

Guest Editorial

Advancing Antarctic climate change policy: upcoming opportunities for scientists and policymakers to work together

Abstract: Climate change is increasingly affecting Antarctica and the rest of the world. Urgent policy responses are needed to mitigate its associated impacts. Engagement of the Antarctic Treaty Consultative Meeting (ATCM), Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) and Committee for Environmental Protection (CEP) with the issue of climate change has culminated in several important meetings planned for 2023/2024. Researchers play a crucial role in the provision of the best available science to inform action by Antarctic policymakers, and the Scientific Committee on Antarctic Research (SCAR) clearly will play an important role in representing the Antarctic science community and delivering the latest science into the upcoming meetings. However, recognizing the ATCM's call for Parties and other stakeholders to bring experts to its meeting to support the work and with acknowledgement by CCAMLR and CEP of the value of including a range of scientific experts, we highlight the opportunity for and importance of researchers engaging proactively to offer further bespoke scientific support. Given the urgency of addressing climate change in Antarctica and beyond, every effort is needed from researchers and policymakers to work together to facilitate the necessary policy responses at both the national and international level.

The Antarctic region is increasingly subject to the impacts of climate change (Chown *et al.* 2022, IPCC 2022). Ice shelves continue to collapse, glacier grounding lines are receding and summer sea ice extent has reached a new record low (Baumhoer *et al.* 2018, Gilbert & Kittel 2021, Turner *et al.* 2022b). Unprecedented seasonal temperature highs have been recorded on the Antarctic Peninsula and in East Antarctica, and the Southern Ocean continues to warm (Swart *et al.* 2018, Robinson *et al.* 2020, Turner *et al.* 2022a). These changes can have direct and indirect (and in some cases devastating) impacts upon wildlife (Convey & Peck, 2019), with implications for the conservation and management of species and the ecosystems of which they are a part (Trathan & Agnew 2010). For example, the emperor penguin is at particular risk due to loss of its sea-ice breeding habitat, and other species have been forced to shift their ranges southward to cooler environments (IPCC 2019, 2022, Trathan *et al.* 2020). Climate change, in concert with intensifying human activity, may also compound other issues, such as facilitating the transfer and establishment of non-native species, which represent one of the most significant threats to marine and terrestrial ecosystems (Convey & Peck 2019, McCarthy *et al.* 2019, Hughes *et al.* 2020).

In recent years, Antarctic science has informed and supported global efforts by the Intergovernmental Panel on Climate Change (IPCC), the United Nations Framework Convention on Climate Change (UNFCCC) and others to raise the profile and understanding of global climate change (e.g. IPCC 2019, 2022). This research has also influenced Antarctic policymakers within the Antarctic Treaty Consultative Meetings (ATCM), the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) and the Committee for Environmental Protection (CEP).

The ATCM governs Antarctica through consensus-based decision-making by its 29 Consultative Parties, with the CEP providing advice on matters relevant to environmental protection and CCAMLR being responsible for the ecosystem-based conservation and management of Antarctic marine living resources. While the texts of the Antarctic Treaty, the Protocol on Environmental Protection to the Antarctic Treaty and the Convention on the Conservation of Antarctic Marine Living Resources (CAMLR Convention) are almost silent regarding climate change, the issue has received increasing attention from these regional policymakers over the past ~20 years (Trathan & Agnew 2010, Njåstad 2020, Cavanagh *et al.* 2021).

Following discussions at the 'Antarctica's Future Environmental Challenges' workshop (ATCM XXIX, Edinburgh, 2006), the CEP added climate change to its agenda and made it a high-priority issue in its 5-Year Work Plan. Further momentum was given following the ATCM's discussion of the Scientific Committee on Antarctic Research (SCAR) Antarctic Climate Change and the Environment (ACCE) report in 2009 (Convey *et al.* 2009, Turner *et al.* 2009). This resulted in the Antarctic Treaty Meeting of Experts on Climate Change

Table I. Upcoming meetings of the policy bodies of the Antarctic Treaty System concerning climate change.

	Meeting	Organization(s)	Date	Location ¹
1	Joint session of the CEP and the ATCM to consider the implementation of the ACCE recommendations.	ATCM, CEP	Early June 2023	Helsinki, Finland
2	Integrating scientific information on climate change and ecosystem interactions into CCAMLR's work	SC-CAMLR	2023	To be confirmed
3	Joint CEP/SC-CAMLR workshop on climate change and monitoring	CEP (to be formally agreed by SC-CAMLR)	2024?	To be confirmed

¹Some or all of these meetings may allow for some degree of virtual attendance

ACCE = Antarctic Climate Change and the Environment; ATCM = Antarctic Treaty Consultative Meeting; CCAMLR = Commission for the Conservation of Antarctic Marine Living Resources; CEP = Committee for Environmental Protection; SC-CAMLR = Scientific Committee for the Conservation of Antarctic Marine Living Resources.

(Svolvær, Norway, 2010), co-chaired by Norway and the UK, which generated 30 Recommendations for the ATCM and CEP to action (see <https://www.ats.aq/devAS/Meetings/Past/75>). Subsequently, the CEP agreed its Climate Change Response Work Programme (CCRWP) in 2015, which Parties strongly supported and encouraged the CEP to begin implementing as a matter of priority. To facilitate this implementation, in 2017 the CEP established its Subsidiary Group on Climate Change Response (see <https://www.ats.aq/e/sgccr.html>). The CCRWP encompasses many climate change-related issues including non-native species, ocean acidification, and the protection of marine and terrestrial environments, species and habitats, as well as the impacts of climate change on Antarctic infrastructure, heritage sites and contaminated sites. Some progress has been reported on almost all of these issues. However, various factors, including the limited capacity (not least, human resources) available within the members of the CEP, mean that much remains to be done (UK 2022, appendix B).

As well as several Resolutions on climate change having been agreed by the ATCM, considerable numbers of policy papers on the issue have been submitted to the ATCM and CEP within the last two decades (see fig. 5 in Pertierra *et al.* 2021). However, the amount of work that the ATCM and CEP have been able to undertake has been reduced in recent years due, for example, to the last-minute change of host nation and subsequent downsizing of the ATCM in 2018, the cancellation of the meeting in 2020 due to the COVID-19 pandemic and the shift to a hybrid format at a shortened meeting in 2021 (Hughes & Convey 2020). Fortunately, notwithstanding the intense contemporary global geopolitical tensions and increasing global economic challenges, some normality returned to ATCM XLIV in 2022, where the number of submitted climate change-related papers reached an all-time high, reflecting concern regarding climate change in the Antarctic region and the need for urgent action. At that meeting, the SCAR decadal update to the ACCE report, based on the latest IPCC research and findings, made sobering reading (Chown *et al.* 2022). It reported that climate change was having significant impacts on Antarctica's ice sheets, climate and life, with far-reaching global consequences. SCAR emphasized the urgency of these matters, including the needs for further research and to meet Nationally Determined Contributions in keeping the world to 1.5°C of warming in line with the Paris Agreement. However, despite the progress that resulted from the very recent 27th Conference of Parties of the UNFCCC (COP27) in Egypt, including the first agreement of funding arrangements for responding to loss and damage associated with the adverse effects of climate change, it seems that the feasibility of keeping to the 1.5°C goal is increasingly in doubt.

As in 2009, the ATCM was quick to respond to the updated SCAR ACCE report. It agreed to hold a full-day joint session of the CEP and the ATCM, with SCAR and the Council of Managers of National Antarctic Programs (COMNAP), to consider the implementation of the ACCE report recommendations (see ATCM XLIV Final Report, para. 278; https://documents.ats.aq/ATCM44/fr/ATCM44_fr011_e.pdf) (Table I). The session will be held during ATCM XLV in Helsinki, Finland, in early June 2023, and it will provide an opportunity to further advance policy to help mitigate the impacts of Antarctic climate change.

Progress has not been limited to the ATCM and CEP. In 2008, the CCAMLR Scientific Committee (SC-CAMLR) recognized that climate change may be important for marine ecosystem management and asked its scientific Working Groups to further consider the issue. In 2009, CCAMLR adopted a Climate Change Resolution, recognizing that global climate change is one of the greatest challenges facing Antarctica and the ocean surrounding it and urging increased consideration of climate change impacts to better inform CCAMLR management decisions.

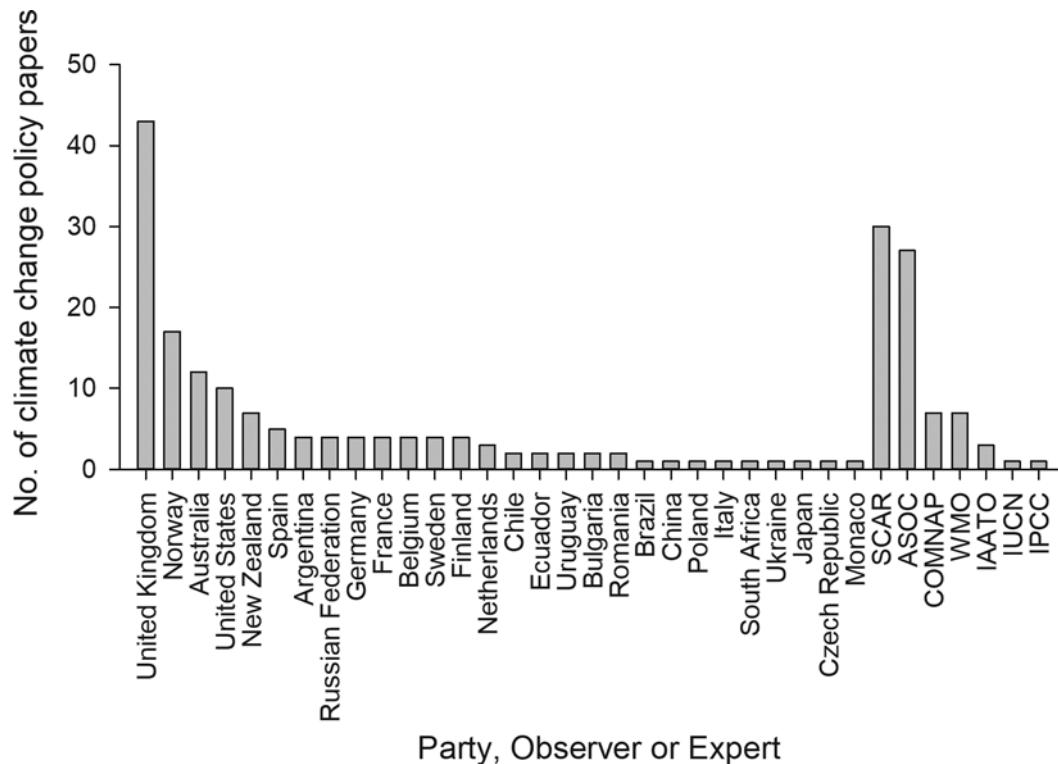


Fig. 1. Numbers of policy papers categorized by the Antarctic Treaty Secretariat under the heading 'climate change' that were submitted to Antarctic Treaty Consultative Meetings and Committee for Environmental Protection meetings between 2007 and 2022 by Parties, Observers and Experts. Parties and Expert Organizations that did not submit policy papers categorised as relating to climate change during that period are not shown. ASOC = Antarctic and Southern Ocean Coalition; COMNAP = Council of Managers of National Antarctic Programs; IAATO = International Association of Antarctica Tour Operators; IPCC = Intergovernmental Panel on Climate Change; IUCN = International Union for Conservation of Nature; SCAR = Scientific Committee on Antarctic Research; WMO = World Meteorological Organisation.

In 2016, the CEP and SC-CAMLR held a joint workshop in Punta Arenas that focussed on climate change in the marine environment (UK and USA, 2016). Many of the workshop recommendations concerning, for example, the provision and sharing of data and the synthesis of research findings, have been delivered (Argentina *et al.* 2022), and, at ATCM XLIV in 2022, the CEP agreed to engage with SC-CAMLR to make plans for a further 'Joint CEP/SC-CAMLR workshop on Climate Change and Monitoring' to take place in the near future (possibly 2024) (Table I).

However, despite the wealth of climate change-related research that has been undertaken and the recognition of its importance, little progress has been made to integrate climate change into CCAMLR's decision-making. In recent years, such discussions have stalled for a number of reasons including limited capacity and geopolitical differences (Wendebourg 2020, Cavanagh *et al.* 2021). In 2022, following on from ATCM XLIV, the SCAR decadal update to the ACCE report was presented at CCAMLR's Scientific Committee meeting (SC-CAMLR-41), with a specific focus on the key findings of particular relevance to CCAMLR (Chown *et al.* 2022). At this meeting, the Scientific Committee agreed to hold a workshop focused on integrating climate change and ecosystem interactions into CCAMLR science (Table I). The workshop has been scheduled for 2023, and it is envisaged that its outcomes will also contribute to the Joint CEP/SC-CAMLR workshop proposed for the following year (see above). At the 2022 Commission meeting (CCAMLR-41) a new Resolution on climate change was agreed that stresses the importance of taking urgent action in the CAMLR Convention Area. Furthermore, all CCAMLR scientific Working Groups are now required to include consideration of the impacts of climate and environmental change in their advice.

Since 2007, the raising of climate change issues within the ATCM has been led by a small number of Consultative Parties, supported by organizations such as SCAR, the Antarctic and Southern Ocean Coalition (ASOC), COMNAP and the World Meteorological Organisation (WMO; see Fig. 1). However, urgent policy work is more likely to be advanced in a timely manner if there is broader engagement by Parties to the Antarctic Treaty and


CAMLR Convention. Antarctic researchers should have an important direct role in supporting the work of policymakers at the upcoming ATCM, CCAMLR and CEP climate change meetings and beyond (Table 1). SCAR, through its Standing Committee on the Antarctic Treaty System (SCATS), will represent the general Antarctic scientific community by delivering the latest science into these meetings (McIvor 2020). However, groups and individuals with relevant expertise, but who are not always directly or closely involved in policy-related activities, may be able and should be encouraged to contribute as well. Indeed, when discussing the Helsinki session, the ATCM encouraged Parties, Observers and Experts to '*bring experts to the meeting to support this work*' (ATCM XLIV Final Report, para. 278). How this will be achieved will inevitably differ between individual national delegations. However, for those researchers who are interested, a first step might be to contact their national representatives to the ATCM and CCAMLR (possibly via their SCAR national committees; see <https://www.scar.org/members-and-officers/national-committees/>) to offer support. This could be through the provision of information, contribution to the development of policy papers and/or, where appropriate, the provision of in-person expert advice at the meetings themselves. Alternatively, SCAR itself provides a route by which researchers can potentially engage in policy-related activities in general and interested individuals should contact SCATS for information on opportunities (<https://scar.org/policy/scats/>).

SCAR will have a key role in the upcoming meetings, as it continues to coordinate collaborations that deliver relevant and timely research on climate change, including through its new generation scientific research programmes (SRPs) 'Near-term Variability and Prediction of the Antarctic Climate System' (AntClimNOW) and 'Instabilities and Thresholds in Antarctica' (INSTANT) (see: <https://www.scar.org/science/srp/>), and other relevant programmes such as Integrating Climate and Ecosystem Dynamics in the Southern Ocean (ICED) and the Southern Ocean Observing System (SOOS). The Antarctic science community is working to provide integration of the relevant science to ensure coherent messages are available for policymakers. However, better communication at the science-policy interface is also needed to support decision-making, an issue that is integral to the SCAR SRP 'Integrated Science to Inform Antarctic and Southern Ocean Conservation' (Ant-ICON; Hughes *et al.* 2018, 2022).

In the past, geopolitics and the pursuit of national interests have delayed or thwarted initiatives to deliver policies relevant to climate change and the protection of Antarctic species and environments (O'Reilly, 2021). It can only be hoped that existing and deeply divisive geopolitical issues both within the Antarctic Treaty System and beyond can be set aside (see Chuffart *et al.* 2022), and that Parties will make full and genuine efforts to engage in the upcoming meetings on climate change. Tangible policy needs to be delivered and a pathway for its implementation identified and funded by the relevant actors operating in Antarctica and beyond. Policymaking can be slow, even at the best of times, but Antarctica - and the world - is running out of time.

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