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Scenario Development for Antarctic Tourism: Exploring the Uncertainties

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Abstract: Over the past two decades, the annual number of tourists landing on Antarctica has increased more than tenfold. The industry benefited from a range of logistical innovations that were introduced by individuals and subsequently commercialised and replicated. As a result of increasing scale and scope, the negative impacts of tourism on the tourist industry itself and on the public domain have been increasing steadily. Nevertheless, the Antarctic Treaty System (ATS) has not yet put a comprehensive regulatory system in place for tourism, which is in sharp contrast to its proactive stance towards other industries, such as fisheries and mineral extraction. In the absence of a strong and decisive government in Antarctica, the tour operators developed a system of self-regulation through the International Association of Antarctica Tour Operators (IAATO). With impacts increasing more and more, pressure on the Antarctic Treaty Consultative Parties (ATCPs) is mounting to assume more responsibility for tourism regulation. Building on new insights from complexity theory, this paper provides a rationale for policy-making to be more proactive and adaptive, as well as a tool to make this new approach operational. Participatory scenario development is presented as a framework for discussing the implications and desirability of a wide range of possible and plausible developments that are relevant to tourism. Scenario analysis helps policy-makers and other stakeholders to get more grip on the uncertainties surrounding tourism development, and to enlarge their ability to deal with complexity. The results of a scenario development workshop in the Netherlands are presented and analysed to show the practical relevance and usefulness of scenario studies for discussing, and preparing for the future of tourism in Antarctica.

Zusammenfassung: Im Laufe der letzten zwanzig Jahre hat die Zahl der Touristen, die auf Antarktika landeten, um mehr als das Zehnfache zugenommen. Die Tourismus-Industrie hat dabei von einer Reihe logistischer Innovationen profitiert, die von einzelnen Personen eingeführt und daraufhin kommerzialisiert und kopiert wurden. Infolge des zunehmenden Umfangs haben die negativen Einflüsse des Tourismus auf die Reiseindustrie selbst und auf die öffentliche Domäne ständig zugenommen. Dennoch hat das Antarktische Vertragssystem (ATS) noch immer kein umfassendes Regulativ-System für den Fremdenverkehr eingeführt, dies im Gegensatz zu seinem proaktiven Standpunkt in Hinsicht auf andere Industrien wie die Fischerei und Mineralförderung. Ohne eine starke, tatkräftige Regierung in der Antarktika haben die Reiseveranstalter ein System der Selbstregulierung mittels der International Association of Antarctica Tour Operators (IAATO) entwickelt. Dem wachsenden Einfluss des Tourismus zufolge, nimmt der Druck auf die Antarctic Treaty Consultative Parties (ATCPs) zu, mehr Verantwortung für die Regulierung des Fremdenverkehrs zu übernehmen. Sich gründend auf neue Erkenntnisse der Komplexitätstheorie, verschafft dieser Artikel ein Grundprinzip zur Entwicklung einer mehr proaktiven Politik in Bezug auf den Tourismus, sowie eine Methode dieses neue Verfahren operationell zu machen. Szenario-Analyse wird als Methodologie präsentiert um so die Implikationen einer breiten Reihe möglicher und plausibeler Entwicklungen, die für den Tourismus relevant sind zu diskutieren und sich dabei zu fragen, ob diese auch wünschenswert seien. Szenario-Analyse hilft Politikern und Interessengruppen die Ungewissheiten, welche die Entwicklung des Tourismus umgeben, besser in den Griff zu bekommen und ihre Fähigkeit dessen Komplexität zu meistern. Die Ergebnisse eines Szenario-Workshops in den Niederlanden werden präsentiert und analysiert um so die praktische Relevanz und den praktischen Nutzen der Szenariostudien zur Diskussion und zur Vorbereitung auf die Zukunft des Fremdenverkehrs in Antarktika zu zeigen.

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INTRODUCTION

Since the mid-1980s, the number of people visiting Antarctica for tourism purposes has increased steadily from a few hundred to over 28000 per year. Most of Antarctic tourism remains ship-based, but other market segments have developed as well, such as land-based tourism and Antarctic over-flights (IAATO 2005). Despite the growth and diversification of the industry, tour operators in Antarctica have managed to maintain a relatively strong record on safety and environmental sensitivities. The establishment of the International Association of Antarctica Tour Operators (IAATO) in 1991 and their self-regulatory regime are believed to have played a major role in this (Splettstoesser 2000, Splettstoesser et al. 2004, United Kingdom 2004). To date, self-regulation is the dominant mode of tourism management in Antarctica. The Protocol on Environmental Protection of the Antarctic Treaty (Madrid Protocol) does provide a regulatory framework that also applies to tourism, but a range of gaps, inconsistencies and weaknesses of the Antarctic Treaty System (ATS) have been identified with regard to tourism operations (Bastmeijer 2003, Hemmings & Roura 2003, Bastmeijer & Roura 2004, Molenaar 2005). IAATO has worked hard to put a consistent and practical set of guidelines into place, and is widely commended for the results that have been achieved.

In view of the past and present effectiveness of self-regulation, it is tempting to embrace self-regulation as the preferred management approach for the future. Why change a winning formula? The almost exclusive focus on self-regulation entails significant risks, however, because the future of Antarctic tourism remains highly unpredictable. Unpredictability is a general trait of tourism development (Faulkner & Russell 1997, McKercher 1999, Russell & Faulkner 1999, 2004), if only because it greatly depends on individuals' actions and on individual events and incidents. Decisions and actions taken by individual entrepreneurs, Treaty Parties or others may upset the current equilibrium in IAATO and undermine the effectiveness of self-regulation. It is impossible to tell if or when self-regulation will break down as an effective management approach, but it is possible to consider various scenarios and start formulating policy response strategies for a range of eventualities.

Anticipation and a proactive attitude would increase the ability of the ATS to respond to any emerging crisis in a swift, structured and effective way. Time is of the essence, because developments in tourism are often difficult to reverse. So far, tourism policies have typically been ad hoc and reactive, targeting individual expeditions rather than clusters of activities, focusing on requirements rather than restrictions, and often

responding to concrete incidents and plans (Kriwoken & Rootes 2000, Hemmings & Roura 2003, Bastmeijer & Roura 2004). In contrast, the ATS has taken a proactive approach in the context of commercial activities, such as fisheries and mineral resource extraction, to make sure that a comprehensive regulatory system was in place before activities commenced (Scott 2001, Molenaar 2005). A number of authors (e.g., Hall 1992, Davis 1999) have argued that similar regulatory efforts be made for tourism, based on the accumulated knowledge about the management and regulation of Antarctic tourism (see Stewart et al. 2005 for an overview), but their calls have so far not been recognised. Nevertheless, in recent years the rapid growth of tourism has triggered debates among policy-makers, the tourist industry and other stakeholders about its consequences for safety and the environment. The future of Antarctic tourism was an important topic during the 2004 and 2005 Antarctic Treaty Consultative Meetings (ATCMs), and the 2004 Antarctic Treaty Meeting of Experts on Tourism and Non-Governmental Activities (ATME) (Bastmeijer & Roura 2004; ATS 2005). These policy meetings confirmed the need for regulatory measures.

In our view a long-term, strategic vision on tourism is required. Not a blueprint, but a vision that has the fundamental unpredictability of tourism as a major premise. Providing a methodological framework for the development of such a vision is the central aim of the research project "Adventure, Tourism, and Leisure in Antarctica: Towards Integrated Scenarios" (ATLANTIS). This paper introduces scenario methodology as a tool to explore the future in a structured way, with the aim of developing robust policies. Results from a participatory workshop for Dutch stakeholders are presented and analysed with a focus on the uncertainties and possible implications of future tourism development in Antarctica.

Our paper is organised as follows. Section two discusses the peculiarities of tourism in Antarctica, and its volatility. Section three draws upon chaos and complexity theory to reveal relevant properties of complex systems such as tourism. Section four applies these insights to some of the developmental and regulatory aspects of tourism in Antarctica. Section five introduces scenario analysis as a tool for policy development in the face of structural uncertainty. Section six and seven present the results from a scenario workshop for Antarctic tourism stakeholders in the Netherlands. The paper ends with a discussion of the findings, and some conclusions in section eight.

TOURISM IN ANTARCTICA: A SPECIAL CASE

Antarctica is a special tourist destination in many respects. To begin with, it is a remote continental landmass that is surrounded by the Southern Ocean, and therefore a long haul destination by definition (Cessford 1997). Adding to the remoteness of the area are the treacherous weather conditions and the presence of sea-ice, which limit the accessibility of Antarctica for tourism. Only a small number of air links are operated for tourism purposes, because of the risks associated with landing on the rock-surfaced and blue-ice runways. Most tourists travel by ship, but even ships can reach Antarctica only five months per year, and their range is usually limited to the Antarctic Peninsula, the part of Antarctica that is closest to South America. The harsh conditions in the Antarctic region call for extensive preparation, including the acquisition of proper insurance, permits, clothing, logistics, and experienced staff (Stonehouse 1994, Mason & Legg 1999). Any omission in planning, and any physical inability, sudden weather changes, sea-ice or iceberg can cause disaster and jeopardise the whole expedition, or the operations of other parties in the area.

Second, no sovereign government is in place for Antarctica. The continent is governed by the Antarctic Treaty with additional Conventions, Protocols and Measures, jointly referred to as the Antarctic Treaty System (ATS). The Antarctic Treaty Consultative Parties (ATCPs) meet annually to make agreements, for which consensus is required. Tourism is regulated by the 1991 Madrid Protocol, which has made the performance of an environmental impact assessment a prerequisite for the organisation of any Antarctic activity originating from an Antarctic Treaty nation. The Madrid Protocol was ratified in 1998. In recent years, a number of voluntary and binding measures were added to the ATS on issues such as codes of conduct, pre-trip and post-trip trip notification, information exchange between ATCPs, compulsory insurance and contingency planning, and site specific guidelines (ATS 2005, Molenaar 2005).

In spite of the introduction of these measures, Antarctic tourism regulation by the ATS has been weak. The decision making and implementation process is arguably too slow to deal with the dynamic tourist industry (Bastmeijer & Roura 2004). Many regulations specifically applying to Antarctic tourism are not legally binding. Those that are binding are implemented into the ATCPs domestic legislations, leaving much room for national translation and interpretation (Kriwoken & Rootes 2000, Bastmeijer 2003). In addition, the rules can hardly be policed and enforced in the field (Tracey 2001, Molenaar 2005), and they do not apply to operators from non-Antarctic Treaty Parties. For a more in-depth treatise of the legal and jurisdictional peculiarities, the reader is referred to Bastmeijer (2003), Bastmeijer & Roura (2004), Hemmings & Roura (2003), Molenaar (2005), and Richardson (2000). The smooth operation of tourist activities thus depends to a large extent on the benevolence of those involved.

COMPLEXITY IN A TOURISM CONTEXT

Tourism studies are commonly acknowledged as a separate research domain, which is multidisciplinary by nature. Indeed, researchers from a wide range of disciplines - including anthropology, geography, economics, demography, health sciences, sociology, ecology, psychology, environmental sciences, law, political sciences, management studies and history - have studied aspects of tourism. The phenomenon of global tourism consists of an intricate system of cause and effect chains running back and forth across spatial and temporal scales and across disciplinary boundaries. Positive feedback abounds. As a result of this non-trivial positive feedback and the associated nonlinearities, the tourism system cannot be properly understood by deconstructing it into its constituent parts. It is a so-called "complex system" (see e.g., Amelung 2006).

The widespread awareness of tourism's multidisciplinary nature and its notorious volatility make the phenomenon a potentially rewarding target for analysis with the tools of complexity theory. This type of analysis has, however, not yet become standard practice in tourism studies. The controllability-perspective on tourism remains dominant. In many studies addressing the impacts of tourism, for example, public authorities are called upon to assume the task of managing tourism in a sustainable way. Implicitly, conceptions of tourism (e.g., the ones by PEARCE 1981, MCINTOSH et al. 1995, and MILL & MORRISON 1992) are used that *"argue explicitly or imply strongly that: tourism can be controlled; disparate tourism players function in a formally, coordinated manner to form a united whole; tourism is organised and that the organisation can be controlled by a top down management approach; individual tourism businesses function to achieve a set of common, mutually agreed upon goals; tourism is the sum of its constituent parts, and by understanding how each part works, an understanding of how tourism works as a whole will emerge"* (MCKERCHER 1999: 426).

Over the past few years, an undercurrent has developed in tourism research, which criticises this dominant "command-and-control" perspective in tourism research. FAULKNER & RUSSEL (1997, 2000), RUSSELL & FAULKNER (1999, 2004), and MCKERCHER (1999) make a strong case for a chaos perspective on tourism. They contend that tourism essentially functions in a non-linear and chaotic manner, although at macro-levels the tourism system may operate "with some semblance of order" (MCKERCHER 1999). To substantiate their argument for a chaos-inspired model of tourism, Russell and Faulkner (1999) list a number of key differences between the old paradigm of reductionism and the new paradigm of complexity (Tab. 1). They conceptualise tourism as being driven by discrete individual' actions ("chaos makers"), surprises, and positive feedback, rather than by marginal change, predictability and negative feedback.

TOURISM DYNAMICS IN ANTARCTICA

The remoteness and inhospitableness of Antarctica and the peculiarities of the regulatory framework makes the development of tourism in the area particularly prone to surprise and volatility. In a sense, all Antarctic tourism businesses operate on the "edge of chaos": a state of tenuous equilibrium, on the verge of collapsing into a rapidly changing state of dynamic evolution (WALDROP 1992). The "edge-of-chaos" characteristic of Antarctic tourism implies very high levels of uncertainty for the entrepreneurs operating in this market. One of the most striking examples is the crash of an Air New Zealand airplane on Mount Erebus in Antarctica in 1979, killing all 257 passenger and resulting in the abandonment of the overflight market for fifteen years (SPLETTSTOESSER 2000). Sky-diving had a similar fate. The first sky-diving expedition in 1997 resulted in several casualties (CHIANG 2000) and, except for one other expedition, sky-diving in Antarctica has not occurred since. By triggering positive (i.e. reinforcing) feedback effects, individual incidents can thus have very serious consequences. This is not necessarily the case, however. Diving activities for example continue to be offered by tour operators, in spite of two lethal diving accidents (ANAN 2003, IAATO 2005).

Positive feedback effects can also work in favour of tourism development. Successful expeditions and innovative activities are imitated and sometimes turned into commercial tourism products, such as ship-based tourism in the "Lindblad-style" (STONEHOUSE & CROSBIE 1995). Organising tourist activities in the Antarctic is a daunting task, however. The barriers to entry

Cartesian-Newtonian Model		Chaos-Complexity Model
Based on 19th century Newtonian physics (deterministic, reductionist, clockwork model)	⟷	Based on biological model of living systems (structure, patterns, self-organisation)
Systems are seen as structurally simple, with a tendency towards linear or quasi-linear relationships between variables	⟷	Systems viewed as inherently complex, with a tendency towards nonlinear relationships being more prevalent
Systems tend towards equilibrium and are driven by negative feedback	⟷	Systems are inherently unstable and positive feedback-driven processes are more common
Individual differences, externalities, and exogenous influences that create deviations from the norm are exceptional, noise-generating factors	⟷	Individual differences and random externalities provide the driving force for variety, adaptation, and complexity

Tab. 1: Differences between the Cartesian-Newtonian and the Chaos-Complexity Models. Source: RUSSELL & FAULKNER (1999).

Tab. 1: Unterschiede zwischen den Kartesisch-Newtonischen und den Chaos- Komplexitätsmodellen. Quelle: RUSSELL & FAULKNER (1999).

are substantial, because high levels of organisation, know-how and experience are required (Landau 2001). In many cases, the pioneering adventurers themselves are the only ones who are able to meet these stringent requirements. Not surprisingly, most organisers of commercial expeditions for tourists started out as adventurers, sometimes against the advise of public authorities. The land-based operations of Antarctic Logistics and Expeditions (formerly known as Adventure Network International) are an example of this (Swithinbank 1998).

Sequences of unpredictable experiments, followed by self-replication and self-organisation are typical for complex systems. They ensure a large influence of unpredictable individual initiatives on the direction and scale of tourism development in Antarctica. Individual experience and learning do not sufficiently reduce the vulnerability of operators to mistakes and accidents caused by themselves or their peers. In addition, uncoordinated activities can harm business if they have a negative effect on tourist experience through crowding and environmental damage. Tour operators therefore have an incentive to organise themselves, coordinate travelling schedules, and institutionalise best-practice guidelines that are subsequently enforced on its members (Splettstoesser 2000, United Kingdom 2004). This is the raison d'être of the International Association of Antarctica Tour Operators (IAATO).

IAATO has succeeded in solving many of the emerging problems related to tourism development and regulation in Antarctica, such as operational guidelines for a range of activities, coordination and communication, reporting, and reducing biosecurity risks. The IAATO regulations that are in force are stricter than those of most Antarctic Treaty Parties, and defection has been limited (Molenaar 2005). Non-IAATO members pose a risk to member companies. They do not need to comply with IAATO regulations while their actions may still affect Antarctic tourism as a whole. As a result, IAATO encourages non-IAATO members to join and explicitly dissociates itself from activities by non-member companies or private expeditions (IAATO 2003, IAATO 2005). However, some argue that this does not mean that the performance of non-IAATO member companies is necessarily worse (Riffenburgh 1998).

In the current context of policy-making, the ability of the ATS to respond to any undesirable tourism developments is low, aggravating the potential impact. The responsibility for tourism development in Antarctica has been put almost exclusively in the hands of the tourist industry. This may be a risky arrangement because there may be issues at stake that are beyond the control and scope of IAATO. The constructive efforts of the tourist industry are to be applauded, and may even be unique in the world, but the main mission of the industry is to make a profit from selling trips (ASOC 1999). Balancing different interests, taking future generations into account, and protecting the common interest belong to the realm of politics and public policymaking. The challenge is in meeting public responsibilities, while taking into account the slowness of policy-making processes and the fundamental unpredictability of tourism development. This paper argues that the tool of scenario development could provide the beginning of an answer. The exploration of a wide range of plausible future developments would enlarge our understanding of the main uncertainties involved and benefit the formulation of response strategies and robust policy options by public authorities and stakeholders.

STRATEGIC EXPLORATIONS WITH THE HELP OF SCENARIOS

Integrated scenario analysis is a well-established tool to explore the implications of a large range of possible developments (Greeuw et al. 2000, Ringland 1998). Scenarios can be defined as "coherent descriptions of alternative hypothetical futures that reflect different perspectives on past, present and future developments, which can serve as a basis for action" (Van Notten et al. 2005: 20). The creation of a diverse set of plausible scenarios makes the uncertainties visible that are inherent in future studies, so that these can be discussed. In addition, the use of scenarios allows the effectiveness of policy measures and other plans to be "tested" under a variety of circumstances. Scenarios can be developed as a desktop exercise, but if time and money allow it is often recommendable to develop them in a participatory way to benefit from the knowledge, know-how, creativity and perspectives of a broad range of stakeholders.

Scenarios are used in a variety of ways and for a range of purposes. Van Notten (2005) classifies scenarios according to the project goal, the process design and the scenario content. In relation to the goal of the scenarios, he distinguishes between exploratory and pre-policy scenarios. Whereas exploratory scenarios are aimed at such ends as learning, and investigating the interaction of societal processes, pre-policy scenarios have a strong normative aspect, in that they examine alternative paths to the future that vary according to their desirability. The design of the scenario development process can range from intuitive to analytical. Intuitive designs strongly depend on qualitative insights, while analytical approaches regard scenario development as a systematic exercise. The third dimension of scenarios refers to the level of complexity of their content. While simple scenarios may be limited to extrapolations of isolated trends, complex scenarios take a web of interrelated causes and effects into account. Exploring the many facets of tourism development, capturing different perspectives and opinions, and social learning are key components of the ATLANTIS project. The scenarios developed in this research project can therefore be characterised as exploratory, intuitive, and complex.

Integrated participatory scenario development has been used in a number of scientific projects, most notably VISIONS –"Visions for a sustainable Europe" (Rotmans et al. 2000) and MedAction – "Policies for land use to combat desertification" (Kok et al. 2006). In the VISIONS project, scenarios were developed for Europe by integrating scenarios for three European regions. In the MedAction project, a similar methodological approach was applied at the Mediterranean scale level with regard to the problem of desertification. Typically, these scenario processes consist of a number of steps, including:

- The identification of factors, actors and sectors that are important to the issue at hand;
- The elicitation of a wide range of possible landmark events in the future by using brainstorming techniques;
- The combination of trends, landmark events, and possible actor behaviour into 'snippets' or strings of events (storylines)

that emphasise the relationships between a limited number of factors;
• The elaboration and recombination of these storylines into full-blown scenarios;
• Discussion of the set of scenarios with the stakeholders, resulting in a set of modified scenarios; and
• Exploration of the opportunities and challenges that these scenarios pose to stakeholders, and identification of strategies to take advantage of them or mitigate them.

Participatory scenario development typically takes place in small groups to stimulate the active participation by all stakeholders in the creative process of developing storylines. The groups are usually given great freedom in developing storylines, to maximize social learning and to increase the chance of obtaining new and unexpected insights. Drawbacks of this approach are that different groups can come up with similar storylines, and that stakeholders regularly have a need for some guidance. Assigning to each of the groups a unique context to develop their storyline(s) in may provide some structure, while retaining a large degree of freedom. Such a context may be defined as a segment of the "scenario space", which is a virtual space that is made up of all plausible combinations that defining variables can assume.

Splitting up the scenario space can be done with the scenario-axis technique proposed by Van 't Klooster & Van Asselt (2006). This technique defines a two-dimensional space made up of all plausible combinations of values that two influential and uncertain variables can assume within the time frame considered. The greater the uncertainty, the larger the scenario space is, and the more room for distinct scenarios there will be. The selection of the defining variables can be a result of the first phase in the scenario development process, when the key factors, actors and sectors are identified.

PRACTICAL EXPERIENCE AT A DUTCH WORKSHOP

To arrive at integrated scenarios for tourism development in Antarctica, the ATLANTIS project follows the six-stage process outlined in section five. This process is guided by a series of participatory workshops. The first of these workshops was targeted at Dutch stakeholders, and hosted by the NWO (the Netherlands Organisation for Scientific Research) in The Hague on 23 September 2005 (Lamers & Amelung 2005). The group of seventeen participants included tourism entrepreneurs, private adventurers, policy-makers, scientists and representatives from NGOs (non-governmental organisations). The workshop covered the first three steps in the scenario development process.

Prior to the workshop, the participants had received a number of fact sheets, describing various aspects of tourism development in Antarctica, including numbers of tourists, types of tourism, spatial concentration, risks, and (self-) regulatory measures. Current and historical driving forces and constraints were not explicitly mentioned in the fact sheets; these were identified in a plenary discussion. This session yielded factors such as: pioneering tour operators, income growth, urbanisation and the presumably associated longing for wilderness, ageing, increased media exposure, new transport connections, and the increased availability of vessels after the end of the Cold War. All items were clustered in two broad categories: factors influencing supply, and factors influencing demand. Factors in the first category included: global tourism trends, global politics, geographical factors, transport technology, organisational factors and institutional factors. Factors in the second category included: new tourist generating markets, oil prices, demographic factors, cultural factors, and communication factors.

The fact sheets and the identification and categorisation of driving and inhibiting forces provided the stakeholders with a basis from which to think about possible future developments. This creative process of imagining future events took place in a plenary brainstorm session. Stakeholders were asked to think of concrete events that might happen in the future up to 2030 and would have a considerable impact on tourism development in Antarctica. These events were written down on post-its and picked up, processed and clustered by the facilitators. As anticipated, the participants identified events belonging to a variety of spatial scales, ranging from the global to the local level. The facilitators clustered the post-its into a number of categories: global context, local context, market dynamics, transport, accommodation, regulation, environment, and accidents. These clusters provided a major source of creative material that the participants could use to develop their storylines.

To facilitate the creative process of storyline development, the stakeholders were split up into smaller groups of around six people each. To ensure that the storylines would diverge sufficiently, each group was asked to develop their storyline from specific assumptions about two key factors: the level of cooperation among the ATCPs, and the level of cooperation among tour operators. The context defined by high scores on both dimensions was called "negotiation"; the one defined by low scores on both dimensions was called "SOS Antarctica". The combination of high ATCP cooperation and low cooperation among tour operators was dubbed the "regulation" context; the final context was called "polar profit". The size of the stakeholder group allowed the detailed elaboration of three of these four development paths. As a result, the "regulation" context was not considered within the scope of the workshop.

STORYLINES

The three groups of participants produced very different storylines, each with its own internal logic. All groups illustrated their storylines graphically with drawings, graphs and with photographic material provided by the project team. The "polar profit" group (cooperative industry, divided ATCPs) projected arrivals to double every five years, reaching a million tourists by 2030. In this vision, the engine of growth is the cruise market, which is boosted by the economic development of China and India. Cruises soon have their start and end in Antarctica itself, with passengers flying in from around the world. Hotels, originally built to accommodate standard cruise passengers, gradually start generating their own traffic, including day trips to Antarctica. Increasing numbers of rogue operators who do not comply with the self-regulatory regime appear on the market. The massification of Antarctic tourism leaves ever less room for wilderness trips, and overwhelms the mechanisms for self-regulation.

The "negotiation" group (cooperative industry, ATCP consensus) also projected arrivals to increase. In this vision, the sheer volume of tourism creates so much internal tension within the self-regulatory regime that by 2015 the organisation breaks down and government is forced to assume responsibility for regulating tourism. Global water and energy shortages and other geopolitical developments trigger governments to engage in new economic activities, such as iceberg harvesting and the mining of minerals. The industrialisation of Antarctica diminishes the continent's attractiveness as a wilderness area, and tourism growth slows down as a result. Some tourist infrastructure and facilities are put to another use in the new industries.

The "SOS Antarctica" group (uncooperative industry, divided ATCPs) projected the dominance of ship-based tourism to gradually shift to land-based tourism. In this vision, several airstrips and one hotel are available in Antarctica by 2010, attracting tourists making day trips. Cruises lose their exclusiveness and slowly go out of fashion. By 2020, the airstrips have grown into hubs, which are extensively used by tourists to experience the whole continent in all its diversity. The growing numbers of tourists put increasing pressure on scientific research in Antarctica. Dog sleds are reintroduced for melancholic reasons; a bird virus causes havoc among penguins, and by 2030 all emperor penguins are extinct. The tourism workforce creates permanent settlements. Tourism growth slows down due to a lack of innovation, and the unwillingness and inability of tour operators to cooperate towards a sensible form of exploitation of the continent for tourism purposes. Multinationals start dividing the continent amongst themselves along geographical and thematic lines, leaving little room for small entrepreneurs.

A prominent feature in all storylines is the increase in tourist arrivals, albeit the growth rates vary substantially. Regardless of all uncertainties involved, increasing growth in tourist numbers seems to be almost inevitable. This may have implications that go beyond the tourist industry, as tourism growth has been linked to increasing environmental pressure and catastrophic impacts (ASOC 1999). Growth does not necessarily mean more of the same, as the storylines show. The nature of tourism and tourism transport in Antarctica might shift substantially; from medium sized expedition vessels to large cruise liners and from ship-based to land-based tourism, serviced by air links. One storyline emphasises the fact that Antarctic tourism is not a closed regional system, but a global industry influenced by many global developments, such as economic growth, terrorism, and climate change. International water and energy shortages, as well as biological invasions and the spread of disease, might have a great influence on the destiny of Antarctic tourism development. Some of the storylines allude to the inherent tensions in the structure of the tourist industry by featuring "rogue entrepreneurs" that upset the self-regulatory system. Strict self-regulation measures increase the incentives for tour operators to withdraw from IAATO or to refrain from joining in the first place. The storylines address the challenge of self-regulation to maximise compliance, while minimising the risk of defection.

DISCUSSION AND CONCLUSIONS

Tourism has grown and diversified substantially over the past two decades. Realising that a certain level of coordination would be beneficial for the tourist industry as a whole, the Antarctic tour operators founded IAATO that subsequently developed a system of self-regulation. This arrangement has produced satisfactory results so far, but it may come under increased stress in the future as a result of tensions among IAATO partners or the emergence of issues that simply cannot be solved by a sectoral organisation such as IAATO.

This paper argues that a more active involvement by the Antarctic Treaty System is warranted, starting with the development of a strategic vision on tourism in Antarctica. Scenario development can support this process, by exploring salient uncertainties and incorporating a broad range of stakeholders and perspectives. Scenarios provide a framework for discussing the implications of a wide range of plausible future developments and the effectiveness of different responses to address them. The "what-if" exercises that are made possible by scenarios do not decrease the fundamental uncertainties in any way, but they allow policy-makers and stakeholders to explore and prepare for a wide range of eventualities. Scenario development is an iterative process, going back and forth between the identification of relevant factors, the development of limited strings of events, and the recombination of these storylines into full-blown consistent scenarios. Various workshops and other participatory meetings may be needed to obtain an appropriate sample of stakeholder perspectives and knowledge.

This paper reports on the findings from the first ATLANTIS scenario development workshop. This workshop for Dutch stakeholders in The Hague in 2005 aimed at identifying driving forces and barriers for tourism development, and at producing an initial set of storylines. The workshop was successful in achieving these goals, but it should be remembered that the storylines that were developed are no more (and no less) than the products of a creative exercise performed by stakeholders. Only Dutch stakeholders participated in the workshop, and future constraints resulting from regulatory measures were not considered specifically. Nevertheless, the results of the scenario workshop represent the views of a wide enough variety of experienced and knowledgeable stakeholders to capture many salient uncertainties. And although the individual storylines represent only a very limited part of possible future developments, together they provide a rich overview of both the shared beliefs about the issue at hand, and the uncertainties and complexities surrounding it. The storylines bave been checked for consistency and plausibility (e.g., the reintroduction of the dogs), and substantiated with evidence so that they can be used in a set of scenarios used for policy purposes. They have been enriched and recombined into more complete and detailed scenarios. In two follow-up workshops, a broad group of stakeholders, reflected on the plausibility, divergence and quality of the scenarios, and explored their policy implications.

Some of the The Hague storylines that may seem far-fetched at first sight turn out to be quite plausible at closer inspection. Large-scale land-based tourism development, for instance, may seem a distant possibility at the moment, but it has

already been proposed in the past (ROHDE 1990), and new initiatives may emerge in the future. In fact, (semi-) permanent land-based accommodation for tourists in Antarctica already exists, e.g., in tented camps and research stations. A number of ATCPs, including New Zealand, Australia and Germany, are currently lobbying for a prohibition on permanent land based tourism facilities (ATS 2005), but to date there are no specific policies in place to prevent the construction of such facilities if so desired. The legal implications of such a development, with regard to property rights and jurisdiction, would nevertheless be large (NEW ZEALAND & AUSTRALIA 2006).

The example of land-based tourism development illustrates the value of the participatory scenario approach in providing a platform for exploring a wide range of plausible future developments and discussing their potential implications. Participatory scenario workshops can provide the building blocks and insight for the development of a vision on Antarctic tourism development that is robust enough to cope with the complexity and unpredictability of the sector. Such a vision could provide the foundations for a consistent regulatory framework for tourism, complementing the self-regulatory efforts by the sector.

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