

PERSPECTIVE

Managing cumulative impacts and protected areas in Antarctica: what can we learn from the rest of the world?

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Abstract

For more than 20 years Antarctic Treaty Parties have been discussing how to appropriately manage cumulative impacts in the continent. Preventing cumulative impacts requires the fluent exchange of information to enable proper and timely assessment of, and response to, the impacts that result from multiple activities, undertaken by multiple stakeholders and supervised by different Parties. This is a particular challenge for the effective management of Antarctic Specially Protected Areas (ASPAs), as a lack of coordination may potentially put at risk the fulfillment of their conservation objectives. Here we suggest that incorporating lessons learnt from protected areas management elsewhere might improve the effectiveness of ASPAs and provide valuable experiences and insights on how to better manage cumulative impacts in the rest of the continent. Key concepts to incorporate in Antarctica's environmental management toolbox include (1) the notion of adaptive management, which is a cornerstone of protected areas management effectiveness elsewhere, and (2) the need of empowering protected area managers, which are a key (but often missing) element to ensure local compliance with management plans, co-ordinate on site activities, facilitate exchange of information, promote cooperation and manage conflicts.

Cumulative impacts of human activities in Antarctica

How to manage the cumulative impacts of human activities on Antarctic ecosystems is an ongoing and generally unresolved issue for the AT Parties, from both policy and more operative perspectives. From a policy perspective, it would be beneficial to incorporate into Antarctica's environmental protection toolbox a range of management tools that have been developed and widely used outside Antarctica since the approval of the Protocol on Environmental Protection to the Antarctic Treaty, also known as the Environmental Protocol or Madrid Protocol (Barrow 2006). For instance, incorporating Strategic Impact Assessments in the process of planning activities in Antarctica, has been on the ATCM agenda for more than 20 years (Roura & Hemmings 2011; ATS 2015). Yet, advances have been very limited so far. At a more operative level, preventing cumulative impacts needs fluent and timely exchange of information among AT Parties. The Parties' use of the Electronic Information Exchange System, which is operated by the AT Secretariat, has

improved significantly in the last few years. However, a qualitative improvement in information-sharing among Parties is needed in order to enable proper and timely assessment of the impacts that result from multiple activities, undertaken by multiple stakeholders and assessed by different Parties (Perterra & Hughes 2013; ATS 2021a).

Finding ways to assess and cope with cumulative impacts in a timely manner is relevant for all issues addressed within the Madrid Protocol, but in particular for those issues considered through Annex I (Environmental Impact Assessment) and Annex V (Area Protection and Management). Designing and setting management goals for an ASMA or ASPA requires the engagement of all Parties and building consensus. Designation and management of PAs is a collaborative initiative. In contrast, except for Comprehensive Environmental Evaluations, which are open to scrutiny and comment by all Parties, the lower levels of EIA in Antarctica are conducted by each AT Party largely in isolation (ATS 2016). Levels of effort and attention put into the follow-up stages of the EIA process, which are key for correcting possible deviations from assumptions at the

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Abbreviations

ASMA: Antarctic Specially Managed Area
ASPAs: Antarctic Specially Protected Area
AT: Antarctic Treaty
ATCM: Antarctic Treaty Consultative Meeting
ATS: Secretariat of the Antarctic Treaty
EIA: environmental impact assessment
PA: protected area

assessment stage (Arts et al. 2001; Marshall et al. 2005), differ widely among Parties, potentially limiting the contribution of EIAs as a tool to protect Antarctic ecosystems from the impacts of human activities.

Adaptive management of ‘wicked problems’

The need to close the loop between assessment, planning and implementation when managing ecosystems is at the heart of the concept of adaptive management. This management paradigm, despite its relevance and prominence for ecosystem management (Williams & Brown 2014; DeFries & Nagendra 2017), is not even mentioned in the Madrid Protocol. Neither it is in current AT directives and guidelines for PA management or EIAs (ATS 1991a, b, 2016, 2017). Adaptive management originated in the 1970s and was initially known as ‘adaptive environmental assessment and management’, an iterative process for improving ecosystem management policies and practices (Holling 1978). Adaptive management formally incorporates a learning process in the implementation of actions aimed at fulfilling management objectives. It is generally characterized as a planning–implementation cycle that integrates project design, management and monitoring, thereby providing a framework for systematically testing assumptions, promoting learning and supplying information for decision-making. The process, therefore, allows for timely adjustments to initial decisions, reassessment of plans and redefinitions of goals based upon new evidence. At the same time, it promotes social learning and collaboration.

Because ecosystems are dynamic complex systems, managing ecosystems is a “wicked problem” (Kawa et al. 2021: 1), that is difficult to solve because of incomplete, contradictory and changing requirements that are often difficult to recognize (DeFries & Nagendra 2017). This resistance to solutions arises from a range of factors, including: complexity and interdependency of components, which create feedbacks and nonlinear responses to interventions; uncertainty of risks and unintended consequences; divergence in values and decision-making power of multiple stakeholders; and mismatches in spatial and temporal scales of ecological and administrative processes. There is no single or best solution to this particular ‘wicked problem’, yet, applying the principles of adaptive management has been suggested as a promising approach when planning interventions in ecosystems and managing the impacts of human activities (DeFries & Nagendra 2017). Applying the principles of adaptive management might therefore constitute a promising approach to manage cumulative impacts of human activities in Antarctica.

Managers and adaptive management of ASPAs?

Some of the best examples of the application of adaptive management principles in ecosystems management come from PAs worldwide. Adaptive management is often considered essential for effective PA management (Westgate et al. 2013). A key component of PA management is PAs management plans. These describe the actions needed to ensure that a PA achieves the purpose for which it was established (Lockwood et al. 2006). They are the central mechanism to apply legislation and policy. The creation, implementation and revision of PA management plans depends on, and can facilitate, meaningful stakeholder participation.

Given the vast experience of applying adaptive management principles in PAs across the globe, and the value of this type of management for ecosystems management, one way to explore its value for managing cumulative impacts in Antarctica is to apply its principles for managing ASPAs in areas with intense human activity. There are currently 75 declared ASPAs in Antarctica (ATS 2021b). These cover less than 1% of Antarctic’s land surface (Hughes & Grant 2018). The process of designating an ASPA includes the approval of an initial management plan by all Consultative Parties of the AT. Management plans are expected to be reviewed at least every five years and updated as necessary (ATS 1991a). For more than 20 ASPAs this deadline has passed without plans being revised (ATS 2021b). It is worth noting that while the decision to develop new infrastructures and activities (with their associated footprints) is taken by Parties individually, a protected site cannot be designated without the agreement of all 29 of the Antarctic Treaty Consultative Parties, making the expansion of the human footprint far easier than the protection of the environment.

An ideal case study to explore how to properly manage cumulative impacts in areas with intense human activities is ASPA 150, Ardley Island, off King George Island/Isla 25 de Mayo, in western Antarctica. ASPA 150 is located just off-shore of the Fildes Peninsula, one of the areas of Antarctica with the greatest density of research stations and largest human footprint (Braun et al. 2012; Pertierra et al. 2017; Brooks et al. 2019; Convey 2020). A recently published paper (Gao et al. 2021) shows that despite being an ASPA, Ardley Island is actually one of the areas in Fildes Peninsula with the highest cumulative impact scores.

PAs need active management to avoid the undesired effects of activities conducted within the areas and in their surroundings (Lockwood et al. 2006). A key component

of PA effectiveness is the ability to promote compliance with the restrictions established in the management plan. In addition to enforcing restrictions, management should also seek to implement positive actions (e.g., restoration activities), and monitor whether these are being successful in advancing the PA's objectives (Coad et al. 2015; Geldmann et al. 2019). This requires allocating resources and personnel that are empowered to take management decisions based on available information. PA managers are thus an essential component of PAs, and one of the key elements to ensure their effectiveness (Muñoz Brenes et al. 2018). However, ASPAs do not have a manager that is routinely present in the vicinity of the PA. This is an issue that deserves a thorough analysis by the AT Parties. PA managers or park managers are present on the ground across the entire globe, except for Antarctica, where, no one manages ASPAs on a day-to-day basis. Such a role might be particularly needed in areas close to human infrastructure or where human activity is intense, such as on Ardley Island.

There is, however, a relevant precedent that exist with regards to area management within some ASMAs. Some ASMAs have a management group that assists in the planning and co-ordination of activities, works to avoid possible conflicts and improve cooperation, and facilitates effective communication between Parties (e.g., ATS 2019). A similar system could be implemented for ASPAs located within highly visited areas. Management plans could suggest the establishment of a management group to ensure the implementation of actions aimed at pursuing an ASPA's goals. A management group provides a means for rapid responses to contingencies and emergencies, and 'live' coordination among operators on the ground. This would provide a flexible framework for the timely exchange of information among Parties operating in the area.

In a further development, not normally considered within ASMA management groups, Parties could also share—through an ASPA management group—information on activities planned or authorized in the vicinity of the ASPA, thus enabling the consideration of both internal and external sources of potential impact when conducting impact assessments. For example, the north-east beach of Ardley Island is a tiny strip of coast that is explicitly excluded from the ASPA to accommodate recreational visitors, for which specific visitor site guidelines have been generated (ATS undated). Where the situation dictates, a management group might conclude that it is advisable to temporarily close the beach to visits. Such recommendation could then be considered by AT Parties when conducting EIAs on activities involving visits to that beach, and/or issuing permits for entry to the ASPA.

There is a need for a shift in the way activities are planned and assessed in Antarctica. We must move from a reactive approach based on EIAs to a more flexible approach based on monitoring and evidence-based adaptive management (Soutullo & Rios 2020). Ardley Island provides a valuable case study to test and expand the ASPAs' management toolbox by incorporating methods and approaches widely used in PAs worldwide. Most importantly, the island provides an opportunity to explore better ways to assess and manage cumulative impacts in Antarctica in general, leading the way towards more up-to-date environmental practices in Antarctica, firmly rooted in concepts such as adaptive management and strategic impact assessment. Antarctica presents unique challenges in terms of environmental conditions, remoteness, governance, funding, enforcement and so on, but many of the lessons learnt from transboundary PAs, PAs in Arctic regions and other PAs are likely to provide useful insights to improve ASPA management and ecosystem management throughout Antarctica (Soutullo & Rios 2020).

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