Cruise tourism on Svalbard –

A risky business?

WWF International Arctic Programme

2004

Bråsvellbreen,
Nordaustlandet.

Photo: Miriam Geitz

Contents

Editor: Miriam Geitz
Text: Miriam Geitz, Stefan Norris, Marie Lier
Maps: Alpha Miljørådgivning AS, Oslo, Norway
Lay out: dEDBsign/Ketill Berger, Oslo, Norway

WWF International Arctic Programme
P.O. Box 6784 St. Olavs plass
N – 0130 Oslo, Norway
T: (+47) 22 03 65 00
http://www.panda.org/arctic
You can contact the editor at
mgeitz@wwf.no

August 2004

Acknowledgements:
Many thanks to Tove Christensen, Ketill Berger, Kjell A. Moe, Odd Willy Brude, Tara Ghandi, Scott Grierson, John Kristiansen, and many more who contributed their time and expertise. Special thanks to Det Kongelige Justis- og Politidepartement (Norwegian Ministry of Justice and the Police) for their financial support.

Walrus haul-out.

Photo: Miriam Geitz

Executive Summary

Cruise tourism is big business on Svalbard, providing tourists with close-up experiences of unique and vulnerable arctic nature. Many operators offer their guests high-quality information along the way, and by that contributing to more awareness about the arctic environment and at best, creating "ambassadors" for conservation. However, Norwegian authorities, environmental organizations and parts of the cruise industry itself are concerned that the existing cruise tourism management regime does not appropriately address current and potential impacts of cruise traffic on Svalbard's vulnerable arctic environment.

This report addresses some of these issues, but it cannot provide final solutions to eliminating the environmental risk associated with cruise traffic around Svalbard. It does, however, raise questions to stimulate discussion, and hopefully action, which will reduce the risks and uncertainties associated with such activities. Though WWF recognizes some of the positive effects cruise activities can have on awareness-building and in communicating the values of Svalbard's wilderness, it was beyond the scope of this particular assignment to include a full analysis of the socio-economic benefits of cruise tourism versus the environmental impacts.

Cruise tourism is by no means the only, or even the single biggest threat to Svalbard's environment. Climate change, toxic pollution, and destructive and excessive fishery activities will continue to have greater impacts on the archipelago and its biodiversity. Nonetheless, cruise tourism is a major activity, and one in which ships and passenger groups of all sizes are brought to remote and pristine areas of the archipelago during a short and vulnerable summer season. Government and tourism industry have repeatedly stated their ambitious goals for Svalbard, and this report provides recommendations on how these goals can be pursued and achieved.

Ship-based tourism has a long history on Svalbard, but it was not until 2001 that reporting statistics for the two main cruise activities – overseas cruises and coastal cruises – were combined and gave a picture of overall cruise traffic. In 2003, 69,691 passenger landings were made by 28,190 passengers. The number of sites where cruise tourists went ashore has increased from 138 in 2001 to 162 in 2003.

What does this mean for the environment? While impacts on a particular landing site, depending on its vegetation, might be small, the increase in the number of sites visited is an indication of the spreading 'footprint' of cruise tourism.

The biggest single threat posed by ship-based activities on Svalbard is from a major oil spill. Cruise ships can carry substantial volumes of fuel for their own use. Those fuels are often heavy oils, the most toxic, polluting, and potentially environmentally-damaging fuels if released into the environment. Svalbard's characteristics, its climate and remoteness, make it extremely difficult to counter an oil spill before it does significant damage. Oil response capacity, provided by the authorities on Svalbard, is also limited. Cruise ships mainly operate close to the shore and during the most productive season, thus increasing the likelihood of severe environmental damage if an accident occurs.

Norwegian authorities should address the risks presented by cruise tourism through a precautionary approach, which involves closing high-risk and high-value areas, demanding the use of best available fuels and other technologies, and matching oil spill response capacity to the increasing cruise traffic around Svalbard.

Other environmental threats from cruise tourism are based on cumulative impacts: Sites visited by cruise ships over a number of years show signs of degradation, both of cultural and historical remains, as well as vegetation. Wildlife disturbances are harder to quantify, but in the harsh arctic climate, where other factors increasingly challenge a species' survival, strict and precautionary measures must be taken to avoid negative impacts.

In addition, cruise ships also represent a source of pollution in pristine areas that are not otherwise directly affected by air emissions or waste discharges. The energy requirements of cruise ships, together with their function as floating hotels, means the vessels produce considerable amounts of emissions and large quantities of sewage, garbage and waste water. The extent to which such discharges cause pollution depends on a number of things, among them technical equipment and a ship operator's policy and practices.

Many of the measures that could be introduced to improve cruise management are realistic. The single most important one in the short-term is to reduce the risk of major oil spills from cruise ships and other vessels. The simplest and most effective way of achieving this is by closing valuable and vulnerable areas completely. Reducing the negative impacts of cruise tourism on Svalbard must also be seen in a wider context. The number of ships and passengers visiting Svalbard is likely to increase because cruise tourism is a booming business globally. A proactive cruise tourism management regime must be established on Svalbard to cope with further increases and diversification in ship-based tourism activities. Svalbard authorities and industry are in a unique position: the time is ripe for the establishment of a "best practice" cruise management regime on Svalbard, which can set the standard not only for the rest of the Arctic, but also the rest of the world.

Box 1:

Background to this report

WWF has been working on arctic tourism issues since 1995. Svalbard has been a focus of this work due to its unique natural characteristics and exceptional value as a high arctic archipelago. Representatives from Svalbard's tourism industry, cruise operators and authorities became involved early on in this work through an arctic-wide network. Although cruise tourism development in all its forms has been discussed on and off for years, it was not until 2002 that a focus on cruises around Svalbard evolved. In discussions, it became clear that WWF, some tour operators, and Norwegian authorities were all concerned about the direction that Svalbard's cruise industry was taking and its sustainability. Consequently, the Norwegian government and local authorities decided to support a cooperative approach led by WWF with the goal of reducing environmental risks associated with cruise tourism and promoting best practices.

Figure 1: Map of Svalbard

1. Introduction

The archipelago of Svalbard is unique in many ways. An important haven for northern wildlife, it is home to charismatic animals and is the feeding and breeding grounds of millions of migratory birds. Svalbard's location and characteristics have always made it a prime destination for ship-based travel. In recent years, the number of recreational vessels visiting the islands has risen steadily, raising concerns by environmentalists, authorities and the tourism industry about the potential negative impacts of this development.

This document aims to identify the potential and, where possible, actual environmental impacts of cruise tourism on Svalbard's unique wildlife and natural and cultural heritage. It provides a general overview and background as well as location-specific information. It is a first step in understanding the overall impacts of ship-based tourism around the Svalbard archipelago, and is meant to serve as a baseline reference for further discussions and actions.

2. Cruise tourism on Svalbard

This section provides a brief overview of the characteristics of cruise tourism on Svalbard and its potential environmental impacts, as well as general background information for the main body of this report.

2.1 Status and developments

Cruise tourism characteristics
All recreational ships coming to Svalbard, whether commercial or private, are required to notify the Governor of Svalbard and obtain approval for their travel plans in advance of their trip. After each journey, and before leaving Svalbard's waters, commercial operators are required to file a report detailing their activities with respect to landing and anchoring sites.

For reporting purposes, the Governor of Svalbard has categorized all cruise activities into three groups (Governor of Svalbard 2002):

- Private yachts
- Coastal cruises
- Overseas cruises

Tourists charmed by arctic fox cubs.

Photo: Miriam Geitz

On board lecture.

Photo: Miriam Geitz

Private yachts: This category comprises individual ship-based travels organized by private persons. In this report, the focus will be on commercial activities and private yachts will not be considered further.

■ **Non-local cruise operators:** companies based outside of Svalbard but with seasonal activities on the archipelago (Governor of Svalbard 2002).

Coastal cruises: The coastal cruise segment offer ship-based travel often referred to as "expedition cruising". Vessels in this category are comparatively small and thus able to land people ashore outside of settlements and the few established landing sites. The focal part of their product is the nature experience on the trip. The majority of cruises start and end in Longyearbyen and some operators have regular, often weekly, departures during the tourist season. The length of cruise trips varies between 3 and 17 days. Coastal cruise operators can be further divided into locally based and non-locally based operators. The non-local operators often combine start and end-of-season trips with other destinations, e.g. the Norwegian mainland or Greenland. Another subcategory, although not specifically identified in the statistics, are local operators who offer ship-based day trips from Longyearbyen. In 2003, expedition cruise operators established the Association of Arctic Expedition Cruise Operators (AECO) to coordinate their activities and improve their operations, among other things with regard to environmental impacts and safety issues.

Overseas cruises: Overseas cruises often visit Svalbard as part of a "northern" itinerary combining other destinations such as the Norwegian mainland, Greenland or Iceland. Due to their large size and passenger numbers, most of the vessels do not land people outside of settlements or do so at the few suitable sites. In addition, many passengers and cruise operators consider the ship itself as the core attraction of the trip, and the destination secondary. So far, the largest vessels travelling to Svalbard have carried up to 2,200 persons, including crew.

Table 1: Overview of cruise categories.

	Overseas cruises	**Coastal cruises**
Purpose of organization	Commercial	Commercial
Type of cruising	Ship-based activities with a few landings in places where there are a suitable conditions.	Ship and small craft-based activities with frequent landings as a core part of their programmes.
Cruising area	Only ice-free waters, mainly on the west coast of Spitsbergen.	Most coastal cruisers (apart from day trip vessels) meet ice class requirements and can also travel to remote and ice-infested areas of the archipelago. Day trip operators mostly stay in the Isfjord area.
Boats employed for landings	Hard-shelled small or medium sized ship-craft (tender).	Small, often inflatable, ship-craft (zodiacs).
Reporting requirements	Notification before the trip.	Notification before the trip.
Length of trips (approximate)	One to two days in Svalbard waters.	Day trips to 17 days.

Ice class: a technical classification system that approves a vessel's suitability for operation in different ice conditions.

Cruise-related activities

In addition to lectures and activities on board, cruise operators offer a variety of activities for their passengers, some onshore and some water-based, such as:

Land-based:
- Walks
- Inland hikes
- Glacier climbs
- Wildlife/bird watching
- Settlement visits
- Historical site visits

Water-based:
- Zodiac cruising
- Wildlife/bird watching from zodiac
- Wildlife/bird watching from cruise ship
- Kayaking
- Diving

The potential impact on the environment of these activities is largely dependent on variables such as group size, the guide to visitor ratio, the way that guides conduct their tours and manage groups under their control, and the sensitivity of specific locations with regard to wildlife, vegetation or other conditions.

Cruise tourism volume and trends

Due to ice conditions, cruise tourism on Svalbard is confined to the summer months, and peaks between June and August.

The following statistics, provided by the Governor of Svalbard, are derived from reports filed by operators about their routines (Governor of Svalbard 2004).

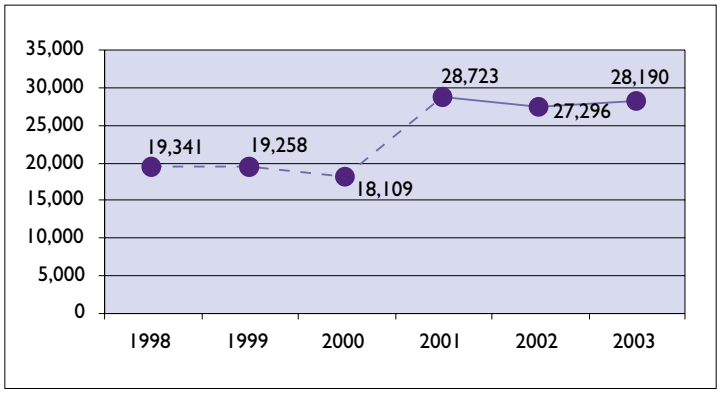
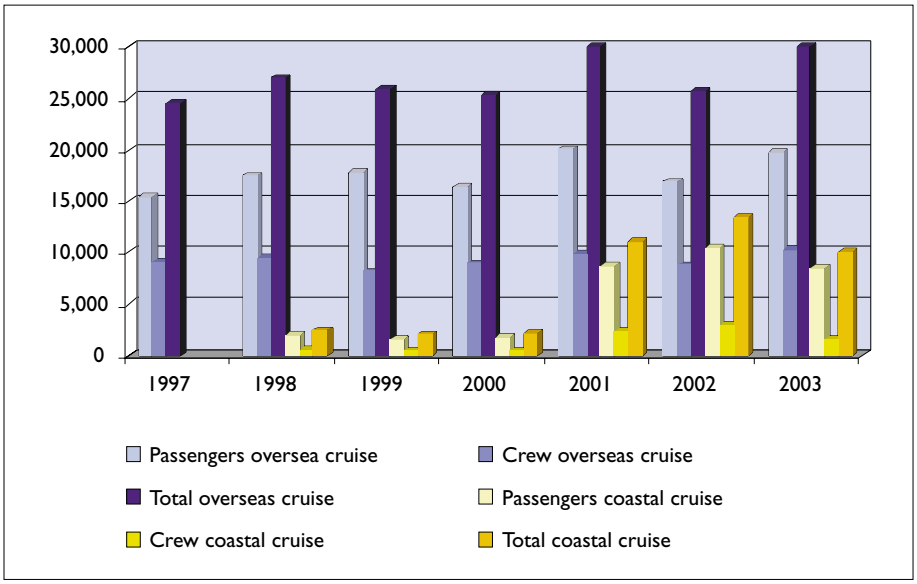


Figure 2:Total cruise passenger numbers (1998 – 2003).

Figure 3: Passenger and crew numbers by cruise category.



In 2001, new reporting requirements for cruise activities were introduced. Previously, locally run coastal cruise operations reported to the local tourism board, Svalbard Reiseliv (formerly Info Svalbard). Now, all operators report to the Governor of Svalbard, making it difficult to compare activity levels between years. Changes in reporting practices may explain the unexpected increase in coastal cruises in 2001. Cruise ship numbers may also have been underreported in the years before 2001.

Table 2: Cruise passenger and crew numbers by cruise category (2003).

	Passenger numbers	Crew numbers	Total
Coastal cruises (local)	5,822	1,137	6,959
Coastal cruises (non-local)	2,632	1,531	4,163
Overseas cruises	19,736	10,238	29,974
Total	28,190	12,906	41,096

Table 2 specifies the numbers of cruise passengers and crew for the sailing season of 2003, during which 28 cruise vessels visited Svalbard 41 times. Crew numbers are included in the statistics to show the actual number of people that would have to be rescued if there was an emergency.

Table 3: Cruise ship-related landings on Svalbard.

	1996	1997	1998	1999	2000	2001	2002	2003
Number of landing sites with persons on shore	63	76	98	111	104	138	153	162
Number of persons ashore outside of Longyearbyen	37,058	37,212	38,974	34,404	43,815	68,065	72,861	69,691

Table 3 and Figure 4 show the development of cruise-related landing activities on Svalbard. Since 1996, the numbers of places visited outside of Longyearbyen and the number of people landed ashore have increased considerably.

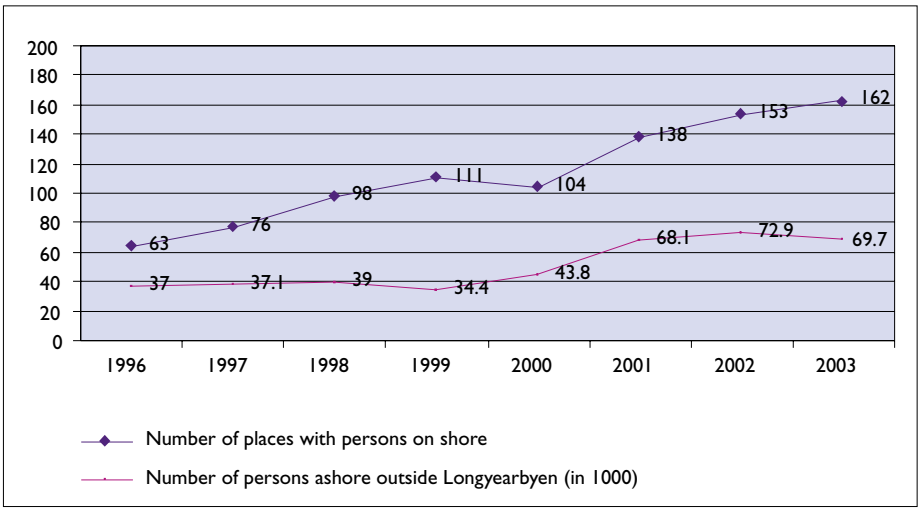


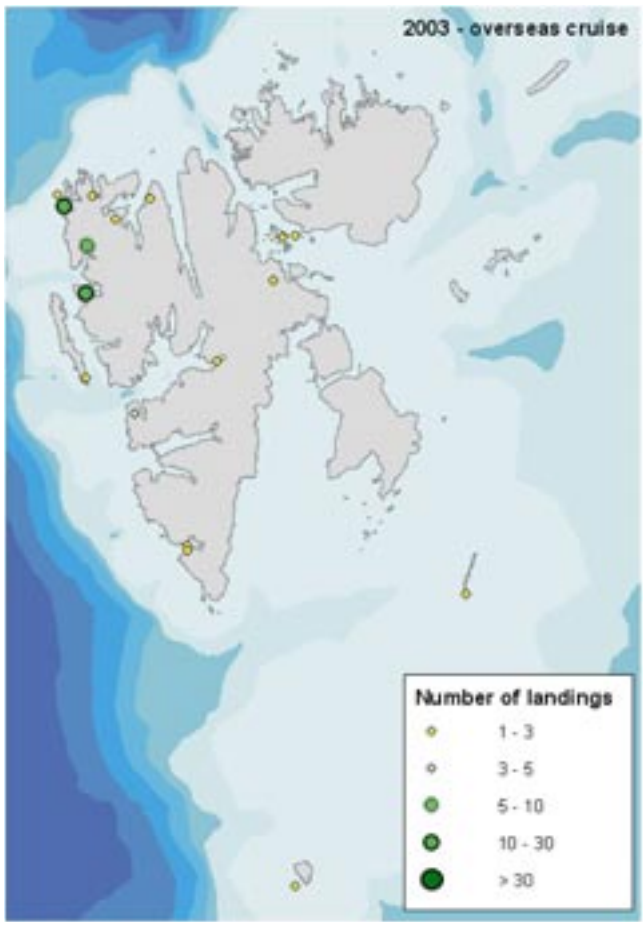
Figure 4: Development of landing sites vs. numbers of landed people.

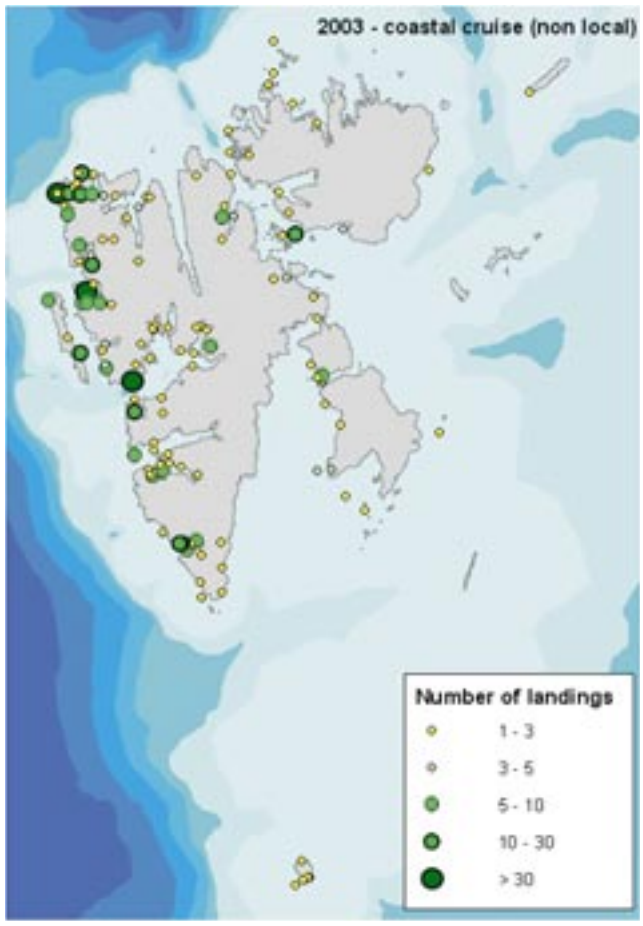
In 2003, cruise guests visited 162 sites around the archipelago (Figure 9). More than 35 of those 162 sites had not been visited by a commercial cruise operator before (Governor of Svalbard 2004), while the total number of sites visited by tourists over the years has now risen to almost 300. Figures 5 to 8 illustrate cruise ship landings and passengers ashore outside Longyearbyen.

The observed increase in landing sites is mostly due to coastal cruise vessels, since overseas cruise traffic is limited by ship size and landing capability to a smaller number of sites on the west coast. Locally run cruises visited fewer sites than non-locally operated ones because only one local cruise operator offered multi-day trips.

Figure 5: Numbers of landings by overseas cruise operators in 2003. (left)

Figure 6: Numbers of landings by non-local coastal cruise operators in 2003. (right)





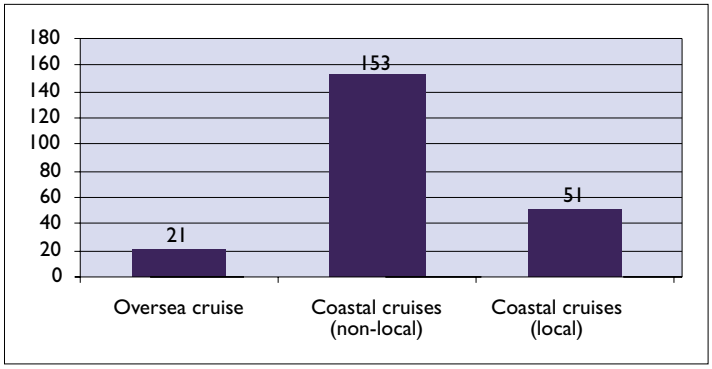


Figure 9: Number of landing sites on Svalbard (by cruise type) in 2003.

The majority of locally run sailings were day trips out of Longyearbyen that visited sites in the Isfjord area. Those day trips accounted for around 4,000 departures in 2003 (Tove Eliassen, Svalbard Tourism, personal communication, 24 May 2004).

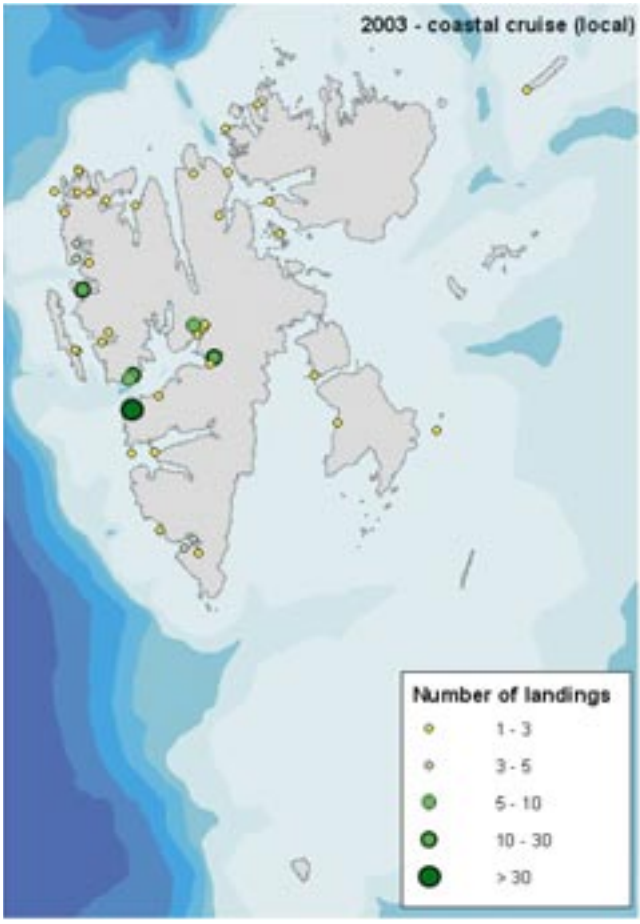
Both the distribution and number of landing sites give a good estimate of the sailing range of cruise ships. However, these statistics alone do not fully reflect the pattern of travel, as anchoring sites or other spots with no land-based activities are not represented. In addition to landing sites, operators are asked to identify anchoring locations in their post-trip reports to the Governor of Svalbard. While reporting on landing sites is generally good, anchoring sites are less well documented (Frigg Jørgensen, Governor of Svalbard's office, personal communication, 31 March 2004).

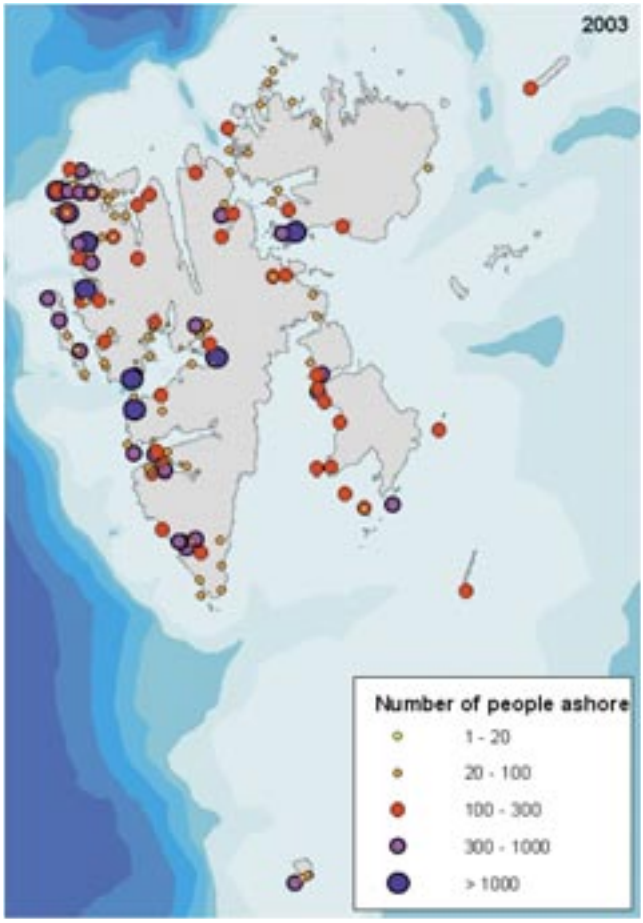
Outlook

Svalbard is a high Arctic destination that is easily accessible and attractive to tourists. Due to its unique characteristics, it is difficult to compare Svalbard's tourism development, even its cruise boom, to that of any other destination.

Figure 7: Numbers of landings by local coastal cruise operators in 2003. (left)

Figure 8: Numbers of people landed by cruise operators in 2003. (right)





It is not easy to predict the future of tourism on Svalbard, but it is likely that at least a moderate level of growth will occur. Central to this assessment is the support of the Norwegian government, which has identified tourism and research as having the potential to become significant economic foundations for Svalbard (Norwegian Ministry of Justice and the Police 1999-2000). The region has benefited from the recent global boom in cruise tourism and it is likely that Svalbard will continue to be a popular cruise destination. The quest for new cruise destinations, the increase in cruise capacities worldwide, especially in Europe (Aftenposten 2004), together with the political stability of the region have already led to more cruise traffic along the coast of Norway (Aftenposten 2004). Northern European and polar cruises in general are currently successful products for cruise operators, and if this trend continues, it is likely that more and more cruise trips will include Svalbard in their itineraries and that capacities on existing trips will increase.

A relatively smaller level of increase can be expected in the coastal cruise segment of the travel market. Generally, coastal cruises are high-end, special interest products with a limited market run by a fairly well established group of operators. However, coastal cruises are becoming popular and some operators have increased their capacity by adding more departures. There is also a possibility that larger ice-class vessels will visit Svalbard in the future. Although these ships may not be able to land as frequently as smaller ships, they are able to travel to less accessible and potentially more vulnerable areas than large vessels do today.

Another development that could influence the amount of cruise traffic around Svalbard in the future is a reduction in the amount of summer sea ice due to climate change. This would make the more remote parts of the archipelago accessible even to non-ice-class ships.

On shore in Hornsund.

Photo: MiriamGeitz

A bearded seal resting on an ice floe.

Photo: Miriam Geitz

3. Svalbard's biodiversity and natural habitats

3.1. Environmental values and vulnerabilities

On Svalbard, the areas visited and used by the cruise industry range from small sandy-beached islands accessed via rough rocky coastlines, to scree and gravel shores, high vertical cliffs with tens of thousands of breeding birds, glacier fronts jutting into the sea and pack ice found some distance from shore.

As documented in this report, cruise activities take place along the entire coastline of Svalbard during the ice-free period of the year. Due to accessibility, attractiveness, or tradition, some areas are used more frequently and intensely than others. Increasingly, new areas are being explored and new landing sites are being established by the industry. For this reason, it is necessary to include coastal areas of the entire archipelago when identifying environmental vulnerabilities to cruise activities.

The mapping of environmental values and vulnerabilities is challenging and is by no means an exact science. It requires a range of assumptions and generalizations, since the ecosystems involved are highly complex, and scenarios and impacts associated with potential events are wide ranging, from minor sounds or smells registered by animals, to a major oil spill in ice-infested waters near a bird cliff. As the planning, management, monitoring and evaluation of cruise activities develops on Svalbard, it will be important to identify areas where ecosystem functions, species survival and visual appearance are most likely to be impacted.

In order to distinguish areas of particular environmental importance in relation to cruise activities on Svalbard, key features of nature, primarily related to biodiversity, were identified and selected using the following criteria:

- Importance for biological diversity
- Importance for biological production
- Uniqueness or rarity
- Scientific value, e.g. reference sites or areas monitored as "natural" ecosystem components
- "Naturalness", i.e. degree of influence from humans.
- Particularly vulnerable during the main cruising season.

The criteria were not ranked, but were applied equally as "filters" when selecting features for consideration. The natural features identified through this process, which are considered important or vulnerable in relation to impacts from cruise activities or incidences related to cruise activities, are listed below.

Marine and coastal features:

- Vulnerable marine areas, including areas off seabird cliffs and colonies
- Feeding and moulting areas for seabirds, eider ducks and other birds
- Special soft bottom and tidal zone habitats (benthic communities)
- Coastal areas used by anadrome (migrating) fish
- Deltas and lagoons.

Land and shore features:

- Important Bird Areas (IBAs) as identified by BirdLife International and Wetlands International
- Areas with high densities of threatened and/or vulnerable vascular plants
- Haul-outs and other areas used by walrus.

Each feature was then ranked according to its degree of importance or vulnerability. Index values were assigned to each site or area covered by each feature on thematic maps. Index value 1 indicates moderate, or in some cases local importance or vulnerability. Index value 2 indicates higher, or in some cases national importance or vulnerability (threatened). Index value 3 indicates highest, or in some cases international importance or vulnerability (irreplaceable[1]) of the feature (see Table 4).

Other features could have been chosen, and the criteria can certainly be refined. But the selection of criteria used is a starting point for an overview environmental features and areas considered important or vulnerable in relation to impacts from cruise activities or incidences related to cruise activities on Svalbard.

Data on polar bears was not included as an indicator vulnerable to cruise-related activities in Figures 10 to 12. While individual animals are vulnerable to disturbance, it is the sites with polar bear dens during the winter and spring that are most sensitive for the population. A major oil spill during summer could seriously affect the health and condition of many bears, including pregnant females entering dens the following winter, as well as cubs emerging the following spring. In this sense all major denning sites could be considered highly vulnerable.

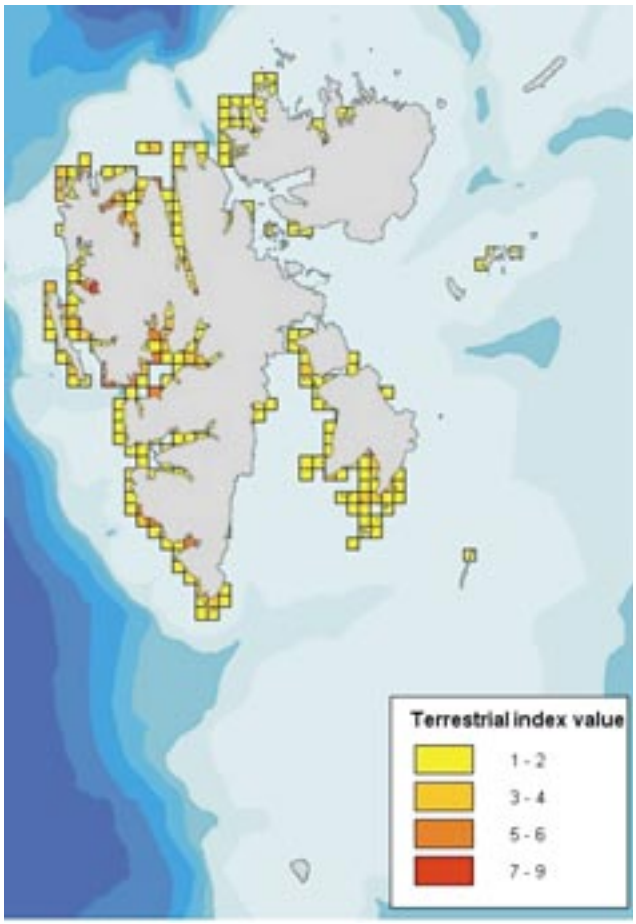
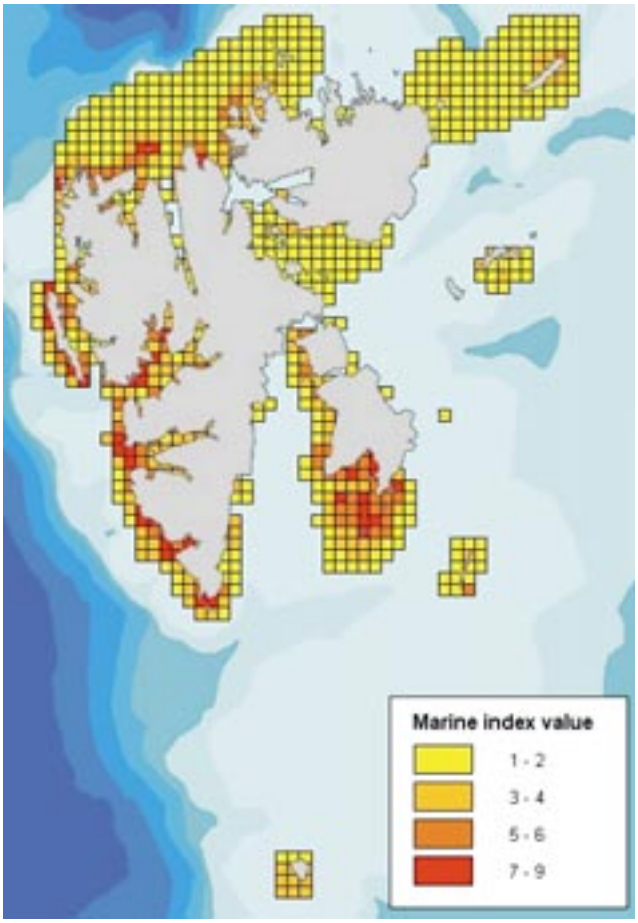


Figure 10: Svalbard's terrestrial biodiversity values (accumulated).

1. Irreplaceability of an area: areas that can not be replaced by protecting other areas with similar functions or value (Theisen and Brude 1998).

Table 4: Overview of environmental features identified as particularly important or vulnerable in relation to cruise activities or events.

Theme	Index values
Vulnerable Marine Areas (including bird cliffs and colonies and their buffer zones).	Regional importance: 1 National importance: 2 International importance: 3
Feeding and moulting areas for seabirds, eiders, and other birds.	2
Special soft bottom and tidal zone habitats (benthic communities).	Regional importance: 1 National importance: 2 International importance: 3 (Moe et al. 2000).
Coastal areas used by anadrome arctic char.	2
Deltas and lagoons.	Delta: 1 Lagoon: 2
Important Bird Areas.	2
Areas with high densities of threatened and/or vulnerable vascular plants.	Threatened: 3 Vulnerable: 1
Haul-outs and other areas used by walrus.	Important summer areas: 1 Past haul-outs: 2 Current haul-outs: 3



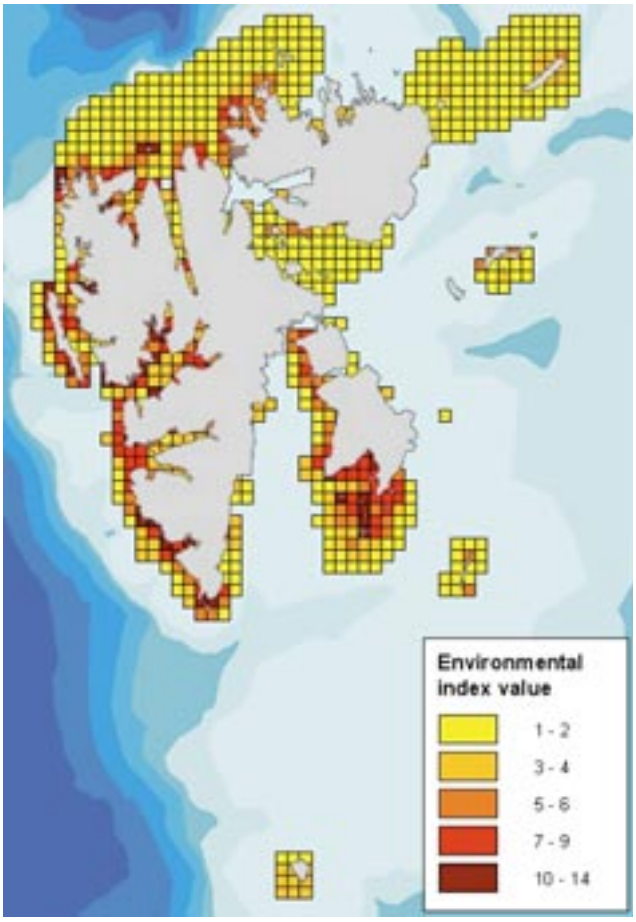


Figure 11: Svalbard's marine biodiversity values (accumulated).

Figure 12: Accumulated environmental values. (right)

The index values for each feature in each location or area on the maps were then aggregated, giving a total sum index value, which indicates the relative importance of the area in terms of its environmental value.

The aggregated index values are presented with colour codes in the following maps.

Figures 10 and 11: Ranking of marine coastal and shoreline land areas by their importance of environmental features, and their vulnerability to impacts from cruise activities and events linked to cruise activities. High numbers (red) indicate high value or vulnerability, and low numbers (yellow) indicate lower, though not insignificant, values or vulnerability.

The approach used is a derivative of the methodology developed and used by Theisen and Brude (1998) of the Norwegian Polar Institute in their evaluation of environmental features in need of formal protection on Svalbard. The Norwegian Polar Institute and the Governor of Svalbard provided most of the data sets. Alpha Environmental Consultants in Oslo performed the data processing and analysis.

Comments on criteria and data used:
Many other features were considered for the analysis in addition to those listed above. For the final evaluation, the criteria for selecting features were relevancy (likely to be impacted by coastal activities in the summer) and availability of data in suitable formats and quantities.

3.2. Protected areas on Svalbard

Svalbard has established the following types of protected areas to conserve the archipelago's natural and cultural values:

- National parks
- Nature reserves
- Bird reserves

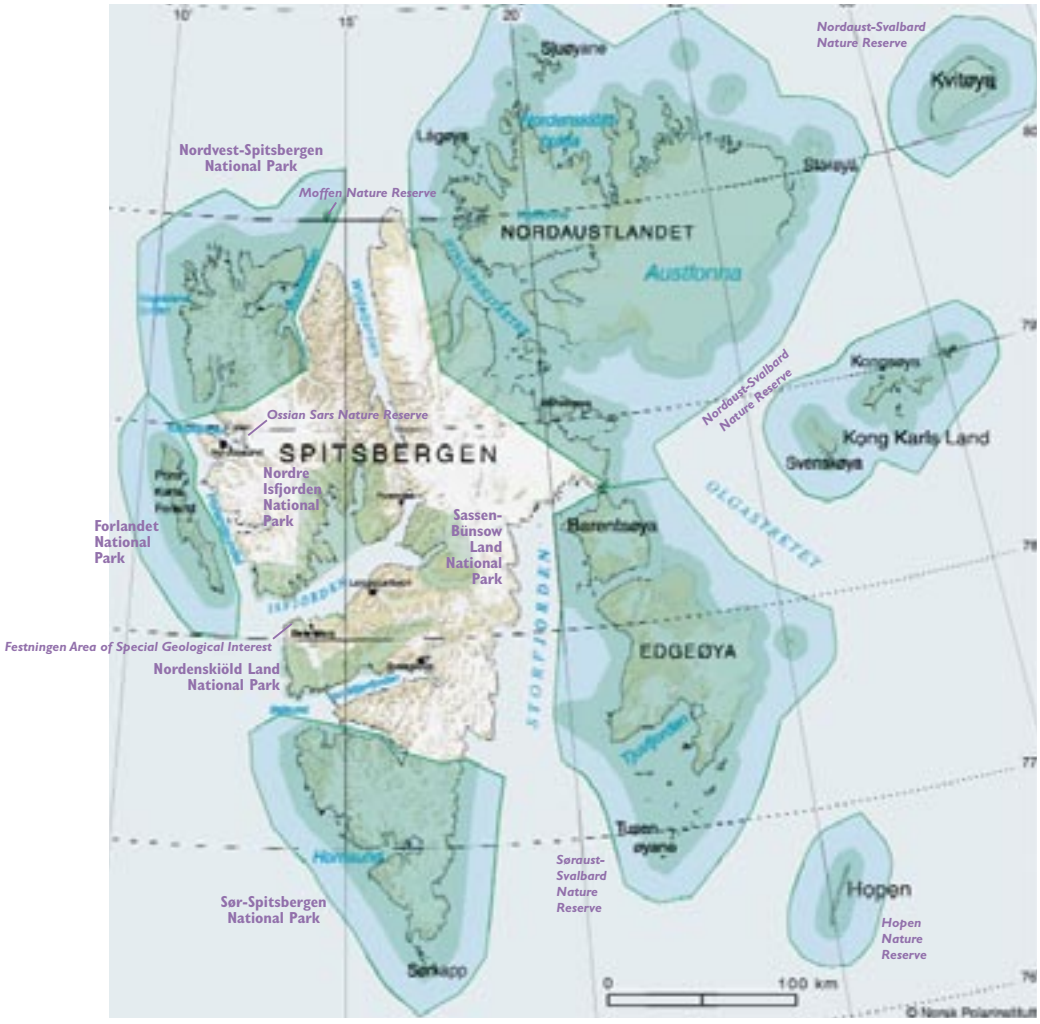


Figure 13: Map of protected areas.

- Geological reserves
- Protected cultural monuments and heritage sites.

Where national parks and nature reserves border the sea, their boundaries extend 12 nautical miles out from shore.

Cruise activities in these areas are not being addressed by a conservation strategy or management regime, as no specific management plans have been developed for these protected areas.

Certain nature reserves, bird reserves and cultural heritage sites have permanent or seasonally restricted access; however, these measures were not intended to specifically address cruise-related activities.

Environmental requirements for ship-based tourism do not currently distinguish between protected areas and non-protected areas. Operators also do not make this distinction when planning or executing their activities. Many operators consider Svalbard to be adequately protected by the comprehensive and relatively new Svalbard Environmental Act (2001), and plan their activities according to these regulations.

Conclusions and recommendations:
Through a fairly simple analysis, such as that presented above, it is relatively easy to identify and illustrate important natural and cultural heritage features that are also vulnerable to impacts from the cruise industry. It has been shown that a significant overlap exists between areas that are popular cruise destinations and vulnerable areas that are also of high conservation value.

This information should be used to identify areas where cruise-related activities should be restricted or banned and to guide the development of planning procedures and monitoring and research programmes on Svalbard.

A cruise ship sailing into Magdalenefjord.

Photo: Miriam Geitz

4.Environmental impacts of ship-based tourism

4.1. Introduction and overview

Like many other human activities, tourism can have a wide range of impacts on the environment depending on how it is managed. Ship-based travel can be one of the more benign forms of tourism, as well as adding to increased knowledge and appreciation of a destination's nature and culture. Nonetheless, concerns have been raised in relation to environmental pollution and wildlife disturbance. On Svalbard and in other pristine destinations where passengers go ashore, cruise tourism can create additional concerns, usually about the degradation of the visited sites.

Most of the risks to the marine environment from ship-based tourism are related to technical and operational factors, which are often exacerbated by external influences such as sea ice conditions. Like in non-passenger shipping, most cruise ships are based in the company's land of origin while the vessel is registered under a so-called "flag of convenience". This tactic secures a variety of benefits for the company such as tax savings. While not a subject of this report, it should be kept in mind that the place of registry often determines a ship's overall condition and the level of safety and environmental standards it is required to meet.

Conversely, potential negative impacts to terrestrial sites, vegetation and wildlife on land are mostly related to the conduct of guides, crew and passengers.

Table 5 gives an overview of the environmental issues and impacts associated with coastal ship-based tourism. Issues come to light when events take place that lead to

environmental impacts. For example: an environmental issue emerges when a grounding (event or cause) leads to an oil spill causing poisoning, visual unsightliness, etc. (impacts).

Table 5: Overview of potential impacts on the environment related to cruise tourism.

Issue	Causes	Impacts
Oil pollution	• Operational discharges (bilge water, fuelling) • Accidental discharges (grounding, collision, operational accident) • Human error.	Immediate effects of an oil spill include the death of wildlife and marine organisms and acute pollution of coastal habitats. Long-term impacts include the accumulation of toxins in marine organisms and wildlife, challenging the survival of populations. Toxins also contaminate coastal ecosystems and marine habitats.
Pollution through wastewater	Legal and illegal discharges of grey water and sewage.	Wastewater streams are nutrient-rich and can contain hazardous substances such as toxins and pathogens. Upon release, they can alter the nutrient composition of the marine environment while toxins contaminate and possibly accumulate in marine organisms.
Pollution through garbage	Legal and illegal dumping or incineration of garbage generated on board.	Garbage may contain hazardous substances, depending on the type of waste and its pre-treatment, and can thus contaminate the marine environment. It can also injure and kill marine wildlife, mainly through ingestion and entanglement. Marine litter is also a form of visual. pollution.
Air pollution	• Fuel combustion. • Garbage incineration.	Ship-based combustion/incineration processes emit greenhouse gases and toxic compounds through emissions and soot. The emitted compounds contribute to global warming, acidification (acid rain), and health problems from air pollution (respiratory problems, carcinogenic substances).
Ballast water	Operational practices for the stabilization of sea-going vessels.	Ballast water can lead to the introduction of a species to areas outside of its normal range. The non-native organism can establish itself and critically disrupt the host ecosystem, leading to biodiversity loss and great economic costs.
Anti-fouling hull paint	Protective coating with biocide paint on ship hulls to prevent the attachment of aquatic organisms.	Anti-fouling coatings for the most part use organotin-based paints, especially the compound tributylin tin (TBT). After leaching toxins and killing organisms attached to the hull, TBT persists and accumulates in the marine environment. It is acutely toxic to some organisms, and can cause serious hormonal disruptions in marine invertebrates.
Physical damage from cruise ship activities	Cruising, navigational manoeuvres or anchoring.	Cruise ships often travel in very sensitive marine areas and close to shore, risking damage or even destruction of underwater structures or plant communities.
Wildlife disturbance	• Wildlife viewing. • Traffic (physical presence and noise).	Wildlife watching or simply the presence of humans can stress the animals observed, leading to increased levels of activity and energy consumption. In the worst cases, disruption can lead to panic and the separation of young animals from their mothers or to physical damage.
Degradation of vegetation	• Choice of landing sites, path, and group size. • Conduct.	Repeated or large-scale trampling of sensitive vegetation can destroy the plant layer, creating visible tracks and erosion. Changes in the composition of vegetation may also occur.

Degradation of historical sites	• Conduct. • Overuse. • Collection of artefacts. • Non-human impacts.	Overuse and irresponsible conduct can have physical and visual impacts and can degrade the value of a historical site.
Degradation of geological sites	Conduct.	Repeated or large-scale trampling of sensitive formations can degrade or destroy the site, visually as well as physically.
Littering	Conduct.	The disposing of garbage and cigarettes in nature creates mainly visual disturbances, but can also be an indirect threat to birds and wildlife through accidental ingestion or entanglement.

4.2. Threats to the marine environment

In this section, the issuea listed in Table 5 will be discussed in greater detail under the following headings:

- Background information
- Factors determining impacts
- Svalbard-specific information
- Recommendations.

4.2.1. Oil pollution

Background

Each year, an average of 1.3 million tonnes[2] of oil is released into the global marine environment (Global Marine Oil Pollution Information Gateway 2004). Not all of this oil pollution originates from ships; natural seepage and land-based facilities are other sources. In ship-related leakage, only a small share of the volume is caused by larger scale oil spills, whereas small-scale operational discharges of oily liquids, whether intentional or accidental, are a more common source (IMO 2004).

Oil pollution can be linked to:

Operational discharges

- Discharge of bilge water that has been contaminated with oil or lubricants from engines, other mechanical equipment or leaking closed-system circuits that have not been separated/cleaned sufficiently
- Fuelling activities
- Negligence in or inadequate routines for handling of oily liquids outside of the bilge.

Accidental discharges

- Discharges by unexpected incidents, e.g. collision or grounding
- Airborne oil pollution is covered in 4.2.4.

Pollution of the marine environment through oil is the most serious environmental impact caused by shipping. There are different categories of oil contamination, but all have short-term as well as long-term implications for the environment affected. An oil spill drifting ashore and killing wildlife is the first visible sign that a catastrophic event has occurred. The impacts on coastal wildlife are immediate and often lethal due to suffocation, drowning and damage to an animal's digestive system, resulting in starvation and terminal intoxication. Not only are marine mammals and seabirds threatened; spills of petroleum-based liquids can have severe effects on fish, plankton and invertebrates. Early developmental stages such as eggs and larvae are especially sensitive (Ocean Conservancy 2002).

■ **Bilge water:** The bilge is the part of a vessel between the lower-most floorboards and the bottom, where oil-contaminated wastewater (bilge water) drains until further processing. Bilge water is produced when the spaces in a vessel housing machinery are cleaned (Source: Global Marine Oil Pollution Information Gateway 2004).

2. The numbers quoted are a "best guess".

Even in small quantities and concentrations, oil can have a considerable impact over a long period of time. In a long-term study on the impacts of the 1989 Exxon Valdez oil spill in Alaska, Peterson et al. (2003) found evidence of changes in eco-toxicology of oil over time from acute toxicity to a single species towards long-term chronic, delayed and indirect impacts encompassing a whole ecosystem. Based on their findings, the researchers recommend changing "current practices for assessing ecological risks of oil in the oceans (…)".

■ **Seabirds are particularly sensitive to oil.** In a cold climate one oil spot the size of 2 – 3 square centimetres can be enough to kill a bird; the oil destroys the insulating effect of the plumage, and the bird freezes to death (hypothermia). If a bird is smeared with a lot of oil, its feathers may become clogged, making flight impossible. (Source: Global Marine Oil Pollution Information Gateway 2004).

Major oil spills also generate additional environmental impacts – often severe – through clean-up methods applied in damage control operations, e.g. chemical treatments. As well, damage results from disturbances in the accident area connected to rescue and clean-up efforts.

The human element plays a decisive role in all ship-related accidents, regardless of whether they result in oil spills. The risk of accidents occurring and how they are dealt with if they do occur is closely linked to the qualifications and experience of a ship's officers and crew (Norwegian Ministry of Justice and the Police 2002).

Internationally, MARPOL 73/78 Annex I set the framework for oil pollution prevention, and provides for the establishment of special areas. The International Maritime Organisation (IMO) specifies: "Special areas under MARPOL 73/78 are established where the particular region has specific environmental concerns such as a high density of shipping traffic. In these areas, more stringent discharge standards for the discharge of oily waters are applicable, while the littoral states concerned must provide adequate reception facilities for dirty ballast and other oily residues." Antarctica, among other areas, has this status already.

Another tool recently used for the first time by the IMO is the "Mandatory Area to be Avoided" designation, a status that was given to New Zealand's Poor Knights island group. This measure will force ships longer than 45 metres to stay at least 5.5 nautical miles from shore. New Zealand has been pushing to receive this designation in order to protect the Poor Knights Islands' rich marine resources, which include fish stocks, birds and dolphins. The islands' ecosystem was threatened by a major oil spill in 1999 (Associated Press 2004).

Factors Determining Impacts

Fuel: The choice of fuel for a passenger ship partly determines the potential impact an oil spill will have on the environment. Different types of petroleum-based fuels have specific characteristics and ingredients that determine their toxicity and "performance" over time in various weather conditions. This information is of particular importance for oil spill response efforts (U.S. Environmental Protection Agency 2004). The most common type of fuel in shipping operations is residual fuel oil (or bunker oil), the cheapest and lowest-quality product of the oil refinement process. When spilled, residual oil is more damaging to the environment than more refined fuel types. Many lighter fuels are more expensive however, and have not replaced residual oil to a significant degree. Residual fuel oils remain the staple fuel of the cruise and shipping industry worldwide, though some operators voluntarily use less harmful fuels normally or when operating in particular areas. The burning of low-quality fossil fuels also poses other environmental hazards (see 4.2.4. below).

■ In 2002, Norwegian Cruise Line pleaded guilty because "on numerous occasions from 1997 through April 2000, it routinely circumvented the oily water separator, allowing oily bilge to be discharged directly into the sea. The company was given a lenient sentence because it reported its practices to the Department of Justice." The fine was US$ 1.5 million (Cruise Junkie 2004).

Bilge water treatment: While an oil spill is the worst-case scenario for acute marine pollution, discharges of oil-contaminated bilge water are much more common. Even though regulations have been established concerning the treatment, discharge and delivery of bilge water, technical flaws and operational malpractice are causes of concern. This relates not only to tankers and cargo vessels, but also to cruise ships – in the past, large cruise companies have been fined for intentionally or negligently discharging oily water.

Ship quality: The risk of leaking oil into the environment in the case of an accident is also closely related to a ship's technical construction, engineering and maintenance.

Human error: Technical and operational precautionary measures will not eliminate risks from lack of experience and knowledge or human error.

On Svalbard

For Norway including Svalbard, MARPOL Annex I has become national law ("Forskrift om hindring av forurensing fra skip m.m. 16 – 06 – 1983 1122") and thus determines the framework for the prevention of oil-related pollution. No detailed information is available on oil-related pollution of Svalbard's waters, but as of today, no unresolved oil-related incidents have been observed. However, there is no monitoring programme for this kind of pollution in place (Synnøve Lunde, formerly employed by Governor of Svalbard, personal communication, 12 March 2004).

No published overview exists of the type and volume of oily liquids carried on cruise ships around Svalbard. However, current practices suggest that most coastal cruise operators, including those that refuel in Longyearbyen, use diesel oils when within Svalbard's waters. This might be true for some of the bigger cruise ships as well, such as those owned by Hapag Lloyd Kreuzfahrten (Hapag Lloyd 2001).

Although not in the same league as oil tankers, cruise ships, depending on their size, still carry large enough volumes of fuel and other oily liquids to pose a considerable environmental threat. The harsh arctic climate and dangerous ice conditions magnify the likelihood of an accident occurring. An accident resulting in an oil spill near the coast or the ice edge could be very damaging and difficult to contain. In the past, a number of grounding incidents have occurred around Svalbard, some involving cruise vessels. These groundings were fairly minor, and no oil or other hazardous substances leaked into the environment.

Little information is available with regard to operational discharges of potentially oil-contaminated liquids, such as bilge water. However, it is likely that bilge water has only once been delivered at port in Longyearbyen (Terje Aunevik, Scanautic Ships Agency, personal communication, 2 April 2004), which suggests that the common practice must be to discharge this waste at sea or hold it until it can be released to a reception facility at another harbour.

Recommendations

Operators:

- Avoid sailing in areas with high grounding risks
- No discharge of oily liquids in Svalbard's waters
- Carry and be able to use best available oil spill response equipment.

Authorities:

- Prohibit the use of heavy oils for all vessels travelling in Svalbard's waters
- Identify areas with a high risk for groundings and high biodiversity and close to ship traffic
- Do not allow any ship into a high risk area outside the range of oil spill clean-up capacity
- Ensure oil spill response capacity matches the level of cruise traffic
- Create incentives for companies that carry less and more environmentally friendly fuel
- Require all vessels to carry and be able to use best available oil spill response provisions
- Monitor and enforce the no discharge regulations of the Svalbard Environmental Protection Act.

4.2.2. Pollution through wastewater

Background
Larger vessels carry and process water for drinking and other uses when at sea. Wastewater is divided into two categories: black water and grey water. Black water is sewage from a ship's toilets and medical facilities, and other similar waste. Since a ship's sanitation facilities use less water, black water is more concentrated than regular sewage. This type of waste is nutrient-rich and potentially infested with enteric bacteria, pathogens, diseases, viruses, the eggs of intestinal parasites, and harmful nutrients (Ocean Conservancy 2002). These could be released to the marine environment, depending on how waste is treated and discharged.

The term grey water describes non-sewage waste liquids, which are often considered less problematic than black water. However, in practice grey water can contain almost anything, from detergents to toxic liquids, pathogens and bacteria. In fact, a study from Alaska found that grey water contained the same faecal coliform bacteria levels as black water (Alaska Department of Environmental Conservation 2002). Sometimes, solid waste is ground up and discharged with grey water, a practice that is illegal.

Pollution from wastewater is among the most widely discussed environmental threats originating from cruise ships, because of the sensitive areas visited and volume of waste generated (Apple et al. 2003). In the US, those concerns are being increasingly addressed through legislative action at the state (Press Herald 2004; Alaska Department of Environmental Conservation 2004) as well as the national level, e.g. in the Clean Cruise Ship Bill proposed by Senator Durbin (The Orator 2004).

The more varied a vessel's use of water, the more likely its wastewater will contain a complex cocktail of substances. In recent years, cruise ships have become ever larger, and existing vessels have been upgraded to include more sophisticated and varied amenities and services, challenging onboard cleansing systems with larger volumes and more complex and hazardous substances.

The Alaska Cruise Ship Initiative (Alaska Department of Environmental Conservation 2002) sets the volume of grey water produced per passenger at 50 gallons/190 litres per day for large ships, and at 25 gallons/95 litres per day for small ships. Black water volumes are about the same for small and large vessels (Alaska Department of Environmental Conservation 2002) and are estimated to be between 5 – 10 gallons/19 – 38 litres daily per passenger (Ocean Conservancy 2002). When combined with grey water and multiplied by passenger number, the result is considerable volumes of effluents that require handling in one form or another before discharge or holding for later disposal.

When discharged, inadequately treated wastewater can lead to an imbalance in nutrient-poor ecosystems or become a hazard to wildlife and public health if dissolved toxins and contaminants accumulate in the food chain. Shellfish are particularly sensitive to this impact because they filter water and retain dissolved nutrients and toxins. If contaminated shellfish occur in harvested populations, they could pose a threat to public health.

Box 2:
Case study – Alaska Cruise Ship Initiative (ACSI).

The ACSI was established in 2000 by the Alaskan Department of Environmental Conservation (ADEC) in response to continued concerns about growing cruise traffic and its impacts on the marine environment and air quality in some of Alaska's most frequented ports. ACSI was comprised of representatives from the U.S. Coast Guard, U.S. Environmental Protection Agency, communities, native tribes, industry and environmental groups. The initiative began sampling and testing wastewater effluents, investigating discharge practices of the industry, and exploring pollution prevention measures and waste management solutions. Early samples proved that many of the discharged effluents did not meet the limits set by the U.S. Clean Water Act. As a result of the initiative's activities from 2000 to 2003, the State of Alaska passed legislation that addresses these concerns and has closed some legal loopholes, e.g. allowing for discharging areas within the Inside Passage and its sensitive coastal waters. The work of the ACSI has also looked at the performance and practices of small cruise vessels. As a result of the initiative, larger cruise ships have invested in advanced treatment systems and have thus improved the quality of their wastewater to comply with the new requirements. However, due its older and less adaptable fleet, the small cruise ship industry has been exempted for another three years from compliance with Alaska's cruise ship wastewater effluent standards. Neither the ACSI nor the Alaskan legislation address cruise-related concerns about bilge and ballast water. (Source: Alaska Department of Environmental Conservation 2004)

Unlike many other environmental impacts of cruise tourism, a considerable amount of information is available on the problem of cruise wastewater management thanks to the efforts of the State of Alaska's Cruise Ship Initiative (ACSI) (see Box 2).

Even with advanced treatment systems in place, the probability of pollution from leaking or intentionally discharged raw or badly treated effluents remains. In particular, larger cruise lines have a poor track record for their environmental practices. Royal Caribbean Cruise Lines, for instance, was fined a total penalty of US$ 6.5 million for environmental damage in Alaska. The conviction included knowingly discharging oil and hazardous substances as well as falsification of federally required oil record books (Cruise Junkie 2004).

Internationally, sewage discharges from ships are regulated through IMO's Ml 73/78 Annex IV, which entered into force on September 2003. The new rules allow ships to discharge untreated sewage at a distance of 12 nautical miles from shore, whereas treated sewage may be discharged as close as 3 nautical miles from shore.

Factors Determining Impacts

Wastewater treatment systems: There are many different types of wastewater treatment systems, and some are more advanced than others. The "Assessment of Cruise Ship Ferry and Wastewater Impacts in Alaska" (Alaska Department of Environmental Conservation 2004) examines different types of systems, such as:

Traditional treatment systems

- Maceration-chlorination systems
- Biological and chemical disinfecting systems

Advanced treatment systems

- Chemical treatment and mechanical decanting
- Activated oxidation process
- Reverse osmosis filtration
- Bioreactor/filtration

In addition to not being very effective, some of the simpler treatment systems may use harmful chemicals such as chlorine, ammonia and formaldehyde (Apple et al 2003), which are often discharged with the liquids they treat.

Practices: Whether or not wastewater from cruise tourism poses an unacceptable environmental impact to receiving marine ecosystems can be determined by posing questions such as the following:

- What is the quality of the wastewater before discharge?
- What is the volume of wastewater?
- Where is it discharged?
- How is it discharged?
- What is the ability of the receiving water to accommodate nutrients and potentially toxic substances?
- Are monitoring programmes in place?
- What other factors influence the ecosystems concerned?

While larger cruise ships accordingly create more liquid waste, they are also often better equipped to deal with it. Smaller cruise ships are usually ships that have been refitted for tourist use, rather than being built for this specific purpose. As a result, many of these ships are older, as is their wastewater treatment equipment. Refitting such vessels with up-to-date systems is costly and in some cases may not even be possible (Juneau Empire 2004). Onboard space is also an issue since more advanced systems require more room, e.g. for holding tanks, which means giving up extra cabins or other facilities (Howard Breen, Traveljust, personal communication, 18 March 2004).

On Svalbard

Currently, wastewater discharges in the waters around Svalbard are solely regulated through the Svalbard Environmental Act (2001) which states in §67 ("discharges from ship"):

"No person may release waste into the sea from a ship or other vessel. However, the discharge of uncontaminated waste food from small vessels or of sanitary wastewater in the open sea is permitted."

In addition, Norway is about to implement MARPOL Annex IV and it can be assumed that the new requirements resulting from this step will also become applicable to Svalbard.

Today, little information is available about the volume and composition of wastewater discharges and their potential negative impacts on the marine environment. Even the settlement of Longyearbyen releases its sewage untreated into Isfjorden. One study has determined that the receiving water can accommodate the discharge (Lunde, pers. comm.). However, another study showed changes in the macro faunal community that could indicate nutrient enrichment linked to sewage or other types of wastewater (Holte et al. 1996 in Shears et al. 1998).

It cannot be assumed that Svalbard's waters will accommodate any type of wastewater. The balance in this nutrient-poor ecosystem is fragile, and, for this reason, conditions should be monitored closely. In Alaska, it was found that dissolved nitrogen is the limiting nutrient for phytoplankton (algae) growth (Alaska Department of Environmental Conservation 2002), and it is likely that Svalbard's waters have similar limiting nutrient-related factors.

Recommendations

Operators:

- Ensure high quality (low levels of problematic substances) of wastewater effluents according to standards set by authorities or "best practice"
- No discharge of any wastewater in marine protected areas and other specifically designated areas
- Avoid discharge in vicinity of wildlife and other ships
- Monitor wastewater quality and document type, location and time of discharges.

Authorities:

- Declare marine protected areas and other particularly sensitive areas as no discharge zones
- Develop and enforce reporting requirements for type, volume, and location of wastewater discharges
- Determine acceptable limits of problematic substances in discharged wastewater
- Ensure criteria about wastewater management are included in the check list for field inspectors.

Cleaning up Svalbard's beaches.

Photo: Miriam Geitz

4.2.3. Pollution through garbage

Background

Cruise ships are designed to provide tourists with a comfortable means of travel, though levels of amenity and service can vary widely. In any case, considerable amounts of solid waste accumulate on any cruise ship during a voyage. Regardless of how waste is produced by customers, e.g. by purchasing goods and discarding the packaging, or when food is produced on his or her behalf, it follows that the number of people on board and the type of amenities offered determine the volume and composition of onboard waste. IMO estimates the daily volume of waste generated on a cruise ship to be 3.5 kilograms per passenger (Ocean Conservancy 2002). Based on this estimate, a vessel carrying 200 passengers would generate about 700 kilograms of solid waste per day. By comparison, an average cargo ship generates about 60 kilograms, and fishing vessels produce about 10 kilograms of solid waste per day (GESAMP 2001). Most ships' black water treatment systems also produce sludge (concentrated sewage solids) that needs to be disposed of and that is often combined with solid wastes.

There are different ways to handle solid waste on cruise ships. The first step usually involves some sort of material separation that often already happens during the waste generation process; e.g. separation of food and non-food wastes in the galley. Next, the waste volume can be reduced, e.g. through compression, grinding or dehydration. The output is either stored for delivery in the next harbour, burned on board by incinerator, or dumped at sea. MARPOL Annex V regulates dumping of garbage at sea, but prohibits the dumping of all plastics. However, there are still cases of illegal waste dumping within the cruise industry. As late as February 2003, Norwegian Cruise Lines was under investigation from the U.S. Coast Guard and the U.S. Environmental Protection Agency for dumping solid wastes and plastic overboard during a trip with their ship "Norwegian Wind" (Cruise Junkie 2004).

Burning or dumping treated waste takes care of the immediate problem but poses other negative environmental risks. Depending on the composition of the waste, incineration can result in toxic air emissions (see 4.2.4.) as well as ash with potentially high toxicity levels that is usually also discharged to the marine environment. Untreated or ground-up solid wastes are not only visually offensive when washed ashore, but tend to accumulate in sensitive areas out of sight, such as the seabed. In addition, marine litter injures and kills wildlife and can be a long-term source of toxins (Global Marine Oil Pollution Information Gateway 2004).

The issue of garbage disposal from ships is addressed by IMO in the MARPOL 73/78 Convention (see 8.2.1.). Annex V of that convention, called "Prevention of pollution by garbage from ships", completely prohibits the dumping of plastic anywhere in the marine environment. Garbage encompasses all kinds of food, domestic and operational wastes. Garbage dumping is also restricted in coastal waters as well as in "special areas" like the North Sea, Red Sea, Wider Caribbean and Antarctica (Global Marine Oil Pollution Information Gateway 2004). The law also stipulates that garbage should be dumped as far from shore as possible, but it is legal to dispose of it when the distance to shore is at least:

- 25 nautical miles for garbage that floats
- 12 nautical miles for food wastes and other garbage (including paper, cloth, glass, metal, pottery or like substances)
- 3 nautical miles for food and other garbage that has been processed into pieces not larger than 25 millimetres.

When mixtures of the above-mentioned garbage types are dumped, the strictest regulation applies.

Annex V also specifies the obligations of governments to provide for garbage reception facilities at ports.

Factors Determining Impacts

The impact of solid wastes on the marine environment is determined by a number of factors, which can be grouped into three phases: waste generation, waste treatment and waste discharge. Some of the main factors are:

Waste generation:

- An operators' purchasing policy
- Available goods and their packaging from vendors, e.g. in Longyearbyen
- Laws and regulations
- Level of consumption on board
- Raising awareness of passengers.

Waste treatment:

- Type of primary waste handling, e.g. waste separation
- Range of wastes that have to be dealt with
- Technical facilities (compressors, incinerator, storage space)
- Laws and regulations

Waste discharge:

- Type of waste treatment
- Travel route
- Location
- Laws and regulations.

Another important determinant is the investment needed for a garbage treatment system and its overall running costs.

On Svalbard

Norway has adopted MARPOL Annex V into Norwegian law ("Forskrift om hindring av forurensing fra skip m.m. 16 – 06 –1983 1122") and this regulation thus specifies waste disposal on Svalbard where not overruled by the Svalbard Environmental Protection Act § 67 ("discharges from ship", see also 4.2.2.) and § 68 ("dumping and incineration of waste and other material"):

"The dumping and incineration of waste or other material from ships or other vessels is prohibited. The ministry may issue regulations containing exceptions from the prohibition against dumping."

Thus, it is not legally possible to incinerate or discharge waste and other material from ships within the 12-nautical mile zone around Svalbard.

This strict rule presents a challenge to passenger ships sailing in the archipelago. Most vessels do not call at a given harbour for many days (and some do not even visit Longyearbyen), and thus have to provide for adequate treatment of waste generated during the voyage. There is no comprehensive data available about the types of waste treatment practices currently employed by these ships. However, most ships appear to be making a concerted effort to handle their waste responsibly, e.g. by separating and holding it for delivery to Longyearbyen or the next port on their itinerary (Aunevik, pers. comm.).

Storing accumulated waste for disposal until reaching the next port of call may not be an option for all vessels due to the size of onboard facilities and the volumes of waste generated. The Governor of Svalbard does not encourage cruise ships to dispose of waste in Longyearbyen because of the limited local handling capacity. This capacity restriction makes it costly to dispose of waste there, and it is assumed that many larger ships take their trash back to the mainland. Some ships are equipped with incinerators and must travel further than 12 nautical miles from shore to legally burn their garbage en route. In order to improve the environmental performance of the shipping industry in general, a minimum requirement is the use of tools like Port State Control powers to check on the whereabouts of shipboard waste.

At times, the garbage originating from ships is large and easily visible. Most of the marine debris and litter washing ashore or drifting around Svalbard comes from fishing vessels or from coasts further away. The waste is unsightly and dangerous to animals such as birds and reindeer, which get caught in nets and trawls, and to polar bears, which ingest trash. Some sectors of the cruise industry on Svalbard are actively helping to reduce environmental impacts from marine litter by participating in the Clean Up Svalbard programme initiated by the Governor of Svalbard.

Recommendations

Operators:

- Develop and implement plan for waste reduction
- Identify which materials are a priority to reduce
- Practise waste separation and compression
- No discharge of garbage in all of Svalbard's waters, especially not in marine protected areas and other sensitive areas.

Authorities:

- Declare Svalbard's waters and especially marine protected areas and other particularly sensitive areas as no discharge zones
- Prohibit the disposal of waste in Longyearbyen by ships with other viable alternatives
- Ensure reporting requirements for type, volume, and location of garbage discharge
- Ensure criteria about garbage management are included in the check list for field inspectors.

Visible air emissions from a cruise ship in Geirangerfjord, Norway.

Photo: Miriam Geitz

4.2.4. Air pollution

Background

Cruise ships use combustion engines to generate the power needed for their voyages. Other sources of cruise-related emissions are smaller ship-craft, such as zodiacs or tender boats, and on some ships, garbage incinerators.

These days, cruises can be very energy-intensive operations. Apart from fuel efficiency, it is passenger numbers and the comfort level of a vessel that most affect fuel consumption and the volume of emissions generated.

Based on this, ship-related air pollution problems can be grouped into these emissions categories:

- Greenhouse gases
- Toxic pollutants
- Soot and other visible emissions.

Greenhouse gases:
When fossil fuels are burned, a wide array of compounds is released into the air. The majority of these emissions are composed of gasses that contribute actively to the greenhouse effect, such as carbon dioxide (CO_2) and monoxide (CO), sulphur dioxide (SO_2) and nitrogen oxides (NO_x). Rising levels of these gasses play a role in air pollution-related health problems, e.g. from smog, and alter the natural composition of these substances in the environment, e.g. through acid rain and eutrophication of aquatic systems.

Toxic pollutants:
Cruise engines commonly use heavy fuels (see also 4.2.1.) that often constitute a dumping site for various residual products from oil refining, most of which are of highly questionable quality. Heavy fuels can also contain additives such as hazardous

liquid wastes, e.g. heavily PCB-contaminated transformer oils and organic acids (Global Marine Oil Pollution Information 2004). When burned, these pollutants are released into the atmosphere and eventually accumulate in the natural environment. For instance, a recent report found that emissions of polycyclic aromatic hydrocarbons (PAHs) from ships using residual fuel oils are 30 times higher per unit of energy than from heavy diesel-driven vehicles. PAHs are classified as carcinogenic, among other things (Ahlbom and Duus 2003). Garbage incinerators are also a potential source of a wide variety of toxins, e.g. dioxins, furans, polychlorinated biphenyls (PCB) and PAHs (Apple et al. 2003, Ocean Conservancy 2002).

Smokestack emissions and soot:
The visible air pollution discharged from a ship consists of smokestack emissions and soot. Smokestack emissions contain very small particles that become visible when they scatter and absorb light. Clouds of particles become most obvious when cruise ships are stationary, and can even create opacity in areas where inversion layers can form, e.g. in geographically enclosed areas such as valleys and fjords (Apple et al. 2003). Smokestack emissions can also contain toxins (see Box 3).

Soot is the next most visible emission from a ship. The particles emitted during the combustion process eventually sink to the ground and leave behind a layer of fine ash (Kjell A. Moe, Alphamiljørådgivning, personal communications, 8 March 2004). Based on origin, this ash can also be assumed to contain problematic substances such as PAHs (see Box 3). Sometimes, these particles can be quite large and are emitted in significant quantities, especially during the start up of an engine or incinerator.

Box 3:
Most common air pollutants

Sulphur Dioxide (SO_2): Crude oil contains sulphur that is extracted from high-end products such as gasoline during the refinement process. Sulphur thus accumulates to high concentrations in the residual oil (i.e. heavy oil or bunker oil) used to power the majority of the global shipping fleet (Norges Rederiforbund 2003). SO_2 contributes to smog-related health problems as well as to acid rain (Apple et al. 2003).

Nitrogen Oxides (NO_X): Nitrogen oxides are greenhouse gases that contribute to climate warming, acidification and the build-up of near-ground ozone. Increased concentrations of NOx in the marine environment can lead to algal blooms. Nitrogen emissions are determined by different factors such as engine rotation, pressure and temperature (Norges Rederiforbund 2003).

Chlorofluorocarbons (CFCs) and Halons: CFCs and halons are gas emissions contributing to the greenhouse effect and destruction of the atmospheric ozone layer. Their use is regulated by the Montreal Protocol signed in 1987. On ships, halons are mostly used in fire fighting equipment. Neither CFCs nor halons are allowed in ships built after October 1994 (Norges Rederiforbund 2003).

Volatile Organic Compounds (VOCs): VOCs are a mixture of propane, butane and other gases derived from the vaporization of petroleum oil products, and are divided into methane and non-methane VOCs (Global Marine Oil Pollution Information Gateway 2004). These gases contribute to the build-up of near-ground ozone (Norges Rederiforbund 2003) and other pollution problems.

Polycyclic Aromatic Hydrocarbons (PAHs): PAHs are natural components of petroleum oil that form when fossil fuels are burnt. PAHs can be gaseous, bound to particles (soot), and dissolved in water. As water contaminants they are toxic to aquatic organisms and can cause considerable damage, especially in shallow coastal areas (Global Marine Oil Pollution Information Gateway 2004).

Carbon Dioxide (CO_2): CO_2 is a greenhouse gas, and shipping contributes to around 2 per cent of global CO_2 emissions. The volume of CO_2 emitted from ships is determined by the ships' overall fuel efficiency, fuel type, type of engine, and travelling speed (Norges Rederiforbund 2003).

Table 6: Comparison of emissions from different activities.

Activity	Component in kg/hour					
	CO_2	SO_2-S	NO_x	NMVOC	Soot	CO
Diesel generator	220	0.35	4	0.5	0.34	1
Central heating	150	0.23	0.2	–	–	–
Snowmobiles and small boats	8	0	0.005	1.7		3
Diesel cars and heavy equipment	40	0.06	0.64	0.1	0.07	0.2
Aircraft	70	–	0.08	0.87	–	1.46
Small ships	180	0.25	3	0.3	0.35	0.7
Cruise ships	9000	26	140	16	12	40

(Source: Shears et al. 1998)

The various air pollutants are regulated internationally through IMO's MARPOL 73/78 Convention, Annex VI. More specifically, once implemented, Annex VI will:

- Set a global limit of a maximum of 4.5 per cent sulphur content in residual oil. Currently, IMO is monitoring the average sulphur content of residual oil, which in 2002, was 2.6 per cent (Norges Rederiforbund 2003)
- Provide for "Sulphur Dioxides Emission Control Areas" where a stricter limit for sulphur (maximum sulphur content of 1.5 per cent in fuel or end-of-pipe solutions) applies. The North Sea belongs to such a control area (Norges Rederiforbund 2003)
- Set limits for nitrogen emissions from diesel engines. The IMO has also adopted a mandatory technical code for how to reach those limits (Global Marine Oil Pollution Information Gateway 2004)
- Prohibit onboard incineration of certain products, e.g. PCBs (Global Marine Oil Pollution Information Gateway 2004)
- Prohibit any equipment with ozone-destroying compounds apart from HCFCs, which will be prohibited permanently by 2010
- Provide for, and make requisite, an "International Air Pollution Prevention Certificate".

The Annex is to enter into force on 19 May 2005 and will be applicable to all ships built after 1 January 2000. Furthermore, IMO uses a Greenhouse Gas Index (GHG Index) and an emission standard. GHG indices attempt to measure the relative effects of greenhouse gas emissions on the environment.

The European Union (EU) also has certain regulations in force such as:

- Regulation 2037/2000 regarding existing halogen equipment (Norges Rederiforbund 2003)
- Regulation 1999/32/EC addressing the sulphur content of petroleum oil products; applies to shipping traffic in EU and European Economic Community (EEC) harbours .

The EU is also following a strategy that will lead to further reductions of sulphur emissions (Norges Rederiforbund 2004).

Box 4:

Environmental impacts of two-stroke engines

Two-stroke engines are popular motors for small recreational boats but are also used in vehicles such as snowmobiles. In spite of some advantages from an economic and technical point of view, the environmental performance of a two-stroke engine is quite poor.

According to the Global Marine Oil Pollution Information Gateway (2004), two-stroke engines:

- Are extremely fuel-consuming due to low thermal efficiency
- Cause high emissions of uncombusted PAHs and carbon monoxide (see Box 3)
- Emit PAHs which are swirled into the water and stirred up by the propeller where they rapidly dissolve from their gaseous form into water pollutants.

Factors Determining Impacts

Technical features such as engine type and efficiency, type of fuel used and the energy efficiency of onboard services and operations largely determine the composition and levels of air emissions from ships. While using lighter fuels instead of residual oil reduces the amount of sulphur in emissions, this practice leads to no improvements in other air pollution-related problems. New technologies are now available, however, which provide integrated and end-of-pipe solutions, e.g. filters fitted to exhaust pipes as an alternative to changing fuel or upgrading machinery (Apple et al. 2003, Global Marine Oil Pollution Information Gateway 2004).

On Svalbard

There is no Norwegian law regulating emissions from marine vessels; moreover, the Svalbard Environmental Protection Act does not specifically address air pollution. The act does, however, prohibit onboard garbage incineration through § 68 (see also 4.2.3.). The MARPOL Annex VI regulations will likely also become Norwegian law in the future and could thus be applicable to Svalbard.

It is easy to believe that in Svalbard's pure atmosphere, air emissions from ship-based activities disseminate before they become an envi-

Zodiac cruising.

Photo: Miriam Geitz

Photo: Peter Prokosch

ronmental problem. This is not necessarily the case, however, due to the short season, the limited activity radius of some vessels, the quality of emissions from older ships and the volume of emissions from larger ships. In the summer, Spitsbergen's west coast in particular attracts a high density of cruise vessels, and it is not uncommon to see several ships docked at popular locations. Thus, emissions amass in certain areas and can contribute to localized changes in the concentrations of greenhouse compounds (see Box 3) in the atmosphere, as well as in the terrestrial and marine environment.

Cruise ships also employ a relatively large number of small shipcraft for landing operations, wildlife viewing and small group cruising. When powered by two-stroke motors (see Box 4), these craft bring environmental pollution directly into sensitive areas.

Recommendations

Operators:

- Reduce overall output of harmful emissions by using cleanest possible fuel, being more fuel efficient, using best available technology and ensuring proper functionality of machinery and equipment
- Ban two-stroke motors.

Box 5:

Case study – Atmospheric research in Ny-Ålesund

Ny-Ålesund in Kings Bay (Kongsfjorden) is a popular stop for cruise companies as it has, over the years, developed into a prime research community. In an environmental impact assessment for the research station, conflicts between human activities such as tourism and research were identified, with atmospheric research being one area of concern (Shears et al. 1998). Visitor streams need to be managed to avoid interference with research, but the presence of ships also poses a challenge to the work of scientists (see case study in Appendix) For instance, scientists connected with The Norwegian Institute for Air Research (NILU) have had to delete data that have been influenced by cruise ship emissions, and are sometimes forced to relocate scientific activities (Kim Holmén, Norwegian Institute for Air Research, e-mail to the editor, 27 February 2004).

Cruise vessel docked in Ny-Ålesund.

Photo: Miriam Geitz

Authorities:

- Identify areas with high sensitivity to air pollution and ban or limit emissions there
- Determine limits for acceptable levels of emissions
- Ensure criteria about air pollution in the check list for field inspectors.

4.2.5 Ballast water

Background

Ballast is any material used to weight or balance an object. Ballast water is therefore water carried by ships to ensure stability, trim and structural integrity. Ships have carried solid ballast, in the form of rocks, sand or metal, for thousands of years. In modern times, ships use seawater as ballast (Global Ballast Water Management Programme 2004).

Ballast water is the water that a ship loads for operational reasons, usually in a port when it is also unloading other weight that is not replaced immediately, e.g. cargo or passengers. Since coastal areas are highly productive ecosystems, the water in a ship's holding tank often contains a variety of species, such as micro-organisms, plants, and animals such as shellfish or jellyfish. When there is no longer a need for the ballast water, e.g. because new cargo is taken on, the water, along with species from perhaps other ecosystems, is discharged into a new location. Depending on the circumstances, these species may now be able to establish themselves in this new environment.

The following illustration is taken from the website of the Global Ballast Water Management Programme (2004).

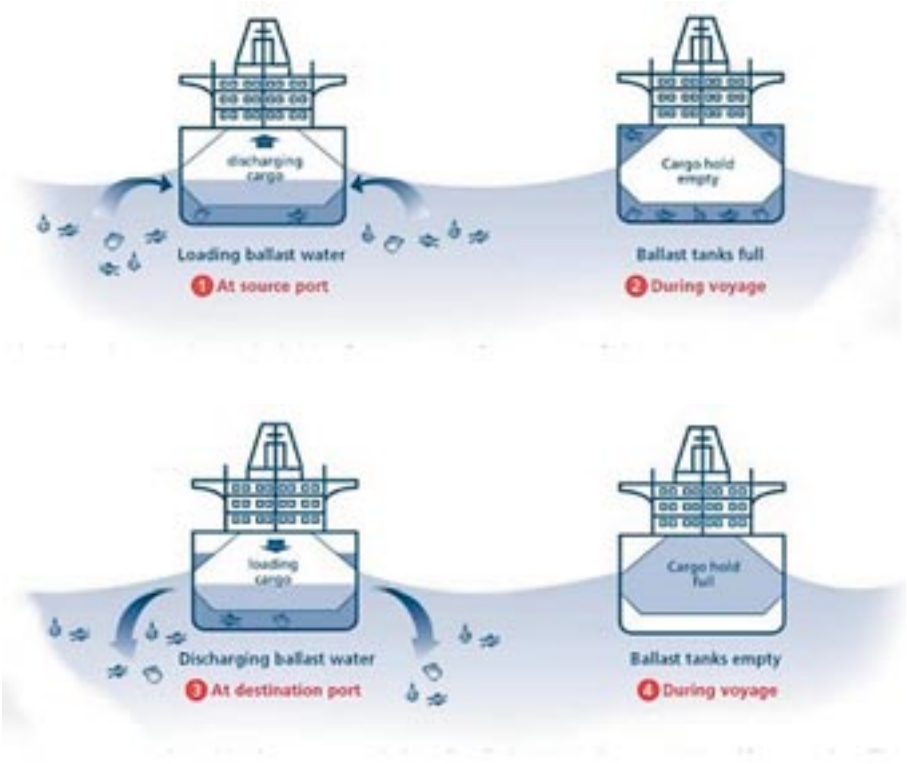


Figure 14: Ballast water

Ballast water from shipping has in recent years become a major environmental concern. Shipping has always been a global industry, and since water has become the standard form of ballast on ships, shipping routes have become highways for all kinds of species to move from one marine environment to another.

The marine organisms in ballast water can have potentially devastating impacts on a marine habitat's ecological balance. If the imported organisms manage to survive and reproduce in their new environment, they are likely to initiate a rapid loss in biodiversity. Endangered species are especially threatened, and the overall degradation of marine ecosystems can eventually lead to the collapse of fishery resources. In general, considerable effort is required to mitigate such negative impacts (WWF 2004a). Examples of invasive species causing imbalance of local ecosystems abound, e.g. the introduction of the European zebra mussel into the Great Lakes, or the spreading of the Chinese mitten crab. Earlier this year, invasive species were discovered on the coast of the Seychelles' main island Mahe, causing concern for the islands' fisheries and tourism industry (Reuters 2004). The introduction of exotic species can cause irreversible long-term damage to an ecosystem.

Though ballast water is generally more associated with cargo vessels and tankers, it is used by cruise ships as well. Passenger vessels carry smaller volumes of ballast water than non-passenger ships. However, cruise vessels travel much closer to shore and more often in extra-sensitive marine areas than other ships, thereby increasing the risk of introducing alien species into vulnerable coastal ecosystems.

The IMO finally adopted the "International Convention for the Control and Management of Ships' Ballast Water and Sediments" in February 2004. Once the ratification process is completed, and the motion has entered into force, all ships will be required to implement ballast water management plans. Mandatory treatment of ballast water will be phased in from 2009 to 2016, depending on a ship's age and ballast water capacity. In the meantime, a number of guidelines are being prepared to facilitate the implementation of the convention (Maritime Today 2004).

Factors Determining Impacts
The potential for negative environmental impacts from ballast water can be significantly reduced through the use of adequate treatment systems. So far, most treatments remain inadequate, and likewise, operational practices such as exchanging ballast water at high seas reduce but do not eliminate the problem. Regardless, cruise ships are a part of the shipping sector where ballast water treatment systems could be fitted with little difficulty, as the volumes of ballast water used are relatively small. Some cruise ships have already installed ballast water treatment equipment.

On Svalbard
There is no Norwegian legislation with regard to ballast water. The comparatively small volume of ballast water used by cruise ships and the relative hostility of the arctic marine environment for introduced species are assumed to limit the threat from ballast water in arctic waters. No ballast water-related alien organisms have yet been reported around Svalbard.

However, a Canadian study recently found that a warming climate will likely increase the risk of non-native species becoming established in the waters of the eastern Canadian arctic (Niimi 2004). In addition to longer access periods and new routes, climate change is also likely to reduce the resilience of ecosystems to exotic species. The spread of highly invasive species poses an important threat to Svalbard's future biosecurity. An example is the recent abundance of the king crab, originally from Kamchatka, in the southern Barents Sea.

Recommendations
Operators:
- Use best available technology and apply best practices for ballast water treatment.

Authorities:
- Prohibit ballast water discharge within 50 nautical mile-zone around Svalbard
- Establish monitoring programmes for invasive species
- Include criteria about ballast water management in the check list for field inspectors.

4.2.6. Anti-fouling hull paint

Background
In shipping, a common practice is to apply a protective coating on a vessel's hull to avoid the growth of aquatic organisms such as mussels and algae. Depending on the volume, build-up on the hull will increase underwater resistance and thus increase fuel consumption. In addition, organisms growing on a ship's hull can also present a potential hazard to biodiversity if they are invasive species (Norges Rederiforbund 2003).

The most common anti-fouling paints use metallic and organotin compounds such as biocides. Since organotins are acutely toxic, these paints kill organisms attached to the hull by slowly leaching poison. However, these toxins have been proven to persist in water, accumulating in some forms of marine life and poisoning others. One of the most effective and thus most used anti-fouling compounds is tributylin tin (TBT), developed in the 1960s. This toxin has led to deformations in oysters and sexual abnormalities in whelks (IMO 2004, Global Marine Oil Pollution Information Gateway 2004). While mostly affecting marine invertebrates, TBT is part of the persistent organic pollutant (POP) group that can cause damage to the reproductive and immune systems of higher animals (Quillfeldt 2002, WWF 2004b).

A ban on organotin-based anti-fouling coatings was adopted by the IMO in October 2001, and the treaty came into force on 1 January 2003. From this date forward, no ship may apply new organotin-based anti-fouling paint. By 1 January 2008, all ships'

Box 6:
TBT in Antarctica's pristine waters

A recent study by the Australian Institute of Marine Science discovered high levels of TBT on the ocean floor at McMurdo Sound, an area where icebreakers frequently operate to make way for scientists and tourists visiting US and New Zealand bases (*New Scientist* 2004).

hulls must be painted with an alternative coating. Intermediary measures include the application of special coatings that seal a vessel's hull to prevent toxins from leaching into the environment (Norges Rederiforbund 2003). Two reasons why TBT-based paints have prevailed for so long is their strong performance and the difficulties in finding equally effective alternatives. However, research into new alternatives is underway, and has been presented at an international symposium (DBU 2003). With the development of new generations of biogenic or organic biocides that do not persist in seawater (WWF 2004 b), more environmentally friendly coatings are being produced. It is noteworthy that prior to the organotin anti-fouling ban, some ship owners had already shifted to alternative coatings on a voluntary basis.

In addition to the international IMO treaty, the EU is working on a review of its chemicals regulations that could have implications for less harmful, but not exactly environmentally friendly alternatives to TBT.

Factors Determing Impacts
The IMO ban on organotin-based paints dictates that no new coatings with this biocide may be applied at all. However, as these toxic coatings have performance ranges between 36 and 60 months, it is likely that TBT will be released from those paints for a few more years.

When choosing an alternative coating, the following questions should be considered:

- What is the biocide based on?
- How persistent is it?
- How long does it stay on/perform?
- Has it been tested and approved?
- Has it shown other side effects on the environment?
- Is it cost effective?

Biocide-free coatings are currently under development.

On Svalbard
The impacts of anti-fouling paint-related toxics originating from hull paint on the marine environment have not been comprehensively evaluated so far. However, in an environmental assessment for Ny-Ålesund, Shears et al. (1998) refer to studies that investigated sexual abnormalities in common whelks in Kongsfjorden in the mid-1990s. The researchers found mild cases of imposex (a deformity that hampers fertilization) in whelks but did not consider them to be related to TBT, as this biocide was not detected in the water column or in sediment samples. According to a report of the Arctic Monitoring and Assessment Programme (AMAP), dog whelks with imposex have been observed on Svalbard, among other places. No data is available about the number of vessels operating around Svalbard that still use organotin-based hull paints.

In § 66 of the Svalbard Environmental Protection Act, the release of environmentally hazardous substances is prohibited. Although this regulation does not apply to the anti-fouling paint problem per se, the section allows the environment ministry to prohibit the use of certain hazardous substances on Svalbard.

Recommendations
Operators:
- Use only proven non-persistent biocides as hull paint
- Safely remove and dispose of existing TBT on ships, thereby limiting leaching of the toxin into the environment to absolute minimum possible.

Authorities:
- Prohibit the use of vessels with organotin-based hull paints
- Assess risk of invasive species due to change in anti-fouling protection.

4.2.7. Physical damage from cruise ship activities

Background
Ship-based tourism is often located in biologically rich areas close to the coast. Cruising in particular involves a lot of navigating and anchoring in such sensitive zones, and damage to softer underwater structures, e.g. coral reefs, is often seen. These incidents are more common in warmer waters, and once again, large cruise lines have been involved (Cruise Junkie 2004, The News 1998).

Factors determining impacts
Factors that contribute to physical damage from cruise ship activity are:

- Turbidity (propellers)
- Use of sonar
- Anchoring practices
- Level of navigational expertise.

On Svalbard
The fact that large areas of Svalbard's waters are insufficiently charted makes it hard to identify underwater structures and ecosystems that could be harmed by physical activities connected to cruise tourism, i.e. anchoring and propellers. However, the biggest threat to these structures and benthic communities undoubtedly arises from trawling and shrimp fishing (Shears et al. 1998).

Recommendations
Operators:
- Obtain knowledge of vulnerable areas and avoid these accordingly
- Do not anchor in areas with rich sea bottom habitats.

Authorities:
- Strengthen charting efforts and mapping of benthic communities
- Identify areas sensitive to damage from anchoring and prohibit anchoring in these areas.

Nesting eider duck.

Photo: Stefan Norris

4.3. Threats to wildlife and the terrestrial environment

The previous chapter focused on the potential impacts of cruising on the marine environment, which are mostly related to technical factors. However, the threats posed by cruise tourism to the terrestrial environment and to wildlife are almost exclusively related to operators' practices and to the conduct of tourists. For this reason, many attempts have been made globally to summarize the main issues of concern and to translate them into proactive guidelines targeting operators and tourists alike. Examples of guidelines relevant to Svalbard are the "Common Sense Rules for Svalbard" initiated by the local tourism industry. On an arctic scale, the WWF Arctic Programme has initiated and led the development of "Ten Principles for Arctic Tourism", which also specifically address tour operators and tourists in separate codes of conduct (WWF Arctic Programme 2004).

As shown in chapter three, the potential impact of cruise tourism depends on the types of cruises taking place in a given area. Specific characteristics of the impacts of coastal and overseas cruises on the terrestrial environment are outlined in Table 7.

Table 7: Cruise tourism characteristics at landing sites.

	Coastal cruises	Overseas cruises
Group size	Tourists are often divided into a number of smaller groups when ashore, and are led by one or several guides.	Tourists are usually not divided into groups when they go ashore, and tender boats are continuously shuttling passengers to and from vessels. Tourists can move freely inside a designated area protected by a few polar bear guards.

Guide to passenger ratio	The guide to passenger ratio usually ranges from 1:10 to 1:20.	Very few overseas cruises can offer a guide to passenger ratio of 1:20; most of them have much less favourable ratios. Some operators use cruise ship staff to look after their passengers on land. However, those staff members cannot be counted as guides as they are not accordingly qualified. The guide/polar bear guard to passenger ratio on these ships can be in excess of 1:200.
Knowledge	Coastal cruise vessels emphasize nature interpretation to guests and usually employ highly-qualified and experienced naturalist guides. Most operators inform guests about environmental guidelines and conduct, and some also inform crew. Consequently, tourists on coastal cruise trips are generally more knowledgeable about and interested in Svalbard than tourists on overseas cruises.	Big cruise ships also often have well qualified guides, but this is not the rule. In addition, there are many more tourists per guide. Before arrival, passengers are given information about the site and the potential danger from polar bears. Written information is handed out, such as booklets containing information about landing sites, regulations and expected conduct. However, passenger groups from overseas cruise vessels appear much less informed and aware of environmental concerns than tourists on coastal cruises.
Activities	In good weather conditions, coastal cruise operators attempt to offer about one to two landings a day. Some also offer other activities such as sea kayaking.	During a trip, overseas cruises schedule about one to two landings outside of a settlement. Activities are mostly restricted to the west coast. Medium-sized vessels on overseas itineraries attempt more activities on land.

4.3.1. Wildlife disturbances

Background

Cruise tourism in general cannot be considered nature-based tourism per se, as the ship itself is often the main attraction and the place where most time is spent. However, mainstream cruises, when sailing to pristine areas, market their trips using the promise of wildlife encounters. For smaller expedition-type cruise operations, the nature experience and wildlife viewing opportunities are an essential part of their product and marketing.

In recent years, wildlife viewing has become an increasingly popular activity in the nature-based tourism sector. Ship-based operations have a large stake in this, especially in regard to whale watching. Unfortunately, not all operators are responsible in their conduct, and compromise good practices in wildlife viewing for commercial interests. At the same time, more and more people want to see exotic animals in the wild and as close up as possible, creating a demand which can be harmful to certain species. Where pressure from tourism is a conservation concern, wildlife watching guidelines, which outline precautionary measures to avoid negative impacts, are being developed by the industry and government authorities. Although guidelines have value as a tool, compliance is generally voluntary and they are seldom holistic in their approach. Consequently, guidelines cannot replace a sound management strategy for the protection of specific animal populations, or even better, ecosystems.

A recently published scientific study about the impact of wildlife tourism on animal populations suggests that harmful effects can be much more severe than previously suspected. This finding has created substantial debate in tourism, science, and nature management circles (New Scientist 2004).

Walrus ahead.

Photo: Miriam Geitz

Often, it is not clearly evident when an animal or group of animals is being disturbed. Fleeing from sources of interference, such as a group of people onshore or a cruise vessel, is usually a telling sign that an animal is in a state of discomfort. Many other indications, such as physiological and subtle behavioral changes, are unlikely to be discernible to visitors, tour operators and even experienced naturalists. Over time, the cumulative effects of even minor disturbances can take a heavy toll. For instance, a brooding bird may have endured stress as a result of the presence of humans long before abandoning its nest.

Factors Determining Impacts

The degree of impact from a wildlife encounter depends on a combination of different variables.

The animal(s') sensitivity is determined by its:

- Species
- Stage in life cycle/season, e.g. brooding, with young, etc.
- Health and physical condition
- Location and environment
- Previous disruptions or unexpected (ecological) events
- Other factors.

The viewer(s') impact depends on

- Viewing point (from land, zodiac, kayak or cruise vessel)
- Group size
- Proximity
- Conduct
- Location, e.g. distance, spread out vs grouped together
- Duration of viewing
- Purpose of the encounter, e.g. wildlife viewing vs passing by
- Mode of transport
- Level of noise, e.g. noise coming from a group or motor
- Activity, e.g. smell from barbecue
- Other factors.

Brünnich's Guillemots close ranks on a bird cliff.

Svalbard reindeer grazing on lush vegetation.

Polar bear climbing along the shore in Magdalenefjorden.

Photos: Miriam Geitz

On Svalbard

One of the main reasons that tourists visit Svalbard is to view wildlife. The vast majority of cruise tourists are primarily interested in marine mammals, and most of all in polar bears. However, other natural attractions, such as bird cliffs, also bring visitors to the archipelago.

Because of this focus on wildlife, marketing materials often prominently feature charismatic wildlife on a backdrop of Svalbard's rather harsh landscape. Though the Governor of Svalbard has tried to steer the industry away from polar bear-focussed marketing, it is not easy to manage tourist expectations, and operators continue to be pressured to "deliver" wildlife sightings.

Table 8: Potential wildlife disturbances on Svalbard.

Wildlife	Cause/activity	Problem/impact	Especially vulnerable
Birds	• Approaching too closely on foot, or by boat or cruise vessel. • Trampling of nests. •Use of ship's horn.	Geese and eider ducks are especially vulnerable to interruptions while brooding because they are already acutely alert to predators of eggs and chicks, such as arctic foxes and glaucous gulls. Any additional disturbance could be critically harmful. Birds repeatedly forced to leave their nests will probably increase their energy consumption in order to reheat the eggs (Gabrielsen 1985). Arctic terns, skuas and purple sandpipers are also sensitive to disturbance. Birds nesting on cliffs, such as auks, are often less sensitive due to the relative inaccessibility of their colonies. Geese regularly disturbed during grazing periods may become underweight, reducing survival ability (Overrein 2002).	– when brooding, nesting, and when with chicks. – when nesting on flat plains or beaches. – when on cliffs: with eggs or chicks.
Arctic fox	Approaching too closely on foot, boat or cruise vessel (seldom).	In general, foxes seem to be little disturbed by human presence. As long as a fox is positioned at a safe distance and above the viewer, it will show few signs of fear (Eid et al. 2001). However, there is the possibility that foxes may become used to humans and lose their natural instincts. Arctic foxes are most vulnerable in the spring when they leave their dens with their young. So far, cruise tourists have been unlikely to encounter dens during that period.	– when leaving den with young in the spring time.
Polar bears	Approaching too closely on foot, or by boat or cruise vessel.	Approaching polar bears by cruise ship or in a zodiac may cause unnecessary stress for the animals. Reactions to being approached vary, but in general are unpredictable. Female bears with cubs tend to retreat immediately, often long before they are discovered. Following polar bears by boat or ship in pursuit of better views may cause them to consume important energy reserves or to overheat (Øritsland 1970, Øritsland et al. 1981; Hurst et al. 1982). The degree of disturbance to polar bears caused by tourist groups ashore is assumed to be limited, and happens unintentionally. However, poorly planned and managed activity on land can endanger humans and/or bears. Habituation and food handling can also be a problem.	– when followed over time and disturbed repeatedly. – when on land. – females with cubs.

Svalbard reindeer	Approaching too closely on foot.	Reindeer need the summer months to graze and build up their fat reserves. Any disturbance from tourists may interrupt this process and even deplete reserves if the animal has to move further away. Near Longyearbyen, Colman et al (2001) observed that reindeer get used to humans to a certain extent even when they are driving snowmobiles. Female reindeer with calves are especially vulnerable to disturbance in May and June. At that time they mostly remain in side valleys away from cruise tourists.	– females with calves.
Walruses	Approaching too closely on foot, or by boat or cruise vessel.	It is not easy to determine when a walrus is disturbed by human presence, especially on haul-out sites. As a result, it is very much up to the guide to decide what is acceptable in a particular situation, leaving much room for interpretation. Extra care is needed when observing mothers with young, as they could become separated from their suckling calf, or the calf may be squeezed to death by other animals if the animals are suddenly panicked and jump into the water. Shears et al. (1998) concluded that human disturbance from scientific research and tourism has the potential to disturb walruses at their haul-out site in the Kings Bay area.	– females and calves.
Whales	• Approaching too closely in small ship-craft or cruise vessels. • Possible: use of sonar for navigation.	Most whale watching on Svalbard tends to happen opportunistically ("along the way"), and no research has been done on this activity so far. One whale species is still being hunted in Svalbard's waters. Although whales on Svalbard mostly tend to stay away from ships, any encounter with a vessel could be stressful and have unexpected impacts on behaviour.	– females with . calves. – rare whale species.

Recent studies and observations in much-trafficked marine areas have sparked debates and further research into the impacts of shipping and cruise-related practices on marine mammals such as killer whales (orcas).

Some types of arctic wildlife are most vulnerable in spring and early summer, when breeding occurs on a massive scale. Typically, few cruise ships are active around Svalbard at this time. However, with increasing tourist demand, departures are being scheduled earlier in the year, putting added pressure on wildlife when protection is needed the most.

Laws and Regulations
All fauna on Svalbard is protected by the Svalbard Environmental Protection Act:

According to §30: "No person may hunt, capture, injure or kill fauna or damage eggs, nests or lairs unless so authorized by the provisions of this chapter. (…). It is prohibited to lure, pursue or otherwise seek out polar bears in such a way as to disturb them or expose either bears or humans to danger." The regulation also specifies special types of nature reserves for birds, polar bears and walrus (see also 8.2.3.).

A group of tourists at a walrus haul-out site.

Photo: Miriam Geitz

Research and Monitoring

The Norwegian Polar Institute collects research and monitoring data for Svalbard and Jan Mayen through its environmental monitoring programme (MOSJ). The institutes' goal is to make the results of research and monitoring on these islands more understandable, accessible and compatible. To facilitate this, the institute has presented its results on a thematic website that covers impacts, flora and fauna, climate, historical sites and further research needs (MOSJ 2004). In a first crosscutting evaluation of available data, Prestrud (2003) has presented the state of Svalbard's terrestrial environment, the impacts it is facing and measures being taken to alleviate them.

So far, little tourism-related environmental research is being done on Svalbard, but in a report published by the Norwegian Polar Institute, Overrein (2002) presents findings on the impacts of motorized traffic (helicopter, planes and snowmobiles) on fauna and flora that are applicable to Svalbard. Impacts from ships are not included in this report.

However, the Norwegian Polar Institute has begun research on the impact of snowmobile traffic on polar bears, and is planning to start research on cruise tourism-related impacts on walrus in the summer of 2005 (Bjørn Fossli Johansen, Norwegian Polar Institute, personal communication, 23 March 2004).

Recommendations

Operators:

- Contribute to the development of Svalbard-specific wildlife watching regulations and develop guidelines for best practice in your operations
- Ensure that your operations, guides and guests comply with these regulations and guidelines
- Avoid expanding sailings at the start of the season

- Contribute to wildlife monitoring and research.

Authorities:

- Develop Svalbard-specific wildlife watching guidelines together with respective experts and ensure enforcement
- Monitor overall impacts on wildlife from tourism
- Monitor the beginning/end of season and be prepared for ad-hoc decisions on protective measures.

4.3.2. Degradation of vegetation

Background

Cruise ships visiting pristine areas often take the opportunity to land their passengers onshore where conditions allow them to do so. These places are often natural harbours or bays with little or no infrastructure. Larger cruise ships only land tourists at places where there is a quay or where conditions are favourable enough to use tender boats. Smaller vessels and private yachts on the other hand carry smaller, often inflatable, ship-craft that allow them many more opportunities to explore a destination.

An example of Svalbard's colorful flora.

Photo: Miriam Geitz

Factors determining impacts

Whether landings at natural sites have lasting impacts or not depends on many factors, such as:

- Time of year
- Group size
- Type of vegetation
- Duration of impact
- Impact pattern and frequency
- Knowledge and authority of the guide.

On Svalbard

Going ashore is an important part of a cruise around Svalbard, and is central to the nature interpretation work of guides. The sites visited differ in geology and sensitivity, but in many places, sensitive tundra vegetation begins close to shore. A study has found that terrestrial vegetation zones on Svalbard with the highest biodiversity values are located in unprotected areas where substantial human activity takes place (Theisen and Brude 1998).

Causes of degradation of vegetation
With respect to the degradation of sensitive plant communities on Svalbard, trampling by passengers is the concern most often raised within the context of cruise tourism.

If the right preconditions exist, overseas cruise ships will often bring all passengers ashore in closely spaced larger groups and allow them to wander freely in a designated area protected from polar bears. These larger groups have poor staff to passenger ratios, which makes it difficult to ensure proper conduct (see also Table 7). This even is a problem at places that have been adapted to tourists like Gravneset, which is now fenced off because of excessive visitation.

Coastal cruisers also land most of their passengers at the same time but then divide them into smaller groups which then usually set off in different directions. In these smaller groups, the guide to passenger ratio is much better, which in theory should increase visitor awareness and prevent negative impacts. However, smaller groups tend to spread further into the terrain and if the landing site is popular, repeated visits from smaller groups can also leave distinct traces.

Impact/Problem
Arctic tundra is highly sensitive due to the harsh environment and the extremely short summer season. Heavy trampling over a short period of time, or less severe but frequent impacts can damage plant communities by reducing vegetation height and cover.

Once damaged, vegetation recovers extremely slowly and full recovery may not occur. Not only are flowering plants sensitive to trampling; lichens, which take about 40 years to reach maturity, are easily destroyed and can take decades to recover.

In addition to visual impacts, many studies show that degradation of vegetation causes a reduction in the number of species represented in an area (Kuss and Hall 1991, Monz et al, 2000). Predominant species are destroyed, and other, typically less common plants may prevail. A study has also shown that trampling can result in increased plant diversity on slopes (Gremme et al. 2003).

Once a vegetation layer has deteriorated to the point where walking tracks become visible, tracks are likely to widen, especially in wet areas as people tend to walk along the edges. When on dry tundra walks, tourist groups usually spread out.

It is likely that trampling of vegetation cover can lead to increased erosion from water, especially when tracks or patches have developed. Flowing water removes fine sediments and makes it even more difficult for new vegetation to establish (Overrein 2002). The existing damage may therefore be further aggravated (Råheim 1992). An increase in sand drift (as is happening at Gravneset, see Box 7), could possibly also be a result of degraded vegetation.

Instead of becoming less visible, vehicular tracks in Gipsdalen left behind in the early 1980s seem to have worsened. In some places, tread patterns of tires are still detectable long after they were produced (Sørbel and Tolgensbakk 2001, Dalen 2001). According to Sørbel and Tolgensbakk (2001) the impacts of the tracks are more aesthetic than ecological.

Laws and Regulations
Svalbard's flora is protected by the Svalbard Environmental Protection Act (see also 8.2.3.):

§ 28: "No person may damage or remove flora. Damage resulting from lawful access and passage or approved activities is exempted from the provision of the first paragraph."

Research and Monitoring

Most of the research information related to Svalbard's fauna has been collected and evaluated using the MOSJ environmental monitoring system (see also previous chapter).

However, there have been other initiatives:

- The Governor of Svalbard is conducting a monitoring programme for certain cultural sites. One of the sites, Gravneset in Magdalenefjorden, has been partially fenced off since 2002. A smaller area has been enclosed since 1996. Recovery of vegetation has been observed in this older reference area (Kristin Prestvold, Governor of Svalbard, personal communication, March 2004)
- In a joint Nordic environmental monitoring project, the degradation of natural and cultural sites in Greenland, Iceland and Svalbard was documented and evaluated between 2000 and 2003. In the resulting report, the project team concludes that degradation is visible at many sites though human-related impacts are not easy to single out (Nordic Council of Ministers 2003). Future changes in climatic conditions in the Arctic together with increased visitation will increase pressure on natural and cultural areas
- In 2002, field inspectors employed by the Governor of Svalbard introduced a more detailed monitoring system at four heavily-visited cultural sites (Gravneset, Virgohamna, Smeerenburg, Ytre Norskøya), providing a better overview of the changes occurring at these sites (Eid 2004). Monitoring activities occur at both vegetation and cultural sites
- In general, very little data about vegetation changes on Svalbard is available. The only available publication is a report from a study performed in Kongsfjorden (Jacobsen 1994).

Impacts on Particular Sites

- At Signehamna, walking tracks as well as larger areas of trampled vegetation can be observed between the various cultural remains (relicts from World War II), and around a nearby lake
- At Gravneset there is considerable sand drift, leading to a decline in vegetation cover, though some smaller areas are still covered by green moss. Other areas are greyish-black, and traces of previous moss cover can be identified. So far, it is not been established whether the drift began as a result of natural or human-induced causes.

Recommendations

Operators:

- Contribute to the development of regulations to prevent vegetation degradation from tourism and develop guidelines for best practice in your operations
- Ensure that your operations, guides and guests comply with these regulations and guidelines
- Land no groups with guide to guest ratios less than 1:15
- Contribute to site monitoring and research.

Authorities:

- Develop regulations to prevent vegetation degradation together with respective experts and ensure enforcement
- Develop management plans and identify sites that should be closed off for recovery and preservation
- Establish no access areas for reference on visited sites.

This oven was once in use at Bohemansneset.

Photo: Miriam Geitz

4.3.3. Degradation of historical sites

Like Svalbard's natural wonders, its historical and cultural sites are very attractive to cruise tourists. These sites contain many artefacts of the islands' polar history, often well preserved by the dry and cold arctic climate. Many are easily accessible or are located in otherwise unique areas. Most cruise ships disembark passengers at one or several cultural sites during a trip. Places visited include sites with old shanties, hunting huts and artefacts, bones from whaling or hunting, and objects from polar expeditions or World War II.

The vast majority of cultural sites on Svalbard have not been designed to meet the needs of visitors, e.g. through signs or paths. Consequently, damage and degradation has unknowingly occurred in some areas due to a lack of information.

Impacts to cultural and historical sites can result from:

- Degradation through people repeatedly walking in or on a cultural site
- Degradation of the site from removal of artefacts (parts of the site).

Another, though less tangible concern, is a perceived lack of respect for some of the cultural sites, such as Gravneset, where cruise operators have been observed holding beach buffets and parties next to the former graveyard.

The problems described above stem from a lack of common guidelines for conduct at the sites visited. Even if a cruise operator trains and prepares its guides, conduct in the field is still often up to the individual guide. This means that guides from the same ship may lead their groups quite differently.

Laws and Regulations

Cultural and historical sites are protected by the Svalbard Environmental Protection Act.

- § 38: "Structures and sites and movable historical objects in Svalbard shall be protected and safeguarded as a part of Svalbard's cultural heritage and identity and as an element of a coherent system of environmental management."

The following are protected:

- Structures and sites dating from 1945 or earlier
- Movable historical objects dating from 1945 or earlier that come to light by chance or through investigations, excavation or in any other way
- Elements of the cultural heritage dating from after 1945 that are of particular historical or cultural value and that are protected by a decision of the directorate.

The law further specifies that no one is allowed to put up a camp closer than 100 metres from a cultural heritage site.

Since 2000, Virgohamna has had site-specific requirements regulating tourist traffic. Tour operators wanting to land passengers at this site are required apply for permission from the governor's office prior to a trip. Each guide is allowed to bring a maximum of 12 persons onshore, and the groups have to spread out. There is no limit on the total number of small groups. A plan for cultural heritage sites (Governor of

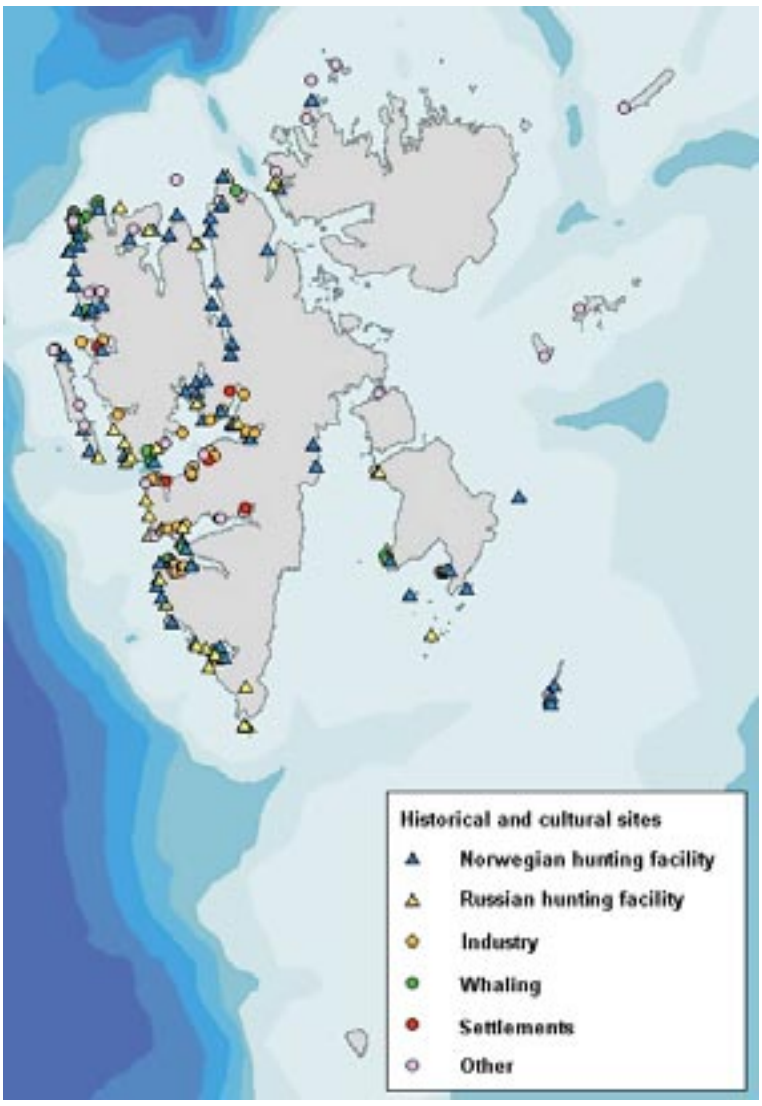


Figure 15: Location of cultural and historical sites.

Svalbard 2000) suggests that similar rules should be applied at other sites, such as Gravneset, Ny London and Smeerenburg. Further recommendations can also be found in the final report of a joint Nordic environmental monitoring project (Nordic Council of Ministers 2003).

The preservation of Svalbard's historical and cultural sites is also anchored in international conventions (Kulturminneplan 2000 – 2010):

- The Malta Convention was signed 16 January 1992 and ratified by Norway on 20 September 1995. The objective of this convention is to protect Europe's archaeological heritage
- The Granada Convention was signed 3 October1985 and ratified by Norway on 6 September 1996. The objective of this convention is to protect Europe's architectural heritage.

Factors Determining Impacts

Whether or not visitors contribute to the degradation of a cultural or historical site depends on a number of factors, such as:

- Sensitivity of the site, e.g. exposure to other impacts, like erosion
- Overall volume of visitation
- Conduct of tourists
- Level of expertise of guides
- Enforcement of rules.

Pomor grave in Hornsund area.

Photo: Miriam Geitz

Box 7:
Cruise tourism on Gravneset.

Gravneset in Magdalenefjorden at the northwestern corner of Spitsbergen is the most visited cultural site on Svalbard (10,374 visitors in the summer of 2003).

Gravneset is an old whaling site dating from the 15th and 16th centuries. The site is comprised of a graveyard where about 130 whalers were buried, and where some artefacts can still be found, including two blubber ovens. When it became clear that visitors were degrading the site, the graveyard and blubber ovens were fenced in to keep people from approaching too closely.

Another protective measure is the hiring of field inspectors by the Governor of Svalbard. During the summer season, the officers survey the traffic along the coast. Two field inspectors are based at Gravneset to monitor cruise traffic. In addition to ensuring compliance with safety regulations and requirements for the site, they also collect data for the monitoring programme administered by the governor.

Gravneset is also a highly visited site because it is one of the few places where large cruise ships can land tourists. Managing the site becomes an immense challenge on occasions when cruise ships allow several hundred passengers ashore at the same time, or when several vessels are in the fjord simultaneously. At Gravneset, 1,500 tourists have been observed on shore at once. Cruise operators are obliged to take qualified polar bear guards on board if they intend to allow people ashore in places other than Longyearbyen or Ny-Ålesund. On expedition cruise ships, the guides are usually qualified polar bear guards. In the case of larger ships, there are usually about 2 – 3 polar bear guards on board for every 1,000 passengers.

Since Gravneset represents the only, or one of a few landing opportunities for larger cruise vessels, operators often use the occasion to host a "special event" such as serving food on shore and playing music. Very often, passengers travelling with these operators are not aware of even basic precautions, such as polar bear hazards. The amount of traffic moving to and from the site as well as the conduct of some tourist groups could not only lead to the physical degradation of the site, but also to the diminishment of its value as an attractive and genuine historical site on Svalbard.

Research and Monitoring
As mentioned before, research on Svalbard's cultural and historical sites is also included in the MOSJ environmental monitoring programme.

Other activities include:

- A cultural site monitoring programme conducted by the Governor of Svalbard. Aerial photos have been taken of several cultural sites since 1997 (Overvåkning av kulturmiljø på Svalbard, Sysselmannens rapportserie, nr. 3 1999). The programme focuses on surveying erosion in the proximity of cultural sites and includes a detailed description of each place. So far, the data has not been analysed. Specifications on how the monitoring should be performed can be found in the management plan (Governor of Svalbard 2000)
- In a joint Nordic environmental monitoring project, degradation of natural and cultural sites in Greenland, Iceland and Svalbard was documented and evaluated between 2000 and 2003. In the resulting report (Nordic Council of Ministers 2004), the project team concluded that degradation is visible at many sites, even though human-related impacts are not easy to single out. Future changes in climatic conditions in the Arctic together with increased visitation will increase pressure on natural and cultural sites
- Since 2002 the Governor of Svalbard's field inspectors have been employing a more detailed monitoring system for four of the most visited cultural sites in the above-mentioned programme (as described in 4.3.2.)

Scientists agree that wear and tear on cultural sites caused by polar bears, weather and erosion is of greater importance than impacts caused by humans (Kulturminneplan 2000 – 2010). Vistad and Kaltenborn (1997) have described wear and tear caused by human traffic.

Impacts on Particular Sites
The increase in both cruise tourist numbers and landing sites in recent years (see 2.1.) has also had some impact on cultural and historical remains found along Svalbard's coasts. While some formerly heavily visited sites may have experienced a stable or decreasing tourism pressure, other new sites have been added to itineraries.

Regardless of how many sites are added, certain places are still visited more often than others. Reasons may be easy accessibility, and a reputation for beauty or uniqueness. Examples of often-visited sites are Virgohamna and Gravneset on the northwestern coast of Spitsbergen.

Recommendations
Operators:
- Contribute to the development of regulations for visiting cultural and historical sites on Svalbard and develop guidelines for best practice in your operations
- Ensure that your operations, guides and guests comply with these regulations and guidelines
- Land no groups with guide to guest ratios less than 1:15
- Contribute to site monitoring and research.

Authorities:

- Develop regulations for visiting cultural and historical sites on Svalbard together with respective experts and ensure enforcement
- Develop site management plans and identify sites that should be closed off for recovery and preservation
- Establish no access areas for reference on visited sites.

4.3.4. Degradation of geological sites

Another important attraction on Svalbard is the thermal wells on the northern coast of Spitsbergen. Natural wells such as Jotunkildene or Trollkildene contain species of algae and mosses that do not exist elsewhere on the archipelago. The wells are only about one metre in diameter, but their chalk-rich waters have, over many hundreds of years, created flat terraces that are several metres in diameter. Chalk, or lime, is a very fragile mineral, and these calcareous formations are very sensitive to physical disturbances such as trampling.

So far, no specific requirements have been introduced for visiting the wells; and consequently, tourists are continuously walking on the terraces.

Laws and Legislation
Norwegian laws do not specifically address thermal wells and other special geological formations.

Factors Determining Impacts
Whether or not visitors contribute to the degradation of a geological site depends on:

One of the thermal wells at Jotunkildene.

Photo: Marie Lier

- The sensitivity of the site, e.g. exposure to other impacts, like erosion
- Overall volume of visitation
- Conduct of tourists
- Level of expertise of guides
- Enforcement of rules.

Research and Monitoring
So far, thermal wells and other physical formations have not been included in the MOSJ environmental monitoring system mentioned previously. However, monitoring efforts and evaluations undertaken for Greenland, Iceland and Svalbard can provide important information (Nordic Council of Ministers 2003). Research has also been done on algae in Trollkildene, a natural spring in northern Spitsbergen (Aftenposten 2003).

Recommendations
Operators:
- Contribute to the development of regulations for visiting special geological sites on Svalbard and develop guidelines for best practice in your operations
- Ensure that your operations, guides and guests comply with these regulations
- Land no groups with guide to guest ratios less than 1:15
- Contribute to site monitoring and research.

Authorities:
- Develop regulations for visiting special geological sites on Svalbard together with respective experts and ensure enforcement
- Develop site management plans and identify sites that should be closed off for recovery and preservation
- Establish no access areas for reference on visited sites.

4.3.5 Littering

Background
Littering by tourists has become a serious problem in most parts of the world, and is of particular concern in pristine areas with no trash disposal facilities. Even though tourist numbers in areas "off-the-beaten-track" are much lower than in more commercial areas, the wastes left behind can amount to considerable volumes, (e.g. from trekking and mountain climbing expeditions in Nepal), creating serious problems for the environment .

Collecting marine debris on Lågøya.

Photo: Miriam Geitz

On Svalbard
Most litter on Svalbard's coasts drifts in from other countries or is from fishing-related activities. The majority of cruise passengers seem to refrain from leaving trash behind, although larger groups with lower guide to guest ratios still lose or intentionally discard rubbish, such as cigarette butts and candy wrappings. This type of littering has also been observed on cruise vessels, where people habitually throw cigarette butts overboard. Cigarette filters left behind on shore or floating on the water could be picked up by wildlife (mainly birds), causing health problems if ingested.

Laws and Regulations
The Svalbard Environmental Act addresses the general issue of waste in § 71.

- "No person may leave waste outside a land-use planning area. The Governor may in special cases grant exemptions from this prohibition. In land-use planning areas waste must be discarded or left only in places specifically designated for this purpose. Waste must be stored in such a way as to avoid it being spread."

The first rule of The Common Sense Rules for Svalbard developed by the tourism industry also refers to the litter problem: "Don't be an arctic litterbug! Leave no lasting signs of your visit."

Factors Determining Impacts

- Awareness of operators, guides and passengers
- Enforcement.

Recommendations

Operators:

- Ensure that your guides and guests do not litter
- Pick up waste on sites you visit.

Authorities:

- Ensure no littering on land or at sea
- Continue the Clean Up Svalbard programme.

5. Other environmental impacts on coastal habitats

Obviously, cruise tourism is not the only source of impacts on Svalbard's coastal habitats.

Other sources of potentially negative impacts include:

- The fishing industry: The fishing industry has potential impacts on both the marine and terrestrial environment. Like other ships, fishing vessels are a source of pollution. Most marine litter found on Svalbard's shores originates from the fishing fleet operating around the islands or is transported there by ocean currents (see 4.2.3.). Further, some fishing practices such as shrimp trawling are destructive to the marine environment
- The coal mining industry: Aside from the physical impacts of mining on Svalbard's terrestrial ecosystems, cargo ships transport coal, raising concerns similar to those associated with cruise vessels and the marine environment
- Cabins: Local people are allowed to own cabins in certain areas. Motorized traffic to and from those cabins and within in their vicinity may disturb polar bears, reindeers and seals, especially in winter (Overrein 2002). If handled carefully, garbage and other pollution should not be a problem in cabin areas
- Research: Svalbard is a world-renowned location for research that is popular with national and international science programmes. Year-round research stations are located in Longyearbyen, Ny-Ålesund and in Hornsund, while seasonal research activity may take place all over the island. Researchers often require transportation to field sites, either by snowmobile, helicopter or boat. Additionally, some research activities may have impacts on the environment, and waste management in a cold climate can be a challenge. Researchers need permission from the Governor of Svalbard before engaging in field work.

The environmental impacts of the various activities under discussion have not been comprehensively assessed so far, but the marine litter problem is being addressed through initiatives such as the Clean Up Svalbard programme, a voluntary litter collection programme initiated by the Governor of Svalbard.

Walrus haul-out.

Photo: Miriam Geitz

6. Assessing the environmental risk of cruise activity on Svalbard

The "risk" related to a specific event is a function of the impact or consequence of the event if it occurs and the likelihood of it actually happening. Following this, the environmental risk of cruise tourism to and around Svalbard is a function of the type and scale of damage to certain components of the environment from specific cruise-related events, and the likelihood of such events actually taking place.

IMPACTS X LIKELIHOOD = RISK

Identifying environmental impacts

The vulnerability of natural areas to cruise-related impacts depends to a large extent on their biological diversity, because of the many interrelationships between species in diverse systems (see chapter three). Biological diversity is what will be disturbed, lost or damaged if a specific event takes place, and is thus an important factor in the "impacts" part of the risk equation. Accessing and compiling information about Svalbard's biodiversity is relatively straightforward, as a substantial knowledge base has accumulated. However, additional environmental information must be collected and made readily accessible if risk assessments are to be used for management purposes. In particular, more information is needed on developing methods for measuring effects of minor disturbances and other, less dramatic impacts that do not necessarily result in visible damage.

The other major factor in the risk equation is the type of event being assessed. Generally, risk assessments are used to calculate risks related to a specific event or scenario, but not for calculating the risk of *any* cruise-related event occurring that *might* have a negative impact on the environment. To a large degree, the magnitude and severity of an impact depends on whether the event is relatively minor and routine, such as when swimming guillemots are startled, causing them to dive, or catastrophic, such as a major grounding leaking heavy oil near a walrus haul-out site or bird cliffs. Within a management context, the usual procedure is to address the factor causing the most acute and visible impacts. However, events causing minor impacts can also lead to a high level of disturbance when they happen frequently, and should also be considered in risk assessments.

Calculating likelihood

The *likelihood* of an event occurring can be estimated through calculations based on detailed information relating to the cruise activity itself. The information must be site and time-specific.

Figures 16 to 18 illustrate types of data that can be entered into models to assess the likelihood of cruise-related incidences taking place.

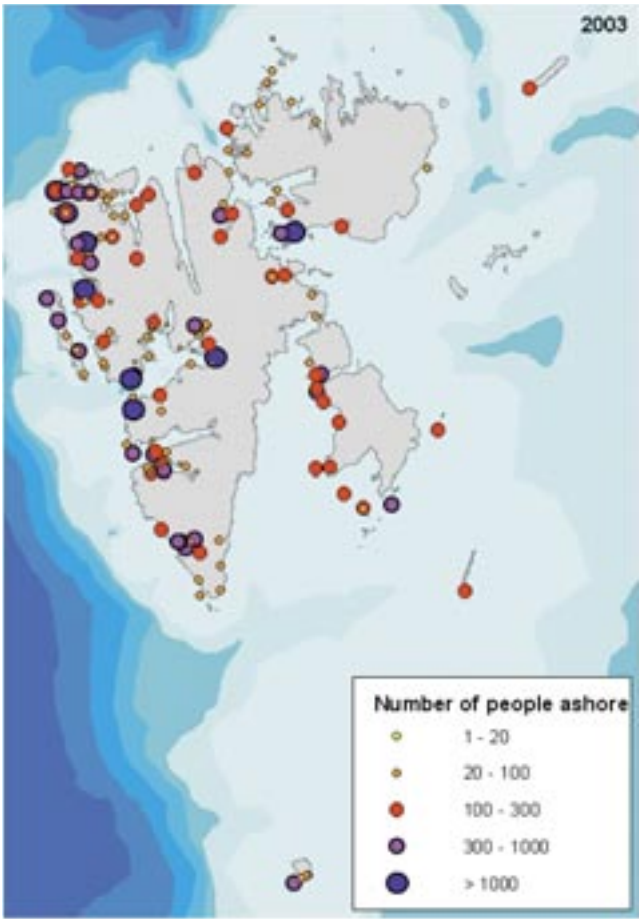


Figure 16: Distribution of landing sites and numbers of people ashore.
This map illustrates different information useful to risk assessments. Landing sites show where cruise vessels land passengers ashore on Svalbard and thus where impacts from tourists can be expected. They also indicate where most vessels spend substantial time anchored or waiting with engines running while passengers are on shore, and where much loading and unloading of passengers takes place, often using smaller boats.

Data source: Governor of Svalbard and the Norwegian Polar Institute.

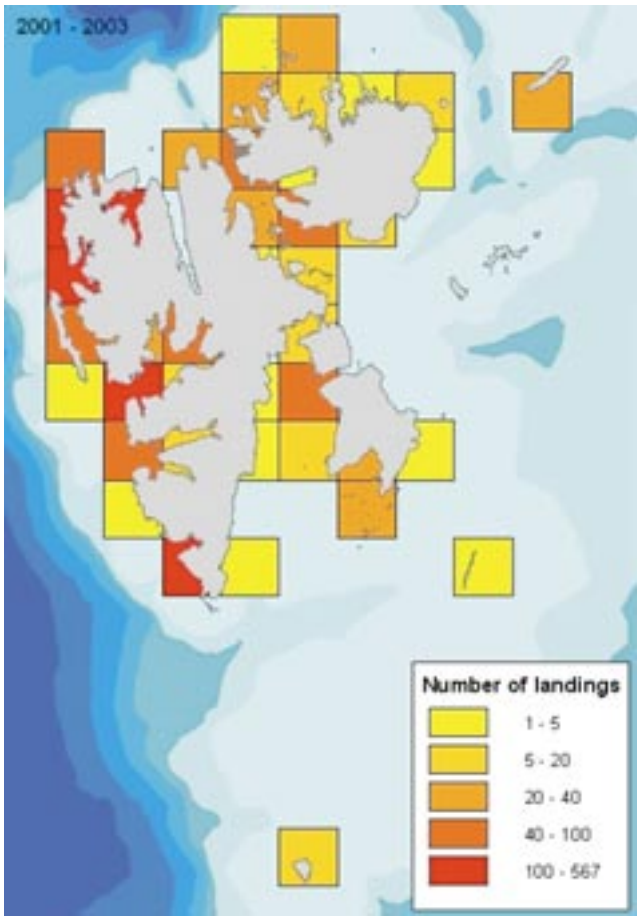


Figure 17: Accumulated numbers of landings (except Longyearbyen) for different coastal areas.

This map shows the numbers of landings by cruise vessels for the sailing seasons 2001 to 2003. The numbers of landings were aggregated for square areas of equal size (grid cells). This type of representation eases comparisons of landing data with other data aggregated for the same grid cells. The west coast of Spitsbergen, Nordaustlandet, Barentsøya and Edgeøya are the areas most visited by cruise ships. (Square size: 50 km x 50 km)

Data source: Governor of Svalbard and the Norwegian Polar Institute.

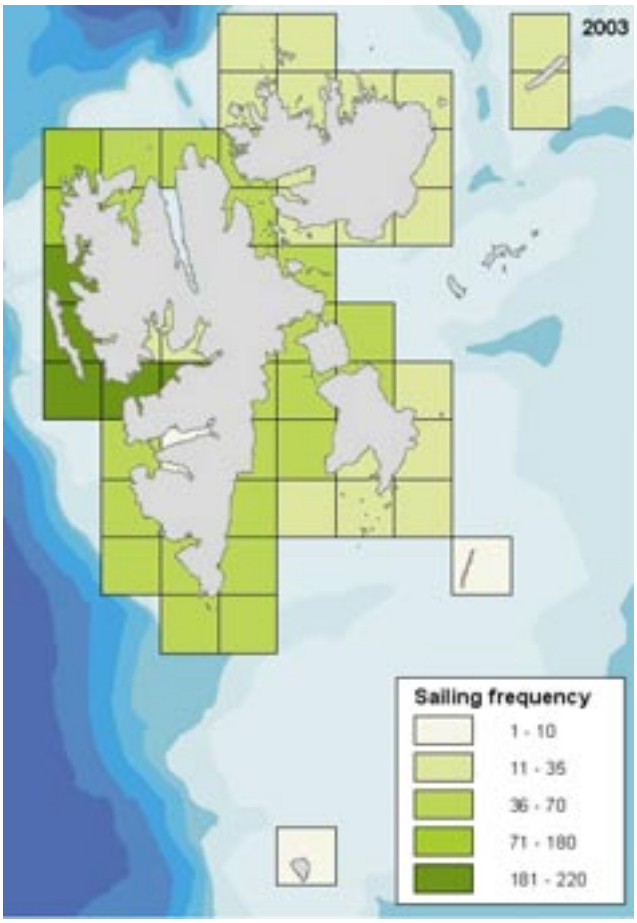


Figure 18: Sailing frequency of cruise ships.
This map illustrates the intensity of cruise vessel traffic around Svalbard in 2003. Darker green areas represent the most visited areas; lighter areas are less visited. The map is based on the landing frequency data shown in Figure 17, though only for 2003. Logical assumptions were made about the traffic pattern and intensity required for the pattern of landings.

Table 9 shows key factors to be considered when calculating the likelihood of an event actually taking place, such as a grounding or collision, leakage of fuel, disturbance to bird cliffs, or destruction of vegetation due to trampling at a new site. The table also shows how the various factors affect the likelihood of an event happening and/or the magnitude of environmental impacts of an event.

Table 9: Key factors for the likelihood of an event

Factor	Increases likelihood	Increases impact
Weather and local conditions.	Strong winds, drift ice, icing, currents – all typical of Svalbard waters – increase the likelihood of accidents.	In case of an oil spill, e.g., weather conditions can increase negative impacts directly due to unfavourable currents, winds or surrounding sea ice. Indirectly, the weather conditions can worsen the impact by constraining rescue and clean up operations.
Vessel characteristics.	Poorly constructed or maintained vessels have a greater likelihood of accidents.	A vessel's construction will determine how fast and how much, e.g. a hull leaks oil when punctured, or how fast it sinks in case of wreckage. Large ships will have a greater impact than smaller ones.
Load and fuel type.	Passenger ships tend to sail closer to shore and possibly more shallow waters due to the nature of their travel.	The number of people aboard as well as the type and amount of fuel being used determine largely the environmental impact of a serious cruise ship accident.

Activities and practices.	Cruise operators can actively manage the likelihood of a grounding through their choice of landing sites and travel pattern.	Ship operators can increase or reduce their impact through conscious and careful operations in anchoring practices, waste management etc, and by being prepared for accidents.
Navigational information and skills.	Svalbard waters are insufficiently charted. The lack of adequate sea charts but also the quality and use of navigational equipment and services, navigational skills and practices, etc. greatly determine the likelihood for a maritime accident.	The correct use of technical aides and the experience and navigational skills of the captain and crew have incomparable influence on the outcome of a critical situation.
Preparedness and prevention facilities, equipment and services.		The level of response facilities and skills to ship-related impacts, e.g. oil spills, are critical for the impact on the environment.
Traffic pattern and density.	The presence of other vessels in areas of interest can accumulate impacts or lead to unfavourable adaptations in the operations.	Otherwise minor impacts can accumulate to critical levels. Avoiding most vulnerable and valuable areas reduces likelihood *and* impact in these areas.

For a model to deliver meaningful statistics about the probability of an event and its potential impacts, detailed and accurate data must be used relating to the specific activities being assessed. Though Svalbard is relatively well studied and mapped when compared to other areas in the high Arctic, the type and quality of information needed to develop useful risk assessment models for other than the simplest scenarios has yet to be compiled.

Presently, the development of suitable risk assessment models for cruise activities on Svalbard is hampered primarily by a lack of suitable data for calculating the "likelihood" part of the risk equation. Data insufficiencies regarding the type and scale of environmental damage that would result from a cruise-related incident also pose a challenge.

Ranking Risk

Some factors are weighted more heavily than others when calculating risk, and can be considered as "drivers" of risk assessment models. Factors that clearly and dramatically increase the likelihood of a cruise-related event occurring with major environmental impacts on Svalbard include:

- Lack of navigation skills
- Poor quality or lack of sea bottom and coastal mapping, and lack of proper navigational equipment and information
- Difficult and unpredictable sea ice conditions
- Large ships
- Heavy bunker oils
- Large numbers of passengers (affects response time for dealing with environmental damage)
- Long distance from or difficult access to rescue and clean-up services and resources.

With respect to environmental impacts, the most worrisome scenario is a ship grounding. Past events show that despite modern technology and improved navigation, cruise vessels still run aground, as do other types of ships. Although a model can provide an estimate of how likely an event is, the more relevant question is when and where a grounding will take place. Given the present state of oil response facilities and equipment, and weather, ice and navigational conditions, it can be assumed that oil spill incidents will not be properly dealt with beyond the immediate vicinity of Longyearbyen.

Example of risk assessment from Svalbard

For the reasons described above, no operational models for assessing the risk of maritime activities are currently in use on Svalbard. However, models have been developed that could provide statistical indicators of risks connected to such activities provided the appropriate data are made available.

One such model was recently used in connection with a Norwegian government assessment of the consequences of ship traffic in the Lofoten area and the Barents Sea, including Svalbard (Moe et al. 2004). In this assessment, modelling was carried out for a specific scenario: the grounding of a cruise ship in Magdalenefjorden on the north western coast of Spitsbergen. The modelled vessel contained 2,000 tonnes of bunker oil (of Russian "Ural Baltic" quality and characteristics). During the scenario, half of the oil leaked within a half-hour of the grounding, and the remaining oil leaked within the next 12 hours. Local current and weather data were entered into the model, and the likelihood of oil reaching various parts of the coast was then calculated. The results were then compared to maps of environmental features indexed according to biodiversity value and vulnerability to oil contamination (similar to the maps presented in chapter three though with somewhat different features). An outcome of this exercise was a set of statistical data indicating the environmental "damage potential" of such an event in different areas and seasons.

The modelling exercise did not provide a calculation of the *likelihood* of such an event happening. It did indicate the likelihood of environmental damage occurring in certain areas at certain times *given* the event happening.

Dealing with environmental risk – the management challenge

An event with a relatively low impact, e.g. the disturbance of one brooding eider duck on a beach by one person one time, and a low chance of occurring e.g. for an unfrequented beach and well-hidden nest, constitutes a relatively low environmental risk. Whereas a catastrophic event, e.g. the sinking of a large ship with heavy oil in inaccessible, ice-infested waters near breeding colonies of rare seabirds, that has a high likelihood of occurring, e.g. in Hinlopen Strait, within ten years given current traffic development, constitutes a higher environmental risk.

Figure 19 illustrates the level of risk for some incidents associated with cruise activities. The higher they score on likelihood and impact, the higher the risk and thus the priority with which they should be addressed. (Note: incident examples are generalized, not accumulated or weighted and are placed in the graph based on relative, not absolute risk.)

From a management perspective, the more difficult event situations are those that have a low impact but a high likelihood and frequency of occurrence. Also challenging are event situations that have a high impact and a low likelihood and frequency of occurrence. In such areas risk assessment models are weak, and human judgement must step in, regardless of the strength of the theoretical statistical model.

The usefulness of statistics produced by risk assessment models, even where substantial, high-quality data has been used as input, is determined in the end by the political or management context in which the results are applied. In other words, once a "risk"

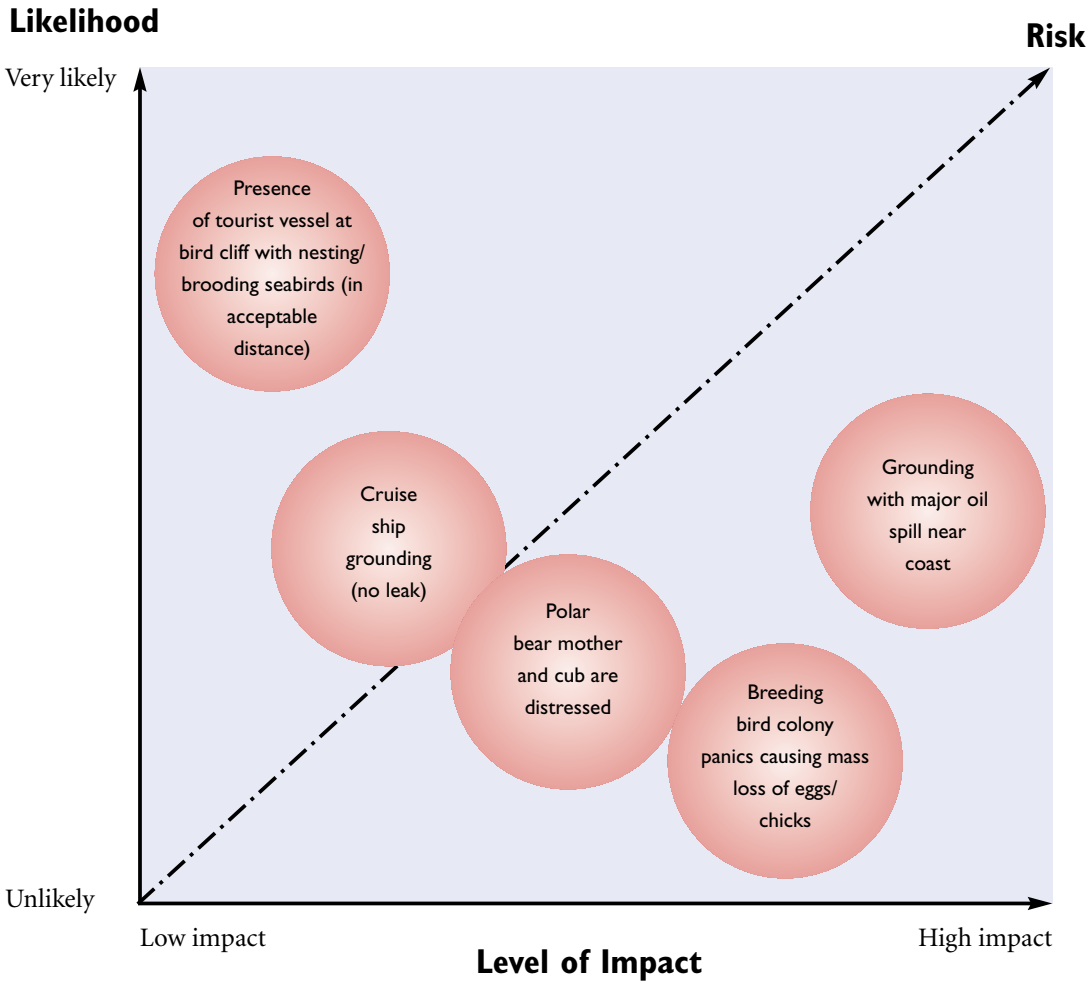


Figure 19: Risks associated with cruise-related activities.

or "likelihood" index is produced, a human judgement must be made as to whether it represents an acceptable or unacceptable level of risk. The situation must then be dealt with accordingly.

The role of non-environmental "risk" factors

Political and management decisions about environmentally damaging incidences linked to cruise activities on Svalbard (or for that matter other maritime activities around the islands), are based on a range of considerations, of which environmental risk is only one. Issues relating to the Svalbard Treaty, relevant national and international laws and regulations, development plans for the tourism industry, and issues relating to human health and safety must also be considered and weighed against the risk of environmental damage.

Examples of ship-related accidents, whether international ("Prestige", November 2003), from Norway ("Rocknes", January 2004) or from Svalbard ("Langøysund", June 2004), have shown that when a grounding or wrecking occurs with the potential for environmental damage, the risk factors that are assessed and managed first are those related to human health and safety, followed by valuable equipment or cargo. Only after these issues have been dealt with do the authorities responsible consider and deal with the environmental issues at hand.

This tendency must be considered in any environmental risk assessments or evaluations that include preparedness and response as factors effecting the likelihood of an event actually having an impact. There have been many cases where the

environmental impacts of an incident could have been limited if environmental issues had been given a higher priority, or if the preparedness and response mechanisms for dealing with priority issues, such as rescuing human lives, were more effective.

Conclusion on risk assessment

As the above discussion has shown, the environmental risks associated with an active and growing cruise industry on Svalbard range from minute and relatively harmless disturbances to catastrophic impacts. Risk assessments provide methods for assembling and evaluating the many and varied parameters, features, and issues influencing how "risky" an activity may be. However, risk assessments cannot provide answers to value judgements that must be made by humans on the basis of the best available information.

A key objective of Svalbard's responsible authorities and cruise operators should be to minimize the environmental risks posed by maritime traffic, including cruise ships. As the "risk equation" shows, the overall risk of maritime activities can be lowered by:

a) Reducing the likelihood of an event happening, e.g. by regulating high-risk activities at certain times and places
b) Reducing impacts and the likelihood of an event happening at the same time, e.g. banning the activity
c) Reducing the consequences or impacts of an event, e.g. strengthening preparedness and response mechanisms.

Although better risk management and the development of effective preparedness and response mechanisms would help to reduce environmental damage to Svalbard's biodiversity; many obstacles stand in the way of progress on these fronts. These include a harsh climate, dangerous ice conditions, the distances involved, a lack of infrastructure, a limited search and rescue capacity and limited clean-up facilities and equipment for oil spills and other contamination. Realistically, the administrative and management tools available on Svalbard to deal with environmental risks are a) and b) above.

Risk assessments can be used to refine and justify arguments for making decisions. But some decisions can and must be made urgently, based on current knowledge of the scope of potential environmental damage caused by cruise activities, and the vulnerabilities and values of the natural and cultural features of Svalbard. These decisions should include:

- Banning ships carrying heavy bunker oil
- Banning large cruise ships from the waters of northeastern Svalbard (east of Wijdefjorden)
- Identifying a representative network of "off limit" areas for all ship-based traffic, to protect at least a minimum of pristine areas from the impacts of tourism, as well as from potential catastrophic events linked to marine accidents.

7. Conclusions

Based on the current situation and outlook, the following steps must be taken to ensure the long-term protection of Svalbard's unique wilderness from damaging human activities, specifically those connected to ship-based tourism.

Activities:
Each cruise operator must show a commitment and willingness to constantly evaluate and improve the environmental footprint of its business operations both in the planning phase and while out at sea. Maritime safety, low-impact ship operations, responsible routines and a highly qualified and dedicated staff are preconditions for the active reduction of environmental risks associated with vessels, crew and passengers. Feasible but nonetheless ambitious standards should be developed, implemented, and monitored. Voluntary but verifiable solutions are preferable, but punitive measures for non-compliance and non-involvement should be put in place.

Policy:
Norwegian authorities must now take steps to develop a clearer and more detailed picture of how they would like Svalbard to appear in 20 to 100 years. Only an ecosystem-based approach considering all users will protect Svalbard's wilderness over the longer-term. Zoning can be an important tool for protection in the interim. Detailed holistic management plans must eventually be developed that take all cumulative impacts into consideration. Cruises contribute to overall impacts, and in some cases are responsible for a significant proportion of all impacts.

As policies are developed, consideration must be given to authorities responsible for implementing and following up on management plans, and adequate resources must be made available to those respective authorities.

Management:
From a management point of view the key issues requiring attention are:

- Eliminating or substantially reducing the risk of major, catastrophic environmental impacts
- Developing and using spatial planning tools to avoid and minimize the cumulative impacts of repeated small-scale disturbances.

As a first and immediate step, precautionary measures need to be taken to protect particularly sensitive areas on Svalbard against the effects of a grounding or wrecking of a cruise vessel. These measures must be accompanied by an advanced evaluation of risks and sensitivities as well as improved response capacities. However, action should not be postponed until this information is available.

More frequent small-scale impacts need to be addressed by developing standards for cruise operations and human conduct as well as through holistic spatial planning and management tools, such as zoning to protect natural and cultural heritage areas.

In preparation, Norwegian authorities need to translate the nature management principles expressed in the Svalbard Nature Protection Act and government White Papers into a practical vision and objectives for tourism and other human activities on Svalbard. By providing a clearly defined framework for its respective sectors, the tourism industry will achieve the necessary freedom to develop within sustainable limits while reducing the degree of reactive management from authorities.

8. Appendix

8.1. Summary of theme-specific recommendations

Oil pollution

Operators:

- Avoid sailing in areas with high grounding risks
- No discharge of oily liquids in Svalbard's waters
- Carry and be able to use best available oil spill response equipment.

Authorities:

- Prohibit the use of heavy oils for all vessels travelling in Svalbard's waters
- Identify areas with a high risk for groundings and high biodiversity and close to ship traffic
- Do not allow any ship into a high risk area outside the range of oil spill clean-up capacity
- Ensure oil spill response capacity matches the level of cruise traffic
- Create incentives for companies that carry less and more environmentally friendly fuel
- Require all vessels to carry and be able to use best available oil spill response provisions
- Monitor and enforce the no discharge regulations of the Svalbard Environmental Protection Act.

Pollution through wastewater

Operators:

- Ensure high quality (low levels of problematic substances) of wastewater effluents according to standards set by authorities or "best practice"
- No discharge of any wastewater in marine protected areas and other specifically designated areas
- Avoid discharge in vicinity of wildlife and other ships
- Monitor wastewater quality and document type, location and time of discharges.

Authorities:

- Declare marine protected areas and other particularly sensitive areas as no discharge zones
- Develop and enforce reporting requirements for type, volume, and location of wastewater discharges
- Determine acceptable limits of problematic substances in discharged wastewater
- Ensure criteria about wastewater management are included in the check list for field inspectors.

Pollution through garbage

Operators:

- Develop and implement plan for waste reduction
- Identify which materials are a priority to reduce
- Practise waste separation and compression
- No discharge of garbage in all of Svalbard's waters, especially not in marine protected areas and other sensitive areas.

Authorities:

- Declare Svalbard's waters and especially marine protected areas and other particularly sensitive areas as no discharge zones
- Prohibit the disposal of waste in Longyearbyen by ships with other viable alternatives

- Ensure reporting requirements for type, volume, and location of garbage discharge
- Ensure criteria about garbage management are included in the check list for field inspectors

Air pollution

Operators:

- Reduce overall output of harmful emissions by using cleanest possible fuel, being more fuel efficient, using best available technology and ensuring proper functionality of machinery and equipment
- Ban two-stroke motors

Authorities:

- Identify areas with high sensitivity to air pollution and ban or limit emissions there
- Determine limits for acceptable levels of emissions
- Ensure criteria about air pollution in the check list for field inspectors

Ballast water

Operators:

- Use best available technology and apply best practices for ballast water treatment

Authorities:

- Prohibit ballast water discharge within 50 nautical mile-zone around Svalbard
- Establish monitoring programmes for invasive species
- Include criteria about ballast water management in the check list for field inspectors

Anti-fouling hull paint

Operators:

- Use only proven non-persistent biocides as hull paint
- Safely remove and dispose of existing TBT on ships, thereby limiting leaching of the toxin into the environment to absolute minimum possible

Authorities:

- Prohibit the use of vessels with organotin-based hull paints
- Assess risk of invasive species due to change in anti-fouling protection

Physical damage from cruise ship activities

Operators:

- Obtain knowledge of vulnerable areas and avoid these accordingly
- Do not anchor in areas with rich sea bottom habitats

Authorities:

- Strengthen charting efforts and mapping of benthic communities
- Identify areas sensitive to damage from anchoring and prohibit anchoring in these areas

Wildlife disturbance

Operators:

- Contribute to the development of Svalbard-specific wildlife watching regulations and develop guidelines for best practice in your operations
- Ensure that your operations, guides and guests comply with these regulations and guidelines
- Avoid expanding sailings at the start of the season
- Contribute to wildlife monitoring and research.

Authorities:

- Develop Svalbard-specific wildlife watching regulations together with respective experts and ensure enforcement
- Monitor overall impacts on wildlife from tourism
- Monitor the beginning/end of season and be prepared for ad-hoc decisions on protective measures.

Degradation of vegetation

Operators:

- Contribute to the development of regulations to prevent vegetation degradation from tourism and develop guidelines for best practice in your operations
- Ensure that your operations, guides and guests comply with these regulations and guidelines
- Land no groups with guide to guest ratios less than 1:15
- Contribute to site monitoring and research.

Authorities:

- Develop regulations to prevent vegetation degradation together with respective experts and ensure enforcement
- Develop management plans and identify sites that should be closed off for recovery and preservation
- Establish no access areas for reference on visited sites.

Degradation of cultural and historical sites

Operators:

- Contribute to the development of regulations for visiting cultural and historical sites on Svalbard and develop guidelines for best practice in your operations
- Ensure that your operations, guides and guests comply with these regulations and guidelines
- Land no groups with guide to guest ratios less than 1:15
- Contribute to site monitoring and research.

Authorities:

- Develop regulations for visiting cultural and historical sites on Svalbard together with respective experts and ensure enforcement
- Develop site management plans and identify sites that should be closed off for recovery and preservation
- Establish no access areas for reference on visited sites

Degradation of special geological sites

Operators:

- Contribute to the development of regulations for visiting special geological sites on Svalbard and develop guidelines for best practice in your operations
- Ensure that your operations, guides and guests comply with these regulations
- Land no groups with guide to guest ratios less than 1:15
- Contribute to site monitoring and research.

Authorities:

- Develop regulations for visiting special geological sites on Svalbard together with respective experts and ensure enforcement
- Develop site management plans and identify sites that should be closed off for recovery and preservation
- Establish no access areas for reference on visited sites.

Littering

Operators:

- Ensure that your guides and guests do not litter
- Pick up waste on sites you visit.

Authorities:
- Ensure no littering on land or at sea
- Continue the Clean Up Svalbard programme.

Crosscutting themes
Information and communication
- Develop specific goals for building awareness of key environmental issues, and follow these
- Ensure guides and crew are qualified and adhere to "best practice" guidelines
- Further develop data collection of ship-based tourism activities
    - Information on the volume and type of discharges and emissions in Svalbard's waters
    - Post-trip reporting of routes, anchoring sites, and onshore activities.

Site management
- Include site management in overall area management (zoning)
- Develop site-specific management plans based on risk of impacts, value and vulnerabilities
- Develop site-specific regulations or guidelines.

Conservation and nature management
- Develop overall management plan for Svalbard's protected areas
- Declare marine protected areas and special designated sensitive areas as complete no discharge zones
- Establish funding mechanism for national park management and monitoring of impacts (through tourism).

8.2. Legal framework for cruise operations on Svalbard

Because cruise lines are a sector of the shipping industry and most companies operate internationally, their activities are subject to a complex network of rules. This chapter gives a brief overview of the legal framework currently affecting passenger ships within Svalbard's jurisdiction, with a focus on legislation relevant to the environment. Maritime safety issues and potential environmental risks are often closely related in shipping.

The Norwegian government's polar commission has assessed the status of maritime safety in Svalbard's waters through a working group (Norwegian Ministry of Justice and the Police 2002). Passenger ships operating around Svalbard must comply with legislation relating to international, national and local jurisdictions.

8.2.1. International law

The most important institution in international maritime law is the United Nations' International Maritime Organisation (IMO) whose regulations have far-reaching effects on national legislation. IMO was established to facilitate cooperation and regulation among nations in the field of international shipping, with emphasis on technical matters and standards in the fields of maritime safety, navigation and marine pollution. In those areas, IMO also has a mandate in legal and administrative matters.

With regard to the environmental impacts of shipping, the IMO has passed a number of resolutions, the most important being the International Convention for the Prevention of Pollution from Ships (MARPOL). MARPOL 73/78, as it is referred to, has, since its adoption in 1973, been updated and amended according to current developments. As of today, MARPOL 73/78 has five annexes, addressing different areas:

		Entered into force:
Annex I	Regulations for the prevention of pollution by oil	2 Oct 1983
Annex II	Regulations for the control of pollution by noxious liquid substances in bulk	2 Oct 1983
Annex III	Prevention of pollution by harmful substances carried by sea in packaged form	1 July 1992
Annex IV	Prevention of pollution by sewage from ships	27 Sept. 2003 (Revised Annex: 1 Aug 2005)
Annex V	Prevention of pollution by garbage from ships	31 Dec. 1988
Annex VI	Prevention of air pollution from ships	Comes into effect 19 May 2005

The signing parties adopted the annexes' content into national law, which makes it applicable to their territorial waters and vessels registered under their flag.

Another IMO convention is the International Convention for the Safety of Life at Sea (SOLAS) which puts requirements on passenger ships with more than 12 passengers. Compliance with SOLAS or similar requirements has to be ensured by the ship's flag state. The practice of registering vessels under flag states ("flags of convenience") with low taxes and a reputation for disinterest in safety, social and environmental standards, is of great concern in general. One major cruise line has, albeit unsuccessfully, argued in a US federal court that due to its registry it would not be subject to US environmental laws when operating in US waters (Oceana 2004).

■ "Port State Control is the inspection of foreign ships in national ports to verify that the condition of the ship and its equipment comply with the requirements of international regulations and that the ship is manned and operated in compliance with these rules." (IMO 2002)

In response to the recurring problems with lack of enforcement from such rogue flag states, IMO has empowered countries receiving foreign-flagged vessels to conduct a "Port State Control" inspection.

IMO has also passed "Guidelines for Ships Operating in Arctic Ice-covered Waters". These guidelines are a tool which IMO members are encouraged to promote within their own territorial waters.

8.2.2. National law

Of the MARPOL annexes in force, Norway so far has adopted all but Annex IV, which is about to be passed. Annex VI will enter into force in May 2005.

The following are relevant excerpts of national laws and regulations that regulate maritime issues on Svalbard:

Norwegian Maritime Law (Sjøloven) from 24 June 1994: main maritime law in Norway. Does not contain specific references to Svalbard

Seaworthiness Law (Sjødyktighetsloven) from 9 June 1903, No 7: applies to all vessels sailing under Norwegian registry as well as to foreign vessels in the inner and territorial waters of the Norwegian mainland or in the Norwegian economic area. However, it does not apply to foreign vessels in Svalbard's inner or territorial waters.

Norwegian Pilot Law (Losloven) from 16 June 1989, No 59: requires a ship to use a state-employed pilot if it does not have its own navigator. Does not apply to Svalbard

Harbour and Shipping Lane Law (Havne and farvannsloven) from 8 June 1984, No 51: issued to secure best possible and safe planning and operation of harbours. Not applicable to Svalbard today, but can be extended by the King

Prescription on the Control of Passenger Vessels in Svalbard (Forskrift om kontroll med passasjerskip på Svalbard) from 29 June 1984, No 1319: all vessels carrying passengers need to have a passenger certificate issued by the respective flag state. The Governor of Svalbard or his aides inspect this certificate and can detain a vessel if it is not appropriately built and equipped to purpose. The flag state determines what standards passenger vessels have to meet, and thus the role of the authorities is limited to checking compliance with these requirements.

8.2.3. Laws pertaining to Svalbard

The basis for Svalbard's special legislative status is the "Svalbard Treaty" established in 1920, which grants equal rights for nationals of treaty nations on certain conditions. It gives Norway legal authority as long as its laws and regulations apply to Norwegians and to treaty party nationals alike.

The "Svalbard Act" (Svalbardloven 1925), based on Norwegian legislation, has fairly recently been complemented with a comprehensive environmental law called the "Svalbard Environmental Protection Act" (Svalbardmiljøloven) of 15 June 2001.

The Svalbard Environmental Protection Act addresses overarching principles and goals within the Norwegian management regime for Svalbard and more specifically issues regarding

- Protected areas
- Flora and fauna
- Cultural heritage
- Land-use planning areas
- Activities with environmental impacts
- Inspection and control measures
- Enforcement and sanctions.

Tourism is not specifically addressed in this law, but the Svalbard Environmental Protection Act provides for supplemental legislation and other measures that regulate tourism activities and thus cruise activities. It also provides for the establishment of an environmental protection fund comprised of proceeds from tourism activities.

A regulation concerning tourism and other travel on Svalbard exists (Forskrift om turisme og annen reiselivsvirksomhet på Svalbard of 18 October 2001) which is based on Svalbard law. In this legislation, the following paragraphs are of particular importance to cruise tourism:

- The purpose of the legislation (§ 1)
- Its extent (§ 2)
- The responsibility of tour operators and tourist carriers for the safety and behaviour of participants (§ 5)
- Requirements for insurance cover for rescue expenses (§ 6), notification of travel plans (§ 7) and requirements for, or prohibitions on travel or activity plans (§ 9).

There is also a provision for specific cruise legislation (§ 82):

- "(…)The Governor may issue regulations relating to motor traffic at sea, for example to prescribe shipping lanes or areas where shipping is not permitted, speed limits and provisions regarding casting anchor and landing. The regulations may differentiate between traffic for different purposes."

Other relevant legislation relates to:

- Toxic substances, waste and fees for wastewater and other waste disposal on Svalbard (Forskrift om miljøgifter, avfall og gebyrer for avløp og avfall på Svalbard of 24 June 2002)
- The protection status of Moffen Island, Bear Island, and other protected areas as well as sites such as Virgohamn (Legislation on area protection and traffic regulation in Virgohamna on Svalbard /Forskrift om områdefredning og ferdselsregulering i Virgohamna på Svalbard of 3 May 2000).

8.2.4. Overview of legislation relevant to environmental issues around tourism on Svalbard

	Law	Applies to Svalbard	Comments
International (IMO)	MARPOL 73/78 Annex I, II, III and V (Annex IV is about to be passed into Norwegian law)	Yes	The annexes apply to Norwegian-registered vessels and Norwegian waters as soon as they become Norwegian law. Laws must specifically name Svalbard in order to be applicable.
	Safety of Life at Sea (SOLAS)	Yes	For passenger ships with more than twelve passengers.
	Port State Control	No	
Norwegian	Norwegian Maritime Law	Partly	
	Seaworthiness Law (Sjødyktighetsloven)	Partly	Applies to Norwegian-registered vessels anywhere, but not to foreign vessels in Svalbard waters.
	Norwegian Pilot Law (Losloven)	No	No formal requirements for pilots on Svalbard.
	Harbour and Shipping Lane Law (Havne and farvannsloven)	No	Not applicable to Svalbard today, but it could be extended.
	Prescription on the Control of Passenger Vessels on Svalbard (Forskrift om kontroll med passasjerskip på Svalbard)	Yes	The Governor of Svalbard has a monitoring function, but standards are set by flag state.
Svalbard	Svalbard Law	Yes	
	Svalbard Environmental Act	Yes	
	Svalbard Tourism Regulations	Yes	
	Legislation on protected areas	Yes	

8.3. Examples of cruise management in protected areas

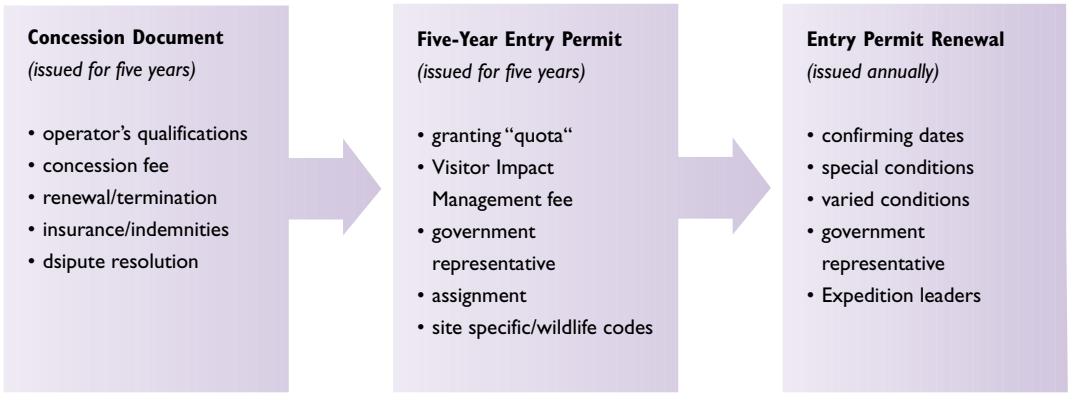
- **i. Tourism management on New Zealand's Subantarctic Islands**
- **ii. Tourism Management on the Galapagos Islands**
- **iii. International Association of Antarctica Tour Operators**

i. Tourism management on New Zealand's Subantarctic Islands
New Zealand's Subantarctic islands are located in the South Pacific Ocean and consist of five islands (Auckland, Campbell, Antipodes, Snares and Bounty Island). The islands are home to an important oceanic ecosystem, and through their isolation have maintained an unspoiled environment. Main attractions are both fauna (especially bird life and marine mammals) and flora (megaherbs).

New Zealand has declared all five islands as nature reserves, to be managed for the purpose of "protecting and preserving in perpetuity indigenous flora or fauna or natural features that are of such rarity, scientific interest or importance, or so unique that their protection and preservation are in the public interest" (from the New Zealand Reserves Act of 1977). All visitors are required to have permits. In 1998, the islands and surrounding sea were declared a World Heritage Site, and in 2003, the Auckland Islands Marine Reserve was approved (4,840 square kilometres). These and other laws and designations provide the framework for advanced and integrated ecosystem management, mainly based on the current Subantarctic Islands Conservation Management Strategy.

The Subantarctic islands are a natural stop for cruise vessels en route to Antarctica during the austral summer. Since the 1970s when regular cruise visits began, tourist numbers have increased and peaked in 1989 when 1,500 permits were sought after. Concerned about environmental impacts, the Department of Conservation restricted the number of permits to 600 per site each season, with access allowed to 3 of the 5 islands (Auckland, Enderby and Campbell Island). Other measures include the prohibition of overnight stays and daily limits on visitor numbers. Operators are also required to bring a government representative on board to oversee compliance with laws and guidelines and to monitor potential changes and impacts on the environment. Specific tourism guidelines for the Subantarctic islands detail further requirements.

The Conservation Management Strategy for the Subantarctic islands, clarified that "cruising expeditions must have a genuine educational or inspirational purpose relating to a better appreciation of nature". Inquiries about visitation are to be assessed in terms of benefits gained through visits versus possible disturbances and risks. According to conservation authorities, only 3 sites are able to accommodate a full quota of 600 visitors each year. However, a smaller number of permits are also



(Source: New Zealand Department of Conservation 1998)

available for so-called secondary sites. For the period of 1998 to 2003, three operators received five-year quotas for visitor permits. The following procedure was proposed for the next permit process:

ii. Tourism Management on the Galapagos Islands

The Galapagos archipelago off the west coast of South America is home to an enormous number of endemic species, both marine and terrestrial, as well as to several unique ecosystems found nowhere else on Earth. Easy encounters with "tame" wildlife and the islands' special biodiversity have made the Galapagos a prime destination for scientists, photographers and tourists alike. Most tourism is ship-based.

Like Svalbard, its popularity has led to serious challenges and pressures on the environment, and strict management schemes are now necessary.

In 1998, Ecuador enacted special legislation for the Galapagos Islands in order to protect the archipelago's unique biological diversity. The precautionary principle is a key part of this law.

The introduction of non-native species and the unsustainable use of marine resources threaten the Galapagos' natural richness more than anything else. These challenges are connected to human activities, both locally and internationally, e.g. non-local fishing fleets. In addition to legal and monitoring measures, environmental education and community-based initiatives have been prioritized to engage the local population in conservation efforts.

A marine reserve extending 40 nautical miles from shore has been established around the archipelago to reduce and control marine resource use. The Galapagos National Park Service (GNPS) manages this protected area. Within the boundaries of the reserve, only tourism and local artisan fishing are permitted.

In addition to legislation enforcement and environmental education, zoning is an important tool for nature management on the Galapagos Islands. Each zone has a specific management plan regulating human activity, i.e. research activity, tourism, photographers, education, farming and the building of new houses or cabins or other constructions.

Five different zones have been established:

- High Protection Zones
- Primitive Zones
- Special Use Zones
- Visitor Zones
- External Zones.

High Protection Zones:

High protection areas are free from significant influences related to humans or introduced species. They are relatively pristine, and include representative samples of native biodiversity. High protection zones also function as a reference point for detecting changes in other zones. Activities in these areas are strictly regulated. Entry is only possible with written permission from the administration of the National Park of Galapagos (NPG). Research, visits, filming and photography are strongly restricted. Only two groups of five persons may visit a zone at the same time. All visitors must take special care to ensure that they are not carrying living organisms on their equipment and food when entering and leaving the zone.

Primitive Zones:

These zones are areas that may or may not contain introduced species. They have maintained the characteristics of an insular ecosystem and are therefore suitable for scientific research, filming and photography. Some restricted educational and recre-

ational visits are also allowed in these zones. Only temporary camps are permitted. Before entering the zone, visitors must have written permission from NPG, and authorized personnel often guide them around.

Special Use Zones:
These areas have been changed considerably by humans. Special use zones are divided into two subzones, Infrastructure and Installations and Extraction of Resources. NPG administers these zones and permits other institutions to carry out controlled research activity or education programmes. All infrastructure and installations must be strictly necessary and must harmonize with the surroundings as much as possible. Educational and interpretative visits are allowed. In the "Extraction of Resources" subzone, a limited extraction of renewable resources is allowed, i.e. stony resources, timber and water.

Visitor Zones:
Visitor zones are areas of great interest to visitors that contain representative samples of native biodiversity, such as geological formations, historical sites, and flora and fauna. These areas must be able to support visitor activities. Visitor zones are divided into three subzones: Extensive Use, Intensive Use and Recreational Use. The visiting hours are limited in all subzones. The number of visitors in a group may be limited, and in the Extensive Use and Intensive Use subzones guides are obligatory. Filming, photography and scientific studies are permitted if related to visitor impacts.

External Zones (non-national park areas):
These areas contain human settlements and agricultural areas, all of which border the National Park of Galapagos. In these zones, the introduction of non-native species by boats or ships is not unlikely. Therefore, it is important to include these areas in the zoning system to develop a relationship between the national park and populated areas. Indicators have been defined in order to evaluate the negative and positive impacts of human activities.

Cruise tourism on the Galapagos
The wonders of the Galapagos are best explored by ship. Unfortunately, trip standards and quality range widely, as does the enforcement of legislation and environmental and safety standards by operators. As in Antarctica and now Svalbard, an interest group has been established consisting of cruise operators, known as the International Galapagos Tour Operator Association. The association tries to address these issues, but on a much less comprehensive level than IAATO.

Another effort is the "Smart Voyager" certification programme designed and run by the Ecuadorian environmental group, Conservation and Development (C & D). The group consists of scientists, conservationists, tour operators and other experts, including specialists in the field of certification, who set standards for cruise tour operators working in the Galapagos Islands. Cruise operators who desire "Smart Voyager" certification allow C & D to audit their operations for compliance with the standards. The audit includes an assessment of pollution potential, the risk of introducing alien species, and standards for training crew and guides. Tour operators complying with the requirements become certified and are allowed to use the Smart Voyager label.

Some cruise operators have also helped tremendously by fundraising for conservation and research efforts on the Galapagos.

iii. The International Association of Antarctica Tour Operators (IAATO)

Seven private tour operators established IAATO in 1991 to implement the requirements of the Antarctic Treaty and its Environmental Protocol by promoting environmentally responsible tourism to Antarctica. The association has since grown to 58 members from 12 different countries (IAATO 2003), a development that also reflects the significant growth and ongoing diversification of antarctic tourism.

Most tourism to Antarctica is ship-based. Passengers are brought ashore with zodiacs, and stay on land for one to three hours. One requirement stipulated by IAATO is that member companies cannot land more than 100 passengers (excluding guides) at the same time. Ships with passenger numbers exceeding 500 are not allowed to land their guests, a ceiling that changed recently from 200 in response to an increase in the number of larger cruise vessels visiting the polar continent. During the austral summer season of 2003/2004, IAATO members landed an estimated 21,000 passengers (2002/2003: 13,500) on antarctic sites, while vessel departures were up from 136 (2002/2003) to 185 (2003/2004)(IAATO 2004).

In order to meet its objectives and comply with the Antarctic Environmental Protocol, IAATO has established a range of requirements and guidelines for its members, which are applied by self-regulation and include, amongst others:

- Limits on the number of people ashore (see above)
- Guidelines for watching marine wildlife: all encounters should be dictated by the animal/s. Operators must continuously evaluate the animals' behavioural patterns; experienced naturalists may be required. The guidelines provide a detailed description of how to behave when encountering different animals in different situations
- Technical operations, such as zodiac and helicopter guidelines
- Post-trip activity reporting
- Safety-related procedures.

IAATO has helped antarctic science programmes with logistics, and many IAATO members also run operations in the Arctic and in Svalbard.

The Antarctic Treaty is an international agreement dating from 1959 that governs all human activity. The law designates Antarctica as a "natural reserve dedicated to peace and science".

8.4. Cruise tourism management in Ny-Ålesund, Svalbard

Ny-Ålesund, situated in Kongsfjorden on the west coast of Spitsbergen, is the world's northernmost permanent settlement. A former coal mining town, it has evolved into a scientific community where international arctic environmental monitoring and research is conducted. Ny-Ålesund is owned and run by a government-owned company called Kings Bay AS and has a reputation as an environmentally friendly community.

With increasing cruise traffic to Svalbard's west coast, numbers of tourists received by Ny-Ålesund have also jumped accordingly. The community is not only visited by coastal cruisers but also by large vessels, mostly because of the infrastructure provided, e.g. a quay. In fact, Ny-Ålesund has become so popular with operators and visitors that tourism has interfered with scientific research programmes (see also Box 5). Kings Bay AS and the research community have had to take measures to encourage conduct that does not have negative impacts on their work and on the environment.

In past years, 15,000 – 20,000 cruise tourists have typically visited Ny-Ålesund each season (mid-June to late August). In 2003, 102 vessels brought 17,487 passengers to the settlement. Larger vessels anchor out in the fjord and use their tender boats to bring passengers ashore.

To prepare for the season, information packages are sent out in May to all ships that have announced their visit to Ny-Ålesund. The information package contains:

- A poster outlining the rules that tourists have to comply with when visiting Ny-Ålesund (see Box 8)
- An agreement, which indicates that tourists wishing to disembark have been familiarized with the information provided. The captain has to sign this contract and deliver it to Kings Bay AS upon arrival, and the tourists receive a sticker indicating they have been informed.

During the high season, Kings Bay AS employs about three to four extra persons to deal exclusively with tourism and harbour services, such as the souvenir shop and post office and to take care of vessels visiting the settlement. In addition, it is not unusual for local residents in Ny-Ålesund to take time from their work to help "guide" tourists in designated areas. Coastal cruisers usually have their own guides accompany the groups.

To reduce the impacts of freely wandering tourists, Kings Bay AS supported by Svalbard Reiseliv AS, has established a 1.5 kilometre-long path with cultural and environmental information about the settlement posted along the way. Tourists have to stick to this path and not venture outside the designated area to protect the tundra, wildlife and scientific work, and themselves from possible polar bear encounters. Apart from the path, there is a museum that can be visited.

Cruise ships are only allowed to anchor in Ny-Ålesund for a few hours to decrease impacts, including those on atmospheric research.

Box 8:
Ny-Ålesund visitor rules

- Do not walk anywhere except on path and roads. The arctic tundra is extremely vulnerable
- Do not disturb nesting birds by walking too close. They are all protected
- Do not touch scientific instruments. They are extremely sensitive to human activity
- Do not throw cigarette butts or other litter on the ground. Use garbage containers
- Be careful around constructions and buildings that are protected by the cultural heritage act. The Amundsen mast and the old locomotive are protected buildings in Ny-Ålesund, as are 20 others. Do not enter buildings marked "Private" or "No Admittance". Many of these buildings are private; others are research stations
- Do not walk outside of the settlement because of the polar bear danger.

8.5. List of tables

8.6. List of figures

8.7. List of boxes

8.8. References

Aftenposten. 30 January 2004. *Mot knallår for cruisegigantene.*

Aftenposten. 14 January 2004. *Flere turister, færre forretningsreisende til Norge.*

Aftenposten. 8 September 2003. *Eldorado for Mars-forskere.*

Ahlbom, J. and Duus, U. 2003. *Rent skepp kommer lastat.* Acid News No. 3, September 2003.

AMAP – see Arctic Monitoring and Assessment Programme

Alaska Department of Environmental Conservation. 2004. *Assessment of Cruise Ship and Ferry Wastewater Impacts in Alaska.*

Alaska Department of Environmental Conservation. 2004. Alaska Department of Environmental Conservation cruise ship reports website. http://www.state.ak.us/dec/water/cruise_ships/reports.htm (17 March 2004).

Alaska Department of Environmental Conservation. 2002. *The impact of cruise ship wastewater discharge on Alaskan waters.*

Apple, D., Burrowes, J. and Klaessens, Y. 2003. *Just cruising? Environmental effects of cruise ships.* Office of the Parliamentary Commissioner for the Environment of New Zealand.

Arctic Monitoring and Assessment Programme (AMAP). 2002. *Arctic pollution 2002.*

Associated Press. 20.05.2004. *International protection given to New Zealand marine reserve area.*

Bensted-Smith, R. 1998. *The special law for Galapagos.* Noticias de Galapagos. No. 59, April 1998.

Bjørge, A. and Mauritzen, M. 2003. Vurdering av havmiljøet på Svalbard: Påvirkninger, tilstand og tiltak. Norwegian Polar Institute report series (in preparation).

Colman, J. E., Jacobsen, B. W. and Reimers, E. 2001. *Summer response distances of Svalbard reindeer (*Rangifer tarandus platyrhynchus*) to provocation by humans on foot.* Wildlife Biology. 7, 725 – 283.

Cruise junkie dot com. Cruise junkie website. http://www.cruisejunkie.com (13 April 2004).

Dalen, E. N. 2002. *Kjørespor i utmark på Spitsbergen, Svalbard.* Hovedoppgave i geografi. Geografisk institutt, Universitetet i Oslo.

DBU. 2003. *Biocide-free antifouling coatings: performance, prospects and regulations.* http://www.dbu.de/foulingrelease.

Eid, P. M. 2004. *Instruks for overvåkning av vegetasjon og kulturminner i NV-Spitsbergen nasjonalpark.* Sysselmannen på Svalbard.

Eid, P. M., Prestrud, P. and Eide, N. E. 2001. *Menneskelig forstyrrelse av fjellrev, rein og sel.* Forrapport til Sysselmannen på Svalbard.

Gabrielsen, G. W. 1985. *Do not disturb nesting eiders!* Norwegian Polar Institute year book 1984, pp. 21 – 24.

GESAMP (Joint group of experts on the Scientific Aspects of Marine Environmental Protection). 2001. *A sea of troubles.*

Global Ballast Water Management Programme. Global Ballast Water Management Programme website. http://globallast.imo.org/(4 March 2004).

Global Marine Litter Information Gateway. 22 March 2004. Global Marine Litter Information Gateway website. http://marine-litter.gpa.unep.org/(2 April 2004).

Global Marine Oil Pollution Information Gateway. 1 March 2004. Global Marine Oil Pollution Information Gateway website. http://oils.gpa.unep.org/index.htm (4 March 2004).

Governor of Svalbard. 2004. Unpublished statistics.

Governor of Svalbard. 7 June 2004. Governor of Svalbard website. http://www.sysselmannen.svalbard.no (14 June 2004).

Governor of Svalbard. 2002. Reiselivsstatistikk for Svalbard 1997 – 2001.

Governor of Svalbard. 2000. *Kulturminneplan 2000 – 2010.* Sysselmannens rapportserie nr. 2/2000.

Governor of Svalbard. 1999. *Overvåkning av kulturmiljø på Svalbard – Målsetning, metode, lokaliteter og overvåkning.* Report no. 3.

Governor of Svalbard. 1998. *Avfall og avfallshåndtering på Svalbard – status og forslag til tiltak.* nr. 2.

Gremmen, N. J. M., Smith, V. R. and Tongeren, O. F. R. 2003. *Impact of trampling on the vegetation of subantarctic Marion Island. Arctic, Antarctic and Alpine Research.* 35 (4), 442 – 446.

Hapag Lloyd. 2001. *Annual report.*

Hurst, R. J, Øritsland, N. A. and Watts, P. D. 1982. *Body mass, temperature and cost of walking in polar bears.* Acta Physiol. Scan. 115, 391 – 395.

IAATO – see International Association of Antarctic Tour Operators

IMO – see International Maritime Organisation

International Association of Antarctic Tour Operators. 2003. *Antarctic tourism briefing – overview.*

International Association of Antarctic Tour Operators. 4 March 2004. International Association of Antarctic Tour Operators website. http://www.iaato.org (2 April 2004).

International Association of Antarctic Tour Operators (IAATO). 2004. *Six-year survey of the dominant tourist activities and trends since the ratification of the Environmental Protocol.* Presented by Denise Landau, IAATO, at the Antarctic Treaty Meetings of Experts in March 2003.

International Maritime Organisation. 19 May 2004. International Maritime Organization home page. http://www.imo.org (21 May 2004).

International Maritime Organisation. 2002. *Guidelines for ships operating in arctic ice-covered waters.*

Jacobsen, L.B. 1994. *Re-analyse av permanente prøvefelter i overvåkningsområde i Kongsfjorden, Svalbard 1994.* Norsk Polarinstitutt Rapportserie nr. 87.

Juneau Empire. 4 April 2004. *Small ships fear pollution controls.* http://juneauempire.com/stories/030404/sta_pollute.shtml (13 April 2004).

Jørgensen, F. 2003. *Clean Up Svalbard. Evaluering etter sesongen 2002.* Sysselmannen på Svalbard.

Kuss, F. R. and Hall, C. N. 1991. *Ground flora trampling studies: five years after closure.* Environmental Management. 15: 715 – 727.

Landau, D. 2001. *Antarctic Tourism: What are the limits?* World Tourism Convention – Striking a new balance – Exploring new horizons; October 31 – November 2, 2001, Hobart, Tasmania.

Maritime Today. 4 June 2004. *Air pollution rules nearing entry into force.* http://maritimetoday.com/more.cfm?ID=14164 (8 June 2004).

Moe, Kjell A. Senior Environmental Consultant, Alpha Environmental Consultants. Personal communication.

Moe, K.A., Brude, O.W., Garsfjord, G., Dahle, E.A., Johansen, Ø. and Skognes, K. 2004. *Skipstrafikk i området Lofoten-Barentshavet – miljørisiko ved uhellshendelser.*

Monz, C. A., Pokorny, T., Freilich, J., Kehae, S. and Ayers-Baumeister, D. 2000. *The consequence of trampling disturbance in two vegetation types at the Wyoming Nature Conservancy's Sweetwater River project area.* USDA Forest Service Proceedings RMRS-P-15, 5: 153 – 159.

MOSJ – see Norsk Polarinstitutt.

New Scientist. 3 April 2004. *Massive growth of ecotourism worries biologists.* http://www.newscientist.com/news/news.jsp?id=ns99994733 (4 March 2004).

New Scientist. 22 May 2004. *Toxic chemicals from ice-breaking ships are polluting Antarctic seas.*

New Zealand Department of Conservation. 1998. *A place for man? An introduction to the management of tourism in New Zealand's Subantarctic islands.*

Niimi, A.J. 04.19. 2004. *Environmental and economic factors can increase the risk exotic species introductions to the arctic region through increased ballast water discharge.* Environmental Management. 32 (2).

Nordic Council of Ministers. 2003. M*iljøovervåking av ferdselsslitasje – Grønland, Island og Svalbard.* Tema Nord 2003:530

Norges Rederiforbund. 2003. *Miljøvennlig skipsfart – Miljøprogram 2003 – 2007.*

Norges Rederiforbund. 19 Februrary 2004. *Nye internasjonale miljøkrav snart på plass.* http://www.rederi.no/articlegethtml2.asp?ArticleID=4247 (4 March 2004).

Norwegian Ministry of Justice and the Police. 2002. *Sjøsikkerhet i farvannene rundt Svalbard.*

Norwegian Ministry of Justice and the Police. *Stortingsmelding nr. 9 (1999 – 2000): Svalbard.*

Norwegian Ministry of Justice and the Police. 1991. *Forskrift om turisme og annen reisevirksomhet på Svalbard*, FOR 1991 –10 – 18 nr 671.

Norwegian Ministry of the Environment. *Ot.prp.nr. 38 (2000 – 2001): Om lov om miljøvern på Svalbard (Svalbardmiljøloven).*

Norwegian Ministry of the Environment. Stortingsmelding nr. 22 (1994 –1995): *Om miljøvern på Svalbard.*

Norwegian Ministry of the Environment. *Forskrift om opprettelse av fuglereservater og større naturvernområder på Svalbard*, FOR 1973 – 06 – 01 nr 3780.

Norsk Polarinstitutt. 10 May 2004. *Miljøvervåking av Svalbard and Jan Mayen* (MOSJ) website. http://miljo.npolar.no/mosj/start.htm (2 June 2004).

Oceana. 2004. *Cruise ship waste – laws and regulations. Fact sheet.* http://www.oceana.org/uploads/!Cruise_Ship_Waste-Laws&Regs.pdf (6 April 2004).

Oceans Blue Foundation. 2002. "*Blowing the whistle*" *and the case for cruise certification – a matter of environmental and social justice under international law.*

Ocean Conservancy. 2002. *Cruise control.*

Overrein, Ø. 2001. *Svalbard – et av de best forvaltede villmarksområder i verden? Prinsipper for god villmarksforvaltning.* Norsk Polarinstitutt Rapportserie. nr. 116.

Overrein, Ø. 2002. *Virkninger av motorferdsel på fauna og vegetasjon. Kunnskapsstatus med relevans for Svalbard.* Norsk Polarinstitutt Rapportserie nr. 119.

Pedersen, Å. 1998. *Turisme og naturvern.* WWF International Arctic Programme.

Peterson, C., Rice, S., Short, J., Esler, D., Bodkin, J., Ballachey, B. and Irons, D. *Long-term ecosystem response to the Exxon Valdez oil spill*. 2003. In: Science. 302: 2082 – 2086.

Polar Tourism: 2004. *Experience gained and lessons learned from Svalbard*, paper submitted by Norway to the Antarctic Treaty Meeting of Experts on Tourism, March 22 – 25, 2004, Norway.

Press Herald. 9 April 2004. *Cruise ship bill nearly law.* http://www.pressherald.com/news/statehouse/040409cruise.shtml (13 April 2004).

Prestrud, P. 2003. Vurdering av landmiljøet på Svalbard: Påvirkninger, tilstand og tiltak. Norwegian Polar Institute report series (in prep).

Quillfeldt, Cecilie H. von (editor). 2002. *Rapportserie nr 118, Norsk Polarinstitut. Marine verdier i havområdene rundt Svalbard.*

Rainforest Alliance. 2004. Smart Voyager program website. http://www.rainforest-alliance.org/programs/tourism/smartvoyager/index.html (18 March 2004).

Reuters. 4 May 2004. *Marine organisms threaten Seychelles ecology*. http://www.enn.com/news/2004-05-04/s_23421.asp (13 May 2004).

Råheim, E. 1992. *Registration of vehicular tracks on the Svalbard archipelago*. Norsk Polarinstitutt Meddelelser nr. 122.

Science Daily. 23 December 2003. *Exxon Valdez oil spill impacts lasting far longer than expected, scientists say*. http://www.sciencedaily.com/releases/2003/12/031219073313.htm (7 April 2004).

Shears, J., Theisen, F. Bjørdal, A. and Norris, S. 1998. *Environmental Impact Assessment – Ny-Ålesund international scientific research and monitoring station, Svalbard*. Norsk Polarinstitutt Meddelelser nr. 157.

Sysselmannen – see Governor of Svalbard.

Svalbard Environmental Protection Act (Lov om miljøvern på Svalbard/Svalbardmiljøloven), Lov 2001-06-15 nr 79.

Svalbardposten. 23 July 2004. Issue no. 29. *Trøbbel for turistnæringen.*

Sørbel, L. and Tolgensbakk, J. 2001. *Undersøkelser av sporskader i Gipsdalen, Svalbard*. Geologisk Inst. Universitetet i Oslo. Rapport til Sysselmannen..

The News. Mexico City. 31 March 1998. *Cruise Ship agrees to pay for environmental damage*. Accessed at http://csf.colorado.edu/mail/elan/apr98/0002.html (19 April 2004).

The Orator. 1 April 2004. Clean Cruise Ship Act of 2004. http://www.theorator.com/bills108/hr4101.html (21 April 2004).

Theisen, F. and Brude, O.W. 1998. *Evaluering av verneområder på Svalbard – Representativitet og behov for ytterligere vern*. Norsk Polarinstitutt Meddelelser no 153.

U.S. Coast Guard. 2004. 5 March 2004. *Cruise Ship Consumer Fact Sheet.* http://www.uscg.mil/hq/gm/cruiseship.htm (25 March 2004).

U.S. Environmental Protection Agency. 23 March 2004. Oil Learning Center. http://www.epa.gov/oilspill/eduhome.htm (14 April 2004).

Vistad, O. I., and Kaltenborn, B. P. 1997. *Plan for overvåkning av miljøpåverknad av Svalbard, forårsaka av friluftsliv og turisme*. Østlandsforskning, ØP-Rapport nr. 14/1997.

WWF. 2003a. *The Prestige: one year on, a continuing disaster.*

WWF. 2003b. *The Barents Sea Ecoregion – a biodiversity assessment.*

WWF. 2004a. *Ballast water convention: a step in the right direction.* http://www.panda.org/about_wwf/what_we_do/marine/news/news.cfm?uNewsID=11264 (2 February 2004).

WWF. 2004b. *TBT – Alternatives.* http://www.panda.org/about_wwf/what_we_do/toxics/what_we_do/educating/tbt_alternatives.cfm (10 January 2004).

WWF. 2004c. *Financing marine conservation – A menu of options.* http://www.panda.org/downloads/marine/fmcnewfinal.pdf.

WWF International Arctic Programme. 14 June 2004. WWF International in the Arctic website. http://www.panda.org/arctic (30 July 2004).

Øritsland, N. A. 1970. *Temperature regulation of the polar bear* (Thalarctos maritimus). Comp. Biochem. Phys. 37: 225 – 233.

Øritsland, N. A., Engelhardt, F. R., Juck, F. A., Hurst, R. J. and Watts, P. D. 1981. *Effects of crude oil on polar bears*. Environmental studies No. 24. Indian and Northern Affairs. Ottawa.

WWF International Arctic Programme
P.O. Box 6784 St. Olavs plass
N – 0130 Oslo, Norway
T: (+47) 22 03 65 00
http://www.panda.org/arctic

WWF