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Communities of practice in the management of an Arctic environment: monitoring knowledge as complementary to scientific knowledge and the precautionary principle?

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ABSTRACT. This article addresses knowledge management in governing vulnerable polar areas and tourism. Since the 1870s, Svalbard has been a cruise tourism destination. Due to less ice during the summer period, the number of tourists visiting the remote northeast corner of the archipelago has increased significantly, and the potential negative impact on this vulnerable natural environment has become an issue. The standard modes of managing these areas have either been to apply the precautionary principle or measures based on scientific evidence. As management models, however, both principles are contested for a number of reasons. This paper argues for a third model that is partly based on a form of monitoring knowledge that has circulated in 'communities of practice' and that has been developed over time. This form of knowledge constitutes viable expertise for the governing and management of the environment-tourism nexus in the area, but it needs to be acknowledged as a complementary management platform. This article demonstrates how such monitoring can be done, and it suggests some principles for the development of monitoring knowledge for administrative and management purposes.

Introduction

Knowledge is today understood as being multiple, with multiple claims to represent reality (Sandercock 1998). Knowledge has a variety of sources and forms. According to Gibbons and colleagues (1994), there is a growing heterogeneity in the types of knowledge production and much greater diversity in the sites at which knowledge is produced. The single epistemological ideal of a neutral view from nowhere has been replaced by multiple views (Nowotny and others 2003). Within the sociology of knowledge, there has been an emphasis on exploring how scientific knowledge is contested by other types of expertise and by lay knowledge (Wynne 1996). 'Only when the "ivory tower" is opened up and experts come to the "agora" is it possible to find out what elements they provide to formulate and implement policy decisions, and how these elements are actually used' (Liberatore and Funtowicz 2003: 147). However, there are a variety of ways to the agora, from patronising and marketing approaches, and informing the public about science and technology, to genuine debate on the way a problem is formulated, and how knowledge is developed and uncertainties are addressed. The problem of understanding and defining uncertainty is large, complex, and nearly intractable, making evidence-based decisions difficult. Uncertainty is also why the precautionary principle (a rejection of an activity not proved not to cause any harm) tends to be called upon in issues related to the environment. This is also the case in Svalbard. Due to increasing traffic, stricter regulation for east Svalbard was suggested, and in the lack of scientific knowledge the precautionary principle was asserted. The proposed regulation was quickly contested; in particularly criticised by the tourism industry, as well as disputed among academics. Hagen and colleagues reviewed the existing knowledge of the 'effects on fauna, vegetation and cultural heritage' (Hagen and others 2012: 2). Their general conclusion was that there are many holes in the stock of knowledge that is necessary to manage the area properly. They based their arguments on published scientific data, and not on the administrative data and different forms of tacit knowledge that also are used in the actual practice of management. We do not argue against the need for better scientific evidence; we argue, however, that there is a huge and viable stock of information, from field inspections of the governor's office and reports from different stakeholders, which do not seem to be valued. Our argument is that there is a 'community of practice' that is producing what we call monitoring data, which also should be included in the stock of knowledge provided for the sustainable management of the environment and the environment-tourism nexus in Svalbard.

The aim of this article is to highlight means to achieve reliable knowledge other than the standard scientific model, and that uncertainties can be managed through methods other than the application of the precautionary principle. In the case study, we argue that, although the available scientific knowledge was limited, evidence existed that was sufficient for management measures.

Evidence-based decisions: scientific or monitoring knowledge

The character and significance of scientific knowledge is a matter of debate within scientific communities and in society in general. One of the problems with knowledge as a base for management decisions is that the research community is not univocal. Also, most research-based knowledge can be interpreted in different ways, and even more important, it is rarely evident how it should be transformed into decisions. Moreover, scientific knowledge

is seldom updated, complete, unambiguous, and comprehensive. Often, alternative, and even contradictory, evidence exists. Research is, by nature, based on past or present observations, whereas decisions give direction for the future, in which the circumstances are always more or less unknown. In addition, for environmental issues, the scientific knowledge of an area tends to be scattered or anecdotal (Hagen and others 2012), and it can never cover all aspects of nature. Within the scientific community itself, universal accord concerning the interpretation of a situation or research results hardly ever occurs, and it occurs even less often when the results are about to be translated into politics. Thus, it is not realistic to expect all decisions to be 'evidence-proofed' (Head 2008: 5) or to be found on a level that is above epistemological differences. This means that there is competing evidence and alternative expert groups in the field. Van Dijk and colleagues (2011: 454), studying health politics, claim that, in policy making processes, there should always be a 'collection and analysis' stage in which different stakeholders are involved. This is a process in which 'policy-makers, scientists and experts, industries, trade unions, NGOs, patient organisations, citizens' panels … have different roles to play' (Van Dijk and others 2011: 454). When the authorities are making policy decisions in a field, not only scientific reports and evidence are on the table, but a whole variety of knowledge that, together, supports the decision makers. The terms 'monitoring knowledge' and 'adaptive monitoring' have been used for the type of knowledge used in the management of ecosystems similar to that at issue in this case (Lindenmayer and Likens 2009, 2010). In such monitoring, the focus has usually been to identify trends (for example whether environmental conditions are getting 'better' or 'worse'), according to Lindenmayer and Likens (2010: 6), who also state:

> Most successful monitoring programs are built on partnerships between people with different but complementary skills. These include scientists, statisticians, policy-makers and resource managers who may be from government and non-government organizations, universities, research institutions and other organizations.

Thus, monitoring partnerships and knowledge regimes are not only based on one, but on several types of knowledge and expertise. A widely used term for such partnerships is a 'community of practice', referring to the 'community' in which the monitoring knowledge is produced. Partnership models and communities of practice fit well with the recent governance traditions in Svalbard (Viken 2006, 2011; Viken and others 2014), which include a movement away from the dominance of hierarchy towards responsive and collaborative governance models. However, not all management proposals emerge within this frame. Svalbard is huge, vulnerable and challenging to manage and to scan scientifically. Therefore, the so-called precautionary principle has also been used as an argument for restricting access to parts of the islands.

Two alternative approaches: the precautionary principle and the community of practice

The precautionary principle

The precautionary principle is widely accepted as a steering principle in fields such as food management, health management, terrorism, and environmental governance. The principle is used mostly when there is believed to be a risk of negative effects of a type of action, but there is a lack of evidence of its harmfulness. For instance, this is the case concerning mobile phone use in airplanes; as a precaution, it is forbidden, although there is no research evidencing its harmfulness (Kriebel and others 2001). This illustrates both uncertainty concerning knowledge and the rhetorical power of the principle; despite the lack of evidence, people, and indeed, a whole industry, take the precaution. But often, the use of the principle is based on a lack of proof, both of harmfulness and harmlessness. This, of course, also raises the question of the severity of the possible harm, and how big the risk is for it to occur and the possible consequences for the authority in charge of a harmful incident.

There are several dimensions of the precautionary principle. According to Sandin (1999), it has four of these: threat, uncertainty, action, and command. Without a threat, there is no reason for precaution, but its likelihood can vary from minor to major. Moreover, the threat can be reversible and irreversible, and it must be preventable for precautionary actions to be defended. Uncertainty (including probability and risk) can often be calculated, but not always. Some therefore say that threats should rather be seen as *plausible* (Resnik 2003). There are also tasks that are so complex or complicated that they are trans-scientific. The action dimension concerns what can be done to reduce or prevent the threats, normally attacking the causes of harm, and not only the symptoms. The command dimension concerns willingness to enforce precautionary decisions, and the legitimacy of such decisions. However, it is at the core of the principle that someone can make a regulation without or before scientific evidence is established. The essence of this discussion is that the precautionary principle is a solution that can be defended only in a situation in which there is a lack of evidence. However, there is also the question of the type of evidence that is lacking. Concerning Svalbard, is it evidence related to the state of the art of nature conditions or evidence concerning the human pressure that should be in place that makes one avoid the use of the precautionary principle? And who are the proponents for the application of the principle? According to Hagen and colleagues (2012), there is a potential for conflict among the stakeholders if the precautionary principle is seen as a substitute for using existing knowledge. It can be argued that the precautionary principle is based on the shortcomings of science and research (Resnik 2003). There are also questions related to epistemological positions; what is seen as a risk or a threat within one discipline is not equally regarded within another. Most often, there are

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alternative frames for understanding the phenomena that are seen as threats, harms, or problems. Moreover, in practice, the application of the precautionary principle very often has societal and economic implications. For example, a prohibition of an action can mean economic losses for businesses or an industry. For precautionary reasons, a pilot demand for big ships along the west coast of Svalbard was introduced in 2013. This seemed to reduce the overseas cruise activities. However, the ships that leave the fjords of Svalbard due to the practice of the principle go other places; they do not stop their operations. And often, it is argued, the practice of the principle moves the problem to another field that is unknown (McLeod and others 2010: 43). For such reasons, the precautionary principle tends to be contested when it is applied.

'Communities of practice' and beyond

Knowledge-based management is propagated as a goal for the northern areas, including Svalbard (Ministry of Foreign Affaris 2012). However, it is widely acknowledged that always operating based on scientific evidence is utopian. In most decision-making processes, scientific evidence is only one of several components in the monitoring of a field. This is in accordance with a well-known view in the philosophy of knowledge. For instance, as claimed by Dewey (1938), knowledge is always a combination of abstract reasoning and action-oriented considerations. Most decisions are therefore made on the basis of some sort of collective accordance, or even on the basis of a consensus generated by and amongst people working together in tightly knit groups that constitute some sort of 'community'. According to Dunham and colleagues (2006), in many decision-making processes, there are different types of communities or stakeholders involved, such as communities of place, communities of interest, virtual advocacy groups and communities of practice. In our case, all of these types of communities or stakeholder groups may be found, but concerning the environmental and tourism-related regulations of Svalbard, 'communities of practice' seems to be the most suitable term (compare Brown and Duguid 1998). Within 'communities of practice', learning is situated and created in processes in which the socio-cultural dynamic of learning is prominent (Lave and Wenger 1991). Through working together, a 'community of practice' develops a shared understanding of its practice, of how to do it, and of how this practice relates to other communities and their practices. In such communities of practice, tacit and explicit knowledge interact:

> An explicit form of knowledge is objective, rational, and created in the then and there, whereas a tacit form is actionable, subjective, experiential, and created in the here and now. Tacit knowledge is acquired with little or no direct instruction, it is procedural, and above all, practically useful (Sternberg et al. 1995, quoted in Nonaka and Krogh 2009: 641).

Nonaka and Krogh argue that tacit and explicit knowledge should not be seen as separate entities, but rather, as mutually complementary, and based on the same continuum (2009: 640). Knowledge and practice are intricately involved; the practice develops an understanding, which can reciprocally change the practice and extend the community. However, 'communities of practice' is an ambiguous concept, as such communities are not homogenous 'social objects' (Handley and others 2006), and they may appear in various forms, depending on the actual case, the kinds of knowledge, and the actors involved (Amin and Roberts 2008). They are heterogeneous across several dimensions, such as geographical spread, lifecycle, and pace of evolution, and individuals may also participate in loose 'networks of practice' across organisational boundaries (Brown and Duguid 1998). The definition of 'truth' resulting from such processes may be contested.

The 'practical wisdom' of professionals within the 'communities of practice' (Head 2008: 6) that often operate within and across public and private sectors represents an often ignored alternative expertise. This expertise is not primarily from scientists or researchers, but constitutes a 'diverse range of professionals and paraprofessionals who are engaged in direct service provision', working within 'communities of learning', evolving knowledge that 'also tend[s] to become systematized and codified, and linked to standard formats and guidelines' (Head 2008). For these experts, scientific knowledge is only one of several premises for planning and policy decisions. Their formal bodies of knowledge evolve and are subject to debate in 'communities of learning', but they also tend to become systematised and codified, and linked to standards and guidelines (Head 2008: 7). To know how science and other expertise can best be transformed to evidence-based premises requires what Head (2008: 5) calls political knowledge: knowing the political system, processes, and legitimate tools.

Based on this discussion, the question to be followed up here is as follows: in situations in which scientific knowledge is missing or inadequate, is there an alternative to the precautionary principle? We argue that relevant 'communities of practice' exist, and that they might come up with an alternative relevant and applicable monitoring knowledge. In the tourism industry, knowledge sharing is boundaryless, it is maintained (McLeod and others 2010). Tourism actors are, in most places, part of formal and informal networks which have knowledge sharing capabilities. In the case discussed below, the social practice is the sharing of knowledge about the environment of Svalbard. How effective this knowledge sharing is depends on the knowledge brokers and translators, and the willingness to accept the knowledge.

The case study

Svalbard is an archipelago about 1,000 km north of the Norwegian mainland, half of the way to the North Pole.

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Due to icy conditions, the northeastern parts of the islands have been more or less inaccessible, as there is only open sea in late August and early September, and there are heavy restrictions on all traffic, including snow-mobiles. The only group that has had some form of activity in the area is scientists, but even research activities have been low, compared to other parts of Svalbard. This is about to change, as the sea ice is melting more rapidly than anyone expected, opening up the area for traffic, particularly in the summertime. Tourism is a fast growing activity in Svalbard, particularly cruise tourism, and the tourist industry is eager to explore new areas. East Svalbard is, in this respect, an interesting new area, for individual tourists travelling both by boat and smaller cruise ships. More regulation and management of the area have come into focus. The area has been preserved as a nature reserve since 1973, but it has not been completely closed to all visitors. In the Svalbard Environmental Act (from 2002), the ideas of the precautionary principle are prevalent: if the government thinks an activity can harm the environment, it can be stopped or rejected. It was also this principle that was stated in 2005, when it was suggested by a group of experts put together by the Ministry of Environment that east Svalbard should be closed to almost all human activities. In the protection guidelines from 1985, it is defined as a so-called 'reference area' for science. This is not a clearly defined term, but it is normally understood as an area that, in the future, is meant to stand out as untouched by human activities, and thus, an area that can be compared with similar areas where human activities have taken place. Thus, such a research environment will have some of the qualities of a laboratory. To obtain this, a closure of the area is preferred by parts of the research and management community. Despite this paragraph in the guidelines, the area has been accessible. In 2005, the argument in favour of closure was the fast-growing interest in new visits to the area. It was argued that, if such new visits continued, the area would lose its character as untouched and would be of less value as a 'reference area'.

A case study following the planning process involving all of the stakeholders in the area, which was conducted in 2013, became a passage into a broader understanding of the construction of knowledge that is relevant in the governance of this unpopulated part of Svalbard. Starting with the planning documents, including hearings from a number of stakeholders, these documents revealed a continuing and occasionally intense discourse between key actors in the field of knowledge construction related to Svalbard. They also identified a number of contested issues and a discussion of valid knowledge, which is a controversy that also split the scientific community; it was not solely a conflict between scientists and business actors in the tourist industry. This discourse was followed up through open-ended interviews with eleven key informants. These interviews not only gave us firsthand insights into the motives and arguments of the stakeholders on different aspects of the suggested regulations, but also, what we might call 'stories of practice' (Flyvbjerg 2006), the type of reflective and fluid knowledge that is prevalent amongst experts. Stories of practice are narratives that are constructed out of material events and achievements; they are contextualised in place, in time, in institutional structures and problem domains, and they are directed at a particular community of practice (Dredge and others 2011: 48). The interviewees were from the AECO (Association of Arctic Expeditions Cruise Operators), the governor's office, *Lokalstyret* (the Local Council), the Norwegian Polar Institute (two persons), the Svalbard Museum, the Ministry of Justice, the local tourism industry, and two local individuals without any formal connection to the case in question. Except for these two, all of interviewees were stakeholders with central positions in the processes described. The stories of practice have also been supported by observations from field trips with scientists and through talks with people who are engaged in the production of a set of guidelines for the AECO, the Arctic cruise ship organisation, and some of the cruise ship guides.

Regulation of east Svalbard

A suggested closure and a management plan process

There were several reasons why the issue concerning the management of East Svalbard was introduced in the early 2000s. The Norwegian Ministry of Environment created a working group at a 'directorate' level to judge 'the vulnerability of the different natural and cultural values on Svalbard in relation to the growing cruise tourism, and . . . to make a proposal of how the ship and cruise tourism should be regulated' (Ministry of Environment 2005: 1). Their proposal was basically to forbid travel in most of east Svalbard, and the argument was strictly to maintain it as a reference area for the natural sciences, particularly for climate change research.

The proposal was acclaimed by the Norwegian Inter-Ministerial Polar Committee, and it was passed over to the governor of Svalbard for implementation. Although large parts of the area were already preserved as national reserves, the suggestion represented a severe change in the management regime. Before, the area was protected, but allowed access; now, it should in practice be closed, except for a certain number of visitor sites. After some modifications, the proposal was sent to a hearing among the involved stakeholders. The proposal provoked many, particularly the cruise tourism industry, which is an industry with a long tradition of visiting the area. Within the scientific community, the proposed regulation was interpreted as an exclusion of the research milieus of the local university studies. The public in general was provoked by both the reduced access to land and sea areas and by the way the proposal had been introduced. For some of the same reasons, the editor of the only local newspaper argued against the proposal, as did several readers' letters (compare Larsen 2012).

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When the proposal was presented, the cruise tourism organisation, AECO, protested loudly and started to form alliances with many actors sharing its view, including everyone from people from Svalbard to politicians in the parliament and foreign embassies. The governor of Svalbard was probably not satisfied with the proposal and observed the protests from different interests. After a couple of years and several hearings, the proposal was put aside, and a process to develop a management plan for east Svalbard began. Management plans are well-known conservation tools in Norway, where there is a procedure to clarify the ways in which a preserved area can be used and how conservation decisions should be interpreted.

When the first amendment was launched in 2005, the authorities tried to implement it through the formal, hierarchical procedures. Locally, people felt that the newly implemented local democracy was contested. Also, staff members at the governor's office felt that the process was conducted in a form that conflicted with the adaptive management culture (as it is called locally) that had been developed (Viken 2006). Thus, the governor decided to open up the management plan process and to involve those having defined interests in the case. As a result of the governor's decision, but also for the sake of the knowledge bases that these different parts held, four working groups were established, as well as a reference group, to discuss and suggest the elements that should be included in the management plan. The stakeholder groups concerning the management plan for east Svalbard were 1) a science and education group, 2) a tourism industry group, 3) a local community group, and 4) a fishery group. The governor assembled the suggestions from the groups and held an encompassing hearing.

In the following, the call for evidence and the application of the precautionary principle will be discussed, as these elements appear in the process of developing a new management regime for east Svalbard. The following sections will show how different stakeholders demand evidence, and how the precautionary principle tends to be called upon as a substitute.

The precautionary model being challenged

The authorities' overall long-standing policy in governing Svalbard has been that it shall be based on scientific and certified knowledge. This is supported by the Norwegian Institute of Nature Research (NINA) (Vistad and others 2008), which argues the following in its report:

> One should aim at moving away from a 'precautionary principle'-based management towards a knowledge-based management system. The management regime needs legitimacy and acceptance of its decisions; this increases the need for scientific knowledge as the fundament for decisions and priorities (Vistad and others 2008: 103, our translation).

However, such knowledge is only partly available. A large number of scientific research projects have been conducted over the years, particularly research on ice conditions, the monitoring of bird colonies, polar bears, and the marine environment. A complete picture of the 'state of the art' is, however, not available. Certified (peer-reviewed) scientific knowledge is therefore fragmented and sporadic, and some aspects are completely lacking as, until recently, the territory has been completely covered with ice almost all year round. Moreover, only part of the research knowledge is useful for management. Much of the research that exists is of the meditative type: conducted for the research community, peer-reviewed, and not necessarily relevant for making policy decisions. To some, and in particular the Norwegian Polar Institute (NPI), which has advisory status concerning Svalbard, the lack of research-based knowledge gives way to the precautionary principle and stronger protection:

> The precautionary principle is a superior principle in the Svalbard Environmental Act, as well as in the mandate from the Ministry of Environment where this principle is to be the foundation for management. The principle implies that if there is insufficient knowledge about the value of nature or effects of activity the areas are to be managed aiming at avoiding possible environmental damage. In the proposal the precautionary principle is set aside as the leading management principle . . . NPI agrees that a complete knowledge-based management should be the goal; however, in a natural reserve, where the point of departure is a strict preservation regime, the precautionary principle must be the foundation as long as knowledge is insufficient to draw a clear conclusion about the opposite (NPI, hearing testimony).

To be sure that there are no damaging or degrading processes occurring, one needs time series data on all fields that potentially can be affected. This is a difficult demand. In the absence of such knowledge, closure seems to be the preferred alternative for many natural scientists. With no human activities, there will be no traces of it, and human-posed pressure or environmental problems will not appear. This stance is legitimated by the widely known and accepted precautionary principle.

This logic is not supported by other parts of the scientific community, such as the Norwegian Academy for Polar Research, which argues the following:

> Documents available in this case reveal that there exist huge disagreements on what the precautionary principle means. It is important that the administration are conscious about how knowledge is to be balanced against the precautionary principle. According to our view it is better and more realistic to go for a knowledge-based management and to use the precautionary principle with sobriety. If one means that knowledge is insufficient, one should make other actions to compensate for this (Norwegian Scientific Academy for Polar Research, hearing testimony)

But, as many claim, there are other ways of practicing the principle, and other types of knowledge exist.

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The cruise ship industry and its organisation, AECO, argue, on the other hand, that their visits to the area are environmentally friendly and hardly leave any footprint at all. This is also supported by an assessment of tourism in the area conducted by NINA, which, in its report, claims the following:

> The environmental effects of tourism in the Arctic are relatively insignificant. The critique against human influence seems often to build more on attitudes than on facts. The fear of environmental effects seems to be greater than the actual knowledge about them. (Vistad and others 2008: 34, our translation).

Thus, according to NINA, there is no research-based evidence that Arctic nature is significantly threatened by the low-level activities that have been occurring. Based on this, the tourism industry claimed that the first proposal was based on socially constructed problems, not on evidence. The suggested closure meant a loss of freedom for the industry to choose landing sites, a loss of sites for field studies for research institutions, and, of course, a lost recreational area for individual travellers, including a few locals. They saw no need for calling upon the precautionary principle. The management plan suggested in 2012 included some restrictions that, it was argued, lacked a basis on evidence; among these was the closure of Tusenøyane. This was suggested despite no scientific evidence that the tourism activities do any harm. It is not surprising that the status and significance of the precautionary principle versus scientific knowledge has been among the contested issues in the debates accompanying these decision processes. The defenders of closure used the precautionary principle because of a lack of evidence of the nature conditions, and the opponents blamed them for not having evidence that ongoing activities were a threat to nature.

Site-specific knowledge production

Knowledge-based management in Svalbard presupposes relevant monitoring data. For instance, the lack of data on vegetation, cultural heritage, and fauna has been pointed out on several occasions. Hagen and colleagues (2012) emphasise that 'site-specific management is not possible without knowledge of specific abundances at the individual sites. Such information is available for only a limited number of visitor sites at Svalbard'. As to cultural heritage, they describe the situation as follows: 'The lack of precise data concerning the technical condition of the historic structures and the historic values of the sites makes it impossible to develop site-specific management actions at the present state' (Hagen and others 2012: 9). It is also argued that collecting relevant monitoring data within a limited number of sites presupposes a broad and multidisciplinary approach. In a situation with increasing tourism in Svalbard, Hagen and colleagues advertise the need for site-specific behaviour guidelines, codes of conduct, and well-qualified guides to improve management. What is not in focus in Hagen and other's overview of the relevant knowledge of Svalbard for management is alternative expertise and knowledge.

Other forms of data and data gathering systems exist and reflect practices that have existed for a long time, but might not be considered 'scientific'. Most important is a system that includes so-called 'field inspectors', that is a system with a few persons placed in the field for the summer season, who work similar to 'park rangers' to provide information, policing and reporting, and monitoring of voyages. Another is a voyage organised by the governor of Svalbard to travel around the islands making field inspections. The ship (for 10 years *Nordsyssel*) is staffed by administratively and scientifically trained people who pay visits to a series of places along the coast, surveying the natural and heritage conditions on a regular basis. There are two types of such expeditions: one that is initiated by a certain department and having a particular focus, and another lasting for three weeks that is staffed by people from the governor's office that carries boats and a helicopter for on-land observations. There may also be experts on board to monitor a particular issue. In 2011 and 2012, experts on PCB took part, and they compiled a report concerning the appearance of toxins in surface soil (Eggen and Ottesen 2012). Further, for more than 10 years, local inhabitants have been invited to join a voyage to the Svalbard coasts to clean up the beaches and the coastal areas also adding to the stock of knowledge about the environmental condition. These three examples are not schematically planned data gatherings, and it is maintained that the reports from the field inspections are not very systematic. Further, most of the reports are not open to the public. However, the monitoring tours add to an evidence-based management system. As these measures are a yearly occurrence, there is evidence from a long time period in many fields. In addition, the governor receives mandatory reports from the tourist companies, and local people and other travellers provide information concerning incidents and observed changes in the environment. Often, the tourist industry makes additional reports from visitor sites, which are compiled by scientists or experienced and academically trained experts on board. However, a representative of the tourism industry is confused about the fact that this knowledge is not always seen as valid by the authorities:

> AECO's members visit the area annually and frequently – and much more often than researchers. They have for years made fauna observations and submitted it to research institutions and the authorities. Unfortunately, it seems like these observations have not yet been used. If they had, the knowledge on fauna in Tusenøyane would have been much better than what is the case (Interview data)

Nevertheless, obviously, there is viable local and experience-based knowledge that adds to the evidence-platform for management. Compared to meriting research, this evidence is broader in scope and, as most actors see it, constitutes a solid basis for management. This type of data gathering has been a platform for

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management, more or less, during the entire 90 years of Norwegian sovereignty over and management of the islands.

Also, the tourism industry takes part in the environmental management of Svalbard. AECO has, for instance, constructed site-specific guidelines for the cruise industry. During the summer of 2011, site guidelines for the west coast were produced, and in summer 2012, correspondingly, for the east coast (AECO 2014). One of the authors of this article took part in the 2011 event as an observer. The guidelines were produced during a voyage from site to site (nine in all) along the coast. On board the ship was the project team (six persons), including the general secretary of AECO, experts in ornithology (two), botany (one) and heritage (one), a journalist, two observers (a representative of the sponsoring body and a tourism professor), and a group of information officers and art designers (six). The art designers, together with the experts and the journalist, were supposed to design the guideline material and websites during the tour (AECO 2015). In all of the sites visited, landings took place using a Zodiac. Ornithologists scanned the area before the group as a whole was set ashore to produce an inventory for each site with regard to flora, fauna, and heritage. Talks with tourists and guides at the sites visited indicated that such guidelines were welcomed. As one guide saw it, it is better to refer to an organisation than to give orders on behalf of yourself. This is also an example of how the precautionary principle is practiced on less general level. The guidelines and the establishment of them was also a topic in their meetings (daily recaps) with the passengers. But, primarily, this is an example of the self-regulation imposed by the cruise tourism industry, and of a non-scientific, but systematic, gathering of information about site conditions.

This monitoring and recording practice is undertaken in cooperation between the tourism industry and scientists, including employees from the governor's office, which can be seen as a 'community of practice'. The observations and information were gathered and discussed, and the observers agreed upon a site report. Thus, the information gathered and the knowledge created was shared and exchanged within the group present at that particular site and on the ship. As the participants also represented the ship owner and the tour operation companies, the knowledge acquired and the guidelines produced were shortly afterwards disseminated among the relevant actors. The knowledge they enhanced shares many of the characteristics of a 'community of practice', such as being social, being based on a shared engagement, using a common methodology as their tool, having a similar background, knowing the field, and sharing a discourse reflecting a certain perspective on the world (compare Amin and Roberts 2008). Such collective practices lead to forms of collective knowledge, shared sense making, and a distributed understanding. The particular form of the situated social practice, learning and knowing that took place at these visits, illustrated the hybridity of 'communities of practice', is characterised by a mixture of close and detached connectivity, temporary local coalitions, and institutional and professional ties that are not reducible to local space.

The AECO example diverts from the site inspections done by the governor's office, as it is more specifically oriented towards a particular mission: the production of guidelines. Moreover, a particular methodology was applied, and the data were systematically stored. However, the data were not scientifically produced, validated, or reported. The data were adjusted to the purpose of the project, which was to assess the environmental condition of each site, and, on this basis, to produce a set of guidelines. According to AECO, this is done to create a more sustainable practice, self-management, and a more responsible governance of the islands.

Discussion

In this article, we have touched upon a whole series of approaches and terms referring to knowledge. Scientific, formal, or abstract knowledge is one; however, it is argued that expert knowledge is much broader, covering knowledge based on both professional skills and skilled practice and experience. Our point is that there is an evidence base that is quite encompassing for the management of Svalbard, both within and outside of the protected areas. There is a stock of evidence, produced through different 'communities of practice', which supports the management of the islands. It is a *monitoring knowledge*, based on expert surveillance. Our observation is that this knowledge base does not have the same prestige as scientific knowledge, although it is just as important for the management of the islands. Data and information are often poorly reported, lack transparency, and could easily be given a more systematic form and an official status. Because of such deficits, those outside tend to blame the governor for lacking evidence for the management measures that are suggested. Paradoxically, this is an argument used both when a new regulation is discussed by its proponents and by its opponents.

As we have used the term 'knowledge', it is seen as something that is embedded in an organisation or field of practice (compare Blackler 1995). This is, in fact, one of the problems in many organisations: knowledge is inscribed in individuals' bodies and brains (Blackler 1995), and not a common good for some type of 'community of practice'. Concerning the case in question, the officers at the governor's office are on time-limited contracts, and the systems for transferring and preserving acquired knowledge are inadequate. It is argued that too much of the knowledge rests in employees that come and go. There is a difference between a 'community of practice' and organisational knowledge. Thus, the quality of a 'community of practice' depends on restoring and retrieving knowledge systems.

There is also a question of whether the case reported here really is a 'community of practice' in the way

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this approach tends to be defined (Wenger 1998). This definition includes practice, community, meaning, and identity: elements that probably are only partly in action within the case studied. The 'community' in this case is probably more like a network, and there are no shared identities. Those who are part of it are people who work together on occasion, but represent different professional and epistemological backgrounds. Their common knowledge can be described as a kind of mutual sharing of meaning based on what has been called reflective practices (Buysse and others 2003: 268) that are derived from professionals' own experiences and observations, as well as from explicit knowledge gained through theory and research. For the Svalbard case and the inspection voyages, management staff members make the observations, gather the data, occasionally assisted by researchers and other types of experts. As within most 'communities of practice', there will be different interpretations of facts, and there is not only one way of transforming facts into practice. It has also been argued that the element of common practice, doing things together, often is more central than the community element (Contu and Willmott 2003). To put it another way, to know how and to act is more central than feelings of unity or identity (compare Duguid 2005). However, the knowledge produced within the frame of field inspection will often be based on some sort of consensus, as was done in the AECO project, as reported above.

A severe obstacle to the acknowledgement of monitoring knowledge relates to power. Abstract, formal, and scientific knowledge have strong positions as 'real' knowledge, and it is also the type of knowledge the governor of Svalbard has requested. The majority of the advisory and hearing institutions involved in the east Svalbard planning process are also found within this disciplinary field. The attitudes towards alternative knowledge, such as the monitoring knowledge from the governor's field inspection tours, are clearly demonstrated in a recent report from the Norwegian Polar Institute, which comments on the form of the results from '… round trips and field inspection… The registrations are not done regularly, and they lack documentation of methods and the basis for the data' (NPI 2013: 124, our translation). There is a whole series of obstacles hindering this type of knowledge from attaining a corresponding position, some of which are reflected in the above quotation. However, despite less systematically gathered data, this is the type of knowledge that, for decades, has been considered to be adequate and has applied in the management of Svalbard. This practice fits well with a strongly acknowledged principle in decision-making theory: when it is impossible to be fully informed, the goal should rather be to obtain a satisfactory level or what has been called 'administrative knowledge' (Simon 1976). The challenge is for this type of knowledge to be recognised and given prestige as a valid evidence base for environmental decision-making and planning. The way to achieve a higher status for this type of knowledge is probably to adopt some of the systematics of the natural sciences, but collecting information through the use of different types of (nature) environmental scanning techniques. Lindenmayer and Linkens (2009: 483) suggest the term 'adaptive monitoring' to be used for the surveillance and management of ecosystems. Inspired by their systematics, we suggest a monitoring-based management system that is responsive, in that it also involves human activities and stakeholders. Such a programme should (i) map and involve all stakeholder groups or communities of interest; (ii) address well-defined questions that are specified before the commencement of a monitoring; (iii) be underpinned by a systematic method for scanning sites and landscapes (such as the AECO model); (iv) include available scientific knowledge concerning natural and cultural conditions and changes; (v) accept a human need to know and take part in the management of their natural surroundings (responsive management) so that they 'pass the test of management relevance' (Lindemayer and Linkens 2009: 483). Such a model can be modified and adapted to the circumstances; for instance, in east Svalbard, it should be balanced towards very vulnerable nature, but also, a long tradition of cruise-based tourism. Applying and adapting this model would, at the same time, represent some sort of responsive management, which is strongly sought in Svalbard (Viken and others 2014). As it is today, the natural sciences have a hegemonic position, and they tend to define the knowledge that is valid and relevant. However, as this article shows, this hegemony is contested by many stakeholders who assert that alternative knowledge exists and can be produced, as the type of monitoring knowledge that the governor of Svalbard's own field inspections provide, and that it is robust enough to have been the grounds for the management of Svalbard for decades. With some modifications and more transparency, it also should be a complementary and valued knowledge in the future.

Conclusion

The analysis of the planning process of east Svalbard has uncovered a continuing power struggle about the legitimacy of different forms of knowledge in managing this part of the Arctic. There obviously is a struggle regarding the competence of the institutions that produce and translate knowledge into policy decisions. The case reported here reveals conflicts not about knowledge as such, but about the form of knowledge upon which the management regime should be based. There is wide acceptance of the fact that all natural elements cannot be regularly measured, and they cannot be measured in every part of an environment as large as Svalbard. Still, it is argued that the application of the precautionary principle in order to limit access is not a good alternative. It tends not to be accepted, and therefore, it lacks legitimacy. There is a long history of tourism practice in the area, but harm or threats to the natural environment that relate to these activities have only rarely

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been scientifically documented. Therefore, it is argued that monitoring knowledge, which has a long tradition of being used as a decisional platform, constitutes a viable alternative. It is knowledge produced by (different) 'communities of practice' that has been accepted as sufficient for a sustainable management of Svalbard for a long time, and it meets a demand for responsive management. The natural sciences will always have a place in such communities, but their representatives are not alone, and they are expected to communicate with persons with other expertise and the wider community. The science of today has to be created in dialogue with the surrounding society. Nowotny and colleagues (2003: 194) claim that '[i]ncreasing permeability provides bases for greater contextualization, by opening up the number of routes along which society can speak back to science.' One problem with this dialogue and with alternative knowledge is its lack of prestige. This article has demonstrated a way in which this knowledge production could be ameliorated and could gain more respect. However, the position of alternative expertise, it is argued, is also weak because the natural sciences, for decades, have had a hegemonic position in environment management issues. This seems to be about to change.

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