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Antarctic Climate Change and the Environment: A Decadal Synopsis

Findings and Policy Recommendations

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Summary

A major update by SCAR to the Antarctic Climate Change and the Environment report has been compiled. This Working Paper provides an infographic summary of key findings from this ACCE Decadal Synopsis, and a series of policy recommendations derived from these findings.

The Antarctic Treaty includes the nations and organisations best placed to be the voice of the state of the environment of the southern polar regions. The messages, informed by research in the Antarctic are clear. It is urgent that states meet, and exceed, the greenhouse gas emissions reduction targets of the Paris Climate Agreement to maintain the Antarctic and Southern Ocean in a state close to that known for the past 200 years.

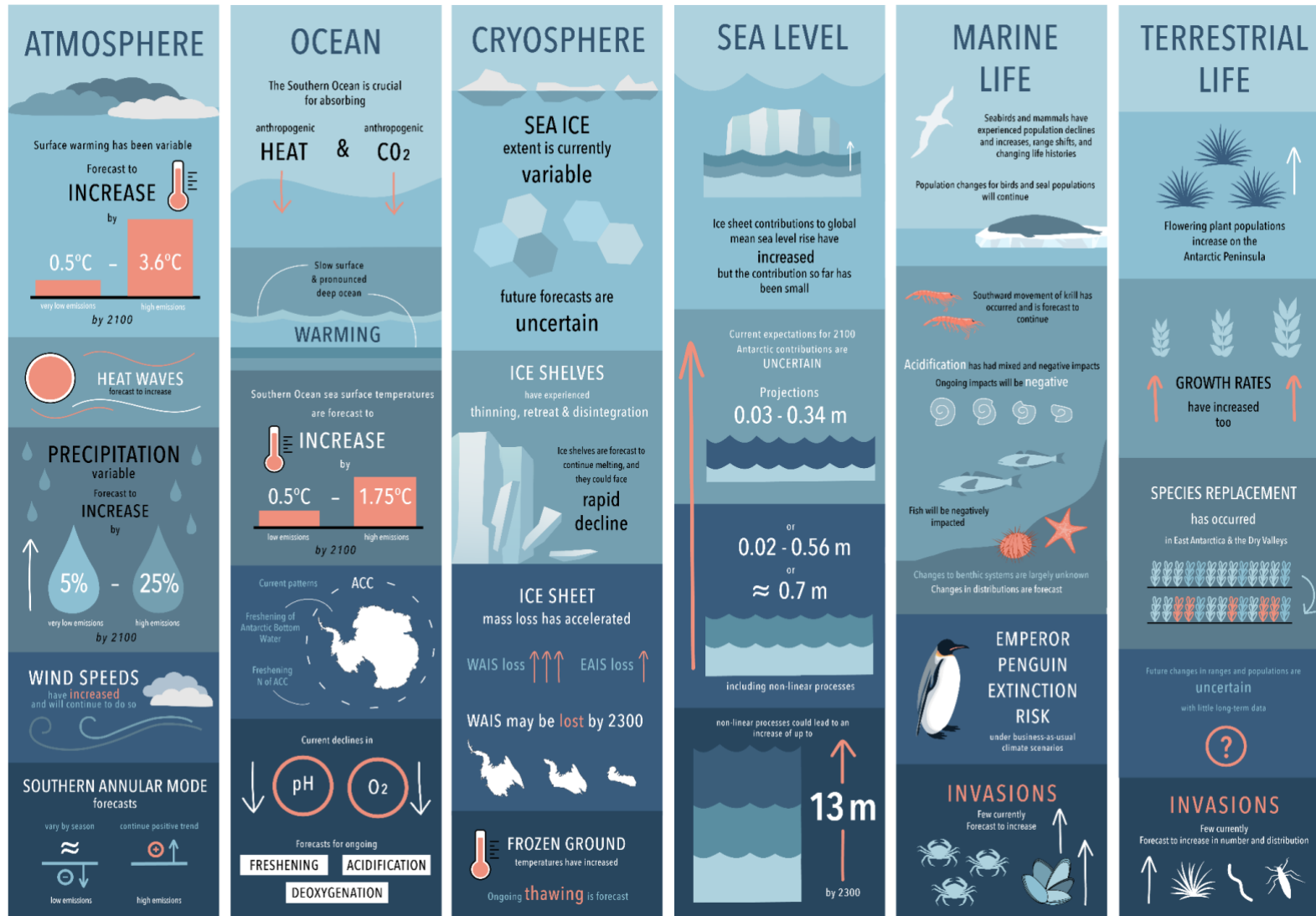
Background

In 2009, the Scientific Committee on Antarctic Research (SCAR) published its landmark report *Antarctic Climate Change and the Environment* (ACCE Report) (Turner *et al.* 2009). On the basis of the report, the ATCPs convened a Meeting of Experts on Climate Change. In turn, that meeting resulted in the establishment of a Climate Change Response Work Programme within the CEP, and more recently a Subsidiary Group on Climate Change Response with the mandate to give effect to the priorities identified within the Work Programme. SCAR published a further update to the ACCE Report in 2014 (Turner *et al.* 2014), and has produced annual synopses of research outcomes for the ATCMs since 2009.

A major update by SCAR to the ACCE report (Chown *et al.*, 2022) (ATCM XLIV IP72 *Antarctic Climate Change and the Environment: A Decadal Synopsis and Recommendations for Action*) has now been compiled based largely on the findings of the Intergovernmental Panel on Climate Change's Sixth Assessment Reports (IPCC AR6). This Working Paper provides an infographic summary of key findings from this ACCE Decadal Synopsis, and a series of policy recommendations derived from the evidence base presented in the synopsis. ATCM XLIV WP31 *Antarctic Climate Change and the Environment: A Decadal Synopsis. Research Imperatives* provides additional recommendations on the most significant and urgent research required for the region.

The figure below summarises in infographic form several key findings from the ACCE Decadal Synopsis in order of the major chapters of the report. No order of importance of findings is represented. The infographic is a schematic representation and is not meant as a substitute for the ACCE Decadal Synopsis or for the details presented in the IPCC reports.

Infographic summary for: *Antarctic Climate Change and the Environment: A Decadal Synopsis and Recommendations for Action*



Recommendations

SCAR encourages the Parties to consider the following recommendations:

1. The Parties and observers to the Treaty should communicate to governments and to civil society the urgency of meeting, and exceeding, the Nationally Determined Contributions (i.e., country greenhouse gas emissions reduction targets) of the Paris Climate Agreement to ensure that Antarctic and Southern Ocean environments are preserved in a state close to that known for the past 200 years, and in so doing help ensure achievement of the Sustainable Development Goals. The ATPs and observers are also encouraged to convey to governments, to parties to other international environmental agreements, and to civil society the outcomes of climate change-related research, and the benefits of informed immediate management actions in the Antarctic region. The need for additional extensive research to resolve uncertainties about cryosphere change, its rate, and its implications is urgent. Equally pressing is the need for effective communication to international efforts to address climate change beyond Antarctica.
2. The Antarctic Ice Sheet (AIS) is changing rapidly, with the anthropogenic signal starting to become apparent. The AIS is projected to contribute substantially to global mean sea level rise, but the risks of significantly larger rates and magnitudes of sea level rise from rapid ice sheet mass loss in the coming decades to centuries are not well known, particularly from vulnerable marine basins in West Antarctica and parts of East Antarctica. Reducing this uncertainty is a globally urgent research priority that will require further support. Novel observations along sensitive marine-based sectors, and from paleoclimate archives, are urgently needed over the time scale of a decade to improve our understanding of the physical processes driving the retreat, document the current evolution in detail, and comprehensively, and critically improve the skills of numerical projections.
3. The consequences of sea-level rise and melting ice (sea, land and shelves) around Antarctica's coastline will present significant risks to society. The need for, and outcomes from, research on sea level in the Antarctic should be communicated by the Parties and observers: to international agreements, governments at all levels, the economic sector, and to civil society, as these entities will largely have to plan for, manage, and endure the impacts of sea level rise and its associated costs.
4. The Southern Ocean is undergoing changes and these changes will continue under higher emissions scenarios. Major impacts on the cryosphere, marine ecosystems and their constituent species, and consequently on the ecosystem services they deliver, including on systems and services outside the Antarctic region, are expected. Significant changes are anticipated in areas that may be especially vulnerable to ice-sheet instability and collapse once thresholds are reached. Changes to the Southern Ocean and its ecosystems will present growing management difficulties, logistics challenges and research requirements that will require special attention within the ATS. Research on these questions, including through expanded long-term monitoring, is imperative.
5. Changes to the Southern Annular Mode, a major climate driver, have implications for average climate conditions, and climate extremes which may be accompanied by extreme events, such as major fires and droughts, especially on Southern Hemisphere land masses. Research to support further understanding of these influences, and their interactions with greenhouse gas-related climate change, should be supported. The outcomes of this work and its significance for disaster preparedness and environmental management must be communicated by the Parties and observers to governments and to civil society.

6. The Parties have declared an obligation to implement the mitigation and adaptation actions that will reduce climate change-related and other human impacts on Antarctic marine and terrestrial environments, their ecosystems and biodiversity, and the ecosystem services they deliver. Continued support for the research required to deliver evidence-informed options for action, including through coordinated, international and transdisciplinary research efforts across Antarctica and the Southern Ocean by all Parties; the development of an appropriately-resourced scientific workforce for the future; and well-supported long-term monitoring programs of the physical and living environment, are essential to meet this obligation. Our human future depends on the success of these actions.
7. The Parties and observers are encouraged to implement strengthened biosecurity protocols for all pathways (ships, aircraft, and people), especially to the Antarctic Peninsula. Procedures to remove weeds and to trap other pests in ports of departure to the Antarctic need to be strengthened in anticipation of growing ease of establishment of non-native species owing to climate change. Surveillance and decision-making processes for determining actions for newly arrived species, especially in the vicinity of stations and sites with high visitor numbers, should be adopted. Collaborations with SCAR and other researchers are needed to establish an image and DNA-based diagnostic service for newly detected species, building on the Barcode of Life Data System approach.
8. The Parties and members of the CEP are encouraged to increase the priority given to documenting terrestrial and marine biodiversity (including in lakes and streams) at the population, species, and community levels. In some cases, to enable observation of these systems before they disappear. Such an enhanced focus, further informed by long-term monitoring of change, is essential to ensure the efficacy of environmental protection and to document the benefits of environmental management.
9. The loss of sea ice, fast ice and ice shelves, together with the expansion of ice-free areas on the Antarctic continent and changes to temperatures and precipitation, including extreme weather events, will present new challenges for the management of areas of high human activity in the Antarctic (including where infrastructure and other assets are deployed). Biodiversity will change and conditions will become more suitable for the establishment of non-native species, especially along the Antarctic Peninsula. These challenges should be urgently addressed by the ATPs and members of the CEP.

References

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