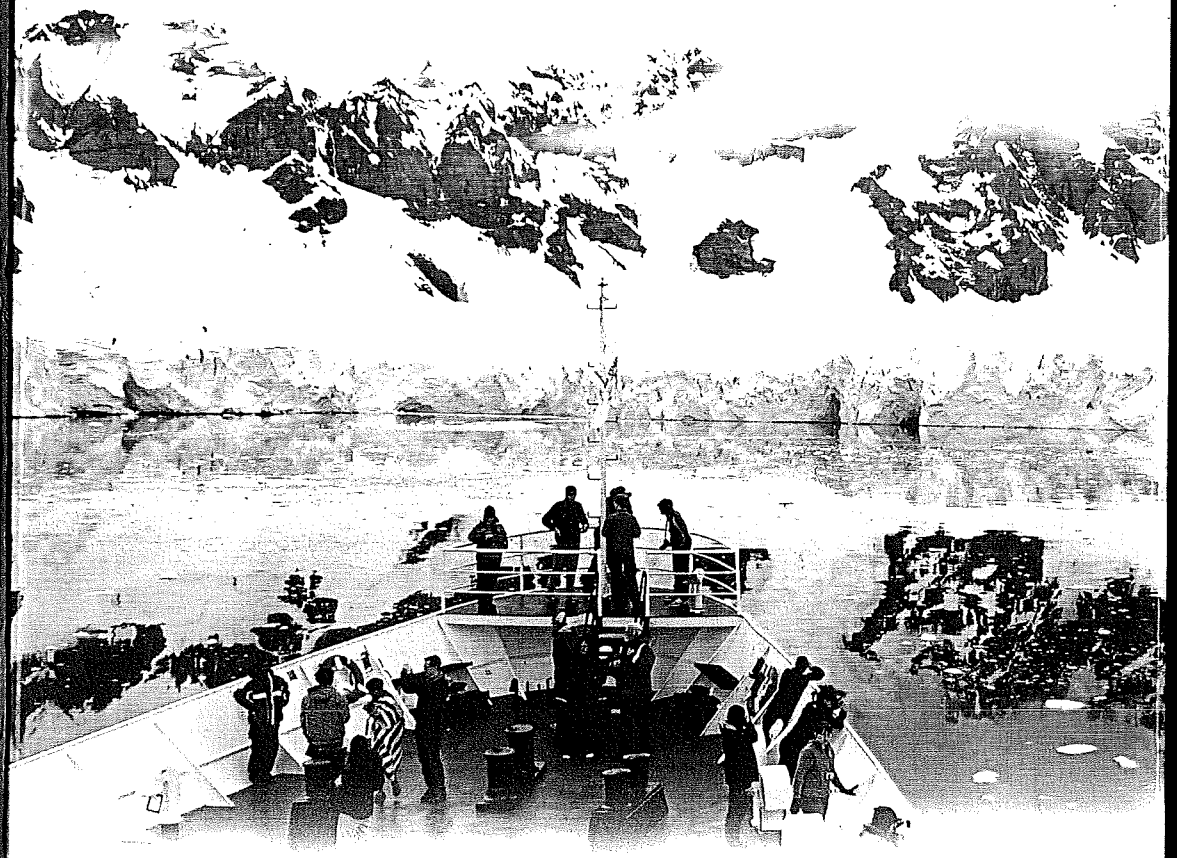
CRUISE TOURISM IN POLAR REGIONS

Promoting Environmental and Social Sustainability?



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Climate Change and its Implications for Cruise Tourism in the Polar Regions

Machiel Lamers and Bas Amelung

Introduction

Since the Industrial Revolution some 250 years ago, the Earth's climate has unmistakably changed. Global mean temperature has risen by around 0.76°C since the end of the 19th century. The Intergovernmental Panel on Climate Change (IPCC, 2007) recently stated that the 'warming of the climate system is unequivocal'. The IPCC also claims that the effects of climate change are most heavily felt at high latitudes, where there is relatively little human activity. The polar regions are particularly affected by climate warming, especially the Arctic region and the Antarctic Peninsula (ACIA, 2005; Johnston, 2006). Changes predicted include decreased sea ice, warmer and shorter winters, thawing permafrost and changes in wildlife populations. Average winter temperatures in the Arctic have already increased by 3° over the past 60 years and the sea ice extent has reduced by 10 per cent over the last 30 years (ACIA, 2005). In the Antarctic Peninsula annual mean temperatures have risen by about 2° in the past 50 years, resulting in the loss of seven ice shelves (Clarke and Harris, 2003).

At the same time, tourism – and cruise ship tourism, in particular – has grown rapidly in both polar regions. In the Antarctic, cruise tourism has increased rapidly from a few hundred passengers annually in the 1980s to over 45,000 recently (Enzenbacher, 1993; IAATO, 2008). Tourist numbers in the Arctic are considered more difficult to calculate due to unclear delineation of the Arctic region and the multitude of nations involved. Nevertheless, around Svalbard the number of cruise tourists increased from almost 15,500 on 24 ships in 1997 to 34,900 passengers on 49 vessels in 2006 (Sysselmannen på Svalbard, 2006). It has been estimated that for the European Arctic region only (consisting of Northern Scandinavia, Iceland, Greenland and Svalbard), tourist numbers already exceeded 100,000 visitors per year in 2002 (Nordic Council, 2003). Recently this figure has grown significantly, as the Norwegian North Cape alone attracts close to 200,000 visitors annually.[1] Tourism

activities in the Canadian Arctic (approximately 225,000 tourists) and Alaska (more than 1 million per year) (AHDR, 2004, Dawson et al, 2007) illustrate the considerable interest in Arctic tourism. The type and scale of tourism activity in the vast Russian Arctic is largely unknown. The total number of tourists travelling to the Arctic region aboard cruise vessels has been estimated at 1.2 million in 2004; by 2007, this number had more than doubled (AMSA, 2009). The effects of climate change and the growing role of tourism in the polar regions raises questions on the relation and the combined impacts of the two sources of change (Stonehouse and Snyder, 2007).

Most of the temperature change observed globally since the middle of the 20th century can very likely be attributed to human activities that are increasing greenhouse gas concentrations in the atmosphere. One of these activities is tourism, which accounts for an estimated 5 per cent of total emissions. A large share of tourism-induced emissions is produced by aviation (40 per cent) and other modes of transport (35 per cent). Tourism's prominence as a source of emissions is growing rapidly as a result of increasing numbers of tourists, a disproportional growth of long-haul trips, and a shift towards the aircraft as the preferred mode of transport (Gössling, 2002).

Tourism as a sector is highly climate sensitive. Enjoyable weather, an interesting natural landscape, sufficient levels of biodiversity, and an adequate supply of water are only a few of the climate-related factors that are of great importance for tourist attraction and satisfaction. Climate change is therefore a very relevant issue for the tourism industry. Indeed, the impacts of a changing climate are already becoming evident at destinations around the world. Winter sport destinations have been among the first to experience the effects of climate change, as snow lines move up and snow reliability goes down (e.g. Breiling and Charamza, 1999). Major changes are also expected for other types of destinations, including the Mediterranean (Amelung and Viner, 2006; Perry, 2006), mountain regions (Scott, 2006) and small island states (Becken and Hay, 2007), and, indeed, for the global distribution of tourism activities.

After a hesitant start, the tourism industry is now quickly acknowledging climate change as a key strategic factor. The United Nations World Tourism Organization (UNWTO) has played a crucial role in this process of awareness-raising by organizing two major international conferences on climate change: the first one in Djerba (2003) and the second one in Davos (2007). Scientific information about the impacts of climate change on tourism is still scarce. Some material on impacts is available for winter sports and a few other tourism activities, and for some regions; but large gaps in our knowledge remain. Few if any empirical studies have been performed on Africa, Asia, Latin America and the polar regions (Hall, 2008). It has been argued that the relation between global (environmental) change factors and polar tourism are under researched (Stewart et al, 2005).

Specifically for the polar regions, Johnston (2006), Dawson et al (2007), Stewart et al (2007) and Snyder (2007) have identified a number of possible mechanisms through which climate change may affect tourism. The purpose of this chapter is to systematically review and critically discuss the implications of climate change for tourism in the polar regions. The aim is to identify ways to improve the knowledge base of climate change and cruise tourism in the polar regions. The assessment is limited to cruise tourism, currently the dominant type of tourism in the Antarctic and rapidly growing in both the Arctic and the Antarctic region.

The chapter is organized as follows. The latest relevant knowledge on climate change in the polar areas is summarized in the next section. A typology of climate change impacts upon tourism is introduced afterwards. Using this typology, the potential impacts for cruise tourism in the Arctic and Antarctic, respectively, are presented. This section also contains reference to the greenhouse gas emissions of cruise tourism in the polar regions. The final two sections compare the findings for the two polar regions and proposes a research agenda.

Climate change in the polar regions: An overview

Climate change typically leads to rapid warming across the polar regions. Mean temperatures in the Arctic region have risen twice as fast as in the rest of the world. Glacial melting, reduction in sea ice thickness and extent, snow and ice cover on land, and shorter and warmer winters are among the changes that are expected (Snyder, 2007). However, in the Arctic as well as in the Antarctic region change is not uniform. For instance, some areas have been reported to be cooling rather than warming. Climate in the Arctic is undergoing dynamic change – for example, in the case of variability in precipitation (Johnston, 2006).

In the European and Canadian Arctic, some endemic marine species will relocate to the north. Permafrost in Siberia and Canada will retreat northwards, and thawing will increase infrastructure damage. On a positive note, an open Northeast Sea Route is expected to generate economic activity in Siberia and facilitate access to natural resources. Sea ice retreat in the Canadian Arctic may also likely open up this sub-region for shipping (Stewart et al, 2007). In the recent Arctic Marine Shipping Assessment (AMSA), the opportunities for future cruise tourism in the Arctic receive considerable attention. The potential future physical effects caused by climate change in the Arctic are given in Figure 10.1.[2] In the Antarctic, regional differences in climate change are more profound. Climate warming is very rapid in the Antarctic Peninsula region, while average temperatures on continental Antarctica remain stable. Recent cooling has been reported at the South Pole (Clarke and Harris, 2003). Due to the limited number and length of available data series, climatic changes in the Antarctic are more difficult to establish.

Climate change is expected to have profound impacts upon the biodiversity of the polar regions. In fact, according to Sala et al (2000), climate change is the single largest threat to biodiversity in the polar regions, whereas land-use change has the greatest impact upon biodiversity on a global scale (Sala et al, 2000). Biologists have already noticed that algae and other species from the warmer waters of the Atlantic Ocean are moving into polar waters. As the endemic Arctic species have nowhere to go, this 'Atlantification' of the Arctic leads to reduced biodiversity (Schiermeier, 2007).

In general, species are migrating polewards to previously cooler climates (McCarty, 2001). Some species, such as flying birds and rapidly reproducing species, may be able to move quickly enough to keep up with climate change. The ability of other species to adapt, such as Macaroni penguins (Cresswell et al, 2008), may

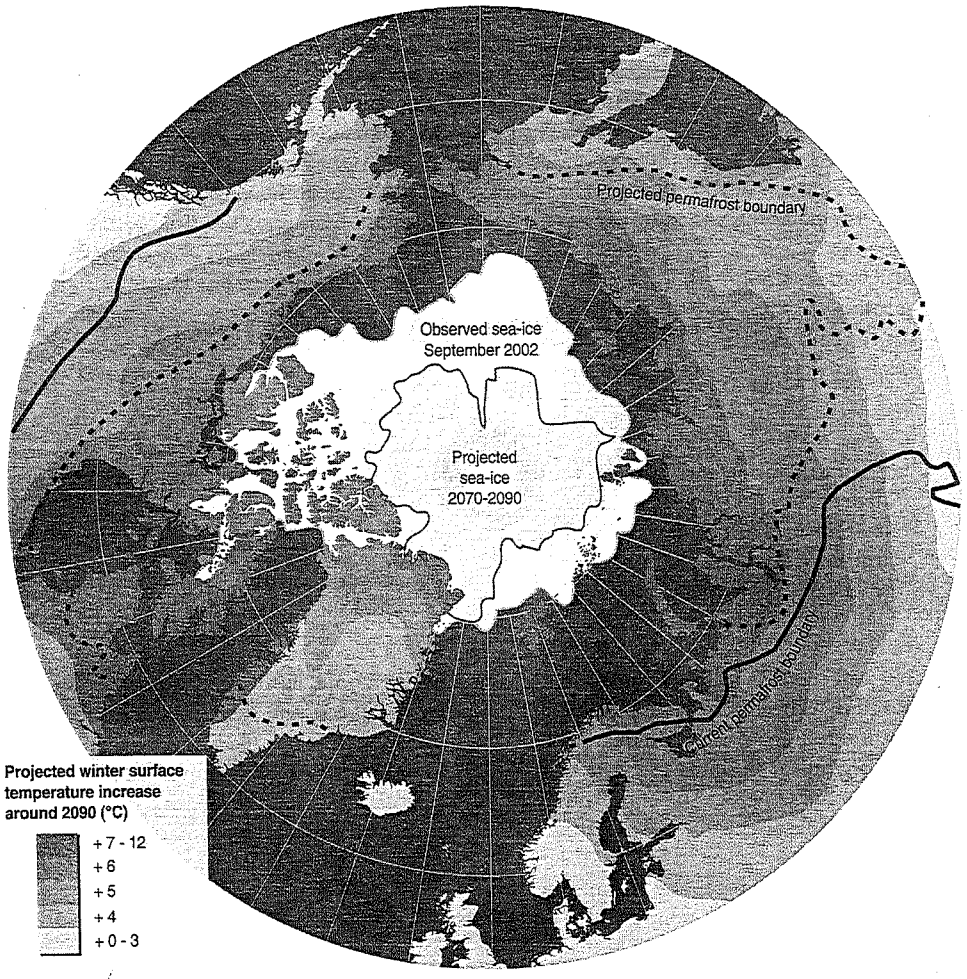

Figure 10.1 *Projected changes in the Arctic climate, 2090*

Source: ACIA (2005)

be insufficient to avoid a major decline of their populations. Species such as the collared lemming in Canada (Kerr and Packer, 1998) and the polar bear (Stirling and Derocher, 1993; ACIA, 2005) that depend on habitats which disappear altogether, run the risk of becoming locally extirpated or, at worst, extinct. An overview of the main polar climate changes is provided in Box 10.1.

Box 10.1 *Overview of polar climate changes reported in several studies*

- The Arctic and Antarctic Peninsula are warming rapidly and accelerated changes are projected.
- Arctic and Antarctic Peninsula warming have worldwide implications with regard to sea-level rise.
- Arctic vegetation zones are very likely to shift, causing wide-ranging implications.
- Animal species' diversity, ranges and distribution will change in both polar regions.
- Increased precipitation is projected.
- Many coastal communities and facilities face increasing exposure to storms.
- Reduced sea ice is very likely to increase marine transport and access to resources.
- Thawing ground will disrupt transportation, buildings and other infrastructure.
- Indigenous communities will face major economic and cultural impacts.
- Elevated ultraviolet radiation will affect people, plants and animals.
- Multiple influences interact to cause impacts upon people and ecosystems.

Source: ACIA (2005); Johnston (2006); Stonehouse and Snyder (2007); AMSA (2009)

A typology of impacts of climate change on tourism

A comprehensive overview of current knowledge about the relationships between climate change and tourism is provided by Scott et al (2008). In discussing the impacts of climate change, they distinguish four broad categories: direct climatic impacts, indirect environmental change impacts, impacts of mitigation policies, and indirect societal change impacts.

The category of direct climatic impacts encompasses the changes in climatic conditions that tourists experience in their holiday destinations. Climatic conditions may become more or less suitable for certain tourist activities and the distribution of suitable conditions throughout the year may change. On the supply side, direct climatic impacts may result in changing heating and cooling requirements. It is expected that the direct climate effects on cruise ship tourism in the polar regions will be minimal.

Indirect impacts are the effects that climate change has on the environment in which tourists spend their holidays, impacts of mitigation polices, and wider societal change mechanisms. Indirect environmental impacts consist of a broad category of impacts, including changes in landscape, coastal erosion, water shortages, biodiversity, and lack of snow. Such changes are crucial for tourism as most tourist activities are related to specific places. One needs snow for skiing, a beach for 'sea, sun and sand' fun, an attractive landscape for trekking, and water-demanding greens for playing golf. Damage to infrastructure also belongs to this category. In earlier review

papers on climate change and tourism in the polar regions a distinction is made between different types of impacts that climate change might pose, such as impacts upon infrastructures, effects on access and attractions (Johnston, 2006). Dawson et al (2007) adopt this typology and add stakeholder capacity as a category of impact.

Besides these two 'traditional' impact categories, there are two other groups of impacts that are much less location specific. One of these is the impact of mitigation policies on tourist mobility. Transport is a pivotal element of tourism, and any change in its cost or accessibility can have repercussions for tourism. Further indirect societal changes may affect polar cruise tourism. Since images of the polar regions are often featured in media reports on climate change, public awareness of the polar regions is growing. Tour operators claim that tourists wish to see the beauty of the polar regions 'before it all melts'. Calving glaciers and suffering polar bears are among the main icons of the climate change public imagery that people may wish to see for themselves (Stonehouse and Snyder, 2007). At the same time, these images may result in increased public support for environmental protection of these regions.

The generic framework proposed by Scott et al (2008) lends structure to the overall assessment, but provides little guidance in identifying and discussing the climate change impacts that are most relevant to the polar regions. This holds particular truth for the direct impacts and the indirect environmental impacts that are most location

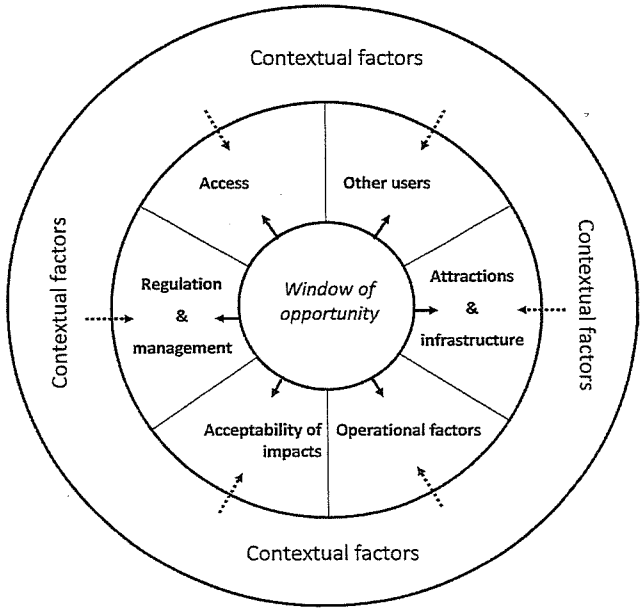

Figure 10.2 *The Antarctic Tourism Opportunity Spectrum (ATOS)*

Source: Lamers (2009)

specific. In order to structure the analysis in these two areas, the Antarctic Tourism Opportunity Spectrum (ATOS) framework complements Scott's framework. Derived from the Recreational Opportunity Spectrum (Clark and Stankey, 1979), ATOS was developed by Lamers et al (2008) to analyse opportunities and trends in Antarctic tourism, including climate change. Whereas the ATOS framework was originally developed for Antarctica, it is easily extended to include the Arctic region, as the key features of tourism in both areas are highly similar (see Figure 10.2).

In the ATOS framework, the 'window of opportunity' for tourism in polar destinations is made up of six elements: access (ease of visitation), non-tourism uses of the area (existence of rival or complementary activities), attractions and facilities (things for tourists to see and do), operational factors (know-how and equipment required to organize polar holidays), acceptability of impacts (sensitivity of the relevant stakeholders to visitor impacts), and regulation and management (institutions to control or foster tourism). Climate change may affect polar cruise tourism through each of these six factors. The ATOS framework also discusses a wide range of 'contextual' factors that affect polar tourism 'from the outside world'. In the context of climate change, the most important of these are the indirect societal impacts and the impacts of mitigation policies that feature in Scott's framework.

Impacts on polar cruise tourism

Historically, Arctic economies were almost exclusively based on the exploitation of natural resources: hunting and fishing, oil and gas exploitation, and mineral extraction. The Antarctic knows no indigenous population and the economy has emerged relatively recently with the development of science and tourism (White, 1994). Major constraining factors, such as access, extreme climatic conditions and the lack of technology to deal with these constraints are undergoing rapid change in both polar regions (ACIA, 2005; Snyder, 2007). Technically, it becomes possible to work under extreme weather conditions, while climate change leads to different, and often less extreme, weather types. Although the effects for fisheries, mineral exploitation, forestry and other economic sectors have been explored in the Arctic Climate Impact Assessment (ACIA), tourism has received little attention. Nevertheless, tourism is generally recognized as one of the important growth sectors in the Arctic, capable of diversifying and increasing the opportunity of income for local communities (AHDR, 2004; Snyder, 2007). For the Antarctic, so far, no equivalent study to the ACIA has been undertaken. Increased media attention, due to the International Polar Year as well as the visible effects of climate change, such as iceberg calving and the images of melting glaciers and wildlife at risk, is feeding the desire of people to experience the polar regions. It is generally expected that tourism in the polar regions will continue to grow and diversify in the future (Snyder and Stonehouse, 2007). Moreover, cruise tourism is among the most rapidly growing tourism sectors in the world (WTO, 2001). In this section, we discuss those effects of climate change that will probably affect polar cruise tourism (for an overview see Box 10.2).

A generally made observation is that reduction of sea ice extent will increase tourism access to the polar regions, particularly by cruise vessels (Snyder, 2007). Sea ice reduction has made it possible to circumnavigate Svalbard during the summer months.[3] Also in the Antarctic, new channels and islands have emerged from receding sea ice and glaciers, such as James Ross Island in the Antarctic Peninsula (Crosbie and Splettstoesser, 1997; Stonehouse and Snyder, 2007). However, these new sites and areas are often not attractive for tourists to see as there is no wildlife.[4] The scenic Lemaire Channel cannot be sailed at the start of the tourist season, and may open up earlier in the season in the coming decades.[5] The Antarctic summer season is also believed to become longer (Stonehouse and Snyder, 2007). Stewart et al (2007) argue that although the Canadian Arctic will become more accessible by cruise ships, the perils of hull penetration by icebergs and multiyear sea ice also grow. During recent years several incidents occurred both in the Arctic and Antarctic involving expedition cruise ships, such as the sinking of the *Explorer*. It has been suggested that incidents such as these might occur more often in the future as cruise tourism grows in both polar regions, without a solid understanding of the changing physical conditions (Stewart and Draper, 2008; AMSA, 2009). Indirect societal impacts include the awareness that climate change generates of the polar regions among the public, and the perceived accessibility.

Figure 10.3 *Kangiqsujuaq (bottom right) in Nunavik (northern Quebec): A place frequently visited by cruise ships in recent years*

Source: Machiel Lamers, 2008

Another indirect effect of growing accessibility due to climate change is the emergence of other resource users, such as fisheries, mining and hydrocarbon extraction. Tourism may have conflicting interests with these extractive forms of resources use. It remains to be seen to what extent the local communities, particularly in the Arctic, jump on the tourism bandwagon in the coming decades to capitalize on their attractions. In recent years, Greenland has made tourism development a priority in their economic policy (AMSA, 2009). In Nunavik (northern Quebec), the Inuit have founded a cruise company called Cruise North (Dawson et al, 2007). A lot depends on the capacity of the communities to really benefit from tourism in terms of education and capital (see Figure 10.3).

Effects on key attractions of the polar cruise industry pose an obvious impact. The polar bear is a major attraction of the Arctic region that might be on the edge of extinction due to its dependence on sea ice for hunting seals. In both the Arctic and Antarctic, variations and fluctuations in sea ice may affect the growth of krill and copepods, which is the foundation of the food chain and affects attractive species, such as seals and whales. In addition, warmer temperatures have already resulted in a southward shift of species in the Antarctic. For example, populations of various penguin species have shifted considerably in the Antarctic Peninsula (Lynch et al, 2008) – shifts that have been related to climate change (Forcada et al, 2006). For example, Gentoo penguins have become more dominant on Petermann Island in recent years, whereas Adélie penguin colonies have started to abandon the island and move further south (see Figure 10.4).[6] Invasive species, pests and pathogens might also be successfully introduced in vulnerable polar ecosystems (Frenot et al, 2005). Warmer summers may lead to more insects in the Arctic region and a nuisance for shore visits. Thawing permafrost and increased exposure to storm surges may lead to coastal erosion – for example, as in the striking case of the Alaskan village of Shishmaref that is disappearing.[7] Next to impacts upon the physical landscape, the built environment and infrastructure upon which cruise tourism is dependent might also be affected. These changes may seriously affect the scenic qualities of the polar landscape as well as key tourism infrastructures. It is even reported that tourists have become disappointed with not seeing ice in the Arctic (Pagnan, 2003). Finally, climate change is reported to affect cultural heritage sites in both polar regions – for example, it has been argued that surface resources that are anchored in the permafrost may destabilize. In addition, permanently frozen materials will be subjected to freeze-thaw cycles, which may accelerate decomposition (Barr, 2008).

Changing environmental conditions, changing customer demands and growing numbers and types of tour operators may require additional or adapted operational standards and guidelines. The potential increase in operational risks for cruise tourism in certain parts of the polar regions (Stewart et al, 2007) and the increased vulnerability of ecosystems present compelling reasons for adapted operational guideline regulations. Both individual tour operators, as well as industry associations, may need to come up with adaptive strategies. It remains to be seen whether different segments of the polar cruise industry (e.g. smaller- and larger-scale cruise companies or land-based businesses) have the same interests in the face of global environmental change.

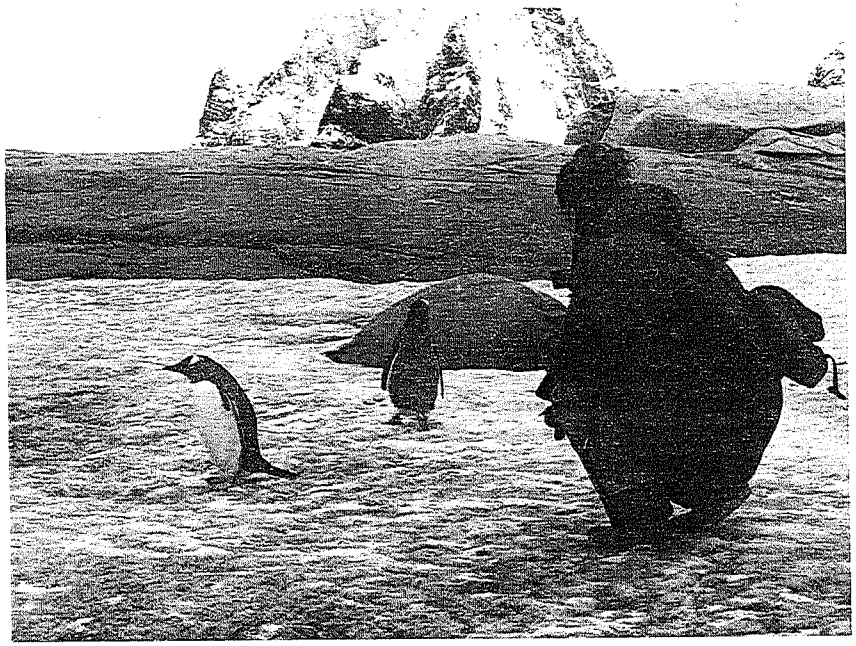

Figure 10.4 *Increasing numbers of Gentoo penguins and declining numbers of Adélie penguins on Petermann Island in the Antarctic Peninsula: How important is it to the tourist?*

Source: Machiel Lamers, 2009

As climate change and its direct and indirect effects occur, it is becoming increasingly difficult to separate impacts caused by tourism from other impacts. The acceptability of impacts in the polar regions will subsequently be greater. Since both of the polar regions are to a large degree dependent on long-haul flights, large amounts of the greenhouse gases are emitted to make polar tourism possible (Amelung and Lamers, 2007; Dawson et al, 2008). Tourism development therefore depends on the acceptability of impacts upon the local and regional scale, but also on the acceptability of the global impacts of tourism activity. At this point in time, it is not clear what the net effect will be of images of suffering polar bears, changing traditional cultures and calving glaciers: more visitation or more support for protective measures? Research has already shown that the European consumer associates Arctic destinations with climate change (Huebner, 2009). A number of polar cruise operators also suggest that the attention of climate change in the media is beneficial for their business.[8]

Finally, climate change may affect cruise tourism through climate change policies on both the national and international level. It is likely that national and international carbon mitigation policies will at some point affect the price of long-haul travel (Amelung and Lamers, 2007; Gossling et al, 2008). It has also been suggested that the management of protected areas, particularly in the North, may need to be reconsidered, as the original objective of preserving ecological and natural qualities

of these parks cannot be guaranteed due to global changes (Stonehouse and Snyder, 2007). Another indirect effect of climate change and the increasing opportunities for economic development in the Arctic is the growing role of self-governance of Arctic indigenous peoples (AHDR, 2004). The degree to which they are willing to accommodate or develop cruise tourism is an important potential future factor. Furthermore, increasing geopolitical tensions in the Arctic may entail that certain areas will be militarized, or that tourism development may be used as a policy strategy to expand influence (Heininen, 2005).

Discussion

The objective of this chapter was to provide an outlook on the implications of climate change for cruise tourism in the polar regions based on the available literature and empirical evidence. It became apparent that the empirical basis for such an assessment is hardly available. Conceptualizing the impacts of climate change upon polar tourism requires a comprehensive understanding of the major historical and current climate–environment–tourism relationships. Today, this understanding is still very limited.

The available literature on the topic of climate change and polar tourism has struggled with the same problem. Studies such as those by Johnston (2006) and Snyder (2007) present a range of assumptions regarding possible or likely impacts; but empirical work is needed to test their accuracy. After all, climate change can have consequences that are different from those envisaged in conjectural exercises. For example, whereas a reduction in the amount of sea ice is commonly interpreted as facilitating access, Stewart et al (2007), in a study on the Canadian polar waters, suggest that the breaking-up of sea ice is increasing safety risks to the extent that accessibility is reduced. Climate change may increase operational risks more than previously assumed.

Perhaps even more difficult than establishing whether the projections are likely or true is gauging the relevance of the various impacts suggested and establishing priority lists of the most pressing issues. Is the dominant impact of climate change the disappearance of landmark species or landscapes, changes in access, increases in transport prices or yet another factor? To have a list of priority issues is important for adaptation by tour operators, destinations, polar managers and other stakeholders; but with the current level of understanding, such a list cannot be drawn up. This chapter adds a number of issues to the discussion that were not included in previous assessments; but it also reiterates many of the ideas from earlier overview papers. Producing lists of possible impacts is important; but what this field of research needs most is empirical work to establish some basic facts.

Thus far, climate change research and polar research have been dominated by the natural sciences. Many effects that climate and climate change may have on physical, ecological and biological systems have been identified, and their likelihood and implications assessed. The social sciences are nowhere near this level of understanding with respect to the links between climate (change) and human communities in the polar regions. As the livelihoods of millions of people – in the Arctic, Antarctic gateway

Box 10.2 *Implications of climate change for polar cruise ship tourism*

Indirect environmental impacts

Access:

- Decline in sea ice extent leads to extending shipping season.
- Glacier melting leads to increased iceberg hazards.
- Increased open water leads to increased storm surges.

Other users:

- Increasing presence of other resource users with potential conflict.
- Increased tourist ship numbers leads to local employment opportunities that may be difficult to meet due to lack of training in hospitality management.

Attractions:

- Ecosystem changes lead to changes in the distribution and abundance of species.
- Ecosystem changes lead to the appearance of new species.
- Storm surges lead to shoreline erosion.
- Scenic values are altered through physical and ecological changes.
- Impacts upon cultural heritage sites may occur.
- Changing cultures, identities and ways of life of Arctic peoples as a result of climate change are taking place.

Infrastructure and facilities:

- Sea-level rise and storm surges cause structural damage and mobility challenges.
- Permafrost melting leads to construction problems and structural damage.

Indirect societal impacts

Operational factors:

- Adaption strategies are necessary for both cruise companies and land-based service providers.
- Increased perils: safety, environment, nuclear.
- Marketing must anticipate consumers who wish to see climate change in action.

Acceptability of impacts

- Higher acceptability of impact due to difficulty to extract tourism impact from global environmental impacts.

Impacts of mitigation and adaptation policies

- Potential implementation of a carbon tax could increase transportation prices.
- Geopolitical tensions and conflicts in the Arctic region may lead to tourism development becoming a policy instrument.
- Transformation of protected areas: re-evaluation of management objectives and regulations.

Source: Pagnan (2003); Johnston (2006); Amelung and Lamers (2007); Dawson et al (2007); Snyder (2007); Stewart et al (2007); Stonehouse and Snyder (2007); Barr (2008)

cities and those employed by polar cruise operators – will be affected by climate change, and as many see tourism as a potential source of income in the polar regions, knowledge of societal impacts and options for adaptation are essential. Implications for the Arctic, with its indigenous population, may be even more profound and significant than for the Antarctic. The baseline of social scientific knowledge must be significantly expanded.

A first avenue for further work is the collection of better tourism statistics, particularly in the Arctic region. Climate change impacts and adaptation strategies vary greatly between regions and seasons, so that tourism data must be of high enough spatial and geographical resolution. A relatively detailed, consistent and reliable dataset is available for the Antarctic, and it seems worth the effort to develop a similar database for the Arctic region.

A second field of follow-up research is related to using 'analogue years' to assess the potential implications of climate change. Climate change implies a shift in the probability distributions of temperature, precipitation and other weather variables. Most regions will become warmer, and so far the polar regions have heated up much more rapidly than average. Applying the technique of 'analogue years' to polar tourism means analysing the observed response of tourism stakeholders to the weather conditions in extremely hot years or seasons (such as the summer of 2003 in Western Europe). The idea is that the 'extreme' conditions may become 'average' conditions as a result of climate change, and thus that people's response to these conditions may tell us something about adaptation to climate change.

A third possible field for further research concerns the integration of available insights from the natural sciences with relevance for tourism. It may be possible, for example, to overlay current and future maps of sea ice (i.e. accessibility), the distribution of polar bears, penguins and other interesting fauna, heritage sites worth visiting, and other crucial factors in order to create tentative maps with vulnerability and opportunity hot spots. For one thing, such maps could help to identify interesting case studies for more in-depth research. For example, comparisons of perspectives of onsite stakeholders on perceived climatic changes, risks and adaptive strategies are an important way of learning to cope with changes ahead.

Conclusions

The aim of this chapter was to provide an overview of the possible implications of climate change for cruise tourism in the polar regions. Following Scott's (2008) generic framework of climate change impacts upon tourism, four categories of impacts were discerned. Direct effects (i.e. changes in tourists' physical comfort as a result of changing weather conditions) are deemed unimportant as pleasant weather conditions are generally not among the key reasons for visiting the polar regions.

Indirect environmental effects may be much more relevant, and past review papers have focused on this category of impacts and identified a number of potential results. Reduction in sea ice extent may broaden the shipping season and open up previously inaccessible areas, but it may also increase iceberg hazards. Landscapes and the distributions of species will be altered by climate change. The shrinking habitat

of the polar bear is a well-known example of a species that is endangered by climate change, but some other species will thrive. In the Antarctic area, penguin species move south in search of better conditions, with some of their former colonies being taken over by other penguin species. It is highly uncertain if tourists will notice the changes and how they will evaluate them. Visiting the sights for just a few hours, tourists will not be able to perceive any change firsthand. And with no context with which to compare the scenes, little experience may be gained. Even if changes are perceived as negative, this may have a positive (perverse) effect on tourist demand. Cruises to the polar regions are already advertised with slogans such as 'Visit the Arctic/Antarctic before it is too late.'

Apart from tourism, climate change will also affect other economic activities in the polar regions, such as the extraction of oil and other minerals. Under the current Antarctic Treaty, this is prohibited; but in the Arctic, tensions are building up over the control of the Arctic seas and their resources. In a direct sense, increased economic activity may reduce the attractiveness of the Arctic region for tourism as it affects its image as an unspoilt wilderness. In a more indirect sense, the increasing accessibility of mineral resources may lead to a more uncertain geopolitical situation, which is not conducive to a flourishing tourism industry. The same holds for a potentially considerable slow-down of economic growth, resulting from climate change, that the Stern report (Stern, 2006) warned of. The implications of the Stern report for (polar) tourism have yet to be explored.

Another issue that has so far escaped research attention is the possible effect of mitigation measures on tourism, particularly tourism to long-haul destinations (Gossling et al, 2008) such as the polar regions. Being among the most energy-intensive segments of the tourism industry (Amelung and Lamers, 2007; Dawson et al, 2008), polar tourism can potentially be hard hit by policy measures such as fuel taxes and emissions trading schemes. Transport prices will undoubtedly rise significantly, and so will holiday prices, especially for vacations with a large transport component in its price structure, such as cruise trips to the polar regions. Strange as it may seem, the first major challenge that climate change poses to polar cruise tourism may not come from climate change impacts, but from mitigation policies.

Perhaps the main conclusion of this chapter is that there is very little known about the relationships between the polar climate and polar (cruise) tourism, let alone about the possible implications of climate change. For the Arctic, part of this knowledge gap can be attributed to a lack of reliable tourism data of sufficient temporal and geographical resolution. Coordinated data collection is urgently needed. Other areas for social scientific contributions include the analysis of 'analogue years' in which human behaviour is studied in periods of extreme weather that resemble future climate conditions, and the integration of available geographical knowledge of physical, ecological and biological effects of climate change that are relevant to polar cruise tourism in order to identify vulnerability as well as opportunity hotspots.

Research into the implications of climate change for polar cruise tourism has a large societal relevance. Hundreds of thousands of livelihoods in the polar regions and beyond depend on it. It is therefore of utmost importance that a long-term approach towards monitoring and management is taken to strive for sustainable cruise tourism development.

Notes

1 Estimate made on the website of the fishing village Skarsvag, which is located close to the North Cape: www.skarsvag.no/index.php?option=com_content&view=article&id=85:north-cape&catid=45:sights&Itemid=223, accessed 25 September 2009.
2 Map produced by Hugo Ahlenius, 2005; available from the *UNEP/GRID-Arendal Maps and Graphics Library*, http://maps.grida.no/go/graphic/projected-changes-in-the-arctic-climate-2090, accessed 30 September 2009.
3 Pers comm with Dr K. de Korte, founder of (and working as itinerary planner for) Oceanwide Expeditions, November 2006.
4 Pers comm with Dr B. Stonehouse, Antarctic tourism researcher and lecturer aboard tourist ships, June 2007.
5 Pers comm with Dr K. de Korte, 2006.
6 Pers comm with Dr J. Watts, naturalist of Waterproof Expeditions, during an expedition cruise in March 2009.
7 See the trailer for the documentary *The Last Days of Shishmaref*: www.youtube.com/watch?v=TS1KRvojupA&feature=player_embedded#t=46.
8 Pers comm with P. Shaw, director of Quark Expeditions, in June 2007; and Dr K. de Korte, itinerary planner for Oceanwide Expeditions, in November 2006.

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