

Report of the SCAR Ant-ICON Workshops on State of the Antarctic Environment Reporting (SAER)

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Executive summary

One function of the Committee for Environmental Protection (CEP¹) is to provide advice to the ATCM on ‘*the state of the Antarctic environment*’, a priority that is also listed in the CEP’s Five-Year Work Plan. A small number of earlier initiatives have delivered state of the Antarctic environment reporting (SAER) at a regional level. However, SAER at a range of spatial scales is likely to further support the work of Antarctic policymakers. Such information could potentially be utilised to: (i) inform the development of the Antarctic Protected Area System, (ii) increase understanding concerning environmental monitoring needs; (iii) identify sites where management could be used to improve environmental state, such as by reducing pollution; and (iv) highlighting gaps in scientific knowledge.

The SCAR Scientific Research Programme (SRP) ‘*Integrated science to inform Antarctic and Southern Ocean Conservation*’ (Ant-ICON) has proposed a community-led initiative to provide information relevant to SAER, in order to support the work of Antarctic policymakers. The project aims to develop a framework and platform for provision of best available science to inform policymakers’ advice on the state of the Antarctic environment. To gauge community interest in such a project, two online community workshops were held on 25th and 26th October 2022.

Main points discussed at the workshops include:

- Identifying that the primary target audience for the reported information as (i) the decision-makers participating in the policy organisation of the Antarctic Treaty System (i.e., the ATCM, CCAMLR and CEP), (ii) national governments, and (iii) national Antarctic programmes and COMNAP. However, other stakeholders, operating within Antarctica and globally, may also find the information useful. The area under consideration for reporting should include the Antarctic Treaty area, the CAMLR Convention area and other dependant and associated ecosystems, as relevant.
- Consideration of climate change and the synergistic/cumulative impact of multiple drivers of change will be integral to the project, where climate change is the background against which all other drivers of change should be considered.
- Drivers of change in the Antarctic environment that should be considered under this project include: (i) human activities and land use; (ii) non-native species; (iii) pollutants; and possibly (iv) harvesting or extraction (e.g., sampling) of resources.
- The various drivers of change do not influence all parts of Antarctica equally, resulting in the need for information provision at different spatial scales (i.e., local, regional, and/or continental). As far as possible, information should be provided at a spatial scale appropriate to the needs of policymakers.
- An on-line and updatable reporting format may be most appropriate. An interactive on-line map or Geographic Information System (GIS) may facilitate effective representation of information at different spatial scales.
- The reporting outputs should be presented in an independent and objective, policy-ready format with source information subject to peer-review, to the maximum extent practicable. The SCAR Antarctic Environments Portal (<https://environments.aq/>) provides an existing platform for delivery of policy-relevant information to decision-makers and could prove an effective and updatable mechanism for delivery of SAER outputs.

Several challenges and risks have been identified that will each need to be managed in order to deliver a successful outcome. Advice from several workshop participants with experience of large collaborative projects was to ‘start small and build up slowly’. To maximise the chances for success, further scoping of the project will be required, taking into consideration feedback from stakeholders, including ATS policymakers.

¹ Acronyms used in this document are defined in Appendix 1

General introduction

Article 12 (1) of the Protocol on Environmental Protection to the Antarctic Treaty sets out the functions of the Committee for Environmental Protection (CEP), i.e.:

‘...to provide advice and formulate recommendations to the Parties in connection with the implementation of this Protocol, including the operation of its Annexes, for consideration at Antarctic Treaty Consultative Meetings, and to perform such other functions as may be referred to it by the Antarctic Treaty Consultative Meetings.’

The Protocol goes on to state that amongst other things, the Committee shall provide advice on *‘the state of the Antarctic environment’* (Article 12(1j)).

The CEP has identified monitoring and state of the environment reporting as a Priority 2 issue in its 5-Year Work Plan. To date, efforts to undertake comprehensive SAER for the Antarctic have been limited, although some nations have compiled regional assessments, including Australia and New Zealand for East Antarctica and the Ross Sea Region, respectively. Progress on this issue may be affected by the level of access policymakers have to scientific information and the availability of capacity and expertise to transform scientific information into a policy-relevant format.

A potential new SCAR initiative

The SCAR Scientific Research Programme (SRP) *‘Integrated science to inform Antarctic and Southern Ocean Conservation’* (Ant-ICON) was established to answer fundamental science questions relating to the conservation and management of Antarctica and the Southern Ocean, with a focus on research to inform international policy decision-making.

Around the globe, state of the environment reporting has been a common tool used to gain better understand and assess the state of a region’s environment. Generally, state of the environment reports provide information on the status of an ecosystem or environment that can be easily compared over time to allow policymakers to track changes (positive and negative) in the health of the system. Often the state of the environment or ecosystem might be represented by measurable indicators and other relevant information. State of the environment reporting can be carried out at different scales, from that of a single bioregion, to that of a country or continent, though it is most often used at broad scales.

Given the potential importance of SAER reporting for stimulating discussion and relevant decision-making within the Antarctic Treaty System, Ant-ICON Theme 2 ‘Human impacts and sustainability’ has proposed a community-led initiative to develop a framework for provision of information and best available science on selected topics to inform policymakers’ on the state of the Antarctic environment. The information could be categorised by each of the primary drivers of change in the environment, including non-native species introductions, pollution from local and global sources, wildlife disturbance and habitat change associated with human activities, and extraction of resources (predominantly marine living resources).

Climate change is the backdrop against which all other drivers of change in Antarctica must be considered. Climate change has been and is currently the focus of other SCAR initiatives (e.g., the SCAR report *‘Antarctic Climate Change and the Environment: A Decadal Synopsis. Findings and Policy Recommendations’*, and the SCAR SRPs AntClimNow and INSTANT). Therefore, while climate change may not be the primary focus of the proposed project, it will inevitably be an important consideration in all aspects of the work. Strong links with other groups addressing climate change issues will be important in the provision of information to inform SAER.

As well as informing SAER, the information collected could potentially also be used to:

- (i) inform the development of the Antarctic Protected Area System;
- (ii) better understand environmental monitoring needs;

- (iii) identify sites where management actions could improve environmental state, such as by reducing pollution;
- (iv) provide Antarctic-relevant information to policymakers involved in global issues, such as the release of long-range pollutants;
- (v) highlight gaps in scientific knowledge or areas where further policy development may be beneficial; and
- (vi) engage early career researchers in the delivery of policy-relevant research.

Ant-ICON workshops

To gauge community interest in a new Ant-ICON State of the Environment community project, two online workshops were held in October 2022. The workshops were scheduled at different times to accommodate participation by individuals located in different time zones (see Appendices 2 and 3). Attendance was open to all and was advertised through the Ant-ICON and SCAR mailing lists and social media platforms. In total, 50 researchers from the natural and social scientists, managers and policymakers participated in the workshops with individuals registering from 28 countries (i.e., Argentina, Australia, Belgium, Brazil, Canada, Chile, Colombia, Czechia, Ecuador, France, Germany, Guatemala, India, Italy, Japan, Republic of Korea, Malaysia, the Netherlands, New Zealand, Nigeria, Norway, Portugal, Russian Federation, Spain, South Africa, Uruguay, the United Kingdom and the United States of America). The high number and diversity of participants demonstrates the interest of the Antarctic community in being involved in a project relevant to SAER and is an acknowledgement of its importance.

Workshop participants were asked for their views on the potential usefulness of a community project relevant to SAER and the format this project (and associated outputs) might take.

The workshops format comprised an introductory presentation on SAER, followed by the formation of breakout groups, led by a facilitator, to allow the opportunity for participants to express their views on the proposed initiative. To help guide discussions, breakout groups were asked to consider answers to the following five questions regarding SAER:

1. What threats/impacts (topics) should we include and how should we divide them?
2. Which topics should we do first?
3. How could we divide Antarctica into regions?
4. How do we best communicate our findings to policymakers (i.e., report format/template)?
5. What other organisations should we involve (or individuals)?

After the discussions concluded, the workshop participants re-convened, and a summary of breakout group discussions was provided by a representative of each group. The workshop convenors used notes prepared by the breakout group facilitators and recordings of the breakout group discussions to produce this report.

The workshop participants were informed of the plan to submit the workshop report to CEP XXV in Helsinki (2023) in order to:

- (i) inform the CEP that the SCAR scientific community are considering how they might contribute to SAER;
- (ii) provide the CEP with information on the views of the Antarctic scientific community regarding the potential provision of information relevant to SAER; and
- (iii) request the views of the CEP Members regarding the usefulness of this proposal and, if considered beneficial, what information would be most useful for supporting the Committee in their provision of advice to the ATCM on the state of the Antarctic environment.

We also aim to submit the report to CCAMLR-42 (October 2023) for information and feedback.

Workshop discussion points

The discussions held during the online workshops have been summarised and grouped under eight primary headings below.

1. Audience and stakeholders

- The primary intended audience for SCAR information could include:
 - Policy bodies established under the Antarctic Treaty System, e.g., ATCM, CEP and CCAMLR.
 - National governments (including parliamentarians with an interest in Antarctica),
 - National Antarctic programmes and COMNAP.
- Although not the primary audience, the information provided through SAER may also be of interest to other individuals and bodies, e.g.:
 - International conservation organisations (IUCN, IPBES, RAMSAR, IWC, ACAP, etc.)
 - International regulatory organisations that sit outside the Antarctic Treaty System, e.g., IMO and MARPOL, which regulate shipping and pollution in the Southern Ocean
 - Industry bodies of the tourism and fishing industries (IAATO, ARK and COLTO).
 - National and regional funders of polar research
 - The general public (potentially promoted through the SCAR Action Group on ‘*Public Engagement with Antarctic Research*’; PEAR)
- It is noted that relevant policy channels for some drivers of change in Antarctica may lie beyond the Antarctic Treaty System. For example, members of bodies involved in global chemical pollution regulation (e.g., the Stockholm Convention). However, in this case, communication of relevant information may fall under the remit of the SCAR Action Group ‘*Input Pathways of Persistent Organic Pollutants to Antarctica*’ (IMPACT), who could work with Ant-ICON throughout the process.

2. Project scope

- For the purposes of this project, the Antarctic environment includes all marine areas, ice-free areas and areas of permanent ice within the Antarctic Treaty area, the CAMLR Convention area and other dependant and associated ecosystems, as relevant.
- The project scope and the range of issues considered should be guided by the needs of the end users, i.e., primarily the policymakers in the organisations of the Antarctic Treaty System. Identification of topics relevant to the CEP may be identified through direct consultation and by examining existing CEP guiding documents such as the CEP 5-Year Work Plan (https://documents.ats.aq/atcm44/ww/atcm44_ww015_e.pdf) and the list of CEP science needs (https://documents.ats.aq/ATCM43/att/ATCM43_att054_e.docx).
- Care should be taken not to duplicate work already undertaken by other policy bodies, organisation and initiatives (e.g., that of MEASO²). Nevertheless, provision of existing information in an integrated accessible format may be considered useful.
- To ensure the delivery of information relevant to SAER is achievable and sustainable, the project should have modest initial goals. Reported information should be made readily

² Marine Ecosystem Assessment for the Southern Ocean: [Progress, key outcomes to date, and next steps](#)

available and be updateable on a regular basis. An important component of the project could be to identify existing knowledge gaps regarding the state of the Antarctic environment, for example, these may concern regions or topics with little information available.

3. *Drivers of change*

- Information could potentially be divided by the following drivers of Antarctic environmental change:
 - Human activities and connectivity: Provision of information on levels and intensity of human presence and activities at a location (e.g., numbers of people/flights/boats, fishing locations, etc.) could be useful as an indicator of potential associated impacts (though information on measured impacts can also be provided where available). The level of connectivity of a given location may also provide useful information on the likelihood of future impacts, e.g., non-native species introductions.
 - Non-native species: Whilst much information on terrestrial non-native species has already been presented to the CEP, less is known about the marine setting. Wildlife pathogens (e.g., the virus causing highly pathogenic avian influenza) could also be considered, along with the movement of species, including microorganisms, within Antarctica.
 - Pollution: Examples could include pollutants where the source is predominantly (i) within Antarctica (e.g., sewage, hydrocarbons), (ii) outside Antarctica (e.g., persistent organic pollutants) or (iii) potentially both (e.g., plastics, emissions).
 - Extraction of resources: Information could be provided on where fishing occurs across different marine regions and possibly the levels of sampling of biological, geological and palaeontological specimens for scientific purposes.
- Changes in species distributions and abundances may be a consequence of the drivers of change, listed above. It may be appropriate to record changes in macro and microscopic species diversity across the continent, as feasible.
- Climate change is relevant to all drivers and will be incorporated into the consideration of each of the above drivers.
- Drivers of change may have a synergistic impact at a given location. Consideration should be given to how this might best be presented to policymakers (e.g., interactive maps, Geographic Information System (GIS), etc.). Emerging drivers of change could also be considered.

4. *Project structure*

- Identified drivers of change could be categorised and/or prioritised based upon whether regulatory jurisdiction resides within the ATS (e.g., non-native species introductions, land use, fishing activity) or resides predominantly within the jurisdiction of global governance organisations (e.g., long-distance transportation of global pollutants, global climate change and greenhouse gas emissions).
- It may be helpful to group drivers of change according to the affected environment, e.g., marine and/or terrestrial environments. Topics relevant to the interface between marine and terrestrial environments should be considered.
- When developing the project structure, it may be useful to looking to precedents established by those considering environmental reporting elsewhere, e.g., using the five main drivers of change recognised by several United Nations organisations: (i) climate change (ii) biological invasions (iii) pollution, (iv) extraction of resources; and (v) land use changes.

- For each driver of change, trends should be identified and explained, where possible. The contribution of natural variability to any change should be determined, as appropriate. Where relevant, possible future trajectories could be explored.

5 Spatial scale of reporting

- The dominant drivers of change may differ across the various regions of Antarctica. For example, climate change and human activity (e.g., tourism, fishing and national operator activity) may be more concentrated in some regions compared to others. It should be remembered that regions do not exist in isolation and impacts in one region may have consequences in others.
- As far as possible, information should be provided at a spatial scale appropriate to the differing requirements of the target audiences (e.g., at local, regional, continental scales). It may be useful to provide a broad overview of an issue, as well as to provide information on a regional basis. Information could be provided at a finer spatial scale at ‘hot spots’ of higher human activity, where data exist.
- Consideration should be given to the use or modification of existing management tools used to separate Antarctica into different regions, e.g., the Antarctic Conservation Biogeographic Regions (ACBRs), Environmental Domains Analysis (EDA), the six continental Antarctic sectors (i.e., Ronne, Maud, Enderby, Wilkes, Scott and Byrd Lands), CCAMLR regions, Southern Ocean Observing System (SOOS) regions, or the Marine Ecosystem Assessment for the Southern Ocean (MEASO) assessment areas. Boundaries between regions may also be guided by existing biogeographical boundaries and human activities and connectivity.
- The spatial scale of the identified regions will have to provide a balance between usefulness to policy makers vs. capacity within SCAR/Ant-ICON to deliver the information. Delivery of finer spatial scales may become possible as the project develops.

6. Report format and editorial standards

- Various format options for provision of information exist. However, an on-line and updatable format may be most appropriate (e.g., see the non-Antarctic example, Science Brief: <https://sciencebrief.org/>). Lessons may be learnt from outputs developed by other organisations, including the IPCC, IPBES, etc.
- The SCAR Antarctic Environments Portal (<https://environments.aq/>) provides an existing platform for delivery of policy-relevant information to decision-makers and could prove an effective and updatable mechanism for delivery of information relevant to SAER.
- Representation of data on a GIS or interactive map might provide one method of representing information at different spatial scales. Different layers could show, e.g., human footprint, areas of high biodiversity, concentrations of wildlife, levels of different pollutants, protected areas, etc.
- The outputs should be presented in a policy-ready format. Outputs should be visually engaging, using good quality graphics, videos, cartoons, and other innovative communication methods as appropriate.
- All information provided must be independent and objective. To the extent feasible, project outputs should be supported by peer-reviewed information. It is recognised that some local environmental monitoring information may not always be readily available. Broad engagement with researchers from across the National Antarctic Programmes may be needed to facilitate access to available information.

- Reporting could include a succinct summary, with further detailed information made available as needed. The development of information templates may help keep formatting consistent across different author groups. Consideration should be given to the development of metrics to determine use of the information by the target audience.

7. Potential challenges and risks

- Identified challenges and risks to the project are listed below:

	Issue	Potential solution
1	Lack of support, or interest, from policymakers, e.g., due to poor communication of goals and objectives.	Clear communication and early consultation with policymakers by SCAR
2	Insufficient on-going funding from SCAR or other sources to deliver and further develop the project	Ensure project scope does not exceed resource availability, both in terms of funds and researchers' time.
3	Insufficient engagement from the scientific community to maintain project momentum over several years	Parties to communicate the value of SAER to researchers and encourage and potentially incentivise participation
4	Lack of sufficient funding to researchers to facilitate the provision of data to support the project's aims.	Parties to communicate the value of SAER to their national science funding bodies
5	Little agreement on the use of standardised methodologies, making robust comparisons of data difficult.	Provide clear templates to use, and SCAR to encourage greater use of standardised methodologies, where feasible.
6	Lack of on-going science communication expertise over extended periods to update SAER-relevant outputs when required	SCAR and the scientific community to engage in mentoring, succession planning and capacity building (e.g., the SCATS/Ant-ICON CEP/CCAMLR Fellowship Scheme)

8. Recommendations for the next stage of project scoping

- Prior to the further commencement of the project, it may be useful to undertake the following scoping tasks:
 - Further explore the range of drivers of change potentially affecting the Antarctic environment. Devise a means to prioritise drivers of change, taking into consideration feedback from policymakers.
 - For each driver of change, identify potential information sources, both within and external to SCAR, to inform SAER.
 - Through broad consultation, determine the level of capacity within the Antarctic research community to deliver policy-relevant information across the full range of drivers of environmental change.
 - Investigate how best to collate and manage the data collected to inform SAER. Consider what the term 'baseline data' means in the context of environments already subject to change.
 - Develop a process to determine how often SAER-relevant information should be updated, including the provision of information overviews. This may vary depending upon the

issue, rate of change, policymaker needs and available resource within the scientific community.

- Explore how best to represent the synergistic effects of multiple drivers of change upon environments and biodiversity.

Conclusions

The aims of this report were to (i) consider the potential benefits of provision of information relevant to SAER, and (ii) provide a summary of workshop discussions by members of the Antarctic science community on the development of a project relevant to SAER.

There was wide interest within the workshop participants in the development of a project to provide information on the state of the Antarctic environment. Workshop participants were very clear that the views and perspectives of policymakers are essential to inform the next stages of this potential activity. Based on this identified need, SCAR would welcome the views of Antarctic Treaty System policymakers and other stakeholders, as relevant, on the proposed initiative.

Acknowledgments

The workshop convenors are grateful to the workshop participants who so generously gave of their time and shared their knowledge. Natasha Gardiner (NZ), Arlie McCarthy (Germany); Hanne Nielsen (Australia), and Luis Pertierra (Spain) are thanked for facilitating the breakout groups. Johanna Grabow (SCAR) is thanked for providing organisational support for the workshops.

Appendix 1: Glossary of acronyms used in this report

Acronym	Definition
ACAP	Agreement on the Conservation of Albatrosses and Petrels
AntClimNow	SCAR SRP: Near-term variability and prediction of the Antarctic climate system
Ant-ICON	SCAR SRP: Integrated science to inform Antarctic and Southern Ocean conservation
ARK	Association of Responsible Krill harvesting companies
ATCM	Antarctic Treaty Consultative Meeting
CCAMLR	Commission for the Conservation of Antarctic Marine Living Resources
CEP	Committee for Environmental Protection
COLTO	Coalition of Legal Toothfish Operators
IAATO	International Association of Antarctica Tour Operators
IMPACT	SCAR Action Group: Input pathways of persistent organic pollutants to Antarctica
IMO	International Maritime Organization
INSTANT	SCAR SRP: Instabilities and thresholds in Antarctica
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IUCN	International Union for Conservation of Nature
IWC	International Whaling Commission
MARPOL	International Convention for the Prevention of Pollution from Ships
MEASO	Marine Ecosystem Assessment for the Southern Ocean
PEAR	SCAR Action Group: Public Engagement with Antarctic Research
RAMSAR	RAMSAR Convention on Wetlands of International Importance
SAER	State of the Antarctic Environment Reporting
SCAR	Scientific Committee on Antarctic Research
SRP	Scientific Research Programme (of SCAR)

Appendix 2. State of the Antarctic Environment Reporting (SAER) - Workshop Agenda

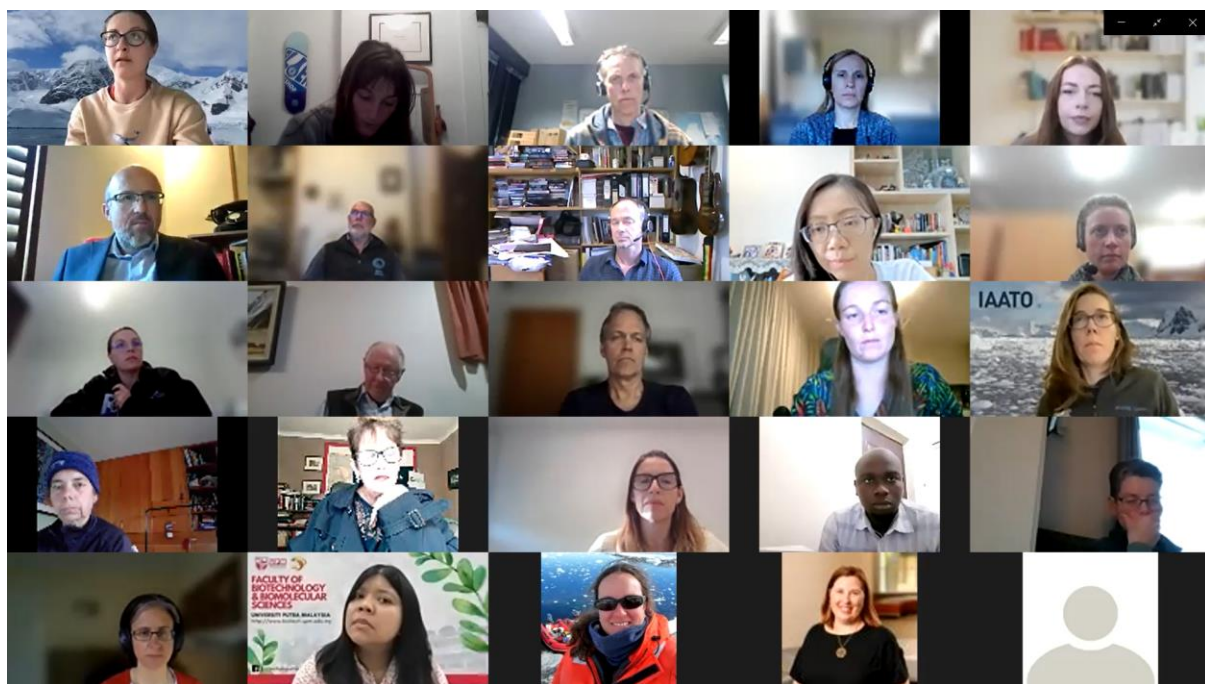
Workshop #1: 06:00-07:30 UTC, Tuesday 25th October

Workshop #2: 15:00-16:30 UTC, Wednesday 26th October

1. Welcome (5 min)
2. Introductory presentation (10 min)
3. Breakout group instructions and questions (5 min)
4. Breakout groups (30 min)
5. Feedback from each breakout group (20 min)
6. Summary and next steps (5 min)
7. Close

Appendix 3: Screenshots of some participants at the online workshops

Workshop #1



Workshop #2

