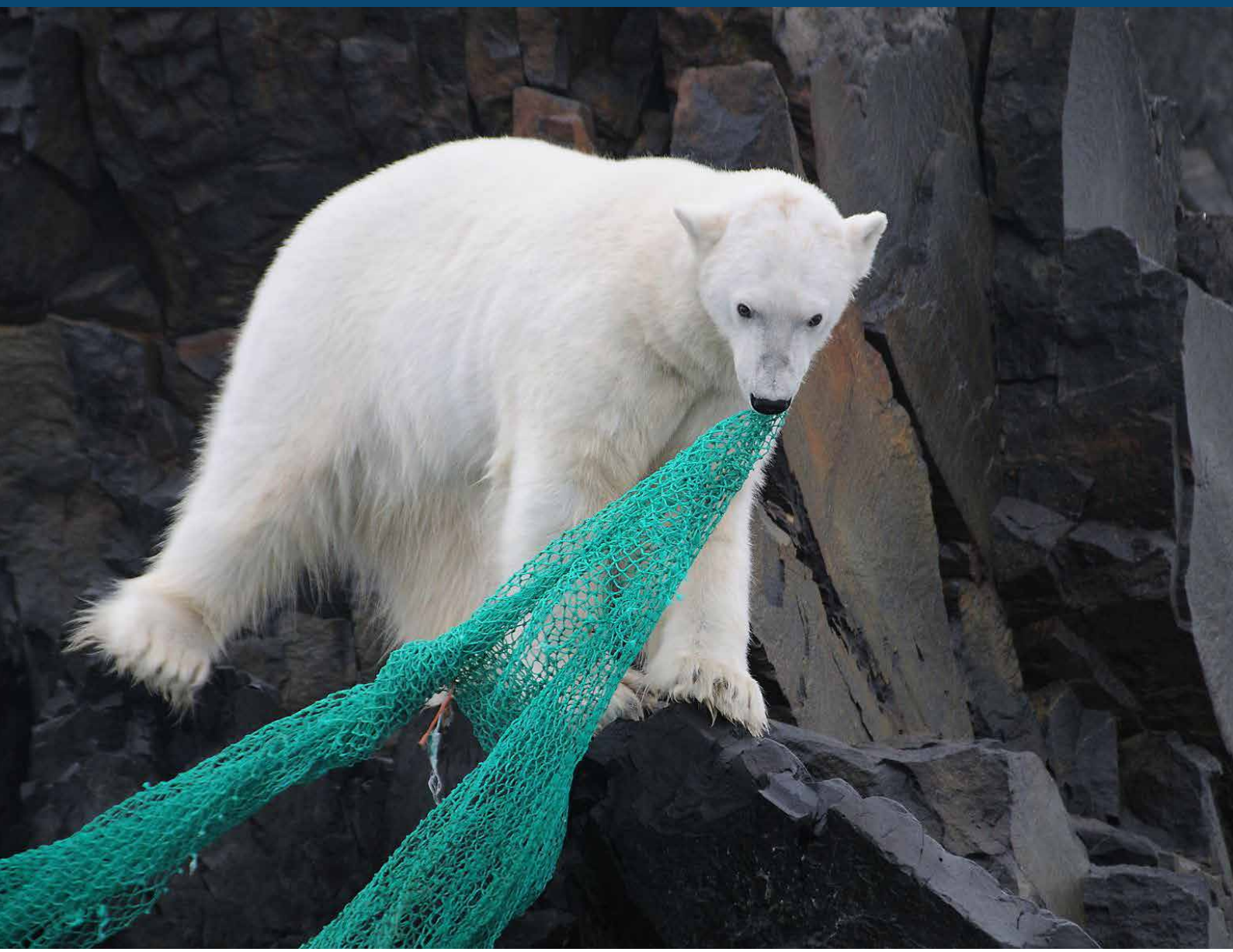
SECOND INTERNATIONAL SYMPOSIUM

PLASTICS IN THE ARCTIC & SUB-ARCTIC REGION

SYMPOSIUM SUMMARY



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Centre for the Ocean and the Arctic

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SYMPOSIUM SUMMARY

SYMPOSIUM PARTNERS

ICES CIEM

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UN environment programme

IASC

PAME
Protection of the Arctic Marine Environment

Photo: Kári Fannar Lárusson

"The Second International Symposium on Plastics in the Arctic and Sub-Arctic Region gathered scientific, local and Indigenous knowledge about plastic pollution and discussed methods to reduce the impact of plastics on Arctic ecosystems."

PREFACE

Plastic pollution is of ever-growing concern. It is a well-known fact that plastic litter is omnipresent in our environment and the eventual destination for much plastic waste is the oceans. Even in the Arctic region, plastic pollution is widespread. There is now a great urgency for actions to stem the plastic tide. Recently, the United Nations Environment Assembly adopted a broad negotiating mandate for a new legally binding international agreement to end plastic pollution. The new agreement is expected to include provisions to promote national and international co-operative measures to reduce plastic pollution in the marine environment.

The volume of scientific research and studies into plastic pollution has grown rapidly in the past several decades. It is essential that we take full advantage of the best available knowledge when we look for solutions to tackle this global problem. To that end, Iceland and the Nordic Council of Ministers hosted a successful Symposium on Plastics in the Arctic and Sub-Arctic Region in March 2021 with participants making a clear call for a follow up.

That call resulted in the Government of Iceland – with the financial support of the Nordic Council of Ministers – hosting the Second International Symposium on Plastics in the Arctic and Sub-Arctic Region on 22-23 November 2023. The symposium gathered scientific, local and Indigenous knowledge about plastic pollution and discussed methods to reduce the impact of plastics on Arctic ecosystems.

The second symposium built on the foundation laid by the first to again gather information and formulate advice required by decision makers to address this issue. This is particularly relevant in light of on-going negotiations for an international agreement on plastic pollution, as well as other efforts to support protection of the marine environment.

The second symposium focused in its deliberations on six themes:

- Monitoring and assessment of plastic pollution in the Arctic
- Methodological developments to determine macro-, micro- and nanoplastics
- Sources and transport of plastic in the Arctic and sub-Arctic
- Impacts of marine litter in the Arctic (environmental, economic and social)
- Arctic challenges and solutions for improved waste management
- Tackling plastic pollution: international collaboration, policies, best practices and novel developments from around the world

Crucially, the symposium stimulated discussions about mitigation methods and how they can be implemented. In recognition of the gravity of the issue, the constant flow of new research about plastics in our marine environment and, not least, the sheer immensity of the task at hand, the Government of Iceland announced that it will convene a third symposium in April 2026.

The symposium's Executive Steering Committee would like to thank the Icelandic Ministry of the Environment, Energy and Climate and the Ministry of Food Agriculture and Fisheries for helping to organise the second symposium. Special recognition goes out to Magnús Jóhannesson, the chair of the Scientific Steering Committee, and Embla Eir Oddsdóttir, director of the Icelandic Arctic Cooperation Network, for their essential role in putting the symposium together.

Support for the symposium also came from: the International Council for the Exploration of the Sea, the Oslo and Paris Commission, the International Oceanographic Commission of UNESCO, the University of the Arctic, the International Arctic Science Committee, the Woodrow Wilson Centre's Polar Institute, GRID-Arendal, the Centre for the Ocean and the Arctic, UiT the Arctic University of Norway, Pinngortitaleriffik-The Greenland Institute of Natural Resources and the Arctic Council working group on the Protection of the Arctic Marine Environment.

Last, but not least, we would like to thank all speakers and attendees for making the symposium possible.

Pétur Ásgeirsson
Chairman of the Executive Steering Committee
Arctic Ambassador and Senior Arctic Official of Iceland

"We hope the symposium has encouraged a more responsible use of plastic and fostered more robust efforts to clean our beaches and oceans."

Photo: Olivia Rempel/GRID-Arendal

WELCOME

Icelanders have long taken pride in our sustainable fisheries policies, and the fishing industry is vital to our economy. However, we have been forced to recognise that plastic pollution is becoming a serious threat to the health of ocean ecosystems and biodiversity. During the Icelandic chairmanship of the Arctic Council in 2019-2021, the Ministry of Foreign Affairs – in co-operation with several local and international partners – organised the first international symposium on the issue.

It became evident during that event that further discussions and sharing of information were necessary. Consequently, the Government of Iceland decided to organise a second symposium that would further awareness of this critical issue and maintain the dialogue between those researching the problem and those playing a crucial role in its mitigation.

We hope the symposium has encouraged a more responsible use of plastic and fostered more robust efforts to clean our beaches and oceans.

I want to use this opportunity to recognise the important work being carried out by the United Nations Environment Program on the international agreement on plastic pollution. Under the leadership of the UN, Iceland and 174 other nations have resolved to enter into a legally binding agreement on plastic pollution to be signed in 2024.

Iceland is also a member of – and fully supports – the High Ambition Coalition to End Plastic Pollution by 2040.

Plastic pollution is a global concern, which was reflected by the participation of the more than 120 speakers from some 20 countries. Speakers came from almost all member states of the Arctic Council, and we had representatives of two permanent participants of the Arctic Council – the Inuit Circumpolar Council and the Saami Council. Speakers came from as far away as South Korea, Japan, India and China, as well as from our European neighbours, with Italy, France and Greece represented.

I was especially thankful for the participation of the Irish minister of state for housing and local government, Malcolm Noonan.

We were also fortunate to hear from Martin Høglund, chair of the Senior Arctic Officials of the Arctic Council. He has the challenging task of leading the Arctic Council under the current circumstances, and we appreciated his presence in Reykjavík for the symposium.

Finally, I would like to thank everyone who participated in the second symposium. The discussions proved useful for addressing plastic pollution in the Arctic and worldwide.

Bjarni Benediktsson
Minister for Foreign Affairs of Iceland

HIGHLIGHTS FROM THE OPENING ADDRESSES

> ***"Marine litter is one of the most pervasive problems affecting the marine environment globally."***
> **Morten Høglund**, chair of the Senior Arctic Officials of the Arctic Council

Addressing marine litter and plastic pollution has been a **growing focus of the Arctic Council**, and Norway has chosen to prioritise the issue as part of an overall focus on the oceans during its two-year tenure as chair.

Like other oceans, the Arctic Ocean, Mr Høglund explained, is experiencing growing pressure due to increasing activity and rapid climate change. In the Arctic Ocean, this has made **plastic pollution the region's most urgent issue**. Challengingly, though, it is also its most complex.

Laying out how plastic pollution affects the region and what steps the Arctic Council is taking to address it, Mr Høglund pointed to a 2019 study compiled by the Protection of the Arctic Marine Environment working group. The first report of its kind, it significantly improved our understanding of marine litter in the Arctic, and it has since been the basis for additional research that has contributed further knowledge. Work of this nature will continue to be crucial, but progress will ultimately be contingent on **collaborative actions** between Arctic and non-Arctic countries, communities and researchers.

> ***"Only 9% of plastic is presently recycled globally. Yet our current recycling and waste management infrastructure cannot – and I mean cannot – cope as it stands."***
> **Jyoti Mathur-Filipp**, Intergovernmental Negotiating Committee Secretariat of United Nations Environmental Program

In a timely address, Ms Mathur-Filipp updated the symposium on the work of the Intergovernmental Negotiating Committee (INC) on Plastic Pollution. The INC was created by the United Nations Environmental Program to come up with a **legally binding method to address plastic pollution by 2024** and had concluded the third of four planned rounds of negotiations three days prior to the start of the symposium.

The third session, according to Ms Mathur-Filipp, marked a critical milestone in advancing discussions towards the development of an initial draft of the treaty. Coming up with an agreement next year is, she admitted, an ambitious goal, but she argued that it serves to emphasise the **high-level engagement** of governments and civil society in addressing the crisis.

> ***"Almost everything that comes into Cambridge Bay stays there."***
> **David Hik**, Polar Knowledge Canada

The symposium's keynote address highlighted the **waste-management challenges Arctic communities face**. These challenges exist largely because the region's remote communities are at the end of supply lines, leaving them with few traditional options for waste management. Instead, communities must rely on solutions tailored to their local conditions, according to Dr Hik.

Dr Hik, who is based at the Canadian High Arctic Research Station in the community of Cambridge Bay, detailed the impact of plastics on the environment, particularly in the Arctic. In pointing to solutions, he emphasised the need to prevent waste from being created in the first place. Engaging young people and national leaders is also crucial, he argued. Regardless of the measures taken, the work of **local research facilities** is vital, as they can make sense of how global issues like plastic pollution play out locally and create responses that are viable for individual communities.

"The very first step towards tackling micro- and nanoplastic pollution is acquiring the knowledge to do so."
John Aldag, Parliament of Canada; Parliamentary Assembly of the Organisation for Security and Co-operation in Europe

Although it might not be immediately apparent from its name, the Parliamentary Assembly of the Organisation for Security and Co-operation in Europe (OSCE PA) has a history of addressing pollution. In July, the OSCE PA passed a resolution that is the first to express concern over the presence of micro- and nanoplastic pollution in the Arctic. Mr Aldag told the symposium that the declaration stresses the **need to fund research** to advance knowledge and address gaps in understanding micro- and nanoplastic pollution.

In his address, Mr Aldag provided an overview of the work of the OSCE PA on environmental issues, particularly pollution. The lesson of that work, he explained, has been the **importance of international co-operation** in solving cross-border issues, underscoring how vital it is for countries that participate in the OSCE to work together towards a binding agreement to address plastic pollution.

"By bridging the gap between diverse fields of study, we can tap into a wealth of knowledge, insights and perspectives that will enable us to develop comprehensive solutions."
Eirini Glyki, International Council for the Exploration of the Sea

In the final welcoming address, Ms Glyki discussed the involvement of the International Council for the Exploration of the Sea (ICES) in various Arctic research initiatives. In the Arctic, as in other areas, the challenges we face today **transcend the boundaries of traditional academic disciplines**.

All eight Arctic Council states are ICES members, and all other ICES members are directly or indirectly involved in Arctic research. This makes ICES **well placed to act** on its recognition of the importance of the Arctic ecosystem. The Arctic is one of ICES' strategic regional action areas, and that has seen ICES contribute increasingly to the science as well as providing advice to activities that benefit the region.

Lise M Strømqvist, Norwegian Centre Against Marine Litter & **Olav Lekve**, Norwegian Directorate of Fisheries

Getting people to understand the cumulative effects of our actions – in this case, that one small piece of rope or net cutting thrown into the water eventually adds up to a monstrous problem – requires a little help. **A touch of humour** never hurts either. In this case, both came in the form of a fictional monster that illustrates the figurative, yet all-to-real, threat that is lurking in our seas.

As part of their campaign to encourage people to stop throwing rope cuttings and other pieces of plastic overboard, the Norwegian Centre Against Marine Litter and the Norwegian Directorate of Fisheries **took a page from the book of our ancestors**, who used myths and legend and fantastic creatures to help them comprehend the world and our role in it. This modern version – in the form of a short video – can be used to illustrate a problem we all have had a hand in causing, while at the same time making us aware of what it takes to slay it.

Photo: Kári Fannar Lárusson

MINISTERIAL DISCUSSION

TALKING TRASH – A CONVERSATION ABOUT PUTTING PLASTIC IN ITS PLACE

Malcolm Noonan, Minister of State for Housing and Local Government, Ireland; **Guðlaugur Þór Þórðarson**, Minister of the Environment, Energy and Climate, Iceland
Moderator: **Jóhanna Vilhjálmsdóttir**, writer, radio host and former TV reporter

Everyone wants a clean environment, but ambitious lawmakers seeking re-election must tread carefully

The good news for lawmakers is that most people are willing to accept some of the responsibility for reducing plastic pollution. Indeed, even measures that may initially be seen as disruptive eventually become accepted as normal. The bad news for lawmakers is that showing the kind of political leadership it takes to get these sorts of policies enacted may get them voted out of office.

In Ireland, for example, the government, according to Malcolm Noonan, the minister of state for housing and local government, has an approach of "designing out" plastic waste. In other words, it pursues measures that seek to change the status quo. Sounds good, right? The problem is, folks aren't always thrilled about changing their habits, even if it's for a good cause.

Some of the resistance, according to Mr Noonan, is because the things we need to do "extend beyond simply planting trees or meadows. It involves evaluating our consumption patterns."

The Icelandic perspective, according to Guðlaugur Þór Þórðarson, the Icelandic minister for the environment, energy and climate, is similar: plastic pollution is a global headache. Sure, it affects some people more than others, but it's a problem that everyone has contributed to. Right now, though, we're in the dark about how much of it is out there, and what it's doing to the maritime environment and, ultimately, us. Governments, he admitted, have a big role to play, and to do that, they need to take climate seriously, but regular folks also need to do their share.

Talking about what works, Mr Noonan said bottom-up initiatives, as well as top-down policies, like banning bags or slapping a tax on the items that are most likely to end up as litter, can make a dent. But, again, lawmakers need to be careful: making it more expensive for

Photo: Peter Prokosch

producers to use one material could lead them to find a replacement that is every bit as unappealing. Likewise, industry – and particularly if there is money involved – will be keen to find loopholes that undermine what lawmakers are trying to accomplish.

Mr Þórðarson gave a nod to businesses trying to reduce plastic pollution. In Iceland, much of the focus is on recycling fishing nets, and he would like to see a recycling system in which big firms foot the bill for the mess they make. But, he admitted, we need smoother ways to make that happen.

One of the best ways to avoid plastic pollution, both agreed, is for industry to make – and us to buy – stuff that lasts, not stuff we toss after a year. Experience tells us that people are willing to recycle, but we aren't willing to bend over backwards to do it. Talking trash is easy. Cleaning it up, it turns out, must be so as well.

PLENARY PANELS

PANEL 1

CONSERVING THE ARCTIC

Moderator: **Thomas Maes**, Senior Scientist, GRID-Arendal
Panellists: **Georg Hanke**, European Commission-Joint Research Centre; **Eva Kruemmel**, Environment & Health, Inuit Circumpolar Council Canada; **Susana Hancock**, Association of Polar Early Career Scientists; **Árni Finnsson**, Icelandic Environment Association

Conserving the Arctic will require a mix of **policy** frameworks, **research** initiatives, **Indigenous** perspectives and **international** collaboration.

One source of inspiration could be the European Union's approach to marine litter. Georg Hanke, of the European Commission's Joint Research Centre, provided an overview of the approach, starting with its origins back in 2008. He emphasised the need for effective measures to **mitigate plastic production**, citing initiatives such as the EU's single-use-plastics directive and regulations on extended producer responsibility.

Despite recognising the challenges, he maintained a sense of **optimism**, citing the increasing focus that decision-makers are dedicating to the issue. While numerous questions still lack answers, he believes that on-going research and the potential for sufficient funding make it likely that these questions will be addressed.

Eva Kruemmel, of the Inuit Circumpolar Council Canada, shed light on the organisation's efforts to integrate human and Indigenous rights into the plastic treaty. She called for a precautionary approach to treaties, emphasising reducing overall volumes of plastic and addressing human-rights impacts throughout the life cycle of plastic products. Additionally, she underscored the impact of contaminants on the Inuit community, calling attention to the **transboundary nature of pollutants**.

Ms Kruemmel stressed the pivotal role of incorporating **Indigenous knowledge** and voices into efforts to address plastic pollution, while also drawing attention to the use of information from programmes like the Northern Contaminants Program and the Arctic Monitoring and Assessment Programme.

Photo: Kári Fannar Lárusson

> ***"Some hold the belief that technology will provide solutions to all challenges, while others argue for the necessity of systemic change. Personally, I am still undecided on which side I lean towards, but I am inclined towards systemic change; considering that technology played a role in bringing us to this point, I am uncertain about its effectiveness in resolving our issues."***
> **Thomas Maes**, GRID-Arendal

> ***"Plastic litter is always a depressing topic, but there are possibilities that we can implement to clean up our act."***
> **Georg Hanke**, European Commission, Joint Research Centre

Photo: Bo Eide

> ***"We can't really recycle our way out of this crisis."***
> **Eva Kruemmel**, ICC Canada

Susana Hancock, of the Association of Polar Early Career Scientists, was struck by the prevalence of plastic pollution when she discovered nylon lines in Arctic waters. In sharing her first-hand experience encountering plastic pollution during an Arctic expedition, she sought to **highlight the absurdity of discovering plastic in a place that was devoid of human presence**. Like other panel members she highlighted the importance of reducing the amount of plastic we use overall and preventing plastic leakage in the environment. Additionally, she cautioned against expecting that we could simply legislate our way out of this issue.

Turning the discussion towards political considerations, Árni Finnsson, of the Icelandic Environmental Association, suggested that the on-going weakening of **multinational regimes**, has undermined endeavours to tackle cross-border issues like plastic pollution. Reflecting the shared urgency and call for collaboration voiced by many during the symposium, he advocated for a return to an international order that enables the formulation of global responses to global issues.

The panel agreed that, in the light of the cross-border nature of many of the issues brought up during the symposium – from harmonising methods to sustainable tourism guidelines – there is an urgent need for **immediate, international action** to mitigate plastic pollution in the Arctic.

PANEL 2

FROM LOCAL TO GLOBAL ACTIONS

Moderator: **Eirini Glyki**, Science Professional Officer, ICES
Panellists: **Todd Gouvin**, TG Environmental; **Georg Haney**, Hampiðjan Group; **Peter Murphy**, NOAA Marine Debris Program; **Veronica Padula**, Aleut community of St Paul Island Tribal Government and Seattle Aquarium

Addressing plastic pollution will require **action at the international and local levels**. Crucial in this respect is finding responses that are appropriate and – in the case of communities in particular – feasible.

According to Veronica Padula, of the Aleut community of St Paul Island Tribal Government and the Seattle Aquarium, these should include initiatives that could formulate the concerns and experiences of communities and then communicate them to a broader audience to **spread awareness** of the impact of plastic pollution on people who bear no responsibility for it.

Many of these communities, she said, rely on marine resources, such as seals, and, as such, any disruption

> ***"We have disentangled numerous seals and that sort of very direct impact of marine debris on the community's resources is felt very deeply, but it's not necessarily something that might be considered on a broader level."***
> **Veronica Padula**, Aleut community of St Paul Island Tribal Government and Seattle Aquarium

to the marine environment is **felt very deeply locally**. Conveying messages of this sort make it clear that, while impacts may be unique from community to community, they are undeniable, and their sources must be addressed.

Peter Murphy, of the NOAA Marine Debris Program, found that the discussions during the symposium about the issue

Photo: Kári Fannar Lárusson

> ***"If you chemically recycle nylon, it's basically endlessly recyclable into a high-quality product."***
> **Georg Haney**, Hampiðjan Group

Photo: Olivia Rempel/GRID-Arendal

had been **strikingly similar**, regardless of which part of the Arctic was being talked about. Although concerning that the problem was so widespread, he found it reassuring that measures to address it in one location might be applicable in another.

In Alaska, his experience is that tailoring responses to local conditions is crucial. Equally important is not waiting too long to act. He described Alaskan communities as prepared to **"give something a try"** based on local observation. Even though such observations would likely be considered inadequate for action at the national level or for academics, at the local level there are lower barriers to action. For scientists and decision makers, this is an opportunity to obtain valuable data and information.

This highlights a paradox: maritime litter in the Arctic is a painful nuisance, but it is also a powerful tool. Beyond catalysing local action, it shows visitors how communities, often with a close connection to the land, **suffer under other people's pollution**.

The panel was aware that overdoing messages like this can be counterproductive. **"Plastic fatigue"**, as Todd Gouvin, of TG Environmental, called it, needs to be prevented by mixing in messages about the gains that are being made.

He agreed that the presence of plastic in the environment is a sign of failure, but, drawing on the example of the airline industry, he suggested that assessing how things had gone wrong could provide us with suggestions for

> ***"I don't think you're ever going to find anybody who thinks plastic belongs in the environment. All stakeholders agree that this is not where it belongs."***
> **Todd Gouvin**, TG Environmental

how to sort it out. It is also helpful that – unlike when it comes to an issue like climate change – **stakeholders are all in agreement** about some of the basics of the issue. No-one, for example, believes that plastic belongs in the environment. Ultimately, Mr Gouvin suggested, moving the discussion forward will require changing the value we place on plastic.

Eliminating plastic waste is often synonymous with recycling, and according to Georg Haney, Hampiðjan Group, we increasingly have no other option, as landfills refuse to accept it and incinerators to burn it. Plastic is a product that has **great opportunities for recycling**, he said – but only if done properly and with the co-operation of industry and producers of plastic and the products that use it.

There has to be a recognition, however, that **whatever works in one place might not work someplace else**, though the lessons learned in once place can serve as a point of departure for others.

He also noted that plastics are a problem that requires **more than recycling to solve**. As he put it "even if we change our minds completely and start recycling everything, we'll still have a problem well into the future".

PANEL 3

INNOVATIVE PLASTIC POLLUTION REDUCTION

Moderator: **Magnús Jóhannesson**, former Director Arctic Council Secretariat; Chair, Scientific Steering Committee
Panellists: **Elin Bergman**, Cradlenet; **Robert B Larsen**, UiT The Arctic University of Norway; **Heiðrún Lind Marteinsdóttir**, Fisheries Iceland; **Hlöðver Stefán Þorgeirsson**, Water Supply and Wastewater

When it comes to ways to reduce plastic pollution, **there are some signs of progress**, among them are a recognition in the fishing industry of its responsibility, the establishment of circular-economy goals and improved wastewater recycling.

In recent years, according to Heiðrún Lind Marteinsdóttir, Fisheries Iceland, action by that country's fishing industry has resulted in it going from being a big source of plastic pollution to being a part of the solution. This is thanks, in part, to its **collaboration with technology firms**. One added benefit of this progress has been a substantial increase in productivity. The co-operation and positive intentions of the fishing companies have driven the progress. Ms Marteinsdóttir cautioned, though, that innovations hold little value for pioneers unless the companies actively embrace and test them.

Photo: Olivia Rempel/GRID-Arendal

> ***"If you are producing high-quality marine products to sell to high-paying markets, a vital part of that story is a healthy ocean, a healthy product. And a part of that is obviously not dumping fishing gear or losing it at sea"***
> **Heiðrún Lind Marteinsdóttir**, Fisheries Iceland

Elin Bergman, Cradlenet, argued that countries must establish ambitious and **well-defined national goals** to transition to a circular economy, along with roadmaps outlining the steps to achieve them. Otherwise, companies are likely to wait for others to act first. Any number of initiatives are emerging in a range of industries, but, as of yet, there is little co-ordination among them.

She disagreed with Ms Marteinsdóttir's suggestion that firms would act on their own, and instead emphasised the importance of **governments taking prompt action**. There is no shortage of examples of companies behaving badly, and regulation can both establish corrective measures and prevent bad behaviour in the first place. No firm can achieve circularity on its own.

> ***"We need to make sure ... that we prioritise the reuse of the plastic we already have produced. It really is as simple as that. The hard part is to make the politicians and decision makers get on board and support this. And maybe this is where most of the innovation is needed?"***
> **Elin Bergman**, Cradlenet

When looking for solutions to problems of the sort plastics pose, Hlöðver Stefán Þorgeirsson, of Water Supply and Wastewater, argued that the most efficient methods are likely to be found in our past or in nature. In his line of business, that approach had created new **business opportunities** and generated "green" jobs, contributing to positive outcomes in multiple industries. As an example, he noted that enhancing wastewater-recycling will improve water quality and availability, fostering advancements in public health, environmental sustainability and economic development.

> ***"To promote necessary change in behaviour with respect to managing plastic wastes the potential of economic instruments for that purpose should be one of the means pursued."***
> **Magnús Jóhannesson**, Chair Scientific Steering Committee

Photo: Bo Eide

Promoting sustainable fishing practices among fishermen, according to Robert B Larsen, of UiT The Arctic University of Norway, stands to have a range of benefits, but full-scale trials in commercial fisheries are essential for testing and validating these practices. Using **biodegradable materials** as a method to reduce marine plastic pollution in fisheries promises to reduce some of the industry's most harmful impacts, but moving forward will require involving manufacturers, both in terms of testing, but also to spread acceptance.

In the end, transitioning to a circular economy will require well-defined goals, roadmaps, and government intervention, with collaboration being key to success. **The collective efforts of businesses, governments, and innovators are essential for a sustainable and circular future**.

THEMES

THEME 1

MONITORING AND ASSESSMENT OF PLASTIC POLLUTION IN THE ARCTIC

- We possess a wealth of data, but it must be harmonised
- Data-sharing remains a challenge
- We must assess what data we have and how we can put it to use
- Strategies, ethical guidelines and innovative approaches are needed

We know a lot about plastics in the Arctic marine environment, but putting the data to use requires that they be harmonised

Standardised data collection and management is crucial, but this necessitates **close collaboration among research scientists and industry stakeholders**. The focus should shift from coming up with new ways to assess the data we have to determining what data are essential, and how they should be utilised. Efforts toward harmonisation should involve transdisciplinary and cross-sectoral collaboration, but this prompts questions about the purpose of data creation – is it for research scientists or broader stakeholders? The need to harmonise information was a topic of constant discussion during the symposium and became something of a mantra.

One question that emerged during the session was **how to put a price on research**. In part, the value of research depends on how the data it produces can be used, and whether it is adequate to inform decision makers of the cost of addressing the issue (and of failing to do so).

> ***"We have people going out cleaning beaches, going to pick up litter from the sea, but we don't know how much their effort is worth. We don't tag or register the effort put into doing that."***
> **Anne Katrine Normann**, Centre for the Ocean and the Arctic, UiT The Arctic University of Norway

Knowledge and **data-sharing remains challenging** – at both the national and the international level. Gathering information from beach clean-ups, for example, poses a number of considerations: do research scientists need to seek permission first, and how does having local populations help out affect the quality of the data gathered?

Rapporteur's reflection

Extensive and interesting work is already taking place on the distribution of plastic in the Arctic, but methodological differences need to be solved for the data to be more comparable, and to get a pan-Arctic picture of magnitude and distribution. Furthermore, to prevent deterioration of Arctic ecosystems and communities, discussions about an international treaty to combat plastic pollution must continue and be finalised.

- **Ólafur S Ástþórsson**, former Deputy Director, Marine Research Institute

The session also dealt with using machine-learning technologies to monitor plastic, and the need for **critical evaluation of data generation and dissemination**. In general, the discussions underscored the importance of strategic collaboration, ethical considerations and thoughtful approaches analysing research and monitoring data.

> ***"We need hard facts. If you can estimate how much there is, it gives decision makers factual grounds for taking a position, deliberating and implementing measures."***
> **Anne Katrine Normann**, Centre for the Ocean and the Arctic, UiT The Arctic University of Norway

Photo: Olivia Rempel/GRID-Arendal

Moderator: **Anne Katrine Normann**, Centre for the Ocean and the Arctic, UiT Arctic University of Norway
Rapporteur: **Ólafur Ástþórsson**, former Deputy Director, Marine Research Institute
Keynote speaker: **Jennifer Provencher**, Environment and Climate Change Canada

PRESENTATIONS

Beach Litter Monitoring in the Arctic using drone and satellite imagery
Marc Schnuwara, BioConsult SH GmbH & Co. KG

Floating microplastics in the Eurasian Arctic: spatial and temporal trends
Svetlana Pakhomova, Norwegian Institute for Water Research

Reproducible pipelines and readiness levels in plastic monitoring
Amy Lusher, Norwegian Institute for Water Research (NIVA)

First analysis of micro- and meso-plastic particles in sea-surface samples collected in Icelandic coastal waters
Belen Ovide, Ocean Missions

Sentinels of plastic: Monitoring plastic pollution in the sub-Arctic ecosystem using Icelandic fin whales as indicators
Valerie Chosson, Marine and Freshwater Research Institute

Implementing national monitoring of plastic pollution in Norway
Eivind Farmen, Miljødirektoratet

Microplastic monitoring in the ice cover of a Finnish freshwater lake
Tuomo Soininen, University of Eastern Finland

Monitoring the Presence, Abundance, and Identity of Micro- and Nano-plastics of Arctic and Beringian Foodwebs
Soren George-Nichol, University of Alaska Anchorage.

Microplastics and plastic additives in salmonids from the central Canadian Arctic
Bonnie Hamilton, Environment and Climate Change Canada / University of Alberta

Indicators for plastic monitoring – linking the plastic value chain with environmental occurrence
Katrin Vorkamp, Aarhus University

THEME 2

METHODOLOGICAL DEVELOPMENTS TO DETERMINE MACRO-, MICRO- AND NANOPLASTICS

- Plastic is an immensely complex and varied material
- The big challenge is how to harmonise data collection and analysis
- There is a variety of fascinating projects seeking to identify new methods to study and monitor plastics in the environment
- More support is needed for efforts to develop practical solutions

Despite advances in environmental science, much remains to be learned about plastic pollution, particularly in the marine environment

Unlike in other environmental sciences, the long-term monitoring activities required to understand plastic pollution have yet to be established. Acquiring this information is necessary if we are to gain the insights needed to **understand how plastic pollution affects the ecosystem**.

The most striking aspect of the session was the consensus on the need to harmonise methods for monitoring and assessing the amount of macro-, micro- and nanoplastics in the Arctic environment. At the same time, it is important to stress that **plastic is an immensely complex and varied substance**. That makes it much more difficult to assess than other environmental parameters.

> ***"We have to acknowledge that this is an evolving field."***
> **Amy Lusher**, Norwegian Institute for Water Research (NIVA)

Photo: Olivia Rempel/GRID-Arendal

Rapporteur's reflection

There is a great amount of important innovative work being undertaken to address the issue of plastic pollution in the Arctic and elsewhere. There is an impressive diversity of methods being developed and used to assess the scale and impact of plastics in all shape and sizes, but challenges lie ahead with regard to harmonising methods to be able to achieve a wholistic picture of the status.

- **Hrönn Egilsdóttir**, Marine & Freshwater Research Institute

Panellists and the audience alike agreed on the importance of making relevant information accessible to the public, policy makers and other stakeholders, since **plastic litter is a matter that affects us all**, it can only be addressed successfully through concerted action.

It also became evident that broader and stronger support is needed for efforts to address the complicated scientific questions related to plastic litter. However, although **the need to act is urgent**, we must resist the urge to reach for simple solutions. Rather, we must speed up the research and development that will deliver useful solutions.

> ***"So we need more funding, yes, but we need to be very selective of what kind of research we are conducting."***
> **Jóhann Sigurjónsson**, former Director, Marine Research Institute

Moderator: **Jóhann Sigurjónsson**, former Director, Marine Research Institute
Rapporteur: **Hrönn Egilsdóttir**, Marine & Freshwater Research Institute
Keynote speaker: **Amy Lusher**, Norwegian Institute for Water Research (NIVA)

PRESENTATIONS

Nanoplastics in Arctic ecosystems: Myth or Reality?
Julien Gigault, Takuvik, CNRS/Université Laval

Microplastic Pollution in Ny-Ålesund, Svalbard
Yubo Li, Shanghai Municipal Engineering Design Institute (Group) Co., Ltd.

A pan-Arctic Monitoring program for litter and microplastics
Jennifer Provencher, Environment and Climate Change Canada

Marine litter pollution in Southern Spitsbergen—lessons learnt from 6 tonnes of litter picked up from 30 km of the coast
Adam Nawrot, forScience Foundation

Differentiating between microplastics, algae and dissolved organic matter using single particle ICPTOFMS
Lyndsey Hendriks, TOFWERK

Characterization of microplastics in surface waters from Great Slave Lake and the Mackenzie River, Northwest Territories
Madelaine Bourdages, Carleton University

Marine beach litter in the Baltic Sea. Outcome from the HELCOM BLUES project
Eva Blidberg, Keep Sweden Tidy Foundation

Uptake and accumulation of car tire rubber-related organic chemicals in blue mussels (Mytilus edulis)
Kristin Galtung, Norwegian Institute for Water Research (NIVA)

Production and analysis methods for pristine and degraded microplastic and nanoplastic reference materials
Andy Booth, SINTEF Ocean

Challenges and opportunities regarding beach litter monitoring in Norway: Lessons learned from three different datasets
Marthe Larsen-Haarr, Salt Lofoten AS

Photo: Olivia Rempel/GRID-Arendal

THEME 3

SOURCES AND TRANSPORT OF PLASTIC IN THE ARCTIC AND SUB-ARCTIC

- Plastic is everywhere, but understanding the picture requires different approaches in different places
- Long-term monitoring and a better understanding of how plastic makes it to the Arctic must be prioritised
- Some sources – such as general carelessness – are easier to address than others
- In some cases, we don't know what we need to know in order to act

Effectively addressing plastic pollution in the Arctic and meeting policy and management objectives requires a better understanding of where it came from and how it got there

Despite its remoteness, the Arctic has not escaped the impacts of the Anthropocene: plastic first became widely available in the 1950s; half a decade later, **it is found throughout the region**, on the land, in the sea and in the air.

We mostly understand the what when it comes to plastic; we are much less certain about the who and the why. Although how plastic reaches the Arctic remains somewhat unclear, we understand that **there are several pathways**: it predominantly comes from the EU mainland and through the North Atlantic via ocean currents, but there is a significant local contribution, just as the fishing industry is a major source. Local and Indigenous knowledge can help fill in some of the blanks and point to a solution.

> ***"When you take everything together – removal, understanding where things are, research, understanding what impact they have – you can work towards prevention, because you need to work towards behaviour change."***
> **Peter Murphy**, NOAA Marine Debris Program

Pollution stemming from the fishing industry is a particular problem. More formally known as "abandoned, lost or otherwise discarded fishing gear" (ALDFG), this type of litter **poses a significant threat to marine life and to navigation**. Mitigation efforts should concentrate on improving the collection and storage of net cuttings on bottom-trawl vessels and implementing proper disposal procedures in ports.

Rapporteur's reflection

I think oftentimes we should dare to take action when we see the trends, and not only when we know enough, because we never know enough. We should continue doing the research to confirm what we are seeing, but we don't need to wait to act. It's like with climate policies.

- **Gunn-Britt Retter**, Saami Council

In the Icelandic case, research revealed that longlines and trawl nets, made from durable plastic, constitute most of the marine litter on the seafloor. These materials, entangled with corals and rocks, pose a threat to vulnerable marine ecosystems. This discovery led to the creation of a marine protected area (MPA), underscoring the **importance of funding and continued research** and marine spatial-planning tools to protect essential ecosystems.

> ***"Research data needs to resonate with policy makers and the media – part of it is creating relationships and having two-way discussions about what is needed for people to take action."***
> **Eirini Glyki**, ICES

Moderator: **Eirini Glyki**, Science Professional Officer, ICES
Rapporteur: **Gunn-Britt Retter**, Saami Council
Keynote speaker: **Peter Murphy**, NOAA Marine Debris Program

PRESENTATIONS

Atmospheric Microplastic in the Arctic and the Norwegian mainland
Dorte Herzke, NILU & NIPH

A plastic archive in Greenland: micro and nano particles in marine sediment
Karla Parga Martinez, University of Copenhagen

Fishing nets on the coastline of the North Atlantic region - What is causing the issue and how can it be solved?
Wouter-Jan Strietman, Wageningen Economic Research

Vertical fluxes of microplastics and other anthropogenic particles measured using moored sediment traps in two Arctic glacial fjords (Svalbard archipelago)
Andrea Paluselli, CNR-ISMAR

Modeling influence of biogeochemical processes on the transport of microplastics in the Arctic Ocean
Anfisa Berezina, Norwegian Institute for Water Research (NIVA)

Atmospheric deposition-flux rates of microplastics particles recorded in Icelandic surface-lake sediments
Mathis Blache, University of Iceland

Microplastic pollution in sediments around Svalbard, from sea-ice covered areas on the continental shelf to deep slope gullies
France Collard, Norwegian Institute for Water Research

Microplastic concentrations and modelling of microplastic transport in the Baltic Sea and Arctic sea ice
Hermanni Kaartokallio, Finnish Environment Institute

Evidence of highly local marine litter sources in an Arctic archipelago (Lofoten, Norway)
Vilde Sørnes Solbakken, SALT Lofoten AS

Marine litter on the seafloor around Iceland: Analyzing seafloor images from benthic habitat mapping in 2004-2019
Petrún Sigurðardóttir, Marine and Freshwater Research Institute

Photo: Kári Fannar Lárusson

THEME 4

IMPACTS OF MARINE LITTER IN THE ARCTIC (ENVIRONMENTAL, ECONOMIC AND SOCIAL)

- "Unfair" transport patterns put plastic on a direct course towards the Arctic
- Clean-up projects provide important information about the type and amount of litter
- Removing plastic from the environment is futile unless the source is addressed
- Plastic and climate solutions are connected, and in both cases should engage younger generations

Plastic pollution is a complex issue that spans environmental, social and economic dimensions

Plastic pollution is particularly pervasive in the Arctic, thanks to **"unfair" transport patterns** that deposit waste in an area that bears no responsibility for it. Once there, it compounds existing environmental and social problems, giving the issue a human-rights dimension. Research showing that plastic builds up in the food web can result in Indigenous groups replacing traditional, country food – seabirds and seals, for example – with processed, unhealthy Western food. Research is crucial for understanding pollution patterns. As mentioned in other panels, harmonising data and the way it is collected is crucial.

Involving local and Indigenous communities in clean-up projects is vital. The knowledge that these communities possess is essential for effective clean-ups and research. The clean-ups themselves can provide job opportunities for the community while at the same time increasing awareness of Indigenous cultures. Taking a **holistic approach** that considers both environmental and social aspects is necessary.

> ***"There's an unfairness for us to let children clean up plastics, because we, as the adults, might have been the ones who caused many of these issues."***
> **Kristian Jensen**, Lofotrådet

However, to truly maintain a healthy environment in the Arctic it is essential that we **"turn off the tap"** of plastic pollution. This requires initiatives at all levels: local, regional, national and global. It is unfair to expect local communities on the receiving end of litter to shoulder the burden of doing something with it. Exploring alternative uses for the plastic communities gather, such as turning it into building materials or repurposing tyres for asphalt, could be a way of turning misfortune into opportunity, but this is typically uneconomical: recycling plastic costs more than making products from new plastic. Transporting it out of the region only adds to the cost.

When communicating why plastic is a problem, **tailor the message to the audience**. When speaking with policymakers, for example, explain impacts and propose solutions (such as uses for old plastic) without going into technical details. Any future gathering that seeks to address the issue should include discussions of the economic impacts of marine litter on different societal groups.

Rapporteur's reflection

Plastic pollution is having an impact globally in all ecosystems, even in remote areas of the Arctic, and it is already affecting people's livelihoods and inflicting social costs. Further research, educational efforts and remedial actions are vital and need to be financed. Furthermore, we need effective communication between scientists and policymakers, so research and activities are fit for purpose. However, it is imperative that we stop plastic pollution at its source.

- **Sigurrós Friðriksdóttir**, Environment Agency of Iceland

Moderator: **Kristian Jensen**, Lofotrådet
Rapporteur: **Sigurrós Friðriksdóttir**, Environment Agency
Keynote speaker: **Lisa Qiluqqi Koperqualuk**, ICC Canada

PRESENTATIONS

Development of a decision matrix for coastal litter clean-ups in Norway
Jannike Falk-Andersson, Norsk Institutt for Vannforskning

Social perspectives on plastic pollution. Example from northern Norway
Christina Koch, Vårt Hav, Troms og Finnmark / Naturvernforbundet i Finnmark

Benthic organisms in Arctic ecosystems: presence and effects of nanoparticles in the context of single and multiple stressors
Charlotte Carrier-Belleau, Laval university and University College Dublin

Plastic pollution in Norwegian coastal soils affect microbial diversity and soil gas composition
Gunhild Bødtker, NORCE

Characteristics of microplastic particles that influence atmospheric deposition in remote regions
Sydney Fox, Reykjavík University

Educating Our Future Arctic Plastics Researchers
Matthew Johnson, Volatus Aerospace

A spatiotemporal analysis of plastic ingestion in Canadian Arctic-breeding northern fulmars (Fulmarus glacialis)
Kristine Hanifen, Acadia University

Clean-up Norway Svalbard
Snorre Sklet, SALT

Including local voices in the marine debris conversation to advance environmental justice for island and coastal communities: Perspectives from St. Paul Island, Alaska
Douglas Causey, University of Alaska Anchorage

Marine litter in the Arctic: Results from three years of citizen science
Malin Dahl, Keep Norway Beautiful

> ***"It was said that though our theme touched on the impacts of plastic on the environment – on the sociological and ecological aspects – we didn't quite get to the core of the impacts. And perhaps the reason for that is that all scientific papers have a list of adverse effects of plastic in the introduction. And it could be said that we have forgotten to communicate that there's still a lot we don't know about the impacts of plastic on the environment, on people and on the economy."***
> **Kristian Jensen**, Lofotrådet

Photo: Kári Fannar Lárusson

THEME 5

ARCTIC CHALLENGES AND SOLUTIONS FOR IMPROVED WASTE MANAGEMENT

- We need to learn how to live with plastics
- Wastewater and the fishing industry are the primary sources of microplastics in the Arctic
- Wanted: better systems, better processes and a better-informed public
- Responsible management has economic and environmental benefits

There is an urgent need to address microplastic pollution

Reducing microplastic pollution will require improved waste-management, but success is contingent on **better stakeholder engagement and a better-informed public**.

Wastewater and the fishing industry are the main sources of microplastic in Arctic waters. There are a number of ideas that could reduce the amount of microplastic that winds up in the ocean; the challenge is striking a **balance between implementing the necessary technology and minimising any undesirable impacts it may have**.

> ***"The discussions identified examples of a lack of co-ordination between administrative levels – central versus local – that can restrain waste-management plans in fishing harbours and the challenges of accurate sorting of plastic by residents. Emphasis should be on the need for better systems, better processes and public education."***
> **Sigurgeir Bárðarson**, Fisheries Iceland

Photo: Olivia Rempel/GRID-Arendal

Rapporteur's reflection

Plastic production can be monitored relatively easily, but actually it doesn't say much about plastic pollution. And the same is true for plastic use alone, but maybe these parameters can be combined with something like a recycling and incineration rate telling us in an indirect way how, what is the quantity of mismanaged waste so that it's not covered by recycling or incineration.

- **Katrin Vorkamp**, Department of Environmental Science, Aarhus University

The fishing industry's contribution to marine debris – particularly in the form of nets and cuttings – were a key issue that came up during this session, and indeed during all of the symposium's discussions. **Nets and ropes account for approximately 30% of all beach litter** in the North-east Atlantic. This underscores the need to identify practices and policies that engage stakeholders in the fishing and aquaculture industries, harbour management and waste-management firms.

Responsible disposal of fishing gear was highlighted as an effective way to turn waste into valuable resources. But, if waste management systems are to be profitable and effective, we must address what has been a **failure on behalf of public agencies to act and the lack of awareness among industry and individuals**.

> ***"The truth is that we need to find a way to live with plastics because of their benefits. We don't have any better materials at this moment in time."***
> **Thomais Vlachogianni**, MIO-ECSDE

Moderator: **Sigurgeir Bárðarson**, Fisheries Iceland
Rapporteur: **Katrin Vorkamp**, Department of Environmental Science, Aarhus University
Keynote speaker: **Thomais Vlachogianni**, MIO-ECSDE

PRESENTATIONS

Microplastic in Gravity-driven Membrane Filtration for Cold Climate Decentralized Wastewater Treatment: Fouling Analysis and Water Quality Investigation
Selina Hube, University of Iceland – Faculty of Civil and Environmental Engineering

Net cuttings waste from fishing: developing best practices in the fishing industry
Ryan d´Arcy Metcalfe, KIMO International

Occurrence of microplastics in the sub-Arctic waters near a wastewater treatment plant in Reykjavík, Iceland
Ásta Margrét Ásmundsdóttir, University of Akureyri, Iceland

Novel bio-inspired alternatives to plastic packaging in Arctic fisheries
Philippe Amstislavski, University of Alaska Anchorage

Plastics: From Wishcycling to Recycling
Audrey Matthews, University of Akureyri

Marine Debris from Wastewater Outfalls
Jake Thompson, University Centre of the Westfjords

Blurred interface: How lack of coordination between governance levels obstructs waste management in fishing harbors. The case of Tromsø
Anne Katrine Normann, Center for the Ocean and the Arctic, UiT

Creative Solutions for Marine Debris Prevention in the Arctic
Veronica Padula, Aleut Community of St. Paul Island Tribal Government and Seattle Aquarium

Bringing value to marine waste
Øistein Aleksandersen, Nofir

Climate Change and Plastic Pollution – Similar Needs for Systemic Changes
Jakob Bonnevie Cyvin, Norwegian University of Technology and Science

Photo: Bo Eide

THEME 6

TACKLING PLASTIC POLLUTION: INTERNATIONAL COLLABORATION, POLICIES, BEST PRACTICES AND NOVEL DEVELOPMENTS FROM AROUND THE WORLD

- Collaboration is key to advancing efforts to address plastic pollution
- Effectively addressing plastic pollution requires a common understanding of the problem
- Scientists must adapt their behaviour if they hope to connect with young people
- Urgent action is required – but it must be sustainable

There is no shortage of initiatives for addressing plastic. The next step is to make sure they succeed

The good news is that any number of initiatives to address plastic pollution are underway. These range from the interpersonal and local to the efforts of the upcoming legally binding instrument on plastic pollution. In some cases, the initiatives are narrowly focused, but highly significant – such as drawing attention to the amount of plastic waste generated by dental care. Some of these efforts are specific to the circumpolar region – and, again, they are **taking place at all levels**.

These initiatives generate significant amounts of information, but, due to their variety and their varying approaches, **making sense of them collectively is challenging**. And, even with the extensive amount of information being collected in the Arctic, there are considerable knowledge gaps, such as the extent of the problem and its impacts.

> ***"We try to estimate the amount of waste in in the ocean. We can do surveys of where the plastic ends up – what happens to it when it gets into to the ocean. There are many research projects looking into that. And, on a larger scale, you can document where some of it ends up within the lifetime of a human being, but we have not been able to detect where all of it is."***
> **Josephine Nymand**, Pinngortitaleriffik-Greenland Institute of Natural Resources

Similarly, we lack a full understanding of **what happens to plastic once it reaches the ocean**. In part, this is because plastics in the water are hard to see or, as is the case with micro- and nanoparticles, not visible at all. And that makes them difficult to identify or even detect in the first place.

The most successful initiatives will bridge the gap between scientists, decision-makers and young people, just as closer collaboration and discussion will be two keys for moving the issue forward. We have abundant data and guidelines; what is necessary is a **legal framework that aligns with the lives of young people**.

Rapporteur's reflection

To effectively address plastic pollution we need the public, scientists and governments to collaborate, share understanding and engage in discussions.

- **Katrín Sóley Bjarnadóttir**, Environment Agency of Iceland

> ***"I urge you to reach out to the young people because the young people are going to inherit this planet and they know what they want to do, but sometimes they lack the scientific knowledge."***
> **Sæunn Júlía Sigurjónsdóttir**, former Director, Marine Research Institute

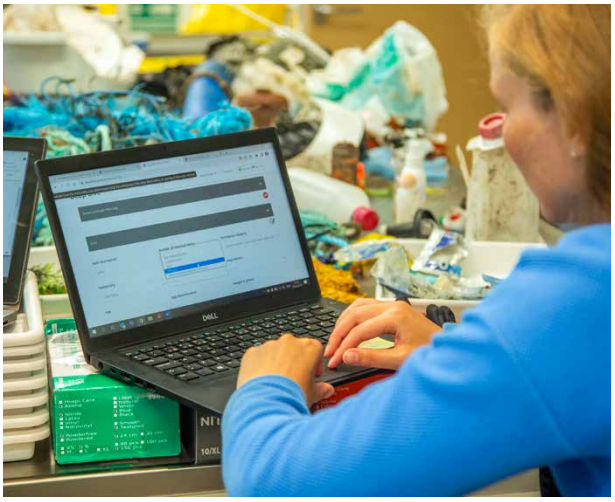

Photo: Olivia Rempel/GRID-Arendal

Moderator: **Josephine Nymand**, Pinngortitaleriffik-Greenland Institute of Natural Resources
Rapporteur: **Katrín Sóley Bjarnadóttir**, Environment Agency of Iceland
Keynote speaker: **Sæunn Júlía Sigurjónsdóttir**, Young Environmentalists

PRESENTATIONS

FAO global efforts to prevent and reduce ALDFG
Haraldur Einarsson, Fishing Technology and operations team (NFIFO)/Food and Agriculture Organization of the United Nations (FAO)

A marine plastic cloud – Global oceanic plastic pollution mass balance in relation to the Arctic
Thomas Maes, GRID-Arendal/SEAMOHT

Plastics in dental care clinics and growing concerns about the environmental impact
Ásbjörn Jokstad, UiT The Arctic University of Norway

The Arctic on a global scale: influence of Arctic States within the ongoing global plastic treaty negotiations
Emily Cowan, SINTEF Ocean

Fighting Marine Litter in the Arctic: How to Engage Tourists
Julia Hager, mountain2ocean & PolarJournal

Raising Awareness of Marine Litter and Engaging International Partners through the Arctic Cleanup
Kristina Tirman, Ocean Conservancy

Clean Up Iceland: The Expedition cruise industry's efforts to clean Icelandic shorelines
Gyða Guðmundsdóttir, Association of Arctic Expedition Cruise Operators

Developing a solid policy framework for plastic pollution and waste management in the Arctic through multi-stakeholder co-creation – Implications for national and international policymakers and Indigenous groups
Dimitris Symeonidis, Afforest4Future

Experience and challenges through development of Rent Hav – a digital tool for mapping marine litter
Eirik Okkenhaug, The Norwegian Center Against Marine Litter

"Valuation of nature" as a tool to reduce (the impact of) plastic pollution
Gunn-Britt Retter, Saami Council

Photo: Olivia Rempel/GRID-Arendal

CLOSING REMARKS

FROM THE PRIME MINISTER OF ICELAND

In recent years, the issue of plastic pollution has come to the forefront of the international environmental agenda.

Long-lived plastic waste is filling our rivers, washing up on beaches and choking and entangling wildlife. Microplastics are now found just about everywhere on earth, and their long-term effect on living organisms and human health is not well understood. What we do know is that the problem is big; it's getting bigger every year; and we must act.

Business as usual will lead to our seas containing more plastic than fish within a few decades. And this is not a picture that any of us want to see, and I don't think this is a future that any of us can accept.

But there is room for optimism: the on-going global talks on plastics and plastic pollution have been described as the most important environmental negotiation since 2015 Paris Agreement on climate change. I think this is no exaggeration. I hope that the talks can be concluded by the end of 2024 as planned, but the time for action at the regional, national and local levels is now. Iceland

Photo: Peter Prokosch

has an action plan aimed at all parts of the lifecycle of plastics, but we too need to do more.

We can all imagine what plastic waste looks like. Many of us will envision tropical rivers choked with plastic debris or sea turtles entangled in ghost nets or six-pack beverage rings. These troubling images are often close to the biggest sources of mismanaged plastic waste.

The Arctic, on the other hand, still retains an image of a pristine wilderness in the public imagination. But make no mistake about it: plastic waste is found on remote Arctic beaches. Plastic pellets are found in the stomachs of seabirds. Arctic seals get entangled in ghost nets. Microplastics are found in seawater and ice transported thousands of kilometres to the polar north. This was confirmed during the First Symposium on Plastics in the Arctic and the Sub-Arctic Region held by Iceland and the Nordic Council of Ministers in 2021.

The signal from the Arctic is loud and clear.

Of course, plastics are not made for the purpose of fouling the environment or threatening our health. Plastic is an amazing material fit for many purposes and it can improve our lives. But we can have too much of a good thing. One thing we cherish in plastic is durability, but about half of the plastic we use is single-use. This is not a good combination.

A few years ago, I participated in a beach clean-up, and it didn't take long until I found a plastic medicine bottle. It was from 1976 – the year I was born – and it was fully intact. In fact, I looked older than the bottle did. And, I thought, if I had not found that bottle and recycled it, it would still be there, rolling around for decades, centuries or even millennia.

Millions of plastic bottles are sold every minute worldwide, and typically less than half of them will be recycled. The recycling rate for plastics as a whole is even lower – only around 10%. Every day, according to the United Nations Environment Program, the equivalent of two thousand garbage trucks full of plastic are dumped into our rivers, lakes and seas. Every day. There, it will be processed by nature for centuries to come.

Plastic production is projected to increase significantly. Currently, the amount of mismanaged plastics is almost thirty million tons a year. In a business-as-usual scenario, we could see fifty million tons of plastic entering the environment every year. But we have an alternative: the Nordic Council of Ministers has identified robust measures across the lifecycle of plastics, buttressed by an ambitious global treaty. In this version of the future, we would still produce a lot of plastic in 2040, but much more of it would come from recycled material, just as the amount of mismanaged plastic would be drastically reduced, with some seven million tons being released into the environment. That is still a lot, but it is rather less than the fifty tons we are heading towards.

Of course, our goal for plastic pollution should not be seven million tons per year. It should be zero. None. But what is most important is that we turn the tide now.

We need less plastic, more recycling, better waste management, more clean-up projects, zero pollution. Will all that cost? (The first thing any politician will ask.). Yes, it will cost, but it will cost a lot more if we do not end the wasteful and harmful system we have today. Indeed, the Nordic study finds that a sustainable plastic regime comes with economic gains – not to mention the all-important environmental benefits.

The message from this conference to the global talks on plastic waste is clear: we urgently need to replace a single use throwaway culture with a truly circular economy.

But it does not end here, and that is why Iceland is ready to host the **Third International Symposium on Plastics in the Arctic and the Sub-Arctic Region** in 2025. We still need improved science, more knowledge and, above all, to make progress to put an end to plastic pollution.

We have no time to waste.

Photo: Kári Fannar Lárusson

Katrín Jakobsdóttir
Prime Minister of Iceland

CONCLUSION

The presentations at the Second International Symposium on Plastics in the Arctic and Sub-Arctic Region shed light on crucial challenges and potential solutions

The overarching theme emphasised the complexity of waste-management issues, urging a co-ordinated and interdisciplinary effort. From addressing microplastic in the environment and integrated waste management by the fishing industry, to the need for awareness and co-ordination and the involvement of young people, the discussions highlighted the multifaceted nature of the problem.

Effective waste management requires innovative solutions, but it also demands a co-ordinated effort, and, not least, an awareness of the problem and of how we can solve it. Sharing failures – not just successes – is vital, and it is part of the collective and proactive approach that is necessary for preserving the Arctic environment.

Photo: Olivia Rempel/GRID-Arendal

KEY FINDINGS

HARMONISATION, COLLABORATION AND CO-ORDINATION

- There is an abundance of data, but harmonising it through standardised collection and management is essential. Achieving a comprehensive understanding of the current situation and identifying effective pathways forward requires harmonised methods across different geographical contexts. This was a message that was repeated frequently during the symposium.
- Plastic litter is pervasive, but research into it is relatively recent, and the lack of long-term monitoring poses challenges.
- Plastic arrives in the Arctic through various pathways: by air, embedded in sea ice, and carried by ocean currents and rivers. This underscores the need for international collaboration on monitoring, research and policy implementation.
- Microplastics reach the Arctic predominantly from the European mainland and the North Atlantic, but local sources are a significant source as well, and this points to a need to focus on household-waste management and the fishing industry in Arctic communities.
- Plastic pollution is a global human-rights issue because it threatens traditional ways of life, food security and health. In addition, it disproportionately affects vulnerable communities.
- Indigenous communities and young people should not bear the sole responsibility for cleaning up plastic waste.
- Consumers should have a right to refuse certain plastics, and there should be limits on plastic production.
- Some 30% of beach litter in the North-east Atlantic can be traced back to the fishing industry, suggesting there is a need for best practices and policy solutions involving stakeholders across the fishing industry. The agriculture industry should also be engaged.
- Bridging the gap between scientists, decision-makers and young people is crucial for implementing effective policies.

GAPS

- Our understanding of the impacts of plastic pollution on the environment, people and the economy are still not fully understood.
- Social scientists can give us an insight into why people do things that are harmful to the environment. Research scientists, meanwhile, should do more to engage with young people and create time and space for discussions.
- Understanding and accountability for plastic use, possibly through mechanisms like the EU taxonomy tracing carbon footprint, is an area that requires exploration and discussion.
- The difficulty of identifying waste endpoints and the invisible presence of plastic in the ocean is a significant hindrance to understanding the impacts it has.
- Innovative solutions like gravity-driven membrane filtration and bio-inspired alternatives should be studied further.
- Best practices and policy solutions involving stakeholders from the fishing and agriculture industries are not specifically tailored to Arctic contexts.

NEEDS

- Long-term research to better understand temporal and seasonal trends over time.
- Science-based and ambitious national and international policies to target marine plastic pollution and single-use plastics.
- Further exploration of how artificial intelligence could be integrated into plastics-research methodologies.
- Further work to determine best practices for engaging with communities and identifying target groups for communication.
- A deeper understanding of the long-term impacts of longlines, trawl nets and other durable materials that wind up on the seafloor and in other vulnerable marine ecosystems.
- Continued monitoring of microplastic contamination from municipal wastewater-treatment plants.
- Improved plastic-sorting systems and processes.
- More accurate methods for estimating the amount of ocean waste, as traditional detection methods are especially challenging in the Arctic.
- Technology and methods that can improve our understanding of the challenges posed by micro- and nanoplastics, particularly detection through satellite imagery or observation at sea.

Government of Iceland

Centre for the Ocean and the Arctic

Nordic Council of Ministers