Further steps towards a structured sample and data collection of environmental contamination

**Further steps towards a structured sample and data collection of environmental contamination in the Antarctic**

**Working Paper submitted by Germany, Italy, Australia, United Kingdom, United States of America and Sweden**

***Summary***

Increasing levels of chemical contamination in the Antarctica environment are resulting from global and regional human activities. Unlike other areas of the world, Antarctica lacks continent-wide systematic and coordinated monitoring of contaminants.

Germany, Italy, Australia, United Kingdom, United States of America and Sweden recommended that the CEP:

1. request SCAR, in particular SCARs ImPACT Action Group, to consider the outcomes of the Expert Workshop ‘Act now – Legacy and Emerging Contaminants in Polar Regions’ and the report ‘Emerging and legacy organic contaminants in the polar regions’;
2. request SCAR to submit recommendations to CEP XXV on how a more systematic sampling and data collection of chemical contamination in the Antarctic could be delivered, including by taking the objectives detail in this report into consideration; and
3. encourages Parties to intensify cooperation between all stakeholders, e.g., National Antarctic Programs, National Competent authorities and Environmental Specimen Banks, to initiate a more structured sample and data collection of environmental contamination in the Antarctic.

***Introduction***

There is growing evidence that Antarctica is increasingly exposed to chemical stressors. Antarctica is impacted by global issues such as climate change and long-range transport of chemical contaminants and pollutants. Furthermore, expanding tourism and research activities (including logistical activities serving their conduct or preparation) can affect the pristine environment. To date, there has been a lack of systematic approaches for gathering data to study and assess chemical pollution of the Antarctic environment and to derive knowledge-based measures for its protection.

Therefore, an international network that brings together all relevant actors and stakeholders, including the National Antarctic Programs (NAPs), Environmental Specimen Banks (ESBs) and policy makers is necessary to develop a more structured sampling and data collection on chemical contamination in the Antarctic Synergies between ESBs and NAPs could be a valuable way to guarantee that:

* current and future monitoring actions will be representative and continuous,
* procedures will be harmonized,
* quality control of the analytical data will be established, and
* that future generations will be enabled to retrospectively assess data.

It is expected that systematic and efficient sampling and data collection will improve the effective use of scientific information to enhance decision-making and, consequently, the future conservation of the Antarctic environment and its dependent and associated ecosystems.

This paper draws attention to the current steps to establish such an international network, aimed at promoting and coordinating a more structured sample and data collection of environmental contamination in the Antarctic. This is based on:

* the outcomes of an Expert Workshop ”Act now – Legacy and Emerging Contaminants in Polar Regions” co-hosted by the *German Environment Agency* (UBA) and the *Institute of Coastal Environmental Chemistry, Helmholtz-Zentrum Hereon* (Geesthacht, Germany) in January 2022[[1]](#footnote-1),
* the report ‘Emerging and legacy organic contaminants in the polar regions’ commissioned by UBA with the aim to review studies on the occurrence of emerging organic contaminants (EOCs) in polar regions (https://www.umweltbundesamt.de/publikationen/emerging-legacy-organic-contaminants-in-the-polar); and
* the related publication “Legacy and emerging organic contaminants in the polar regions” <https://doi.org/10.1016/j.scitotenv.2022.155376>.

Further details are provided in IP 7.

***Background***

Serious threats to the conservation of the Antarctic environment do exist and persistent organic pollutants (POPs) and trace elements have been detected in Antarctica (ATCM XXXI/IP097, ATCM XXXII/IP069, ATCM XXXVII/IP008, ATCMXL/IP022). Furthermore, emerging contaminants (e.g. flame retardants, pharmaceuticals and personal care products, microplastics) can be found in Antarctica (Waller et al., 2017; Vecchiato et al. 2017; Dreyer et al. 2019. Organic contaminants in polar regions have become significant concerns because of their long-range potential and their persistence, bioaccumulation and toxic properties. Climate change can alter the biogeochemical cycling of POPs and contaminants of emerging concern (CECs) and amplify their effects on polar ecosystems. Glacial ice and snow act as secondary emission sources in the polar regions and release POPs and CECs into the atmosphere and ocean. Future research will need to understand the impact of climate change and other anthropogenic pressures on various biogeochemical and geophysical processes to be able to predict the environmental fates and toxicity risk of pollutants in polar regions, to monitor the temporal trends of POPs, and to strengthen the investigation of CECs in the Antarctic through national and international research programs.

ESBs are facilities that systematically archive samples from the environment and biota for future research and monitoring purposes. Today, there are about 30 national ESBs in Europe, North America, Asia, and Australia, including the Italian Antarctic ESB (BCAA), which has operated since 1994 within the Italian National Antarctic Research Programme (Soggia et al. 2001). Germany with its ESB has started to investigate environmental contamination in the Antarctic and aims to support relevant future monitoring, research and policy development across the Antarctic Treaty area.

The SCAR ImPACT (Input Pathways of Persistent Organic Pollutants in Antarctica) Action Group has already identified priority challenges for persistent organic chemical research in Antarctica (ATCMXLIII/ IP137). Moreover, it identified priority research gaps and proposed actions that resulted from a scoping meeting of this group. It identified potential approaches for coordinated research and monitoring efforts and outlined a set of actions needed to bring research on persistent organic chemicals in Antarctica in line with international efforts and existing global monitoring frameworks.

The Workshop ‘Act now – Legacy and Emerging Contaminants in Polar Regions’ (<https://www.umweltbundesamt.de/en/node/94089%20>) discussed potential impacts of legacy and new hazardous chemicals, accumulating in snow, ice and wildlife. The workshop concluded that all key stakeholders including policy makers and the public, need to join forces to achieve better networking of actions to protect ecosystem and human health in the polar regions. Cooperation between the experts, researchers, decision-makers and interested stakeholders with respect to screening, monitoring, assessment and data sharing should be improved. Such action would provide robust environmental contamination data to inform effective environmental policies and chemicals management aimed at protecting the Antarctic environment.

***Next steps***

Germany, Italy, Australia, the United Kingdom and United States of America see greater cooperation with and between the ESBs of Antarctic Treaty Parties, SCARs ImPACT Action Group, NAPs and Environmental Agencies as an opportunity to initiate a more structured sample and data collection of environmental contamination in the Antarctic. ESBs could contribute to this important work by archiving samples and providing expertise in environmental chemistry for systematic long-term trend monitoring in the Antarctic environment. Such archives will enable researchers in the future to study changes in Antarctica at any given time in a retrospective manner. Those results, together with the precautionary approach as a fundamental part of the Protocol and the work of CEP, would enable the Antarctic Treaty Parties to facilitate necessary decision-making and inform measures for the protection of the Antarctic environment.

An international network, which brings together all relevant actors and stakeholders for a more structured sampling and data collection of chemical contamination in the Antarctic, could achieve the following objectives:

* Expand geographic coverage of chemical contamination data for Antarctica to include tourism sites, areas near research stations as well as new and existing protected areas in pristine regions.
* Ensure the continuity of long-term data on contaminants in Antarctica and the development of continental-scale monitoring programs.
* Assess the long-term effects of persistent contaminants on the organisms and food webs and to predict future trends, including responses of terrestrial and marine ecosystems to climate change and anthropogenic activity.
* Establish harmonised protocols and QA/QC (Quality Assurance/Quality Control) procedures for sampling, archiving, chemical analysis, sample and data storage and treatment.
* Guarantee the quality of the analytical data, including intercalibration exercises and production/use of certified reference materials.
* Investigate contaminants of emerging concern (CEC), with particular attention to organic compounds as there is little environmental exposure data for these compounds to date. Establishing the most sensitive and selective analytical methods is mandatory to identify these compounds at trace and ultra-trace concentrations.
* Overcome the practical challenges of sampling in extreme environments and ensure that sufficient samples from the different available ecosystem types.
* Allow next-generation scientists to perform retrospective analyses and monitoring of the chemical contamination in Antarctica, considering chemicals which could emerge in the future.
* Work with ESBs to establish archives and provide expertise to enable future researchers to conduct retrospective studies of Antarctica
* Make data and knowledge more easily available to improve the effective use of scientific information to facilitate decision-making process.
* Inform the public, policy makers, regulators and media about the status of chemical contamination on the Antarctic environment and raise awareness of risks arising from chemical pollution.

***Recommendations***

Germany, Italy, Australia, the United Kingdom, United States of America and Sweden recommended that the CEP:

1. invite SCAR, in particular SCARs ImPACT Action Group, to consider the outcomes of the Expert Workshop ‘Act now – Legacy and Emerging Contaminants in Polar Regions’ and the report ‘Emerging and legacy organic contaminants in the polar regions’;
2. request SCAR to submit recommendations to CEP XXV in 2023 on how a more systematic sampling and data collection of chemical contamination in the Antarctic could be delivered, including by taking the objectives detail in this report into consideration; and
3. encourages Parties to intensify cooperation between all stakeholders, e.g. National Antarctic Programs, National Competent authorities and Environmental Specimen Banks, to initiate a more structured sample and data collection of environmental contamination in the Antarctic.

***References***

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1. <https://www.umweltbundesamt.de/en/node/94089%20> [↑](#footnote-ref-1)