EPB Workshop Report

Minimising plastic use and waste in polar research and logistics

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Report compiled by J Caccavo

EPB Plenary members and other participants: K Latola (Chair, Thule Institute), N Biebow (HGF), D Blok (NWO), J Buckingham (University of Hull), H Burgess (NERC) J Chappellaz (IPEV), N Chipev (BAI), J Fort (CNRS), J Francis (NERC), T Gibéryen (polar.lu), P Huybrechts (FWO), N Mikkelsen (DASHE), A Quesada (MINECO), H Savela (Thule Institute), J Sorribas (CSIC), T Stocker (SNF), T Stockings (British Antarctic Survey), M Vancauwenberghe (BELSPO), D van der Kroef (NWO), C Waller (University of Hull)

EPB Secretariat: R Badhe (Executive Secretary), J Nolan (Policy Officer), J Caccavo (Rapporteur), J Holloway (Rapporteur), Neelu Singh (Rapporteur), A Thornton (Rapporteur)

Executive Summary

It is acknowledged that plastics waste is a growing problem in the polar regions. Plastics waste at the poles is both of autochthonous and allochthonous origin. The purpose of this workshop was to identify how plastics are being used in polar research and logistics, suggest areas in which plastics use could be reduced, propose alternatives, and recommend changes to practices that would ultimately reduce plastics waste. Participants formed breakout groups to discuss plastics use in four different areas - logistics, scientific equipment and consumables, field equipment, and domestic uses at research stations and on vessels. Major themes that arose in all groups included the inevitability of plastics use in polar research, the need to reduce plastics in packaging, and the implementation of best practices among researchers and operators. Given that the participants of this workshop represented a limited group, the outcomes outlined in this report are not a formal statement from the EPB regarding plastic pollution in the polar regions, but rather recommendations to be considered as best practices are developed later. Attendees committed to changing personal behaviour and to continue to work on the concerns raised regarding plastics use and waste. This report summarises the workshop discussions and recommendations made by participants.

Workshop presentations

The workshop began with three short presentations before participants broke out into discussion groups:

- J Francis - *The impacts of plastics in the polar regions – a scientific overview*
- C Waller - *Plastics in fieldwork, SCAR plastics group*
- A Quesada - *Polar programmes and plastics: procurement, use, end of life - an organisational perspective*

General discussion points

Workshop participants noted that the types and quantities of plastics used in polar research and logistics are mostly unknown, along with rates of reuse and recycling, and precise waste management and disposal protocols. An auditing process is required to full understand the plastic use and waste in polar research and logistics, and to effectively work towards its minimisation.

The type of plastics used in polar research and logistics can influence its environmental impact. The longevity/returnability of a piece of equipment will inform how stringent regulation should be. It will be important to develop an easy-to-use best practices system to identify the risk a given type of plastic, such as with colour-coding, and clear practical guidelines to avoid unnecessary plastic use for all involved in polar research and logistics. Guidelines indicating particular types of plastics and items that should be avoided or encouraged would also be of use.

The duration of stay of plastic items used in polar research and logistics can be divided into three categories: 1) Quick return (plastic items taken to the polar regions that are returned within one field season); 2) Long return (plastic items that are deployed in the field for several years before return); and 3) No return (plastic items deployed in the polar regions that are never recovered or returned, e.g. scientific moorings and drifting sea ice observatory equipment). Different management approaches are required for plastic items in each of these categories.

Industry can provide information about how plastics break down and implement coding systems and guidelines. Working with industry can help change practices. Engaging the public is also key to change industry and facilitate best practices in the field. Images work well on the public, and should be distributed via social media and other means to raise awareness about the issue of plastics pollution at the poles.

It was noted that the management and disposal of plastics following their return from the polar regions could be an issue. Consideration must be given to the management and disposal of plastic items once returned to home ports or institutions – removing plastic items from the Arctic and Antarctic alone is not a solution if plastic waste is inappropriately managed or disposed of. Some national polar programmes bring all plastics taken to the field back to their country of origin for recycling by ISO certified companies. Others use intermediaries in ports or hubs that serve as gateway points to Antarctica and the Arctic. The recycling and waste disposal protocols and regulations in intermediary countries should be investigated by national polar programmes to ensure waste from their work is appropriately managed. It is noted that dumping of waste at sea, including plastics, from research vessels has been observed, despite restrictions.

Extreme conditions in the polar regions exacerbate the release of plastics into the environment. Wind, UV radiation and cold accelerate the breakdown of plastic equipment. In order to reduce the impact of this conduit of plastics into the environment, more resistant plastics should be used where viable. While alternatives to plastic do exist (i.e. glass, metal, cardboard), each have their drawbacks. Glass can be breakable and heavy. Weight is also an issue with metal, as well as temperature. Cardboard can introduce biosecurity concerns. Better alternatives need to be investigated, and it will be essential to partner with industry in this endeavour. The benefits of plastic use in polar research and logistics should not be overlooked.

While top-down management of plastic use and waste is critical, encouraging and guiding changes in individual behaviour is also important. Furthermore, options presented to logistics operators must be realistically implementable on a large scale. Compiling and sharing best practices for minimising plastic use and waste between polar programmes and institutions will be beneficial.

Logistics (packing, biosecurity, transport, etc.)

In polar logistics, plastics are largely used to securely transporting equipment and supplies (boxes, wrapping, packing material, ties, ropes, latches, etc.). Being lightweight, durable, readily available, and low-cost, plastics are often the only viable material for these purposes. For transport to remote field locations, where equipment must be carried by researchers themselves, lightweight plastics are particularly important. The low cost and weight of plastics make them ubiquitous, and they are especially important when used as wrapping for biosecurity, particularly in Antarctica.

Scientific equipment and consumables (field and lab)

Some of the main uses of plastics are in sampling. These plastics are often single use, packaged for biosecurity. A small device such as a sticky bracelet, to which researchers could append small pieces of plastic waste produced during sampling would reduce the introduction of plastics into the environment by wind. Sampling devices that are left in the field for the longer-term, such as buoys, moorings, and sediment traps, contribute to plastics pollution by degradation and loss.

The return of plastics used in the field is essential. This can be facilitated by raising awareness of the implications of plastics waste among field researchers and staff, as well as implementing tracking systems for materials. Any code of conduct created will need to be general in order to maximise its applicability, and the implementation of any regulations will rely on communication between station managers and researchers.

Field equipment (clothing, camping gear, food, safety, etc.)

Clothing for extreme climates is often composed of plastics, the fibres of which can be released into the environment with degradation from UV radiation, wind exposure, and wear and tear. The use of alternative materials less resistant to degradation, as well as reintroducing natural clothing, materials such as wool, would reduce the release of plastic microfibers into the environment. In addition filters can be used on water pipes to collect microplastic fibres released from clothing during washing.

Wind is often the culprit in creating plastics waste in polar environments. Reducing plastic packaging materials associated with field gear and safety equipment, along with simple guides for unwrapping gear prior to departure to the field, or if necessary, unpacking in sheltered areas when in the field, would reduce loss due to wind.

Domestic (catering, cleaning, medical, personal, etc.)

Plastics used in catering include food wrapping and packaging, plastic straws, and cutlery. Plastic food packaging in particular is typically single-use. Cleaning materials such as sponges, brushes, gloves, and their packaging, often all contain plastic. Beverage packaging is a large source of plastics waste. While certain stations have tried reducing individual packaging, this is not possible everywhere.

Several options may be considered to reduce the use of single-use plastics in catering and cleaning. In the Arctic, it may be possible to and appropriate to source food and supplies locally. Purchasing food and cleaning supplies in bulk would reduce plastics used in packaging, as well as using alternative types of packaging (i.e. glass, linen, wax coating) and dehydrated food. Where possible, using reusable and compostable options for catering and cleaning supplies and packaging would also reduce plastics use and waste.

Medical equipment presents a particular challenge to reduce plastics use, due to the need for sterile material and other concerns. Syringes and medical tools are wrapped in plastic, medicines are kept in plastic bottles or blister packs, and personal protective gear (i.e. gloves, masks) are often plastic. Daily-use of these materials is often required in the field (i.e. first-aid kits). Once again, bulk can help reduce plastics use by reducing packaging, as well as using alternative packaging materials (i.e. glass, metal, cardboard), where possible.

Personal items, such as toiletries, cosmetics and hygiene products used by researchers and staff at stations and on vessels are often composed of or contain plastics. Banning products containing plastic microbeads (as already implemented by some national polar programmes), encouraging use of alternative materials (such as bamboo toothbrushes, cotton sponges) and reusable items, and removing unnecessary packaging before departure to the polar regions, will help to reduce plastic waste from personal use at stations and vessels. Certain stations have practices that could be useful to share among national programmes (i.e. recycling of grey water at Concordia). Furthermore, increasing the awareness among researchers and staff of plastic pollution in polar regions will be essential to changing personal behaviours and habits.

Recommendations from workshop participants to help minimise plastic use and waste in polar research and logistics

- Develop an auditing process for plastic use and waste in polar research and logistics
- The approach to use, type and handling of plastics should be based on their length of stay in the environment: quick, long or no return
- Consider carefully the management and disposal of plastic waste after it was been removed from the polar regions, and engage with certified recycling programmes in home countries and at Arctic and Antarctic gateway ports
- Develop specific regulation of plastics use in Antarctica through the Antarctic Treaty System
- Clean up of plastic waste generated during research activities should be integrated into project plans from the earliest stages
- Increase awareness of the impacts of plastic pollution and need for waste mitigation among field scientists and staff, promote changes in personal behaviour at stations and on vessels
- Track equipment by tags or bar codes to help retrieval of lost items and identify sources of plastic waste in the polar regions
- Remove unnecessary wrapping and packaging of equipment and supplies before departure to the polar regions, and implement simple guides to minimise loss of materials in the field (such as to the wind)

- Continuous investigation of possible alternative materials to plastics for all uses in polar research and logistics, including of more durable and resistant plastic varieties, and other materials
- Procure and package items in bulk, where possible, to minimise packaging use
- Procure supplies and equipment locally, where possible and appropriate, to minimise transport and packing needs
- Filter microplastic fibres from grey water at stations and on vessels
- Implement a colour-coding system which distinguishes between low and high-risk plastics in order to assist scientists in selecting the best products to utilize in polar research
- Engage with industry to develop plastic risk identification system, explore alternative materials and develop other solutions
- Raise public awareness of the impacts of plastic on polar environments and of efforts to minimise plastic use and waste in polar research and logistics
- Ban personal containing plastic microbeads from polar research stations and vessels