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Innovative Community Engagement for Building Effective Resilience and Arctic Ocean Pollution-control Governance in the Context of Climate Change

Waste and wastewater management in Arctic communities

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A policy paper prepared by the ICEBERG project, presenting background information on various elements relevant to pollution governance in the Arctic.

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THIS FACTSHEET IS BASED ON A POLICY PAPER WRITTEN AS A PART OF THE ICEBERG PROJECT

Regulating Arctic waste and wastewater

Regulations and policies for solid waste and wastewater management in Arctic communities are relatively advanced, but limited funding, high initial costs and the small size of Arctic communities lead to minimal or non-existent processing of wastewater, poor recycling rates for waste and the need for costly transport of waste out of the Arctic.

CURRENT GOVERNANCE - KEY ISSUES

• Regulations in Iceland (part of the European Economic Area; and thus, implementing EU legislation in this area), Greenland and Svalbard are generally aligned with European standards.

• There have been a number of positive developments recently, including improving recycling and hazardous waste management in Iceland and Longyearbyen, as well as introducing primary wastewater processing in Akureyri and Longyearbyen.

• Municipalities generally bear the greatest burden of responsibility for solid waste and wastewater management.

• There is an increasing role of Extended Producer Responsibility (EPR) schemes across the Arctic, but with limited reach in small communities.

• Cruise vessels are a potential source of waste and wastewater, but a regulatory framework (including at the international level) is in place, and the operators claim that these rules are generally followed.

THE MAIN GOVERNANCE GAPS

• There is insufficient monitoring of wastewater impacts in many locations (Eyjafjordur by Akureyri, North Iceland appears to be an exception) and limited monitoring of solid waste pollution.

• Local capacities and resources for advanced waste and wastewater management are limited, and national support for local initiatives is insufficient.

• Fisheries waste is dependent on self-reporting and is rather problematic for both fishers and public oversight agencies.

• Old waste incinerators remain in use in many communities and can be sources of air pollutants.

• Tires and road dust are among the important local and global sources of microplastic pollution, while the regulations and policies are in early stages of development.

EXAMPLES OF GOOD PRACTICE

• Introducing mandatory collection programmes: minimising cross-transmission of disease and residents' contact with waste, and minimising landfill maintenance duties (Clean-Starts in Canada and Alaska).

• Prepaid hazardous and harmful waste handling (Ylitornio, Finland, where an option to acquire four prepaid visits per year has been introduced).

• Limiting the use of single-use plastics in fishing and hunting activities (Greenlandic 2022 regulations).

• Setting up regional hubs for e-waste (Green Star in Fairbanks, AK).

Photo: ForScience, 2025

FURTHER READING & CONTACT

Read the full policy paper at arctic-iceberg.eu/publications

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ICEBERG project

Climate change and pollution, including plastics, ship emissions and wastewater, pose threats to human health and the ecosystems of the Arctic region.

From 2024-2027, the ICEBERG project, funded by the EU under the Horizon Europe programme, studies pollution and its impacts on the ecosystems and communities in the European Arctic, focusing on three regions: southern Kalaallit Nunaat (Greenland), Northern Iceland and Svalbard.

The ICEBERG project integrates natural and social sciences with Indigenous and local knowledge. Researchers employ an ethical, multi-actor and gender-sensitive approach to assess the impacts, risks and vulnerabilities of local communities. The project applies the One Health approach, which recognises the interconnectedness and interdependence of the health of humans, animals, plants and entire ecosystems.

The aim is to mitigate the impacts of pollutants in the Arctic. The project investigates the sources, types and distribution of pollutants, such as plastics, ship emissions, wastewater and heavy metals, by using simulations, remote sensing and observations. On a practical level, the project develops, for example, automatic marine litter detection tools using drones, AI and citizen science. The toxicological impact of microplastics, nanoplastics and persistent organic pollutants (POPs) on human digestive health is being evaluated. The impact of pollution emissions on the marine food web is assessed.

Researchers work together with communities and stakeholders to co-develop pollution monitoring, mitigation and adaptation strategies, as well as policy recommendations for multilevel pollution-control governance.

Policy papers

The series of policy papers outlines the main elements of the governance framework relevant to pollution control in the Arctic areas of the North Atlantic, with a focus on the three ICEBERG study sites.

Each paper starts with an introduction to the specific policy area or economic sector relevant to Arctic pollution governance, then proceeds to discuss national regulations in the three ICEBERG study sites, and provides an overview of international law, European Union policies and legislation, Arctic Council actions, and corporate governance. Governance gaps and selected best practices are presented.

The policy papers produced and published on the ICEBERG website are:

- Cruise tourism
- Solid waste & wastewater management
- Microplastics and plastics pollution
- Frameworks for Arctic beach clean-ups
- POPS and heavy metals
- Pollution related to mining activities

The policy paper does not constitute a formal deliverable of the ICEBERG project.

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Key insights:

- and Management of solid waste and wastewater remains a major challenge for Arctic communities, with respect to costs, logistics and local impacts on the environment and human health. There is societal attention and interest towards waste and wastewater management.
- All study sites' jurisdictions have developed relatively robust regulatory frameworks for dealing with waste and wastewater (with Greenlandic legislation introducing a comparatively lower level of obligations). However, there are challenges related to implementation, limited resources available to local communities, and a high reliance on the coping capacity of coastal waters to deal with sewage.
- There is limited availability of funding for waste and wastewater management at both local and national levels.
- In many Arctic locations, monitoring of impacts of wastewater disposal in the coastal waters is lacking in many Arctic locations. Eyjafjörður (the fjord of Akureyri) stands out as a relatively positive example.
- Capacities of agencies and municipalities to oversee the implementation of regulations with respect to both wastewater and solid waste are limited across the study sites.
- Icelandic legislation is primarily driven by policy developments in the EU.
- There has been some work done on establishing standards and collecting best practices at the Arctic level (via the Sustainable Development Working Group project) and extensively across Europe. Many of these practices can be valuable for study sites.
- Among issues of interest for ICEBERG scenarios and strategies are: the implementation of EU legislation in Iceland, availability of local circular solutions useful specifically for Arctic communities, public and decision-makers' awareness of wastewater and waste management challenges, as well as the applicability of extended producer responsibility schemes for small remote communities.

1. Introduction and background

The waste and wastewater are among the key local environmental issues in Arctic settlements and are of relevance to all ICEBERG coastal study sites. Technologies and practices related to solid waste and wastewater are very different, but are approached in this paper together, as from the point of view of small coastal communities, they constitute one set of challenges linked to capacities, costs and externally imposed rules and standards. Compared to other pollution issues – shipping pollution, long-range air pollutants, etc. - dealing with solid waste and wastewater management generally falls under the responsibility of municipalities and is autonomously organised, at least partly, at the local level.

The remoteness and small size of communities are among the main drivers of challenges related to the collection, transport and disposal of solid waste and the treatment of wastewater. Crucially, the costs of appropriate facilities for managing waste and wastewater are very high, and the incentives for small coastal communities, compared to inland settlements, are limited. If equipment is in use (incarcerators, primary wastewater treatment), there is no financial capacity to create redundancy in case of a facility malfunction.

While Arctic communities often reuse and recycle various items, the more technologically advanced forms of circularity are not available or affordable due to a lack of scale (critical mass to invest in innovative solutions).

Solid waste often needs to be transported out of small communities – and for some types of waste, partly out of Arctic countries and territories for processing – resulting in high costs and additional environmental impacts due to waste transport. Dealing with hazardous waste, which is the most strictly regulated waste type, also remains a problem.

Moreover, for some coastal communities, there has historically been the notion that the marine environment can cope with wastewater produced by relatively small Northern settlements, without harm to human health or coastal/marine ecosystems. This contributed to many communities not developing sewage systems in the past. The same is true for solid waste disposal, which remains dependent on landfills (often lacking appropriate safety measures) and burning.

During the fieldwork and interviews in Iceland (March 2025), Greenland (September 2025) and Svalbard (remote interviews), the questions related to solid waste management were raised consistently. Developing more sustainable and cost-effective ways of managing solid waste and wastewater has become an increasing priority. There is a need for incentives and policies to encourage investment and to develop, scale up, or transpose solutions suitable for the small size and conditions of remoteness, typical for Arctic settlements and municipalities. National regulations, EU legislation, and global commitments create increasing pressure to address waste and wastewater issues, also in small Arctic communities.

In Northern Iceland, ICEBERG covers two distinct communities: Akureyri and Húsavík. Both are coastal settlements situated at the coastal waters (which are designed as non-sensitive under the EU acquis-derived legislation) with a relatively high capacity for managing wastewater. However, Akureyri is a town of almost 20 thousand inhabitants. It is not only faced with greater challenges but also has more resources to deal with these challenges. The key example is the wastewater

treatment plant opened in 2019, which provides close-to-primary processing of wastewater. The town was also able to move the wastewater outlet further away from the centre and closer to the opening of the mouth of Eyjafjörður. Húsavík does not have any water treatment with the exception of a crate that stops larger solid items flushed in the toilet.

The management of solid waste in North Iceland is also a major challenge, including segregation, transport, disposal and recycling (e.g., recent obligation to separate textiles, where, as of March 2025, there was no solution for managing the textile waste within Iceland and no agreement concluded with processing facilities abroad). Generally, while each municipality sets up its own system, the collection from municipalities is centralised at the national level. The recycling infrastructure in Iceland is very limited, and segregated waste is largely moved abroad (mainly to Sweden) for processing. Organic waste is partly processed into compost or biogas. Landfilling remains important, although it has diminished over the last two decades.

In Southern Greenland, the small coastal communities that are ICBERG study sites have no water treatment facilities.

Dealing with solid waste is a particularly prominent challenge for Greenland due to transport costs, logistics, and the relatively small volume of waste, which makes it difficult to encourage effective circular solutions. Across Greenland, only Nuuk, Sisimiut and Ilulissat have facilities to collect and process waste and separate hazardous waste (which is partly transported to Denmark for processing). The amount of hazardous waste produced in Greenland is likely to increase if multiple mining projects become operational. Composting organic waste is present, but minimal, with several projects launched in Nuuk in recent years (dealing also with waste beyond Nuuk). There are around 20 incinerators operating in communities across the territory. Challenges included limited capacity, leading to high rates of unsafe landfill disposal; old, inefficient equipment, resulting in air pollution; the need to bring in personnel from outside Greenland to carry out repairs; and the necessity to transport ashes to Denmark. Moreover, some hazardous waste (e-waste, batteries, etc.), which should be separated, is effectively subject to incineration due to suboptimal separation and recycling practices. The challenge, substandard condition of incarcerators, and 30% deficit in capacity were acknowledged by the Government in 2018. Currently, the plan is for most waste burning to take place in the Nuuk waste-to-energy facility (completed in January 2024) and a similar facility in Sisimiut (to be completed in 2025, both of which constitute an investment of over EUR 50 million, in line with the government's current waste management strategy. In smaller communities, landfills (often not properly separated from the environment) and open burning are often used out of necessity, when transport to the main incineration facilities is not possible (e.g. due to capacity limitations).[1] The Arctic Marine Litter Project, which conducted beach clean-up campaigns in 2021, found that the majority of marine litter originated from local sources, likely landfills. It was recommended that municipalities and the government take urgent action to improve landfill facilities. In larger towns, such as Nuuk, Sisimiut or Ilulissat, the collection of waste is carried out by private companies, while in smaller settlements, where commercial collection is

[1] Greenland – Waste Management on thin Ice (2021). N/A. GLOBAL RECYCLING Magazine 3/2021. URL: https://global-recycling.info/archives/5971; Pelletier, Jeff (2024, July 8). Throw it, burn it, let it heat your home: Greenland's garbage gets new life, Nunatsiaq News. URL: https://nunatsiaq.com/stories/article/throw-it-burn-it-let-it-heat-your-home-greenlands-garbage-gets-new-life/; McGwin, Kevin (2021, January 9). Two new incinerators aim to ease Greenland's trash problem. Nunatsiaq News. URL: https://nunatsiaq.com/stories/article/two-new-incinerators-aim-to-ease-greenlands-trash-problem/

not profitable, the responsibility falls on municipalities. Data on waste composition in Greenland remains limited.[2] In 2015, only 25% of household waste was delivered to recycling stations. However, over the last decade, municipalities have introduced several recycling pilots and recycling systems. A major component of the solid waste management challenge is fishing waste, both fishing nets and equipment, as well as around unutilized biological waste originating from fish processing (around one-third of fish mass becomes waste during processing). The role and actions of companies like Royal Greenland are crucial here, as there are technological options to utilise close to 100% of fish mass.[3]

The challenges with waste collection, processing, transport and disposal, both for municipal waste and fishing waste, impact marine litter presence in Greenland. It appears that nearly all beach litter in the investigated stretches of the Greenlandic coast is of local origin.[4] Moreover, there is an increasing presence of solid waste originating from wastewater (e.g. wet wipes in untreated wastewater).[5]

In Svalbard (Longyearbyen and Ny-Ålesund), the amount of waste and wastewater has increased over the years due to the expansion of the tourism sector. Currently, non-hazardous, non-biodegradable, and non-recyclable solid waste is disposed of in the landfill in Adventsdalen outside Longyearbyen, while recyclable and hazardous waste is transported to mainland Norway for processing. Aluminium/metal and glass are separated by households and businesses, while plastic and general waste are collected together with burnable waste.[6] That is also the case in Ny-Ålesund, where a publicly owned Norwegian company handles waste generated by research stations. Since November 2022, Longyearbyen has had a primary treatment facility for wastewater (mechanical removal of solids and suspended material) at the settlement. Before, the wastewater was released into the ocean without any treatment.

There are significant differences between larger urban areas (Reykjavik, Akureyri, Nuuk, Sisimiut) and smaller communities in wastewater management and solid waste processing. Within Iceland, there is also a clear distinction between communities/municipalities located inland (where wastewater processing is necessary) and those on the coast, which rely largely on the coastal marine environment's coping capacity.

Furthermore, the small number of people in Arctic coastal communities means that with respect to solid waste, there is very limited economic incentive to facilitate circular solutions or introduce more advanced waste management schemes, facilities and technologies.

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[2] Eisted R, Christensen T. H. (2010). Waste management in Greenland: current situation and challenges. Waste Management & Research: The Journal for a Sustainable Circular Economy. 2011;29(10):1064-1070.

[3] See, e.g. the results of the EU-funded WaSeaBi project, at the Danish Technical University website, URL: https://www.dtu.dk/english/newsarchive/2024/08/todays-fish-waste-can-become-tomorrows-nutritious-food

[4] Strietman, W.J. (2021). Fishing nets on the coastline of the Arctic and North-East Atlantic: a source analysis; Findings and recommendations based on an in-depth analysis of the sources, origin and pathways of fishing nets collected on beaches in Greenland, Iceland, Jan Mayen, Svalbard, the Netherlands, Norway, and Scotland. Wageningen, Wageningen Economic Research, Report 2021-022, 36 pp.

[5] Lis Bach, Jakob Strand, Hadi Salame, Márta Simon, Janne Fritt-Rasmussen, Pernille Erland Jensen (2024). "Wet wipes in untreated wastewater are a source of litter pollution to the arctic marine environment – a case study on the loads of litter and microplastics in wastewater effluents in Greenland". *Environmental Science Advances* 4(2): 223-234.

[6] Cowan, E., Setsaas, L. & Nørstebø, V.S. (2023). End of life at the top of the world—stakeholder perspectives for plastics and circular transitions in the Arctic. J Environ Stud Sci 13, 545–556.

The lack of primary wastewater treatment (i.e. removing solid matter from wastewater) in many smaller Arctic communities means that wastewater is also an important contributor to marine litter and microplastics, as was shown in a Nordic Council of Ministers study on untreated water outflows in Greenland.[7]

Another emerging concern is the need to address waste produced by tourists, especially cruise tourists. While wastewater is normally not introduced into the coastal waters and municipal wastewater systems, tourists produce waste when they disembark for day visits, adding – often significantly – to the amount of waste that needs to be collected and processed.

Based on interviews in Iceland (March 2025), Greenland (in earlier projects), and literature on Svalbard,[8] there is a fair degree of local interest and concern over the waste and wastewater pollution, and that concern has been growing over the last two decades. There appears to be increasing – although not necessarily widespread – awareness of the problem. In many locations (e.g. in North Iceland), inhabitants have a limited understanding of the processes and practices currently in place. The level of awareness is often linked to the costs of waste processing.

Access to clean drinking water and adequate sanitation is recognised as a fundamental human right. The 2015 United Nations Sustainable Development Goals (SDGs) emphasise the importance of ensuring universal access to safe, affordable drinking water and adequate sanitation and hygiene by 2030. In the Arctic, insufficient water and sanitation services can be linked to health outcomes, with disproportionate impacts on rural and Indigenous communities. Addressing these disparities presents significant challenges for Arctic nations, as they must navigate unique geographical, infrastructural, and socio-economic constraints, compounded by emerging threats posed by climate change.[9]

2. National/local governance

2.1. Greenland

Solid waste

Greenland's Waste Action Plan (Affaldshandlingsplan) 2020-2031 (policy) covers all solid waste sectors for the period 2020-2031, setting the general guidelines for the national waste policy. Community management is an important principle within the Plan, as all municipalities are expected to prepare waste plans in line with the planning framework outlined by the national plan. One of the aims is to increase the level of knowledge in the field of waste among both citizens and businesses. The plan also includes guidelines for recycling and reducing waste.

[7] Erland Jensen, P. et al. (2024). Plastic in raw wastewater in Greenland. Nordic Council of Ministers. TemaNord2024-516. URL: https://pub.norden.org/temanord2024-516/temanord2024-516.pdf
[8] Cowan, E., Setsaas, L. & Nørstebø, V.S. (2023). End of life at the top of the world—stakeholder perspectives for plastics and circular transitions in the Arctic. J Environ Stud Sci 13, 545–556.
[9] See Results of an Arctic Council Survey on Water and Sanitation Services in the Arctic, Sustainable Development Working Group, Arctic Council, 2017.

The Waste Act (2013) remains the main legal instrument covering waste management, although many issues are dealt with under the 2021 Regulation on Waste.[10] It promotes recycling and reuse, sets requirements for separation, storage and disposal of waste, and establishes the responsibility of municipalities. Greenland's Environmental Policy (2019) highlights the central role of waste management in environmental protection efforts on the local level. The Environment Protection Act (No 9 of 2011)[11] puts the primary responsibility for managing waste on those producing it, the Act bans imports of waste into Greenland (unless to be recycled). The 2013 Waste Act is further specified in the 2021 Self-rule Regulation on Waste (an administrative regulation), which outlines rules governing recovery, disposal and recycling. Municipalities are required to adopt collection and sorting schemes for different waste types, and they are the ones specifying sorting rules, containers and fees. A municipal waste management plan needs to be prepared every four years for a 12-year horizon.

Hazardous waste is likely the best-regulated sector within waste management in Greenland, and generally follows international standards. All companies and producers generating hazardous waste need to notify the local municipality, and generally, the processing of hazardous waste is billed separately. However, exemption from municipal hazardous waste collection can be obtained if a company can prove that it can safely manage waste by itself, via a contract with an approved facility (often outside of Greenland). Mixing of hazardous waste with other waste types is prohibited (2021 Regulation). Greenland remains fully reliant on Danish facilities for specialised hazardous waste treatment.

The same Environment Protection Act includes provisions on wastewater treatment in urban areas, primarily aimed at preventing contamination of local water bodies. Wastewater and Sewage Disposal Regulation (2014) obliges municipalities to treat wastewater in line with set environmental standards, although most communities are not required to ensure processing.

A national action plan on plastics Denmark, Faroe and Greenland (Miljø- og Fødevareministeriet 2018) contains 27 initiatives, including mapping and analyses, legal changes, new standards, information campaigns, financial support and international cooperation. The plan outlines how to make all actions related to the use and handling of plastic more efficient and environmentally sound. This includes producing more knowledge in order to identify the most suitable solutions.

The Greenlandic Action Plan to Reduce the Consumption of Plastics was adopted by the Government of Greenland (Naalakkersuisut) in 2021. For microplastics, the measures include reducing the releases from artificial turf and from sewage water. This requires knowledge building on simple wastewater treatment methods to reduce the release of microplastics into the environment. Another governmental policy document (an action plan) aims to reduce lost fishing gear.

In general, municipalities in Denmark and Greenland are responsible for clean-up on the coast and in ports. Regular beach clean-ups are financed by municipal budgets.

There are also Greenlandic corporate actors who undertake commitments related to the reduction of waste. The fisheries sector remains the largest part of the Greenlandic economy and a major

[10] Selvstyrets bekendtgørelse om affald (Government Degree on Waste), Administrativ forskrift Nr. 3, 7. januar 2021.
[11] Inatsisartutlov nr. 9 af 22. november 2011 om beskyttelse af miljøet. Note that the act does not cover mining activities, which are regulated by separate legislation. The act applies only to land-based waste and pollution.

source of waste. Royal Greenland company – the major player in Greenlandic fisheries – has as one of its sustainability goals the maximum utilisation of fish resources, to limit biological waste originating from processing.[12]

Wastewater

The wastewater management in Greenland is guided by the Environmental Protection Act (no. 9 of 2011) and the administrative regulation on disposal of latrines and wastewater (no. 10/2015).[13] The regulation covers the definition of wastewater (black and grey water, runoff water and industrial processes wastewater), responsibilities of wastewater producers, municipal responsibilities (the main actors for wastewater regulation and management) and powers to set up schemes for wastewater collection (and latrine emptying), requirements for the adoption of municipal wastewater plans including fees for users, and rules for the transportation of latrine-collected wastewater. Municipalities have inspection powers. Naalakkersuisut provides limited funding for wastewater management investments via regularly adopted national plans. The Government is also responsible for inspecting larger facilities.

One of the key tools in Greenland regulation is multi-annual municipal wastewater plans, which map current systems, forecast needs, and define necessary investment and repair requirements. In addition, the Government can prepare receiving-water plans for water bodies, specifying water quality requirements, minimal treatment requirements for given areas, including the option to ban discharges in specific water bodies considered particularly vulnerable or highly impacted. However, so far the Government has not exercised such requirements. For larger industrial discharges (fish processing plants, mines), Environmental Impact Assessments and permit conditions outline wastewater management requirements.

Municipalities take increasing actions on wastewater management. For instance, Qeqqata adopted a broad-ranging municipal wastewater plan. However, limited capacities, financial resources and human resources lead to challenges for making progress in the sector.

2.2. Iceland

Responsibility for pollution, both preparedness and response, lies with the Environment Agency of Iceland (Umhverfisstofnun, UST). The role of different authorities (Icelandic Coast Guard, Traffic Authority, and Police) is described in the "Action plan for response to acute pollution outside port areas and the use of ship refuge" (Environment Agency of Iceland, 2022).

The 2004 Law on the Protection against Pollution of Seas and Beaches (33/2004)[14] together with the 2012 Regulation on Response to Acute Pollution of Seas and Beaches (1010/2012)[15] provide framework for preventing and handling of wastewater and marine litter releases, including regulating onshore facilities for collecting and handling waste from ships. Vessels need to pay a

[12] Royal Greenland, Our Footprint, corporate website at https://www.royalgreenland.com/sustainability/our-footprint
[13] Selvstyrets bekendtgørelse om bortskaffelse af latrin og spildevand (BKG No. 10/2015)
[14] Lög nr. 33/2004 um varnir gegn mengun hafs og stranda frá 7. Maí 2004 og með síðari breytingum
[15] Reglugerð nr. 1010/2012 um viðbrögð við bráðamengun hafs og stranda

waste fee, with the exception of fishing vessels, pleasure with not more than 12 passengers and warships. The 2017 regulation (586/2017) [16] also implements fully the MARPOL Annex V into Icelandic Law.

Wastewater

With respect to wastewater management, the Regulation of Sewers and Sewage (798/1999)[17] is the basis of the domestic legal framework. However, the EU legislation binding on the European Economic Area is of profound importance as meeting it requirements poses key challenges on Icelandic production

The Icelandic 2011 Water Management Act (36/2011) transposes the EU Water Framework Directive 2000/60/EC (WFD) and constitutes currently the basis for Iceland's water management. All water bodies should reach or maintain "good status". The Environment Agency of Iceland is responsible for the formal implementation of the regulation and has delivered Iceland's first River Basin Management Plan (RBMP, in force in April 2022 and running until 2027).

The EU's Water Framework Directive (2000/60/EC) (WFD) applies to Iceland and sets the framework for protecting water bodies within the EU, including rivers, lakes, coastal waters, and groundwater. Under WFD, Iceland established its first River Basin Management Plan (for the whole country) in 2021. A Water Council at the national level has been established to implement the WFD, in cooperation with the Icelandic Environmental Agency, supported by Water Consultant Committees. Under WFD, Iceland is divided into four Water Regions, each with local authorities and health inspectorates, which are, among others, responsible for the implementation of the so-called Programmes of Measures and monitoring plans. For instance, water pollution permits issued to private operators had to be reviewed due to WFD implementation. EU environmental water legislation applicable to Iceland also covers: the protection of groundwater against pollution and deterioration; technical specifications for chemical analysis and monitoring of water status; and the environmental quality standards in the field of water policy.

Cruise vessels are potentially an important element of wastewater management challenges in small Icelandic communities. The rules generally follow those of MARPOL 73/78 Annex IV (concerning sewage). Ships bigger than 400 gross tonnage or certified to carry at least 15 passengers (thus covering also all expedition cruise vessels, but not small boats operated locally) are prohibited from discharging sewage (blackwater) and greywater 12 nautical miles (nm) from the coastlines. The limit is 3 nm for treated sewage (when sewage treatment is approved by the Icelandic or other state's authority). No discharge whatsoever can occur in port areas or within 300 meters from the coast (low water mark level).[18] Large cruise ships are generally expected to be equipped with appropriate wastewater treatment systems. Wastewater can be also transferred to port facilities – in Akureyri, for example, there are no limitations on discharging grey water into the municipal sewage system.

Solid waste (including plastics) and its management

[16] Reglugerð nr. 586/2017 um innleiðingu viðauka við alþjóðasamning um varnir gegn mengun frá skipum, 1973, með breytingum samkvæmt bókun 1978 (MARPOLsamningur)
[17] Reglugerð nr. 798/1999 um fráveitur og skólp
[18] See, for example, the Environment Agency of Iceland, Icelandic Transport Authority and the Icelandic Coast Guard (2024). Guidelines for masters of cruise and passenger ships arriving in Iceland.

Icelandic policies generally promote the circular economy, partly via decreasing the amount of waste and enhancing its management. The overall policy direction – similar to the approach in the EU and across Europe – is set by the 2021 Towards a Circular Economy policy, as well as the documents Together Against Waste (2016-2027) and the General Strategy for Waste Management (2021-2032)[19]. There is a prominent focus on domestic waste reduction, producing waste, and ramping up the rates and quality of recycling. Moreover, the documents emphasise the need for more robust analysis and research with respect to the processes of waste production and management and actual impacts. The 2020-2025 Action Plan on Plastics[20] is a key element of these efforts and concretises the priorities.

The 2003 Law on Waste Management (55/2003) is to decrease the quantity of waste by preventing waste generation, increasing recycling and recovery and reducing the quantity of waste deposited in landfills.

Like other major sectors of waste management, the processing of **hazardous waste** in Iceland is regulated in line with the EU legislation. Hazardous items (batteries, pains, solvents, chemicals, electronics, medical waste and oil) are collected at municipal collection centres or as part of the corporate EPR schemes. Some specialised hazardous waste is shipped abroad for processing or storage.

With respect to **plastics specifically**, Iceland is implementing the EU's Directive 94/62/EC on Packaging and Packaging Waste, directive on port reception facilities for the delivery of waste from ships (2019/883) and on the reduction of the impact of certain plastics products on the environment introduced a ban on selected single-use plastics (SUP) with existing market alternatives (Directive 2019/904). In Icelandic legislation, the SUP ban was introduced through the amendments in 2019 (34/2019[21]) to the 1998 Law on 'Sanitation and Pollution Prevention (7/1998)[22]. In addition, the 1989 Law on Measures against Environmental Pollution Caused by Disposable Packaging for Beverages (52/1989) [23] and the 2017 Regulation on the Collection, Recycling and Return Fee for Disposable Beverage Packaging (750/2017) [24] create a framework for limiting the disposal of plastic bottles into the environment. The packaging is also covered by the 2002 Law on the Processing Fee (162/2002).[25] The Law created the Icelandic Recycling Fund (Úrvinnslusjóður),[26] responsible for the implementation of EPR schemes, and makes companies introducing packaging into the market responsible for covering the expenses related to its disposal.

Iceland has operated an **Extended Producer Responsibility (EPR)** scheme for plastic and paper packaging since 2005, expanding it to all packaging types in January 2023. Managed by the Icelandic Recycling Fund, a government agency established in 2003, the system uses recycling fees

[19] Í Átt Að Hringrásarhagkerfi - Stefna Umhverfis– Og Auðlindaráðherra í Úrgangsmálum' (2021).
[20] Úr Viðjum Plastsins: Aðgerðaáætlun í Plastmálefnum' (2020)
[21] Lög nr. 34/2019 um breytingu á lögum um hollustuhætti og mengunarvarnir, nr. 7/1998 frá 15. Maí 2019 og með síðari breytingum (EES-reglur, burðarpokar).
[22] Lög nr. 7/1998 um hollustuhætti og mengunarvarnir frá 12. Mars 1998 og með síðari breytingum.
[23] Lög nr. 52/1989 um ráðstafanir gegn umhverfismengun af völdum einnota umbúða fyrir drykkjarvörur frá 29. Maí 1989 og með síðari breytingum
[24] Reglugerð nr. 750/2017 um söfnun, endurvinnslu og skilagjald á einnota drykkjarvöruumbúðir og með síðari breytingum
[25] Lög nr. 162/2002 um úrvinnslugjald frá 20. Desember 2002 og með síðari Breytingum.
[26] See Expra (Extented Producer Responsibility Alliance) website at https://expra.eu/members-detail/icelandic-recycling-fund/

charged to producers and importers to fund waste management and recycling efforts. The fee, determined by actual waste management costs and collected by customs, varies by product type—for example, 82 ISK/kg for plastic and 42 ISK/kg for paper. Since 2023, producers must also cover cleanup costs for littered plastic items and contribute to public education and waste prevention efforts. While initially focused on waste management, the IRF now supports awareness campaigns, mainly through municipalities and social media, to encourage recycling. Following problems at the early stages of implementation (regarding collection, similar to other parts of Europe), the mandatory system is largely viewed as successful, with high compliance. However, the continuous problems include the lack of penalties for missing recycling targets and rigid, non-differentiated tariffs that don't incentivise environmentally friendly materials. Iceland has met plastic recycling targets but still aims for the 50% overall target by 2025. Future plans include introducing fee modulation based on product durability, reusability, and recyclability.[27]

As the **fisheries** sector is a major source of marine litter across the Arctic and within Iceland, the legislation and policies covering this sector are particularly important for the research within ICEBERG. The agreement between the Icelandic Association of Fisheries Companies (SFS) exempts fishermen from the processing fee, while making the SFS responsible for managing fishing gear containing plastics. The 2020 Regulation on the Marking of Fishing Gear and Lost Fishing Gear (474/2020)[28] requires trawlers and fishing vessels to clearly mark the gear with their registration numbers. The fishers are required to attempt to retrieve lost items, and the loss must be recorded in the ship's logs and the information given to the Icelandic Coast Guard. There are provisions for penalties for violations, governed by the 1996 Law on Handling Marine Resources (57/1996)[29].

2.3. Svalbard

Waste management is covered by the 2001 Svalbard Environmental Protection Act.[30] Effective as of 2021, the Regulations no. 1517[31] relating to Pollution and Waste in Svalbard (implementing provisions for the 2001 Act) provides for requirements for wastewater discharge and treatment, obligations related to waste collection, sorting and disposal, management of hazardous waste and fees related to wastewater and waste treatment.

The overall objectives of the Longyearbyen Local Council's plan for waste management are:

- "Waste in Longyearbyen shall be handled in a way which profiles Longyearbyen as a worthy entrance point to one of the world's best-managed wilderness areas",
- "The waste management in Longyearbyen shall be at least as good as on the mainland in regard to resources and the environment"[32]

[27] Nordic Council of Ministers (2024). Extended Producer Responsibility: Learnings from the Nordics. TemaNord 2024:506.
[28] Reglugerð nr. 474/2020 um merkingu veiðarfæra og töpuð veiðarfæri
[29] Lög 57/1996 um umgengni um nytjastofna sjávar
[30] Act on protection of the environment in Svalbard (No. 79 of 2001).
[31] Regulation No. 1517 on pollution and waste in Svalbard (2021).
[32] Longyearbyen Lokalstyret (2017) as translated in Cowan, E., Setsaas, L. & Nørstebø, V.S. (2023). End of life at the top of the world—stakeholder perspectives for plastics and circular transitions in the Arctic. *J Environ Stud Sci* 13, 545–556.

Dumping waste at sea is generally prohibited. Storage of hazardous waste and petroleum products is allowed only based on a permit unless the material is stored in small tanks or when necessary for small-scale heating or transportation, provided that risk reduction measures are implemented.

All recyclable waste (except food waste), burnable waste and hazardous waste are collected in Svalbard (Norwegian settlements) and are transported to mainland Norway for processing. Food waste (and biodegradable material) and part of non-recyclable waste is disposed at the landfills off Longyearbyen (Adventdalen). Cowan et al. suggest that the rigidity of current legislation may discourage inhabitants and businesses from seeking circular solutions.[33]

With respect to wastewater, discharges within Longyearbyen need to be connected to the sewage system collector, which, from November 2022, is connected to the mechanical (primary) wastewater treatment facility.

Ny-Ålesund research stations are covered by guidelines adopted in 2021 for waste management, including categories of waste, a no-waste-down-the-drain policy, and dealing with hazardous waste. Kings Bay – a company owned by the Norwegian government set up to manage research logistics in Ny-Ålesund - is responsible for collecting and managing the waste.[34]

3. Supra-national initiatives

3.1. Arctic Council initiatives

There has been increasing attention to waste and wastewater management within the Arctic Council working groups. Under the Arctic Contaminants Action Programme (ACAP), an Expert Group on Waste has been established. The EG oversees pilot projects promoting environmentally-sound waste management practices in the Arctic, including hazardous waste management, contaminant releases from industrial and municipal waste, and waste management in remote communities.

An example of Arctic Action dedicated to waste was the Kola Waste Project (there have been no waste-focused projects based in Iceland, Greenland or Svalbard), coordinated by the Saami Council. The project worked on identifying and cleaning up illegal and unauthorised waste disposal in the Sami areas of the Murmansk region in Russia.

The Sustainable Development Working Group (SDWG) implemented a project (completed in 2017) on Improving Health through Safe and Affordable Access to Household Running Water and Sewer (WASH), which focused on water-related health challenges in Arctic and Sub-Arctic communities. The project delivered an informational summary of the status of household running water and sewer services, together with a comparison of water-associated illness rates across Arctic and Sub-Arctic communities. A two-day circumpolar conference was organised in Anchorage, Alaska, in 2016.

[33] Cowan, E., Setsaas, L. & Nørstebø, V.S. (2023). End of life at the top of the world—stakeholder perspectives for plastics and circular transitions in the Arctic. *J Environ Stud Sci* 13, 545–556.
[34] Guidelines for Management of Waste and Hazardous Waste in Ny-Ålesund, KB HSE Documentation, 27 February 2021, amended 2022, URL: 05a_KingsBay_Guidelines-for-Waste-Management.pdf

SDWG also launched the project Solid Waste Management in Remote Arctic Communities. The project addresses the unique challenges of waste management in isolated Arctic regions. It aims to develop sustainable solutions tailored to the specific needs of these communities, considering factors like limited infrastructure and harsh environmental conditions. The report on Best Waste Management Practices for Small and Remote Arctic Communities was published as a result of this undertaking, focusing on communities in Alaska, Canada, and Finland.[35] The report covered such aspects as integrated waste management systems (reduction-recycling and disposal), infrastructure adapted to Arctic conditions, policy support by national and sub-national authorities and legislators, as well as the crucial role of community engagement and education.

3.2. The EU's legal framework and initiatives

The management of wastewater and solid waste, and the costs of necessary investments and installations for businesses and communities, affect the relative competitiveness within the Single Market. Therefore, the EU has developed a broad spectrum of measures in both sectors. This affects the Arctic in three ways. First, EU legislation is implemented in Iceland (and Norway), as part of the European Economic Area framework. Waste and wastewater legislation is almost fully incorporated into the EEA Agreement and thus applicable to Iceland. Second, the quality of waste and wastewater management influences how much pollution reaches the Arctic via long-distance transport, by limiting releases of waste into the (especially marine) environment. Third, the EU attempts to position itself as a standard-setter, at least in the area of environmental policy, with a hope that other jurisdictions take up EU solutions and/or targets.

Currently, the drivers of the waste and wastewater ambitions in the EU are the broad EU Green Deal strategy and specifically the Zero Pollution Action Plan (2021).[36]

Wastewater management

The key EU instrument covering wastewater management is the Water Framework Directive (2000/60/EC), which outlines the overall approach to the protection of inland surface waters, coastal waters and groundwater. It sets targets for the quality of water bodies, aiming for good environmental status. States and subnational actors are pushed to more strictly control the discharges of the wastewater in order to meet the targets or preserve the good status of water bodies. To facilitate these dynamics, the WFD promotes integrated and regional water management, bringing together also urban and rural use and taking account of the interconnection between different elements of the natural and human environment (different elements of the ecosystem as well as different industries and pollution sources).

The Urban Waste Water Treatment Directive (UWWTD, 91/271/EEC) focuses specifically on wastewater management systems in cities and settlements. The Directive requires collection and treatment of wastewater in settlements larger than 2000 people and sets minimum treatment levels

[35] Sustainable Development Working Group (2019). Best Waste Management Practices for Small and Remote Communities. Arctic Council. URL: https://oaarchive.arctic-council.org/items/772b3cdf-318c-4abe-a558-75530ecaadf5?utm

[36] European Commission (2021). Communication from the Commission: Pathway to a Healthy Planet for All EU Action Plan: 'Towards Zero Pollution for Air, Water and Soil', COM/2021/400 final.

depending on the area: primary (removal of suspended matter via sedimentation) for all required locations, secondary (basic biological treatment) and tertiary (nutrient removal and sludge treatment) in sensitive areas (also, preliminary treatment is basic screening of wastewater to prevent access of large items). The directive also provides standards for treatment of wastewater for different industries (agro-food, industrial, chemical) when it is discharged into municipal systems. In 2024, the UWWTD was amended[37] in line with the EU Green Deal ambitions (zero pollution for air, water and soil by 2050), with a focus on energy efficiency in wastewater treatment as well as facilitate micropollutant removal, in particular with respect to pharmaceuticals.

For industrial plants, the Industrial Emissions Directive (2010/75/EC) regulates not only air pollutants, but also wastewater discharges. The companies are required to adopt sectoral Best Available Techniques (BAT) with respect to the wastewater treatment.

The specific legislation on groundwater (Directive 2006/118/EC) and bathing water (Directive 2006/7/EC) also play a role in the local choices with respect to wastewater management, as sewage releases can affect the quality of both groundwater bodies and recreational waters.

The EU's Circular Economy Action Plan (2020)[38] encourages the reuse of treated wastewater, recovery of nutrients and energy production from the refuse/sludge. The EU is also to invest in technological development with respect to wastewater reuse in different sectors. In 2020, minimum requirements for water reuse were legislated (Regulation EU/2020/741).

The EU has also advocated applying nature-based solutions to wastewater treatment. This is pronounced, for instance, in the EU Strategy on the Adaptation to Climate Change (2021).[39]

Solid waste

Waste Framework Directive (2008/98/EC, amended in 2018 – Directive EU/2018/851) provides the overall basis for dealing with waste within the EU. It introduces key definitions, outlines waste hierarchy (prevention > reuse > recycling > recovery > disposal), and thus, *de facto* legislates circular economy principles. EU and EEA states are required to prepare waste prevention programmes and introduce segregation, which covers separating textiles and hazardous household waste, since 2023. Recycling targets for municipal waste are set (55% by 2025, 60% by 2030 and 65% by 2035). Extended Producer Responsibility (EPR) schemes are introduced.

An important element of the legislative framework from the point of view of ICEBERG research is the Packaging and Packaging Waste Regulation 2025/40 (PPWR, in force since February 2025)[40], which replaced the earlier directive (94/62/EC, amended in 2018 by Directive EU/2018/852), which introduces separate targets for different packaging materials (plastic, paper, metal, glass and wood)

[37] Directive (EU) 2024/3019 of the European Parliament and of the Council of 27 November 2024 concerning urban wastewater treatment (recast) (Text with EEA relevance).
[38] European Commission (2021). Communication from the Commission: A new Circular Economy Action Plan For a cleaner and more competitive Europe, COM/2020/98 final.
[39] European Commission (2021). Communication from the Commission: Forging a climate-resilient Europe - the new EU Strategy on Adaptation to Climate Change, COM/2021/82 final. Note that EU policies and strategies are not affecting EFTA states, although they form the basis for legislative developments, which are legally-binding on Iceland and Norway.
[40] Regulation (EU) 2025/40 of the European Parliament and of the Council of 19 December 2024 on packaging and packaging waste, amending Regulation (EU) 2019/1020 and Directive (EU) 2019/904, and repealing Directive 94/62/EC (Text with EEA relevance)

as well as provides for specific EPR schemes for packaging producers. The Regulation broadly encourages the reuse and recyclability of packaging, stepping up the ambition from the directive. The 2024 Regulation aims at making all packaging in the EU/EEA recyclable by 2030 while maintaining economic viability, increasing the use of recycled plastics in packaging (via ambitious 2030 and 2040 targets) and including packaging in the EU's climate neutrality target (by 2050). Importantly, for ICEBERG, the regulation includes restrictions on packaging containing per- and polyfluorinated alkyl substances (PFAS) when safety thresholds are exceeded.

A crucial development in the EU waste management was the introduction of the ban and reduction of single-use plastics (SUP). Directive EU/2019/904 on Single-Use Plastics[41] was adopted in 2019 and banned items such as cutlery, plates and straws made of plastic. EPR obligations for plastic producers were strengthened. Targets for reducing the consumption of such products were set, including 90% target for plastic bottles collection by 2029. The directive also introduced the mandatory requirement for tethered caps in plastic bottles, which entered into effect in July 2024.

The above legislative developments follow from the EU's 2018 Plastics Strategy[42] and the general Circular Economy Action Plan (2020)[43] where reduction of waste generation is a priority.

Of some relevance in the Arctic context are:

- Waste Electrical and Electronic Equipment (WEEE) Directive 2012/19/EU.
- Batteries Regulation (EU) 2023/1542.
- Landfill Directive (1999/31/EC) aimed at reducing the environmental impacts of waste that is landfilled.
- Waste Shipment Regulation EU/2024/1157,[44] which enhances traceability of waste, limiting exporting of waste outside of the EU and preventing illegal shipments.[45]

3.3. International policies and legal instruments

The OSPAR Commission addresses solid waste and wastewater management as part of its broader mandate to protect the marine environment of the North-East Atlantic. Through its Regional Action Plan on Marine Litter, OSPAR works to reduce inputs of solid waste, particularly plastics, into marine ecosystems by targeting land-based and sea-based sources. The plan promotes measures such as improving waste management infrastructure, fostering circular economy approaches, and addressing key contributors like microplastics and abandoned fishing gear. In wastewater management, OSPAR focuses on reducing pollutants such as hazardous substances and nutrients

[41] Directive (EU) 2019/904 of the European Parliament and of the Council of 5 June 2019 on the reduction of the impact of certain plastic products on the environment (Text with EEA relevance).
[42] European Commission (2018). Communication from the Commission: A European Strategy for Plastics in a Circular Economy.
[43] European Commission (2020). Communication from the Commission: A new Circular Economy Action Plan For a cleaner and more competitive Europe COM/2020/98 final.
[44] Regulation (EU) 2024/1157 of the European Parliament and of the Council of 11 April 2024 on shipments of waste, amending Regulations (EU) No 1257/2013 and (EU) 2020/1056 and repealing Regulation (EC) No 1013/2006 (Text with EEA relevance).
[45] For example, the majority of Icelandic waste is transported for utilization in Sweden.

through its Hazardous Substances and Eutrophication Strategies, which encourage improved treatment technologies and stricter discharge standards. By facilitating collaboration among member states and aligning its initiatives with EU directives and global frameworks, OSPAR supports the implementation of effective waste and wastewater management practices to safeguard marine biodiversity and ecosystem health.

Waste and wastewater management in cruise vessels (and other ships) is covered by the Convention on Marine Pollution from Ships (MARPOL 73/78), and specifically by Annex IV dealing with sewage. The rules primarily cover larger vessels (400 gross tonnage or larger ships, or vessels certified to carry more than 15 persons). All vessels need to have a sewage treatment plan, sewage comminuting and disinfecting system or a holding tank. Untreated sewage can be discharged only beyond 12 nm from land, and the treated sewage 3 nm. There are also some special areas where the rules are more restrictive (e.g. Baltic Sea, although no such areas are designated for the Arctic waters as yet). However, the Polar Code has introduced additional rules for ice-covered waters, prohibiting sewage discharges unless higher standards if treatment are implemented or discharges happen away from ice. Larger ships covered by MARPOL are required to carry an International Sewage Pollution Prevention Certificate (ISPPC).

Annex V of MARPOL 73/78 deals with garbage. Liquid food waste and associated washing water (part of the 'greywater' category) can be discharged 12 nm from the coast or 3 nm if the waste is grounded.

In addition, the IMO has developed guidelines on Annex IV implementation (2012 Guidelines) that provide standards for sewage system design, operation and maintenance. These outline limits for the Biochemical Oxygen Demand (BOD) and the Total Suspended Solids (TSS) following the treatment. The guidelines also cover pathogen control (referring primarily to faecal bacteria counts).

Of importance in this context is also the Ballast Water Management Convention (BWM), which regulates discharges of ballast water, to a great extent, to prevent invasive species release.

For greater detail, see the policy paper on pollution related to the operation of cruise vessels in the same series.

4. Existing regulatory and policy gaps and current developments

- **Local processing of waste (including plastics):** At the moment most of the waste from Iceland and other Arctic locations is either directed to local landfills or transported for recycling/processing to other locations (e.g. facilities in Sweden). Creating local ways of using waste, including for the combined heating and electricity production, is being discussed. However, the challenge is that there is not enough waste available to invest in technologically advanced plants.
- **Recycling and disposal of clothing waste:** In Iceland, the separation of clothing waste has become obligatory due to the EU legislation. Nonetheless, the system for collecting and

processing such waste has not been developed. The amount of such waste in Iceland is growing.

5. Best practices for waste and wastewater management in small, remote, coastal communities

Solid waste

The Arctic Council's (SDWG) report "Best Waste Management Practices for Small and Remote Arctic Communities"[46] and ACAP 2024 "Scoping Assessment of Solid Waste Management in Small and Remote Arctic Communities"[47] provide several examples of good practice for Arctic communities (Alaska, Canada and Finland):

- Safer waste burning: implementing procedures to minimise smoke inhalation.
- Landfill access control: minimising residents' contact with waste.
- Mandatory collection programmes: minimising cross-transmission of disease and residents' contact with waste, and minimising landfill maintenance duties.
- Improved equipment maintenance to minimise surface runoffs, leachate migration, and marine litter.
- Handling of hazardous and harmful waste: pre-paid hazardous waste handling.
- Implementing regional special waste programme: creating regional facilities for special waste to decrease the burden on communities.

Examples of good practice:

- Golovin, Alaska: successful self-haul program because the operator, community, and council chose to purposely adapt their waste program to the community's needs. There is no open burning of waste, and burning is done in appropriate wind conditions. Hazardous waste is sorted before burning. The landfill is fenced to minimise windblown litter. Semi-regional backhaul programme for electronics, batteries and lights is implemented, with collection at the tribal office and operator shop for lead acid batteries, used oil and antifreeze. Recycling programme for plastic bottles. A waste management operator plays a central role in the environmental management of waste.
- Ulukhaktok, Northwest Territories, Canada: A hamlet that has supported stricter access controls and burn policies, as well as partnered for a landfill "clean start". Central role of an active and innovative waste operator. Ulukhaktok has a dedicated and secure storage area away from the disposal site for hazardous waste.
- Ylitornio, Finland: Households used to be charged 15-25 Euros per visit to drop off hazardous and bulky wastes at sorting stations. Three years ago, Perämeren Jätehuolto implemented

[46] Sustainable Development Working Group (2019). Best Waste Management Practices for Small and Remote Communities. Arctic Council. URL: https://oaarchive.arctic-council.org/items/772b3cdf-318c-4abe-a558-75530ecaadf5?utm

[47] ACAP (Arctic Contaminants Action Plan) (2024). A Scoping Assessment of Solid Waste Management in Small and Remote Arctic Communities. Arctic Council.

the Jäkälä customer card, for which customers prepay 24.80 Euros per year and are allowed four station visits. The fee covers the district's management of hazardous waste, medical waste, recyclable waste collection, sorting stations, and environmental and recycling advisory. The new card system doubled the amount of hazardous and bulky wastes coming into sorting stations.

- In Finnish Lapland, groups of communities manage waste together, commissioning a waste management company to take care of waste in the given area (there are three waste management companies in Lapland without geographical overlap).
- Canada funds local community-hire cleanup of landfills, as well as needed operator training. Termed "Clean-Starts", these projects are funded on an irregular basis through various funding mechanisms.
- Establishing regional hubs for e-waste (e.g. Green Star in Fairbanks, Alaska) or mobile phone recycling stations (as those created by the Canadian Wireless Telecommunication Association in Canadian territories).
- Norway's Sustainable Materials for the Battery Value Chain (SUMBAT program)[48]
- Legislation mandating EPR for electronic equipment (Norwegian and Swedish legislation can be seen as a benchmark in the region).[49]
- End-of-life vehicles programmes – free of charge or subsidised disposal, stripping vehicles from hazardous components (oils, batteries, tyres, etc.) (several programmes in operation across Canada, Finland).
- Utilising fish and shrimp side-streams – leather products or grounded seasoning (Greenland's shrimp peeling plant); use as fertiliser in Alaska (Alaska Department of Environmental Conservation 2019 recommendations as well as guidance by Sea Grant Alaska). Fish waste (fish waste composting) was traditionally used as fertiliser across the Arctic, and these traditions could be revived.
- Fishing waste - ghost gear mitigation efforts in Iceland and Finland (marking nets to link them to a given vessel).
- Annual clean-ups of fishing gear by vessels and via beach clean-ups. In Norway, annual clean-ups are based on fishermen's reports of lost gear and returning to owners lost gear that is marked – at no cost to the fishermen, incentivising both marking the gear and reporting lost gear.

Wastewater

- Low-complexity, low-maintenance treatment systems (e.g. engineered lagoons, packaged secondary treatment, constructed wetlands, compact biological reactors), allowing (Alaska 1999 Small Communities Sanitation Guide).[50]
- Moving secondary treatment to larger communities and investing in transport of wastewater (where possible) (examples from Nordic countries).

[48] SINTEF (2023).
[49] Swedish Environmental Research Institute (n.d.).
[50] Department of Community and Economic Development (1999). Sanitation Planning Guide for Small Communities. State of Alaska.