NordMar Plastic RISK: Socioeconomic risks of plastic to the bioeconomy – Icelandic case study

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Report summary

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Ágrip á íslensku:	Áhættan sem tengist plasti fyrir lífhagkerfið er ekki aðeins líffræðileg, eiturefnafræðileg eða efnafræðileg, heldur einnig samfélagsleg og efnahagsleg. Slæmt orðspor í umhverfismálum, bæði fyrir ferðaþjónustu og sjávarútveg, getur haft neikvæð markaðsleg áhrif og valdið miklum kostnaði fyrir greinarnar. Markmið NordMar PlasticRISK verkefnisins er að meta hin margvíslegu áhrif og helstu félagslegu og efnahagslegu áhættur sem tengjast mengun sjávarplasts á lífhagkerfi Norðurlandanna með því að nota Ísland sem dæmi. Ljóst er að tvær af helstu atvinnugreinum hér á landi, sjávarútvegur og ferðaþjónusta, eru mjög háðar lífhagkerfinu sem og hreinu og óspilltu umhverfi. Efnahagsleg áhætta fyrir ferðamannaiðnaðinn vegna sýnilegs plasts ásamt óljósri þekkingu á áhrifum örplast á umhverfi, menn og dýr er talin mikil vegna aukinnar umhverfisvitundar neytenda og ferðamanna, sér í lagi þar sem aðaláhersla ferðamanna sem kemur til landsins er að upplifa óspillt umhverfi. Nokkrar aðgerðir eru lagðar til svo sem að meta og bæta íslenska kerfið til endurvinnslu á notuðum veiðarfærum, meta frekari markaðskosti og gildi auglýsingar á lítilli og ábyrgri plastnotkunar í þessum tveimur greinum ásamt því að auka fræðslu um umhverfismál í Sjómannaskólanum.		
Lykilorð á íslensku:	*Sjávarútvegur, ferðaiðnaður, markaðsmál, menntun, örplast*		
Summary in English:	The risks related to plastic on the bioeconomy are not only biological, toxicological and chemical, but also societal and economical. Influence of tainted opinion on the Nordic environment or Nordic production could influence tourism, marketing and general wellbeing. The aim of the NordMar PlasticRISK project is to evaluate the diverse impact and main socioeconomic risks related to marine plastic pollution on the bioeconomy of the Nordic countries using Iceland as a case study. Two of the main industries in Iceland, the fishing industry and tourism, are heavily dependent on the bioeconomy as well as clean and pristine environment. Economical risks, followed by tainting the environment with visual plastic debris and macroplastic as well as unclear status of microplastic, is estimated to be high due to increased environmental awareness of consumers and tourists, where the main focus of tourist arriving to Iceland is to experience pristine environment. Several actions are suggested such as to evaluate and improve the Icelandic system for recycling of used fishing gear, evaluate further marketing options and value of advertising low and responsible plastic use in these two main industries and increase education on environmental issues in the School of navigation.		
English keywords:	*Fisheries, tourism, marketing, education, microplastic*		

Contents

1. Aim

Risks related to plastic pollution and its impacts on the bioeconomy are not only of biological, toxicological and chemical nature, but also societal and economical. Poor environmental reputation of the Nordic environment or Nordic production could have negative impacts on tourism, marketing and general wellbeing. The aim of NordMar PlasticRISK is to evaluate the diverse impacts and main socioeconomic risks of marine plastic pollution on the bioeconomy of Nordic countries, with Iceland as a case study. The results are based on a literature review as well as interviews with experts and stakeholders. The results are then used to form recommendations for actions to reduce the societal and economic impact of plastic pollution.

2. Introduction

The Nordic and the Arctic environment and ecosystem is vulnerable to pollution and effects of climate change, due to its cold climate, extremes in sun radiation, unique and fragile ecosystems and short food chains. The unique circumstances in the West Nordic, with its vast open areas, unique wildlife and harsh environments, serves as both strength and weakness when the opportunities related to the bioeconomy in the Nordic are discussed. In addition to the vast natural resources, the unspoiled and unmatched nature and biological diversity serve as important tourist attractions. Given the economic and socio-economic importance of the Nordic and Arctic environment, green growth is a vital element of the value creation within these regions. Green growth should be based on efficient and sustainable use of resources and should be at the forefront in Nordic and Arctic policy making, with additional focus on transparency and co-operation. Plastic litter in the marine environment is a growing problem and considered as one of the major environmental challenges of today, with 5 to 13 million tons of plastic enting the oceans every year (European Commission, 2018; Jambeck, 2015). The marine environment is particularly vulnerable to plastic litter, where it accumulates and has a harmful effect on marine species. Plastic residues are found in many marine species but how this affects the marine life is still not fully known. Plastic is therefore not only a global challenge in terms of waste, but is also linked to food security and food safety. Distribution, amount, sources and impact of plastic pollution on marine ecosystems and species has gathered interest of environmental scientists, many of which are focusing on toxicological and ecotoxicological effects of marine plastic. However, the socioeconomic impact of plastic on nations that are heavily dependent on biological recouces remains unclear. In a society where both accurate and misleading information is abundantly available to the public, the derivative effects of plastic pollution on socioeconomic factors, e.g. tourims, market influence and food production, must be investigated.

On 2nd of May 2017, the Nordic ministers agreed to establish a Nordic programme with the aim of reducing environmental impacts of plastics. The programme includes 16 objectives focusing on increasing the cooperation between the Nordic countries and demonstrating the commitment of the Nordic countries to the implementation of the United Nations Environment Assembly (UNEA) Resolution 1/6 (“Marine plastic debris and microplastics”) and Resolution 2/11 (“Marine plastic litter and microplastics") and initiatives under relevant regional agreements (Nordic Council of Ministers, 2017). The programme was operated between 2017 and 2018, however, several objectives are still under development. Around 80% of all waste found on European beaches is plastic, e.g. food containers, cups for beverages, cutlery, bottles, straws and plastic bags (European Commission, 2018) and actions are needed to prevent further negative impacts of plastic waste in the marine environment. While cleaning plastic from coasts serves good purpose, preventive actions are generally considered more effective than reactive. Therefore, capacity building and awareness raising among

the general public and industries should be put higher on the agenda. Creating and communicating accessible information on the risks and the consequences of marine plastic polluting, i.e. through Nordic Youth engagement, can have multiple benefits for the future and serve as important step towards reducing marine litter. Furthermore, reduction of single plastic use and increased plastic recycling as has been identified as important parts of the solution by the EU, as well as innovation within production and recycling, design and finally, education of future generations.

Background

Plastic litter in the marine environment is increasing and is considered as one of the major environmental challenges of today. It is estimated that 5 to 13 million tons enter the oceans annually (Jambeck, 2015; European Commission, 2018). The marine environment is particularly vulnerable to plastic litter, where it accumulates and has a potentially harmful effect on marine species. Plastic residues are found in many marine species but how this affects the marine life is still not fully known (Falk-Andersson & Strietman, 2019). Plastic is therefore not only a global challenge as waste but is also linked to food security and food safety. Evaluating and mitigating the increasing impact of plastic on the environment should be one of the main environmental focus of governments and research organizations, especially for nations highly dependent on the blue bioeconomy.

Plastic litter can be divided into three size categories, i.e. macro, micro and nano. Macroplastics are visual plastic parts, microplastics are particles, fibres and fragments less than 5 mm and nanoplastics are particles in the nano size range (10–100 nm). Entanglement of wildlife and ingestion is the major threat of macroplastics, while ingestion and possible direct (physical) and indirect (chemical) effects are the main concerns regarding micro- and nanoplastics (Falk-Andersson & Strietman, 2019).

Despite several initiatives and studies on plastic pollution in the Nordic environment, information on occurrence and distribution of microplastic is severely lacking, as pointed out in a recent review of the current knowledge of microplastic in the Nordic marine environment (Bråte, 2017). Main sources of marine plastics have been identified and vary between areas. However, maritime activities (including fisheries, aquaculture and shipping) have been identified as the main sources of macroplastic in the Arctic (including Iceland), as well as increasing tourism (PAME, 2019). While sources of microplastic are more difficult to study, several have been identified, such as waste water (Magnusson, 2016) and road dust (Sigurðsson, 2019). A classification of microplastic has been proposed (Magnusson, 2016) but there is a lack of harmonized standards for nano- and microplastic sampling and analyses, as well as interlaboratory comparison, which severely hampers plastic research. Further, studies on toxicology and impact studies of nanoparticles are required, as these can be absorbed into the body of humans and marine organisms and theoretically affect internal organs directly.

The available literature on microplastics in water, sediments and biota globally was recently reviewed and gathered data was modelled to estimate microplastic concentrations and total load in different components (water, sediment, biota), focusing on the distribution, degradation mechanisms and transport of microplastic in the ocean (Booth, 2017). However, to be useful and accurate, modelling requires real data collected with standardized methods, which would further enable projections on larger areas where information is patchy or limited. This makes method standardization the basis for further studies on microplastics.

Main sources of plastic and plastic clean-up of Icelandic beaches

There are several NGOs and citizen groups performing beach cleaning in Iceland and even participating in citizen science projects on evaluating and registering beach litter, including plastic. Initiatives by authorities are limited. However, the Environment Agency Iceland performs beach surveillance on limited number of beaches. Below are examples of NGO and citizen group beach clean-up initiatives. While beach cleanings are in many ways an efficient method to remove accumulated, localised plastic pollution, it is costly and remains less effective than tackling the problem at its source, i.e. before the plastic is released into the environment.

The Blue army[1] was formed in 1995 by Tómas Knútsson. Since its establishment, the focus has been on beach cleaning, mostly in the Reykjanes peninsula. The initiative has put in approximately 76.000 labour hours in 300 different projects with 9600 volunteers and collected 1540 tons of waste. The Blue army was nominated to the Nordic environmental price in 2018 for the project Cleaning Iceland (Hreinsum Ísland) in cooperation with Landvernd, the Icelandic Environment Association.

Since 2014, a group of people have been collecting debris at Hornstrandir in Nort-West Iceland, a non-inhabited area since 1946 and an area open for ocean current drifting from the North Atlantic Ocean. The group collects all debris found on the beaches, but they estimate that around 80 – 90% of the waste originates from the fishing industry (Geirsson, 2019). A summary of the results is shown in Table 1. This year, 2020, the group will focus on cleaning Smiðjuvík, Hrollaugsvík and Bjarnarnes and next year, volunteers will revisit the first beach, Hlöðuvík, the second time. Comparing results from 2014 to results obtained next year will give an indication of plastic drift (Geirsson, 2019).

Table 1. Summary of beach cleaning initiatives in Hornstrandir.

Year	Location	Number of volunteers	Tons collected	Length of beach (km)	Tons/km
2014	Hlöðuvík	55	5,0	4,5	1,11
2015	Hornvík	48	5,2	7,0	0,74
2016	Furufjörður	25	4,8	3,5	1,37
2017	Aðalvík	25	3,0	7,0	0,43
2018	Bolungarvík	53	9,5	2,0	4,75
2019	Barðsvík	40	6,3	4,0	1,58
	Total	**246**	**33,8**	**28**	**9,98**

A group of volunteers from the University Centre of the Westfjords (UW)[2] coordinated a marine litter week at Strandir in September 2019, Figure 1 (Chambers, 2019) and hosted a Marine Litter Workshop at Ísafjörður, as a part of the Arctic Marine Litter Project, run by Wouter Jan Strietman from Wageningen Economic Research, Holland. The project focused on specifying marine litter in the Arctic where the group conducted studies on litter gathered from beaches in Svalbard, Jan Mayen, Greenland and now Iceland (Falk-Andersson & Strietman, 2019).

[1] https://www.blaiherinn.is/
[2] https://www.uw.is/

Figure 1. A group of beach clean-up volunteers from the University Centre of the Westfjords.

Table 2 shows a breakdown of main categories of plastic litter found on the beach at Strandir, Westfjords, Iceland, based on 6.800 items and 300 kilos collected. Majority of the plastic debris originates from the fishing industry: 58% in terms of abundance (number of items), and 42% of the total weight, which is in line with what has been presented by a PAME desktop study (PAME, 2019).

Table 2. Categorization of debris found in Strandir.

Based on numbers (6,800)		
1.	Net cuttings	32%
2.	Unidentifiable pieces of plastic	26%
3.	Caps and lids	11%
4.	Shogun cartridges	7%
Based on weight (300 kg)		
1.	Fishing nets > 50 cm	26%
2.	Ropes	16%
3.	Tangled nets and ropes	14%
4.	Floats and buoys	8%

For comparison with other countries, a group of volunteers in Svalbard performed a beach litter study in 2019 (Falk-Andersson & Strietman, 2019), focusing on plastic debris on the shores of Svalbard. Approximately 4820 litter items were collected and analysed. Collaboration with experts on fishing gear and marine related waste allowed the group to identify the sources of litter found on the beaches. Most of the items found were unidentifiable pieces of plastic, but the second largest group were seafood industry related waste, including nets, strapping band and string and ropes, as presented in Table 3.

Table 3: Major items identified in beach clean-up in Svalbard 2019.

#	Top items	Contribution to total	Contribution of unidentifiable pieces
1	Unidentifiable pieces of plastic	63%	
2	Nets and pieces of nets	7%	19%
3	Caps/lids	5%	14%
4	Strapping band	5%	14%
5	Strings and ropes	3%	8%
6	Industrial packaging/sheeting	3%	8%
7	Floats/buoys	2%	5%
8	Plastic bottles and containers	2%	5%
9	Plastic bags	2%	5%
10	Cotton bud sticks	1%	3%
n	Other items	7%	19%

More than half of the debris was unidentifiable pieces due their small size. Expert judgement however indicated that most of the items were derived from the fishing industry. Most of the nets and ropes were cut-offs from repairing trawls, with ropes and nets with sharply cut ends, indicating the debris was intentionally discarded but not lost by accident. This indicates that discarding of nets is still occurring and focus should be on actions preventing this practice with management actions. Similarly, strapping bands are traced back to fishing activities, suggesting a deliberate discharge. Preventive measures and education could significantly reduce the amount of litter from fishing vessels, focusing on nets, ropes and strapping band as discarded intentionally. It should be emphasized that it is difficult to determine the age of the debris found on the shores or for how long it had been there (Falk-Andersson & Strietman, 2019). According to this, beach litter is a world-wide issue where the Icelandic government, industry and society must take part in the responsibility, learn from other initiatives and participate in international research and clean-up projects but also export successful solutions developed here to other areas.

3. Main industries in Iceland

A country such as Iceland, where a large part of the GDP relates to the bioeconomy, is heavily dependent of environmental quality and bioresources (Smáradóttir, 2014). Two of the main industries in Iceland are fisheries and tourism and impact of plastic and poor environmental quality would impact these heavily.

Fisheries

Historically, the fishing industry commonly discarded waste overboard into the ocean instead of bringing it to land for recycling (Johnsen, 2019). Old fishing gear was discarded at sea as well, if it was not seen to be a risk for other ships and its propeller far away from fishing grounds, so only larger pieces of nets were brought back to land. This was a common practise, not only in the Icelandic fisheries, but worldwide. The International Maritime Organization (IMO) adopted an international Garbage Management Plan (GMP) in 1996 (IMO, 1996), which applies to the Icelandic fishing industry and has been activated on board Icelandic vessels. The GMP is audited by The Environment Agency of Iceland according to international regulations (Annex V of MARPOL 73/78 Regulations for the

Prevention of Pollution by Garbage from Ships). This has changed the behaviour of the fishing industry and changed waste management practices within the fisheries (Johnsen, 2019). All biological waste is supposed to be grinded before it is dumped into the ocean. Unwaxed paper can be discard into the ocean but waxed paper must be taken ashore with other waste. Crew members are supposed to fill out a garbage calendar regarding all waste signed by the captain before handed over to a recycling company when coming back to harbour. There is a lack of awareness of environmental issues of crew members on board many Icelandic fishing vessels and often recycling plans are missing, there is a lack of knowledge and commitment in this field (Johnsen, 2019).

In 2002, a cooperative proposal on recycling systems between the Icelandic fishing industry and the government was suggested. The suggestion was to add a recycling fee on fishing gear for economic incentives to recycle worn fishing gear. The recycling system proposal required that all trash on board vessels was to be collected and brought to land. This recycling fee was also to be applied to all raw materials used for manufacturing of fishing gear in Iceland and should cover the cost of collecting, grading and recycling waste from the fishing fleet. However, this recycling fee was considered to have a negative impact on the competitiveness of fishing gear manufacturers in Iceland since it would increase the price of domestic production. To avoid this, the fishing industry agreed with the government to establish a national mutually beneficial collaboration[3] to take full responsibility of the recycling of worn fishing gear made of synthetic materials, and the industry would be responsible for collecting and shipping all worn fishing gear used by the Icelandic fleet to recycling facilities abroad. To aid the fleet, Fisheries Iceland (SFS) published instructions for all parties responsible for recycling; vessel owners, fishermen, fishing communities and net producers, Figure 2.

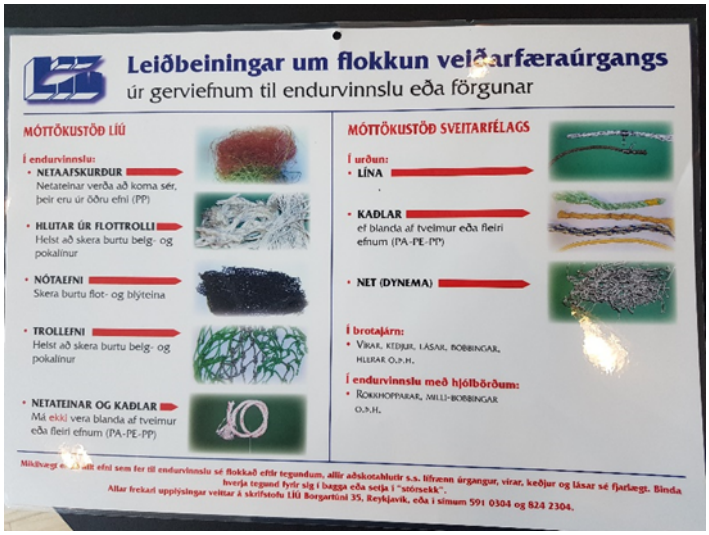

Figure 2. Information board on grading of fishing gear into recycling categories.

The fishing fleet companies are responsible for collecting and transporting the waste fishing gear used by their fleet to the fishing gear manufacturers/importers Reykjavík and in rural towns in Iceland. The companies often gather the waste gear for months or even a year, before transporting it to Reykjavik. Fishing gear manufactures/importers in Iceland are then responsible for receiving used nets and ropes from their customers, both the fishing companies as well as net producers in Iceland. The fishing gear manufactures grade/sort the waste according to the recycling plan presented above in Figure 2, or

[3] https://www.urvinnslusjodur.is/um-urvinnslusjod/starfsemi-og-hlutverk

return it to waste collection as non-recyclable disposal material. However, fishing net companies that specialise in repairing nets and trolls often end up with amount of plastic packaging material and cut-offs from net production/repair from servicing the fishing fleet. Unfortunately, since the cost of sending worn nets and cut-offs to manufactures/importers in Reykjavik falls on the net companies and the recycling value of these waste products is low and no financial benefit in transporting this to recycling, these waste products are commonly sent to local land fills (Sigurhjartarson, 2019) lowering the efficiency of the recycling system.

It is the responsibility of the Vessel Shipping Service of SFS to manage recycling of fishing gear. Fishing gear from Iceland is sent to Polivektris in Lithuania[4] and Platix in Denmark[5] for recycling, where waste unfit for recycling is sent to power production abroad or to landfills domestically. Systematically, stakeholders strive to improve the recycling rate of worn fishing gears, for recycling or for energy production. The SFS operates a training program for its clients and fishermen for recycling of fishing gear, which has been successful. Today, the Icelandic recycling system for fishing gear is functional, with some issues remaining that need to be improved. Lack of cooperation between… and stakeholder consultation in the recycling business for worn fishing gear is the main obstacle for successful and environmental implementation. Valuable recycling material is therefore used as landfill instead of being reused for new product or recycled for energy production (Johnsen, 2019).

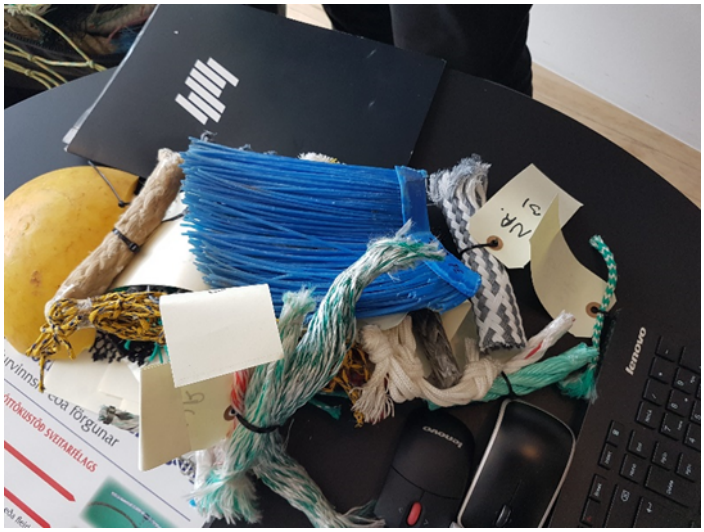

Figure 3. Difference material in fishing gear

The plastic used for manufacturing fishing gear is highly diverse, increasing the challenge in recycling the material, Figure 3. Normally, the best recycling prices are for traditional trawling nets, whereas ropes are more complicated to recycle. There is a great potential in further educating and training all parties responsible for the collection and grading of worn fishing gear waste in fishing communities around the world. The Icelandic model seems to be successful and could be exported as a best practice to other regions to decrease the possibilities of fishing gear being discarded at sea.

The awareness of consumers for environmental issues is increasing constantly and marketing of seafood products focuses more and more on environmental issues, sustainability and traceability

[4] http://polivektris.lt/
[5] https://plastixglobal.com/

(Brécard, Hlaimi, Lucas, Perraudeau, & Salladrré, 2009). Not having data on occurrence, distribution or amount of macro- or microplastic in the Icelandic Economic Zone is a high-risk factor for the Icelandic seafood industry but a well-documented situation could be considered as a marketing tool and investment. This could be performed in collaboration between the industry, academia and research institutes in Iceland, though funding is the foremost criteria for such monitoring or surveillance.

Tourism

Tourism is hugely important to Iceland's economy and the country's largest export sector. As of 2016, export revenues from the tourism sector were higher than the combined revenues from the countries traditional export base-industries, fisheries and aluminium. Tourism is estimated to have contributed about 8.6% of the Icelandic GDP in 2017 according to Statistics Iceland[6]. Employment in tourism and related activities in Iceland increased by 99% between 2008 and 2018 and tourism provides employment both in rural and urban regions, according to Statistics Iceland. From November 2018 until October 2019, Iceland received just over two million visitors, of which 90% came for the purpose of traveling for holidays (Icelandic Tourist Board, 2019). In a 2018 survey, foreign tourists were asked where they got the idea to visit Iceland. There, 92% replied that Icelandic nature and natural phenomena influenced their decision to visit. When asked what it was about Icelandic nature that attracted them to Iceland, the most common answer was the intact nature and the countries cleanliness (Ólafsdóttir, 2019). Another research shows that a large majority of tourists that have visited Iceland are happy with their stay, would recommend visiting Iceland and that they find the Icelandic nature to be the most memorable part of their stay (Wendt, 2019). It is therefore expected to be of the upmost importance for Iceland to maintain its image of intact and pure nature in order to fulfil the expectations of travellers and to continue attracting foreign visitors.

To our best knowledge, no survey has been conducted on the specific experience of tourists relating to the country´s ocean and beaches but it can be assumed that their expectations of pristine and clean environment there are just as high as for the rest of the Icelandic nature. It is evident that tourism in Iceland heavily depends on pristine environment and there are publications indicating that tourists are willing to pay more for responsibility and integrity of the tourist industry.

4. Socioeconomic risks, summary and recommendations

As according to Smáradóttir et al., (2014), it is clear that two of the main industries in Iceland, the fishing industry and tourism, are heavily dependent on the bioeconomy, whose health and function is largely based on clean and pristine environment. With the tourist industry in Iceland being highly dependent on the country's clean and pristine environment, the economic impacts of plastic pollution, including visual plastic debris and microplastics, could be severe. Thirty Icelandic municipalities experienced 15% population decline or more during the period 1994 – 2011 (Þorgrímsdóttir, 2012), underpinning the importance of tourism, both in terms of economics (income) and socio-economics (job creation) for the rural development of Iceland. Maintaining tourism is therefore important and it is unclear how much impact debris could have on tourism development.

Studies of litter on beaches around the North Atlantic Ocean suggest that the fishing industry is a large source of marine plastic (Falk-Andersson & Strietman, 2019), therefore identifying the fishing industry an important target for preventative actions. Considering the environmental impact of marine related

[6] Statistics Iceland, https://hagstofa.is/

litter found on beaches and the potential economic impacts to the fishing industry itself, education and awareness raising within the fisheries industry should be one of the priorities in the near future. Successful implementation of preventive actions requires a good understanding of waste sources using expertise and know how to determine the best practice to solve the problem in the future.

The Icelandic system for recycling of fishing gear appears to be functioning well, but with room for improvement, particularly in terms of aligning all stakeholders within the waste management and recycling chain. After improvements and modification, this system could be used as a best-practice model for other fishing nations world-wide.

The Icelandic society has several environmental and industrial strengths useful in marketing within the seafood and tourism industry. There are potentials and there are risks. Following are issues important to focus on. For example, the Ministry for the Environment and Natural Resources established a working group focusing on mitigating plastic pollution in Iceland. The working group developed an action plan with 18 actions, those that are important for the fishing industry and tourism from the results of the working group are following[7]:

Action 3: Establishment of a research and innovation fund for plastic issues.

Action 8: Strategic policy for agriculture, industry, seafood industry and tourism on reducing use of plastic.

Action 13: Comprehensive monitoring of plastic (macro, micro and nano) in the Icelandic biosphere.

Action 14: Better waste water treatment.

Action 15: Use of detention basins for road water.

Action 17: Cleaning Icelandic coastlines.

Action 18: Labelling of all fishing gear for better traceability.

Other recommended actions are:

- Establish a research and monitoring system evaluating occurrence and trends of plastic debris and microplastic in the Icelandic marine environment. To evaluate the current status of plastic in the marine environment as well as evaluate the impact of actions taken, it is important to install this system, as stated in Action 13 above.

- To evaluate marketing options and value of advertising low and responsible plastic use in the tourism sector.

- To evaluate marketing options and value of advertising low and responsible plastic use in the seafood sector.

- To further reduce the discharge of waste to the sea by the Icelandic fishing fleet and seafood industry, it is important to improve education regarding environmental issues and recycling

[7] https://www.stjornarradid.is/efst-a-baugi/frettir/stok-frett/2018/11/01/Tillogur-i-plastmalum-afhentar-radherra-/

of waste material and to emphasise the topic to the curriculum of the School of navigation for marine captain and master of ships study programs.

- Evaluate and improve the recycling system of used fishing gear with e.g. better collection stations in harbours as well as establish incentives for the seafood industry to use environmentally friendly fishing gear.

- Evaluate and improve the recycling system of used fishing gear by improving cooperation between different actors within the whole value chain of recycling and waste management of fishing gear.

- After improvement of the Icelandic recycling system, it is important to share the experience and setup of the system of recycling fishing gear as best-practice with other Nordic and Arctic areas.

- Increase cooperation with international initiatives in plastic research, clean-up and citizen science and further support global efforts to mitigate plastic waste.

- To strengthen the citizen science and citizen initiative it is valuable to increase support to beach clean-up initiatives around the country.

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