of electromagnetic radiation. Most frequently this is caused by very common IT equipment such as ordinary wireless telephones, portable computers with wireless LAN-systems or other sorts of wireless equipment using the frequency between 2000 and 2500 MHz. But also the radars on some large ships could cause major disturbance.

The Norwegian Mapping Authority in Ny-Ålesund has a licence to use the frequency between 2000 and 2500 MHz. They comment that modern mobile telephones and iridium telephones used in the local area do not disturb their measurements.

Remedial actions

Information must be given to all visitors to Ny-Ålesund and to new research stations about this special arrangement to secure Ny-Ålesund as a "radio-silent" area.

Measures

NySMAC should register instruments at the stations and enforce regulations.

8.3 Visible light

The Auroral observatory at the Sverdrup station has for 20 years been operated by the University of Oslo. Their research has experienced an increase in diffuse light pollution during

the dark polar night which disturbs their optical observations of weak auroral signatures especially connected to the dayside/cusp auroral emissions. Measures were taken to stop the planned establishment of road-lights around the town, and some of the strongest lights near the Sverdrup station are still turned off with campaign measurements during the 3 minimum moon periods December-February. The Chinese now also carry out research on the aurora. It is important for the settlement to maintain a strict lighting regime and to be prepared for new scientific investigations monitoring incident radiation and light.

Remedial actions

The continuous dialog between KB and the research stations doing measurements vulnerable to local light pollution must continue to make the best possible compromise between good conditions for the scientist and security for the settlement.

Measures

KB should carefully control the external lighting scheme.

8.4 Vegetation and soils

EIA98 assessed the effects of physical degradation of the tundra and pollution. In addition, the effect of grazing from geese and reindeer was considered an important factor in controlling vegetation growth.

Physical damage by constructions

Buildings: The new buildings that have been constructed since EIA98 have mostly been built on plots allocated for construction in the land use plan and avoid the most sensitive areas. (See chapter 6.7 and 7.1).

Roads: Roads have been enlarged by digging trenches for pipelines and cables into the shoulder, as noted in EIA98. Since then, one new road has been constructed along Tvillingvatnet in 2005, when the new dam was built. The western road from the dog house to the harbour, that EIA98 proposed to remove, is closed for cars, but has not been demolished.

Pipelines (freshwater, sewage, heated water) and cables: There is a continuous upgrading and maintenance of these pipelines, which causes further digging and damage to the tundra. Today no systematic registration of the pipeline network is available to assess the extent of such activities.

Gravel and rock extraction: Gravel and sand for construction work has to a large extent been imported to Ny-Ålesund over the past few years, including the material needed for the upgrading of the airport runway in 2005. Sand has, however, been taken from the ground close to the road junction at "Sinsenkrysset". For the building of the dam at Tvillingvatnet in 2005, material was taken both from the bottom of the lake and from the nearby sparsely vegetated moraine.



Figure 8.5. The new dam at Tvillingvatnet. Photo: Gunnar Sander

Stabilized compost from the food waste in the village has occasionally been used to recover land destroyed by construction work.

Traffic on tundra

Motorized traffic on the tundra with wheeled vehicles is now forbidden according to the Svalbard Environmental Protection Act (2001). There are no reports indicating that this regulation is not complied with in Ny-Ålesund. Snowmobiles, however, may damage the ground if driven on bare ground (forbidden) or on loose snow. Traffic on tundra in the summer is only allowed for scientists by foot (hiking, tenting, permanent equipment), leisure walking trips by personnel at the station and tourists walking around the settlement. Most tourists now stay on the roads because of the stricter visitor management regime. KB today requires that larger tourist vessels put out guards on the most critical sites. A few attractive sites, like Amundsenmasta, still lead tourists away from the roads and onto the tundra.



Figure 8.6. Path leading to the Amundsen mast. Photo: Gunnar Sander.

Pollution

The sources of pollution of the tundra identified in EIA98, were:

- Fuel spills and leaks.
KB does not know of any new oil spills after the ones described in EIA98 that have been cleaned up or stabilized (see 6.2).
- Waste disposal and landfill.
Old garbage dumps have been closed and the areas around them have been cleaned up, though final levelling of the ground and eventual revegetation at Thiisbukta still remains to be done. No old dumps have emerged and burning of waste has been stopped.
- Sewage.
The disposal of sewage on to the tundra, which was described in EIA98 (p36), has been stopped. Sewage from the houses by the airport at Rabben now passes through a sedimentation tank and is pumped out in the Kongsfjorden.



Figure 8.7. The old garbage dump in Thiisbukta is closed. Only final levelling of the ground remained to be done in 2005. Photo: Gunnar Sander.

Grazing of birds and reindeer

Inside the village, the tundra provides important feeding habitat for birds, mostly geese. The effects of the foraging by the birds on the tundra have been studied since 1996 by measuring the growth of plants on plots grazed by the birds and in cages that protect the vegetation from grazing. The results show that the geese have a significant effect on the vegetation (Loonen, pers. comm.). This is a natural interaction between birds and their feeding habitat. It should be noted that among the reasons why Ny-Ålesund is attractive to geese, is the fertilization of the tundra by human wastes during the old mining period and the protection from predating foxes that the settlement traditionally offered. The problem today, however, is that human activities have indirect effects on the vegetation, mediated through effects on birds and foxes (see Sections 8.6 and 8.7). This influences the number of birds and hence the total grazing pressure on the tundra. In periods with high predation of geese by foxes, which were for a time fed by humans, the biomass of the tundra increases. But foxes and human activities also influence the spatial pattern of grazing inside the village and hence the state of different parts of the tundra.

Reindeer mostly graze outside the village. Their main diet is lichen. When the reindeer were introduced by NPI in 1978, the tundra was rich. Today the vegetation has changed significantly, which has been the subject of studies conducted by NPI. It can be argued that this is a long-term ecological effect of a human action, as scientists originally introduced the reindeer to the area. On the other hand, reindeer are a natural species for Svalbard that most likely would have reached Brøggerhalvøya anyhow since the population naturally spreads to new areas.

The population dynamics is ruled by climate with negligible human influence (snowmobiles, hikers). The state of the tundra therefore will change in a dynamic equilibrium with the climate and the reindeer population.

Impacts on nature

There has been no systematic mapping of the vegetation in Ny-Ålesund since EIA98, apart from the scientific investigations of geese and reindeer grazing referred above.

The most important effects of physical degradation by human activities, however, are the ecological impacts of reduced plant cover and changes in the composition of plant species, which in turn will influence the biomass available for plant eating (herbivore) species. These effects are discussed in Sections 8.6 and 8.7 together with other factors influencing the populations.

Impacts on science

Any physical degradation or fertilization of the tundra by human activities represents a human induced change to the biomass available. Though the changes in the short run may be small and of less importance than other regulating factors, such as climate and grazing pressure, the accumulated effects need to be considered. It is therefore important to be able to do such assessments by documenting changes and by long-term monitoring.

Recommendations for further studies

The state of the vegetation and physical damage caused by roads and buildings were studied in 1986 and again in 1997 (Kruszowska-Waitkus, 1989 and 1997). These studies should be repeated in 2007 as a part of a comprehensive monitoring programme to get a more accurate picture of the current situation and the changes over the last ten years. The studies should map all changes from construction work and traffic and be documented in a GIS, using the same methods as in the previous studies.

Remedial actions

- KB should continue its focus on better protection of the tundra during all construction works and also continue its efforts to keep tourists and others on the roads.
- All changes (both positive and negative) in the physical state of the tundra, like construction work or compost application, should be registered in a GIS annually.
- Research activities should be registered in the GIS.
- The principle of revegetation of damaged ground with use of locally produced compost, eventually combined with seeds from local plants, should be further discussed.
- Green corridors through the settlement should be maintained so that grazing birds and reindeers can pass through.
- Removal of redundant infrastructure was proposed in EIA98 and should be encouraged according to the Svalbard Act §64. The western road from the dog yard to the old harbour should be considered as a resource for stone and gravel instead of opening new pits or importing. For the biologists working with birds, it is important that the road is not in use and that the small pond by the road is not removed. Shrinking of existing roads is recommended.
- To prevent physical damage to the tundra, it is better to channel pedestrian traffic to roads and paths instead of having a dispersed pattern of movements. Tourist paths should be built at least to Amundsenmasta – maybe also to other attractions/end-points frequently visited outside the existing road and path network. The topic will be discussed in the new land-use plan.
- The locations with polluted ground should be inspected regularly to see if the situation
- changes. Also new chemical measurements should be conducted regularly.



Figure 8.8. Digging by hand. Ditch for power cable to Veteranhytta summer 2005. Photo: Linda Bakken



Figure 8.9. One year later. Photo: Aina Holst

8.5 Freshwater ecosystems

The EIA98 found no information about studies of human impact on freshwater ecosystems. No new reports have been provided to the authors of this study. It was assumed that there might be contamination of streams passing old landfills, mining areas and ground contaminated by diesel. These sites have been cleaned or stabilized (see 6.2).

8.6 Marine ecosystems

EIA98 identified three types of activities with impact on the ecosystem:

Shrimp fishing

Pressure and impact assessment

Sonar images show deep furrows on the bottom of Kongsfjorden resulting from deep-water shrimp trawling. Sediments are disturbed, and benthic communities are kept at early successional stages, whereas the effects on the harvested shrimp population are mainly unknown. For science, fishing means a risk of losing research instruments deployed in the fjord (EIA98).

The EIA project team do not know of any recent studies that document the effects of trawling on Kongsfjorden.

Remedial action

Fishing will probably be forbidden in Kongsfjorden, see ch. 6.4.

Chemical contamination

The local sources of chemical contamination can include leakages from closed landfills and old mining areas, as well as recent fuel spills and release of anti fouling agents from ship's hulls. Later measurements have confirmed the data reported in EIA98 about elevated levels of some chemical pollutants in Kongsfjorden near Ny-Ålesund.

In marine sediments, moderate levels of PCBs have been found outside the harbour area (Olsson et al. 1998). Elevated levels of PAHs were also found in sediments near the Ny-Ålesund fuel tank depot. This contamination was mainly attributed to oil contamination, most likely due to leakages and spills from oil tanks or damaged pipes (Skei 1993).

In marine biota, three species at lower trophic level (*Hyas araneus*, *Buccinum undatum*, *Myoxocephalus scorpius*) sampled close to the old dock, have been analysed and compared to four other fjords in Svalbard. PAH levels of 47.8 ng/g wet weight for these species in Kongsfjorden were the lowest in the study. The PCB levels were higher than found in Adventfjorden outside the Norwegian settlement of Longyearbyen, but lower than outside the Russian settlements Pyramiden in Billefjorden and Barentsburg in Grønfjorden. The characteristic PCB congener profiles indicate local pollution rather than long-range transport of these compounds. The HCB levels in Kongsfjorden (1289 pg/g wet weight) were the highest in the study although not higher than what has been found in other Arctic areas (Hop et al. 2001).

Impacts on nature

The effects on the species of the pollution levels measured have been little investigated.

Remedial action

The Governor of Svalbard has concluded that the pollution levels in fjords in Svalbard are far below what will trigger clean-up actions on mainland Norway. With continued measures to cap and cover known local sources (e.g. polluted ground and old dump sites), marine sedimentation will probably cover and dilute the contaminants on the seafloor. Continued monitoring is recommended (SMS 2004).

Sewage

Impacts on nature

Apart from some preliminary monitoring work undertaken in 1986 (Krzysowska, 1989), little is known specifically from Kongsfjorden about the effects of untreated sewage. However, Norwegian pollution authorities in general accept discharges without chemical or biological cleaning to sea recipients in the north, as long as the sewage is mixed well into the currents.

Remedial action

In 2006, KB plans to extend the sewage pipeline at Palm Beach so that the sewage can be discharged further out in the fjord. The ambition is both to prevent pollution of the area close to the harbour and ensure that the sewage will be transported into currents and be diluted. New routines should ensure that the sewage from the septic tank at Rabben will be emptied through the central sewage system.

Research and tourism

No reports have been provided about scientists or tourists eventually affecting the marine life in Kongsfjorden.



Figure 8.10. Little attention has been paid to the fact that cruise ships visiting Kongsfjorden can have large discharges to the fjord. Photo: Kim Holmén.

8.7 Birds

EIA98 identified four mechanisms for human pressure on birds:

- Habitat loss (discussed in Section 8.3)
- Human disturbance
- Noise
- Hunting

The only quantitative data the EIA project team have found regarding human pressure on bird populations are Maarten Loonen's counts of geese, reindeer and people on the street twice daily since 1996 within the village.

Research activities in Ny-Ålesund are an important part of the overall human disturbance of birds. In the nesting period, birds that leave the nest can leave their eggs open for predation. Glaucous gulls and arctic foxes, but also skuas, are the main predators that take advantage of a visitor scaring off brooding birds. Vulnerability of the different species varies both due to different reactions to visitors and different life cycle strategies. In general, few scientific studies report on the effects of the researchers themselves so we have little systematic knowledge about effects.

Human impacts on birds

Indirectly through periods of feeding of Arctic foxes, humans have influenced the local bird populations. It should however be noted that feeding is only one reason for the distribution and density of foxes around Ny-Ålesund (see Section 8.7). Figures 8.11 and 8.12 show that in years with heavy predation from foxes, the population of barnacle geese is stable or declining. The total number of foxes is not a major factor, as in some years only one active fox was responsible. The foxes kill both goslings and adult geese. The hunting occurs in two distinguishable periods; the geese nesting period and the brood raising/moulting period. The geese and several other birds, such as common eiders, tend to nest on the islands to avoid fox predation. In some years the ice gives access to the islands, and there have been years with heavy predation caused

by this natural factor. As a response, geese have moved their nests to the village area, where the foxes traditionally were not active. This illustrates the more subtle effect of the village and its inhabitants giving protection to birds. When foxes are more active within the village, and less wary of people, this barrier has been broken. The number of foxes involved seems to be increasing, and the predation pressure within the settlement increased with an active fox den in the area in both 2003 and 2004 (Loonen 2005a).

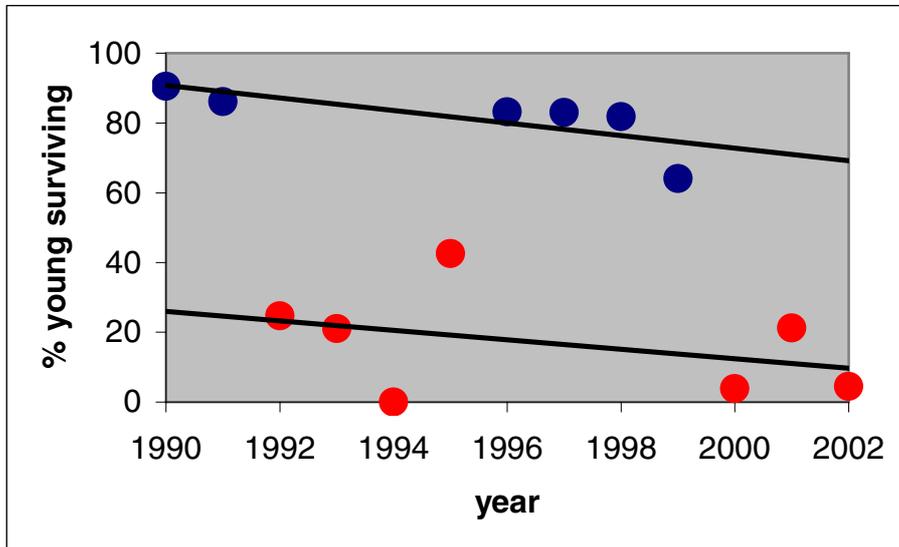


Figure 8.11. The survival of barnacle goose goslings since 1990. Years without fox predation are marked with blue, years with predation with red points. (Maarten Loonen)

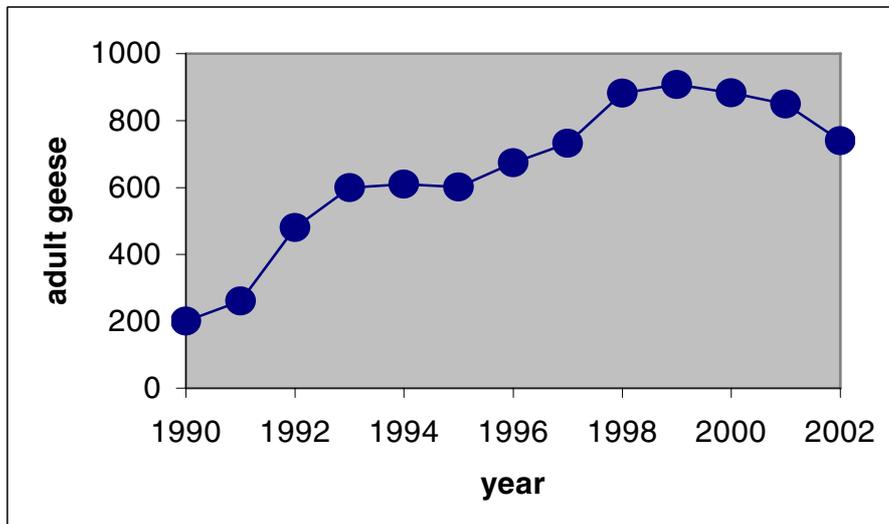


Figure 8.12. The population development of barnacle geese in the area around Ny-Ålesund. (Maarten Loonen)

The arrival of foxes in the settlement also has had a devastating effect on the local population of Arctic terns (Loonen, pers comm.)



Figure 8.13. Arctic tern in Ny-Ålesund. Photo: Aina Holst

The EIA 98 included a major survey of birds in Ny-Ålesund undertaken in 1997 by NPI. The EIA project team has not received studies that could explain the eventual human role in the change of densities for other bird species than barnacle goose, though several projects monitor birds.

Further studies

Studies should be initiated on the effects of scientific activities on different bird species.

Remedial action

- GIS is especially important in order to build up a historical record of human activities influencing the vulnerable bird species and colonies around Ny-Ålesund. This is important both for scientific research on the birds and also for managing the impacts of research on birds.
- The co-ordination of field activities needs to be further enhanced to reduce disturbance of birds.
- There needs to be a stronger justification for research permitted on vulnerable bird colonies and bird species. Increased use of birds hatched in captivity as an alternative to studies on free ranging birds should be encouraged for the most intervening studies (physiology, toxicology etc).

8.8 Terrestrial mammals

The EIA98 concluded that human activities in Ny-Ålesund had only a minor effect on the reindeer population. This is supported by later studies (Aanes, pers. comm.).

As discussed above in Section 8.7, deliberate feeding of arctic foxes has led to an increase in the population with significant predation on local bird colonies. Feeding has not been approved, but it appears that there was systematic feeding of food scraps from the Mess building in 2003 and 2004. After New Year 2004, the feeding of the foxes stopped completely.

In the 1990s, there was probably no hunting of foxes in Kongsfjorden. The last three winters, the Governor has permitted hunting for three residents in Ny-Ålesund. The hunting took place “north of Kongsfjorden” (i.e. north of Kings Bay’s property – see 6.7).

Table 8.1 Number of foxes caught by permanent residents in Ny-Ålesund.
Source: Governor of Svalbard.

Hunting season	2003/04	2004/05	2005/06
Number of foxes	9	5	0

Remedial actions

KB and all leaders of scientific stations in Ny-Ålesund should inform and urge all members of staff and visitors not to feed foxes or to hunt them and not to disturb other animals.

8.9 Marine mammals

Pressure

Seals have been shot in Kongsfjorden for scientific purposes over the last two decades. These studies have been permitted by the Governor. Approximately every ten years, a large number of ringed seals have been killed for research studies. The largest numbers in recent years were 100 in 2004 and 25 in 2000. Between these peak years, there is usually a small harvest of less than 10 animals. In a few seasons, less than five bearded seals have been shot. In recent years, surplus meat from the harvest has been given to the Mess in Ny-Ålesund and local owners of sledge dogs. Skins have been dropped in the sea or left on the ice.

Hunting of seals by permanent inhabitants in Ny-Ålesund takes place at a very small scale. For the season 2003/04, two hunting permits were given and eight bearded seals and eight ringed seals were caught. In 2004/05 and 2005/06 respectively three and seven hunting permits were given and six bearded seals were caught each of the two years.

Impacts on nature

Impact on the populations of seals from hunting is thought to be small. In spring, ringed seals are territorial within the fast-ice habitat of Kongsfjorden. Here they defend underwater territories with associated breathing holes and lairs. This is the period when the hunting occurs. When ringed seals are removed, their territories will be filled by other seals from the large surplus of animals outside the fast ice breeding habitat.

The blubber left may lead to increased surplus of nutrition for other parts of the ecosystem – either in the sea, or through scavenging by birds, arctic foxes and polar bears. The effects are however considered negligible because of the small amounts of blubber left (less than 15 kg per seal).

Impacts on science

There is no programme at the moment monitoring the number of seals in Kongsfjorden that could have its results disturbed by hunting.

Remedial action

All leftovers after sampling should be dropped under the ice in order not to attract animals.

8.10 Protected areas and buildings

Protected areas

Our general impression is that tourists now respect the borders of the specially protected areas around Solvatnet and Thiisbukta. There is, however, a problem that pipelines were constructed through these areas in the past and from time to time need to be repaired.

Protected buildings

All buildings, structures and items in Svalbard dating from 1945 or before are automatically protected as cultural heritage by the Svalbard Environmental Protection Act. In Ny-Ålesund, about 30 of the buildings in the settlement are protected. Since the EIA98, no more protected buildings have been identified. The Directorate of Cultural Heritage must approve all changes to the protected buildings. Minor repairs can be approved by the Governor of Svalbard.



Figure 8.14. Protected huts in Ny-Ålesund. Photo: Aina Holst.

Remedial action

The Governor of Svalbard is planning to cooperate with KB in developing a new protection and maintenance plan for the protected buildings in Ny-Ålesund. The work is planned to start in 2006. In addition, KB will outline the management of the protected buildings in the ongoing revision of the land-use plan for Ny-Ålesund. Where possible, old buildings should be used for new purposes instead of constructing new ones.

8.11 Noise

Pressure

The environmental noise emissions come from natural and manmade sources. Low-frequency noise is produced naturally by certain weather phenomena, waves and calving glaciers. Manmade low-frequency sources come from power/diesel generators like the power station, ships and certain helicopters. The low-frequency noise can propagate several tens of kilometres without significant attenuation. High frequency noise is generated mainly by normal operations and construction work. The local noise has probably increased significantly with the increased activities in Ny-Ålesund. The new power station is a new permanent infrasound generator which affects the whole fjord.

Impact on nature

The Norwegian Polar Institute has carried out several studies on noise impact on animals in Svalbard, both from helicopters and snowmobiles.

Impact on science

Measurements performed with a Passive Infrasonic Sodar (Ørbæk 1992), which was active in Ny-Ålesund some years from 1994, was closed down due to the new intense infrasound emitted from the new power station. The intense infrasound is expected to be caused by the combination of exhaust pipe geometry and the generator stroke frequencies. This research has not continued in Ny-Ålesund. It is not expected that the local infrasound sources have significant impact on other physical science programmes.

Remedial action

It would be valuable to document the local noise generators including the infrasonic frequencies in the fjord and perform an assessment of their impact on nature and science.

8.12 Cumulative impacts

EIA98 refers to a cumulative loss of 78 ha of tundra between 1917 and 1986. During the next ten years, an additional 38 ha was degraded. The combined effects of this habitat loss, along with increased fragmentation of natural habitats because of roads and pipelines, result in cumulative impacts that will have effects on local populations of birds and animals.

8.13 Summary and conclusions from analysis

In EIA98, a concluding summary of impacts on the environment and their significance is made in table 8, and of conflicts between activities in table 9. It is hard to repeat these assessments without more data about the impacts. The measures implemented seem to have led to reduction of the problems with local pollution of soil and water, while trawling will probably not be a problem in the future. All these factors were ranked with “high significance” in EIA98. On the other hand, the damage of habitat, possible cumulative impacts and conflict between locally produced emissions and the air measurements, should probably still be ranked as having “very high significance”. The rest of the impacts described in EIA98 were evaluated as having “medium”, “low” or “very low” significance.

A general observation is that the focus so far has been very much on the infrastructure. In the future, the environmental effects of the scientific activities themselves should be more in focus.

9 Recommendations

The project team has not discussed administrative matters for the tasks proposed in this section. For each of the tasks, NySMAC, KB, SSF and NPI must assign responsibilities for conducting the activities and sharing the costs according to their roles described in the Science plan.

9.1 Further studies

Since the EIA project team has not had a budget, we have not been able to initiate technical studies as in EIA98. There are two larger studies we consider to be so important that they should be conducted in 2006 and 2007. Both are in fields evaluated to have a “very high significance” in EIA98:

- Effects of local emissions on the air measurements at Zeppelin, and forecasting of future impacts following changes to the settlement energy system (see 8.1). Regardless of the alternative chosen for future energy system, the implementation of an air quality assessment tool should be part of the new investment.
- Degradation of the tundra: Previous studies of the changes in vegetation in 1986 and 1997 should be repeated ten years after the last investigation as a part of a continuous monitoring of changes (see Section 8.3).

This means that decisions on them going ahead should be taken as soon as practical.



Figure 9.1. Energy saving should be a main energy strategy for Ny-Ålesund. Here “Snekkasjen” is insulated summer 2005. Photo: Gunnar Sander.

9.2 Environmental plan

A major conclusion is that there is no sufficient systematic work to ensure the goals for the quality of the local environment in Ny-Ålesund. This is a serious issue for a research station with high environmental ambitions; not necessarily because the environmental performance is poor, but because we are unable to document the situation sufficiently and to quantify what happens. This can cast doubt on the legitimacy of the activities and on the environmental record of KB and the research community. But it is also problematic for scientific results that should be based on a “near pristine environment”.

All parties working in Ny-Ålesund must therefore jointly increase their efforts on working to protect the environment aspects of the station and work in a more systematic way. We therefore propose that an Environmental Plan should be elaborated in 2009 with a revision every five years. This plan should consist of:

1. Objectives

Ny-Ålesund has overall objectives for the environmental performance of the station. These should be made more specific for specific activities/results. This is necessary both as a basis for targets and measures in the environmental action plan, but also for setting the baseline standards needed to evaluate monitoring results.

2. Monitoring with assessment against objectives

In principle, NySMAC has again agreed to establish a programme for monitoring of key environmental indicators (Andøya, Potsdam). A first new proposal for both pressure and state indicators exists, building on the proposal in EIA98. NySMAC should elaborate and approve a final list of indicators, after quality assurance by its partner scientific institutions. For each of the indicators/parameters, objectives for the programme (e.g. detect human impacts of a specific type), quantitative demands for accuracy and monitoring strategy should be defined.

The data should be made available on intranet in Ny-Ålesund. Individual datasets should be analysed annually. A basic part of the environmental planning system of Ny-Ålesund, however, is to evaluate all indicators jointly to assess the changes in the overall environmental situation in Ny-Ålesund and the linkages to local activities. This overall evaluation must be compared to the environmental objectives for the settlement and should be a regular, first step in the revision of the Environmental Plan.

Many of the indicators in a monitoring programme for detection of local human impacts will also be a part of the ongoing scientific monitoring in Ny-Ålesund.

3. Environmental action plan (EAP)

The environmental action plan must be elaborated each time the plan is updated. If necessary, studies of alternative strategies/measures to reach the proposed objectives should be conducted before the plan is made. The environmental action plan should be binding for all parties working in Ny-Ålesund. NySMAC, working with KB, should report annually on the compliance with the plan.

Before the elaboration of the Environmental plan in 2008, the studies proposed in 9.1 must be conducted. The monitoring programme must also be initiated, and the first joint assessment of the data elaborated as a first step in the planning process.

9.3 Registration of activities

Project registrations

All research activities in Ny-Ålesund should be registered in a database. Such a system already exists through ENVINET, and can easily be applied immediately by all the stations⁴. In addition, NPI has developed the ENVINET database further to assist in the management of the scientific activities (in use at the Sverdrup station).

On request from the Research Council of Norway, NPI has delivered the specifications for a new database that will be mandatory for all research in Svalbard. It will replace “Research in Svalbard” and be linked to the applications for permissions to the Governor. The system for Ny-Ålesund needs to be linked to this future system for Svalbard so that scientists do not have to make multiple registrations. In the meantime, the stations should use the ENVINET system. Information from this will be included in the new databases.

⁴ The ENVINET project database allows for registration of research projects: <http://pusnes.grida.no/amap/amappd/index.asp?org=2> The ENVINET Site Specific Information allows for standardized presentation of research infrastructures: <http://amap.no/envinet/>

A research Geographical information system

Ny-Ålesund needs a GIS system to document the location of projects registered in the project directory and details of field activities and equipment. This is necessary in order to document potential disturbances, which need to be known if a new project wants to work in the same area and in order to evaluate the environmental impacts. It will also be an important tool for better coordination and management of the activities (e.g. to coordinate work on vulnerable species/-environment, installation of research equipment or markers installations in the field).

Abisko research station in Sweden already has such a GIS system. BAS is working on a similar GIS-system for its Rothera research station in Antarctica.

9.4 Environmental Action Plan (EAP) 2006 – 2009

The EAP proposed here, is an update of the programme from EIA98, taking into consideration what has been implemented (se section 6.1) and the most important proposals from section 8 in this report.

This EAP should guide the local work with environmental matters in Ny-Ålesund until the first elaboration of an Environmental plan in 2009.

Table 9.1: EAP – recommendations and measures.

	Recommendation	Measures
1.	Set a precautionary upper limit on the total activity/numbers of people at the station.	<ul style="list-style-type: none"> • Fulfil the discussions on setting an upper limit on the total activity.
2.	Stabilise and reduce local emissions.	<p>Several measures should be implemented, ref EIA98 page 47.</p> <p>Prioritized areas:</p> <ul style="list-style-type: none"> • Improved energy supply with lower emissions (new sources, cleaning equipment). • Reduction in local energy consumption by improved infrastructure and changed habits from users. • Elucidate possibilities for reduced emissions from ships. • Establish a system for monitoring and modelling of air quality.
3.	Protect flora and fauna, and re-vegetate degraded tundra areas.	<ul style="list-style-type: none"> • Register changes in the tundra in a GIS. • Continous focus on vegetation under construction work. • Register research activities and other activities in a GIS. • Remove and limit redundant and oversized infrastructure. • Channel pedestrian traffic to roads and build paths on exposed areas. • Better coordination of field activities in order to reduce disturbances. • More research on effects of scientific activities on the environment. • Elaborate codes of conduct for scientific field work. • Document effects of noise and lights on local fauna.
4.	Increase and improve the information provided to all visitors and residents of Ny-Ålesund, giving them guidance as to how they can reduce environmental impacts and minimize conflicts.	<ul style="list-style-type: none"> • Continue work on information already implemented. • Improve information about electromagnetic equipment and enforce regulations. • Stress the necessity not to feed or disturb local wildlife.
5.	Incorporate the key results of the EIA into the Land Use Plan for Ny-Ålesund.	<ul style="list-style-type: none"> • Use this EIA and subsequent results from monitoring and environmental plans as a basis for revisions of the land-use plan in the future.

6.	Prevent fuel spills and establish a station fuel spill contingency and clean-up plan.	<ul style="list-style-type: none"> • Revise the Emergency plan for pollution incidents and spills in 2006-7. • Inspect locations with polluted ground regularly and measure chemical concentrations (i.e. every 5-10 years).
7.	Maintain a high level of waste management.	<ul style="list-style-type: none"> • Increase the focus on minimization of waste generation. • Continue the high standards on recycling.
8.	Establish the Kongsfjorden area as a “scientific research area”.	<ul style="list-style-type: none"> • Follow and contribute to the Governmental process on establishment and implementation of such an area.
9.	Reduce the environmental impacts from tour ships calling at the station.	<ul style="list-style-type: none"> • Continue and improve the work on information to crew and passengers and ensure enforcement when passengers are in the village. • Find ways to reduce emissions from the ships.
10.	Introduce stricter controls over activities.	<ul style="list-style-type: none"> • Introduce a Project database. • Introduce a research GIS associated to the Project database. • Increased coordination and control through the Ny-Ålesund science plan.
12.	An environmental monitoring documenting pressures on and state of the local environment.	<ul style="list-style-type: none"> • Initiate a process to fulfil the selection of indicators and parameters with responsibilities for the monitoring and assessment work. • Establish a system for displaying indicators and parameters on intranet. First priority is to publish statistics on activities made in this report and continually update them. That should gradually be supplemented by SoE-indicators.

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Environmentally friendly research soars in Ny-Ålesund. Photo: Gunnar Sander.

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