CCME

Canadian Council of Ministers of the Environment | Le Conseil canadien des ministres de l'environnement

POLICY OPTIONS AND BEST PRACTICES FOR END-OF-LIFE FISHING AND AQUACULTURE GEAR

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NOTE TO READERS

This document is based on an unpublished report prepared under contract to the Canadian Council of Ministers of the Environment (CCME) by Cheminfo Services Inc. and Natural Resource Consultants and has been revised and edited by CCME's Waste Reduction and Recovery Committee. CCME would like to thank the individuals and organizations that contributed input and expertise during the development of this work.

This document is not a prescriptive 'how-to' guidance document, but rather a toolbox of options. Every jurisdiction is different in terms of its location, size, infrastructure, existing programming, political engagement, and waste-policy context. For this reason, the generic suite of instruments described in this document can be adapted by governments to suit their own situations, using the supporting details and lessons learned as guidance.

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LIST OF ABBREVIATIONS

CCME	Canadian Council of Ministers of the Environment
EOL	end-of-life
EPEAT	Electronic Product Environmental Assessment Tool
EPR	extended producer responsibility
EU	European Union
FGCAC	Fishing Gear Coalition of Atlantic Canada
LEED	Leadership in Energy and Environmental Design
OLF	Ocean Legacy Foundation
QR Code	Quick Response Code

GLOSSARY OF TERMS

Abandoned fishing gear	Fishing gear that could be retrieved by the owner or operator but is deliberately left at sea due to force majeure or other unforeseen reasons.
Biofoulant	Microorganisms, plants, algae or small animals that accumulate on fishing and aquaculture gear over time.
Centralized supply agreements	Agreements that include a set of predetermined conditions that apply to bid solicitations and contracts.
Discarded fishing gear	Fishing gear that is released at sea without any attempt for further control or recovery by the owner or operator.
Dredge	Gear dragged along the sea bottom, usually to collect molluscs such as mussels, oysters, scallops and clams. Also sometimes utilized to harvest echinoderms such as sea urchins.
End-of-life	When a product or material can no longer be used for its original intended purpose.
Failure rate	The percentage of deployed gear that could reasonably be expected to fail or require replacement each year.
Finfish	A bony fish such as groundfish, pelagic fish and anadromous fish (in addition to groundfish, examples include rainbow trout, salmon, tuna, herring and mackerel).
Fyke net	Normally used in shallow water, a fyke net consists of cylindrical or cone-shaped bags mounted on rings or other rigid structures, completely covered by netting and completed by wings or leaders that guide fish towards the opening of the bags.
Ghost gear	A plain-language term for abandoned, lost or discarded fishing gear at sea where the owner or operator no longer maintains control. Ghost gear can lead to the accidental capture of aquatic organisms.
Gillnet	A net that is hung vertically in the water so that fish attempting to pass through become caught by their gill covers, entangled or enmeshed in the netting. According to their design, ballasting and buoyancy, these nets may be used to fish

	on the surface, in midwater or on the bottom.
Groundfish	A species or group of fish that lives most of its life on or near the sea bottom.
Longline	Fishing gear in which short lines carrying hooks are attached to a longer main line at regular intervals. Longlines are laid on the bottom or suspended horizontally at a predetermined depth with the help of surface floats. The main lines can be as long as 150 km and have several thousand hooks.
Lost fishing gear	Fishing gear that the owner or operator has accidentally lost control of and that cannot be located and/or retrieved by the owner or operator.
Pot	A trap set on the bottom to catch fish such as crab, lobster or sablefish.
Purse seine	Nets characterized by the use of a purse line at the bottom of the net. The purse line enables the net to be closed like a purse and thus retain all the fish caught. Purse seines, which may be very large, are operated by one or two boats.
Shellfish	An aquatic shelled mollusc such as an oyster or cockle, or a crustacean such as a crab or shrimp.
Trap net	Stationary nets that are staked to the shore or in estuaries. They form a labyrinth-like chamber into which fish can easily enter, and from which they cannot easily escape.
Trawls	Nets towed behind a boat to collect finfish or shellfish such as crab or shrimp. Trawls can be divided into three categories based on where they sample the water column: surface, midwater and bottom. They may be divided further by their design and the materials used in their construction.
Waste-management hierarchy	The ranking of the preferred approaches to waste reduction and management to maximize the value of used materials. The most preferred to least preferred approaches are reduce, reuse/repair, remanufacture/refurbish, recycle, recover for energy and finally, dispose.

1.0 INTRODUCTION

The Canadian Council of Ministers of the Environment (CCME) is the primary minister-led intergovernmental forum for collective action on environmental issues of national and international concern. The 14 member governments of Canada work as partners in developing consistent environmental standards and practices to be implemented across the country.

Environment ministers are committed to taking action within their jurisdictions to continuously improve Canada's record on reducing waste. In 2019, CCME ministers approved Phase 1 of the Canada-wide Action Plan on Zero Plastic Waste (the "Action Plan") (CCME 2019) as a first step to implementing the Strategy on Zero Plastic Waste (CCME 2018). One of the key action items within the Action Plan is to develop guidance to assist federal, provincial and territorial governments to increase the collection and end-of-life (EOL) management of fishing and aquaculture gear. This document identifies policy options and best management practices to improve the collection and EOL management of gear as part of priority action 3 of phase 2 of the Action Plan.

2.0 ASSESSMENT OF FISHING AND AQUACULTURE GEAR

This section contains a summary of the assessment of fishing and aquaculture gear generated in Canada. It is important to note that this data was not derived from a comprehensive waste audit of fishing and aquaculture gear. Fishing gear is described first, followed by aquaculture gear.

2.1 Fishing Gear

Estimated annual EOL fishing gear data was generated by analyzing Department of Fisheries and Oceans Canada data and other provincial resource management agencies' available information such as licenses to generate equipment counts (i.e., the amount of equipment actively deployed by fishers of various types each year). These data were then multiplied by failure rates accessed through a wide range of literature sources. The data presented represent the estimated amounts of EOL gear generated annually within Canada. This methodology is summarized in the equations below.

$$Units\ of\ Gear\ Deployed\ by\ Type\ \times Annual\ Failure\ Rate\ by\ Type = Annual\ Units\ of\ EOL\ Gear$$

$$Annual\ Units\ of\ EOL\ Gear = Units\ Stockpiled + Units\ Disposed + Units\ Recycled$$

The data generated were then divided into three categories that represented how gear is managed at EOL: (i) stockpiled; (ii) landfilled; or (iii) recycled. It is important to note that while gear may also be managed through small-scale reuse, repair or refurbishing initiatives, these data were not captured as part of the analysis. Table 1 and 2 summarize the estimated quantities of EOL fishing gear managed via each of these three options in Canada on an annual basis.

Table 1 Estimates of Annual Fate of EOL Fishery Rope and Nets in Canada

Province or region	Gear type	Fishery	Stored	Landfilled	Recycled	Unit
British Columbia	Gillnet	Salmon	152			km
British Columbia	Purse seine	Salmon	2			km
British Columbia	Gillnet	Herring	71			km
British Columbia	Purse seine	Herring	4			km
British Columbia	Trawl net	Shrimp	9			individual nets
British Columbia	Trawl net	Groundfish	14			individual nets
British Columbia	Longline	Groundfish	457			km
British Columbia	Trawl net	Scallop	<1			individual nets
New Brunswick	Pot	Lobster	71	93		MT rope
Newfoundland and Labrador	Pot	Lobster	87	115		MT rope
Nova Scotia	Pot	Lobster	486	644		MT rope
Prince Edward Island	Pot	Lobster	37	50		MT rope
Québec	Pot	Lobster	9	11		MT rope
Atlantic	Trawl net	Shrimp	59			individual nets
Atlantic	Trawl net	Groundfish	34			individual nets
Atlantic	Gillnet	Groundfish	8,903			km
Atlantic	Longline	Groundfish	32,470			km
Atlantic	Dredge	Scallop	72			individual nets
Atlantic	Gillnet	Herring	10			km
Atlantic	Purse seine	Herring	<1			km
Québec	Gillnet	Freshwater	25			km
Québec	Purse seine	Freshwater	<1			km
Québec	Fyke net	Freshwater	470			individual nets
Québec	Trap net	Freshwater	18			individual nets
New Brunswick	Trap net	Freshwater	25			individual nets
New Brunswick	Gillnet	Freshwater	<1			km
Ontario	Trawl net	Freshwater	1			individual nets
Ontario	Trap net	Freshwater	1			individual nets
Ontario	Gillnet	Freshwater	104			km
Manitoba	Gillnet	Freshwater	63			km
Saskatchewan	Gillnet	Freshwater	63			km
Northwest Territories	Gillnet	Freshwater	12			km
Nunavut	Gillnet	Freshwater	1			km

Note: All figures rounded to the nearest whole number. km = kilometres; MT = metric tonnes.
Sources: Natural Resources Consultants and Cheminfo estimates.

It should be noted that fishing nets of various types are expected to contribute significantly to the overall weight of gear but could not be accurately quantified. It should also be noted that no data were received on the recycling of nets or rope in Canada.

Table 2 Estimated Units and Weight of EOL Pots by Type Within Canada

Region	Fishery	Stored (x 1,000)	Landfilled (x 1,000)	Recycled (x 1,000)	Total (x 1,000)	Average Pot weight (kg)[1]	Total weight (MT)
British Columbia	Crab	4.2	2.8	2.8	9.8	18	174
British Columbia	Shrimp	3.5	2.3	2.3	8.1	4	32
British Columbia	Sablefish	0.1	0.1	0.1	0.3	425	134
	Subtotal	**7.8**	**5.2**	**5.2**	**18.2**		**340**
New Brunswick[3]	Lobster	14.5	14.4	4.8	33.7	32	1,076
Newfoundland and Labrador[3]	Lobster	22.4	22.3	7.4	52.1	32	1,666
Nova Scotia[3]	Lobster	105.1	104.5	32.8	242.4	32	7,757
Prince Edward Island[3]	Lobster	16.2	16.2	5.4	37.8	32	1,203
Quebec[3]	Lobster	3.3	2.2	2.2	7.7	32	243
	Subtotal	**161.5**	**159.6**	**52.6**	**373.7**		**11,945**
Atlantic	Snow Crab	29.5	29.4	9.8	68.7	102	6,997
Atlantic	Shrimp	0.1	0.1	0.03	0.2	25	5
	Subtotal	**29.6**	**29.5**	**9.8**	**68.9**		**7,002**
						Total estimate	**19,287**

Note: kg = kilograms; MT = metric tonnes.
[1] Frydendahl (2023); McCarron and Tetreault (2012); Oregon Dungeness Crab Commission (2023); Pacific Northwest Best Life (2023).
[2] Goodman (2020)
[3] Dawe *et al.* 2021; Kendall *et al.* 2021a; Kendall *et al.* 2021b; Kendall *et al.* 2021c; Kendall *et al.* 2021d.

2.2 Aquaculture Gear

Reliably estimating annual gear waste volumes from the Canadian aquaculture sector using Canada-specific data was not possible due to significant data gaps. In the absence of Canadian data, available data on waste production in Norway and waste in China were used to extrapolate 2020 Canadian aquaculture production volume and develop estimates of plastic waste volume per tonne of biomass produced (Huntington 2019; Mengyu *et al.* 2018; Tian *et al.* 2022). The estimates do not consider limited reports from individual producers regarding the fate of waste and reflect only the available sector-wide data on waste production from marine finfish and shellfish operations.

Estimates on the volume of EOL aquaculture gear entering the waste sector each year were generated for finfish and shellfish operations. As EOL gear-generation and value-retention operations for these two elements of the aquaculture sector are very different, they are provided separately in Table 3 and 4. The EOL gear-generation data for these operations did not include information on the volume of EOL gear that is reused, repurposed, repaired or abandoned, and therefore these options were not considered in the analysis. Additionally, information on lost or discarded gear is unavailable.

Table 3 Estimated EOL Shellfish Aquaculture Gear Generated in Canada (2020)

	NL	NS	PE	NB	QC	ON	MB/SK/ AB	BC	**CA**
Total (MT)	118	42	727	77	12	-	-	278	**1,254**

Notes: AB = Alberta; BC = British Columbia; CA = Canada; MB = Manitoba; MT = metric tonnes; NB = New Brunswick; NL = Newfoundland and Labrador; NS = Nova Scotia; ON = Ontario; PE = Prince Edward Island; QC = Quebec; SK = Saskatchewan.
Sources: Natural Resources Consultants and Cheminfo estimates.

Table 4 Estimated EOL Finfish Aquaculture Gear Generated in Canada (2020)

	NL	NS	PE	NB	QC	ON	MB/SK/ AB	BC	**CA**
Total (MT)	86	129	7	208	8	6	-	1,030	**1,474**

Notes: AB = Alberta; BC = British Columbia; CA = Canada; MB = Manitoba; MT = metric tonnes; NB = New Brunswick; NL = Newfoundland and Labrador; NS = Nova Scotia; ON = Ontario; PE = Prince Edward Island; QC = Quebec; SK = Saskatchewan.
Source: Estimates were based on applying 2020 Production Statistics to 2014 Norwegian data extrapolations for microplastic waste production by infrastructure type (Tian *et al*. 2022).

Table 5 Material, Estimated Percentage of Total EOL Finfish and Aquaculture Gear Generated in Canada (2020)

	Percentage of total aquaculture gear
Marine cage collars	55%
Feed pipes	6%
Containment nets	20%
Ropes	14%

Sources: Estimates were based on applying 2020 Production Statistics (tonnes) to 2014 Norwegian data extrapolations for microplastic waste production by infrastructure type (Huntington 2019).

2.3 Fishing and Aquaculture Gear Totals

It is estimated that over 40,000 km of fishing line and nets (i.e., longline, gillnets and purse seine) and more than 700 trawl, fyke and trap nets are stored each year in Canada, while approximately 1,603 tonnes of rope from the lobster fishery were either stored or landfilled in Canada in 2020 (Table 1). It is estimated that 19,287,000 tonnes of various pots were either landfilled, stockpiled or recycled in 2020 (Table 2). Approximately 1,254 tonnes of shellfish aquaculture gear were estimated to be generated in Canada in 2020 (Table 3), as well as 1,474 tonnes of finfish aquaculture gear (Table 4). This is in addition to the length of fishing line and number of nets for which no weights were available.

3.0 ANALYSIS OF POLICY OPTIONS AND BEST PRACTICES

The following 10 policies and practices were shortlisted out of 30 options through research, interviews and workshops with stakeholders and interested parties:

- Infrastructure development
- Extended producer responsibility (EPR)
- Circular design standards
- Eco-design
- Traceability of polymers
- Prohibition or mandating of gear types
- Partnerships
- Gear tracking
- Green procurement
- Certification standards.

For each of the policies and practices, there is a section discussing the following:

1. Challenges associated with the implementation of the shortlisted policy options and practices.
2. Identification of which policy options are suitable for implementation in Canada in the near, mid or long term.
3. Information on what steps or further work might be required to implement the shortlisted policies and best practices.

3.1 Infrastructure Development

Infrastructure for the collection, cleaning, separation and sorting of gear will be required if the desired outcome of EOL fishing and aquaculture gear management is to recycle as much of the material as possible. It can be challenging for recyclers to accept material that is not adequately cleaned (to minimize contamination such as biofoulants), separated by material type and sorted by resin type.

Many areas in Canada do not have existing collection centres. Municipal or regional transfer stations may have limitations or restrictions on EOL gear from fishers and aquaculture operators. Therefore, some areas will require new infrastructure for the collection, storage, cleaning, separation and sorting of this gear. Others will not require infrastructure for collection and storage, but may still require EOL gear to be cleaned, separated and sorted by material type.

This section discusses infrastructure development but does not discuss how the development of such infrastructure would be funded. Regardless of the funding mechanism, the infrastructure development process will need to consider the specific EOL gear generated in the area, the existing waste management infrastructure and the availability of local collectors and recyclers.

3.1.1 Challenges Associated with the Implementation of Infrastructure

Regional needs must be taken into consideration to establish facilities that are effective at preparing EOL fishing and aquaculture gear for recycling. Key variables include: (i) location and type of gear used; (ii) local labour costs and availability; (iii) downstream recyclers and processors available; (iv) volume of various types of gear to be managed; (v) available space and real estate costs; and (vi) distance from downstream recyclers and processors to markets. Further research is required to better understand each of these variables and find solutions for different areas throughout Canada.

Facilities that currently collect and clean EOL fishing gear for the purposes of material separation and transmission to downstream recyclers tend to be located in countries that have lower value currencies and labour costs, indicating that the process may be expensive and time consuming. A region's proximity to important manufacturing, supply, service or transportation centres can impact what level of handling and processing in the local area is viable. While material recovery facilities can utilize automated processes (such as scanners and air-jets that separate out various plastic resins), these processes may not be an option for EOL fishing and aquaculture gear, given the diversity of equipment and potentially complex process of deconstructing this gear.

Harbours often do not have the space and resources required to store, clean, separate or sort EOL gear. Many stakeholders and interested parties indicated that there will be negative impacts associated with trying to use harbours and ports for this type of activity.

3.1.2 Considerations for Timeframes for Implementation in Canada

Organizations like Ocean Legacy Foundation (OLF) have already shown through existing programs that establishing collection infrastructure is a foundational step in organizing an EOL gear-management scheme that recycles plastics where possible. This approach encourages responsible disposal when recycling is not a viable option. Near-term, identifying those areas that could benefit most from the construction of collection depots and finding appropriate locations for these depots would be an important first step.

There is discussion regarding how best to establish depots in different areas of Canada. Some stakeholders and interested parties in the Atlantic Region indicated that fishers and aquaculture operators already transport their gear to transfer stations, and that no additional depots are required. However, the Fishing Gear Coalition of Atlantic Canada (FGCAC) and others indicated that: (i) many fishers and aquaculture operators store EOL traps, rope and other gear on their personal property for extended periods of time with no long-term plans for disposal (taking advantage of programs like those of the FGCAC for free collection and disposal); and (ii) that the illegal dumping of EOL equipment for cost-related reasons (as opposed to safety precautions, etc.) still occurs in Atlantic Canada. Additionally, some waste managers in the Atlantic Region indicated that transfer stations do not have the space, time or expertise required to organize, sort and clean (for the purposes of recycling) within their space — meaning that if the end goal is recycling, new infrastructure would be required. Given the uncertainties regarding these depots, further research is recommended, and a suggested pathway is proposed in section 3.1.3.

Overall, there are several challenges regarding the development of collection infrastructure. For example, if infrastructure for collection and storage is implemented, but labour for sorting or cleaning is unavailable, EOL gear will accumulate at these depots with no destination. Similarly, if cleaning and sortation occurs, finding recyclers to handle EOL gear may be challenging, and cleaned and sorted material would accumulate at the depots. Alternatively, if gear is never collected, sorted and cleaned, then finding recyclers will be difficult. Regardless, in the near term, further research is likely required and the development of infrastructure that will support recycling should be considered a mid-term or long-term goal.

3.1.3 Potential Work to Support Implementation

Further research should be the first step toward the development of infrastructure for the collection, storage, cleaning, separation and sorting of EOL fishing and aquaculture gear. The following numbered list shows potential research steps that could be utilized to determine the type of infrastructure that may be needed in each area of the country:

1. **Identify regions:** Identify the various geographic areas across Canada that could share or may otherwise require infrastructure for one or more of the following steps: collection, storage, cleaning, separation and materials sorting.
    a. Identify areas where fishers and aquaculture operators may use similar types of gear. Investigate the possibility of agreements or incentives to have operators use gear made of the same types of materials or that have common construction to make separation and sorting easier.[1]
    b. Work with local waste managers to investigate potential partnerships to utilize existing waste-management infrastructure.
    c. Look for areas where density or volume of gear generation requires collection infrastructure. In lower-density areas, consider using multiple collection, storage and cleaning depots that feed into more centralized sorting facilities.
    d. Attempt to locate property that is relatively close to one or more port reception facilities as opposed to using the port reception facility for collection. This approach could reduce congestion at port facilities.
2. **Identify organizations:** Organizations that are managing EOL gear from collection to recycling should be identified. Local organizations can often take advantage of local networks to get systems of collection operating successfully but may not have the resources to operate larger cleaning, separation and recycling operations. Developing EPR programs in conjunction with infrastructure planning can help support EOL management and determine the viability of infrastructure development options.
3. **Identify recyclers:** Recyclers that can manage the recycling of the various types of plastics that are present within EOL gear should be identified. Additionally, it is important to understand the costs of shipping materials to these recyclers from various areas of Canada. In some circumstances, depending on volume and shipping costs, it may be advantageous to stockpile materials for a significant period before shipping them to recyclers, or to

[1] Circular design standards will be critical to the rollout of any recycling program for EOL gear, and these standards must be designed in cooperation between recyclers, fishers, aquaculture operators and gear manufacturers.

potentially even landfill plastics in areas where shipping costs are very high and volumes are very low.

3.2 Extended Producer Responsibility

EPR is an environmental policy approach in which a producer's responsibility for a product is extended to the post-consumer stage of a product's life cycle. In making producers responsible for the management of a product at EOL, EPR policies ensure that producers build EOL management costs into the overall cost of the product. This serves as a mechanism to generate funding for the EPR program, including facilitating the collection and transportation of the materials, developing and operating the required infrastructure for collection, transportation and processing, and educating end users. Imposing the responsibility of EOL management on gear producers incentivizes producers to supply gear that is easier to manage in the order of preference of the waste-management hierarchy. In Canada, waste-management policy such as EPR is implemented by the provincial and territorial governments.

The ability of EPR policy to integrate environmental decisions throughout a product's life cycle, from design to EOL management, has resulted in EPR programs becoming increasingly popular for more and more types of products in Canada, the United States, Europe and beyond. The European Union (EU), under the Single-Use Plastics Directive (EU/2019/904), requires Member States to establish EPR schemes for producers of fishing and aquaculture gear containing plastics. The Directive covers the 10 types of single-use plastic products that are found most often on beaches in the EU (estimated to represent around 86% of the single-use plastics found in counts), as well as fishing and aquaculture gear containing plastic and products made from oxo-degradable plastic. The Directive requires EU Member States to report on fishing gear placed on the market and on waste fishing gear collected as of 2022. Member States also had to set up collection targets for fishing gear by July 2021. Austria, Sweden and Estonia are among the first countries to transpose the EU Directive into their national frameworks, and outside of the EU, both Norway and the United Kingdom are planning similar policies.

3.2.1 Challenges Associated with the Implementation of EPR

EPR programs can be challenging to implement due to the number of parties involved, the complexity of defining the producers and the materials to be obligated, and uncertainties regarding how the costs of managing a waste type compare with the resources that end-users may be able to bear. EPR for fishing and aquaculture gear could be more complex than other EPR programs implemented in jurisdictions in Canada to date due to the composition of the materials, the degree of contamination involved, the availability of existing infrastructure and the lack of existing end markets. Most EPR programs in Canada started by utilizing or building on existing infrastructure investments made by the public over several decades, whereas collection, cleaning and deconstruction infrastructure for EOL fishing and aquaculture gear is much less prevalent in Canada. In comparison to existing EPR programs, the time to develop and implement an EPR program for EOL fishing and aquaculture gear, including establishing the necessary infrastructure, is anticipated to be considerable.

Concerns about high costs and administrative burden also exist against a backdrop of international competitiveness. Gear producers could pass on additional costs resulting from EPR to end-users, who are competing with international end-users. This would be concerning for Canadian operators due to the proximity to United States producers that would have lower operating costs. This scenario could be especially problematic given that some stakeholders and interested parties indicated that a relatively small number of producers (nine that are known of) provide the majority of this gear to Canadian operators. Therefore, the cost of developing infrastructure and maintaining a recycling system for EOL fishing and aquaculture gear could be applied to a small number of parties.

3.2.2 Considerations for Timeframes for Implementation in Canada

Provinces and territories within Canada are at different stages when it comes to the implementation of EPR. Select jurisdictions have engaged in discussions with organizations such as FGCAC to explore the feasibility of EPR for fishing and aquaculture gear.

Several stakeholders and interested parties suggested starting EPR programs in phases — starting with products that are common across several industries, such as rope. Others indicated that learning from or even working with other functioning EPR programs, such as the Cleanfarms program for agricultural plastics, and exploring possible synergies with common materials may be one way of taking steps toward implementing EPR.

The FGCAC is piloting the collection and processing of gear in the Atlantic provinces. The FGCAC has also identified recyclers for many of the EOL materials that are generated by aquaculture operators and fishers, as well as a network of transfer stations and other existing waste-management infrastructure to act as stockpiling locations for select materials. OLF has established seven collection depots along the coast of British Columbia and is recycling some of the plastics that it is able to gather from depots while collecting information on the major generators of EOL gear in British Columbia to aid any later efforts to implement EPR. OLF has recently expanded to Atlantic Canada; it established two official sites in Nova Scotia and New Brunswick, and is also collecting material at six wharf sites in these provinces.

3.2.3 Potential Work to Support Implementation

Implementing EPR will require a better understanding of the number and types of gear producers, the types of materials that producers will be obligated to manage, the targeted groups (e.g., commercial fishers, aquaculture operators and recreational fishers), potential costs, and the amount of time to implement. As noted above, this work is unlikely to be completed in the short term and will likely take sustained effort to reach completion. Work will need to include extensive engagement with gear producers, fishers and aquaculture operators, waste managers and organizations currently working toward gear recycling. Given the need for consistency in policies, exploration of Canada-wide implementation of EPR is warranted.

Stakeholders and interested parties discussed the importance of developing supporting policies to EPR such as prohibitions or restrictions to increase the collection of gear, as well as green procurement and/or recycled content requirements to strengthen demand for recycled products.

Stakeholders and interested parties also discussed the value of achievable performance measures and targets and that engaging with organizations that administer and operate EPR programs for similar materials could be helpful. Stakeholders and interested parties also voiced that EPR could be phased in, starting with more prevalent or more easily recyclable materials.

3.3 Circular Design Standards

Incorporating circular design will produce a longer-lived product that can be repaired or updated and/or that considers those who manufacture, maintain and recycle it. Factors such as the number and types of materials and ease of separation are incorporated when products are produced using circular design standards.

Recyclers usually require a clean stream of a single polymer in order to produce a commodity that can be sold into applications that have valuable end-markets.

Designing gear that is relatively easy to separate into component parts is one of the main barriers to recycling EOL gear. Making this process as easy, fast and efficient as possible has the potential to significantly reduce recycling costs.

The importance of these standards is evidenced by the approach of the European Commission, who have requested that the European Standardisation Organisations develop harmonized standards related to the circular design of fishing gear (Landbell Group 2020). The European Committee for Standardisation has established a Technical Committee to address different aspects of circular fishing gear and develop standards.

3.3.1 Challenges Associated with the Implementation of Circular Design Standards

Circular design standards will need to successfully navigate several conflicting requirements. While a single-plastic resin design is desirable for recycling, gear must be made strong enough to survive the marine conditions to prevent accidental releases to the environment, and fishing gear design must comply with federal licencing requirements. This is why some gear is designed with multiple resins. Additionally, some gear is not possible to make from single materials; many types of traps use various materials such as metals, concrete, plastics and wood. The need to make gear that is easy to disassemble and recycle must be balanced with the need for gear to do its job appropriately, last for a long time, and be strong enough to survive in the challenging marine environments in which it operates.

Circular design requirements on the gear Canadian fishers and aquaculture operators use could increase costs, if competitors are able to source cheaper materials and charge less for their products. If possible, pursuing circular design standards at a multinational level — in cooperation with other bodies such as the United States or the EU — could reduce this particular barrier for Canadian operators. The challenge with this approach is that different jurisdictions will have different standards regarding the gear and how it is constructed, and conflicting requirements will need to be addressed within harmonized design standards. This could potentially be a problem within Canada as well, as provincial jurisdictions could have different requirements for gear

already in place. These types of harmonization issues can only be addressed via inter-governmental cooperation and dialogue.

Stakeholders and interested parties discussed the complexity of gear and the lack of research and development work on how to improve recyclability without compromising durability, as well as the need to develop and strengthen markets for recycled materials. Stakeholders and interested parties also discussed the large global market, of which Canada occupies a small share, meaning that imposing standards in Canada could increase costs and make Canada less competitive. Stakeholders and interested parties discussed the prevalence of homemade and customized gear and the risk of increasing its use by strengthening standards. Finally, stakeholders and interested parties emphasized the importance of harmonization among jurisdictions within Canada.

3.3.2 Considerations for Timeframes for Implementation in Canada

There is likely no short-term route to the rollout of comprehensive circular design standards for fishing and aquaculture gear. As indicated in section 3.1.3, implementing requirements on Canadian fishers and aquaculture operators (or manufacturers/importers of gear) could raise competitiveness issues. Stakeholders and interested parties indicated that jurisdictions should focus on identifying opportunities with fewer barriers to implementation. For example, focusing on gear with a reasonable price differential between more easily recyclable gear and gear that is more difficult to recycle could be a starting place to mandate or encourage recycling. Over time, additional opportunities for substitution could be identified and incremental movement toward a larger set of circular design standards that focus on using recyclable materials and making gear easier to separate could evolve.

3.3.3 Potential Work to Support Implementation

As noted above, feedback from stakeholders and interested parties focused on establishing requirements that will transition fishers and aquaculture operators toward gear with the following qualities:

- incorporates more recyclable materials
- is easier to separate
- does not pose a significantly higher cost burden or offer compromised performance/durability.

Stakeholders and interested parties recommended that further research and development support would be prudent for select materials and products to address recyclability without compromising durability. Stakeholders and interested parties also highlighted the importance of adequate education and awareness throughout the industry, as well as the importance of support to help the Canadian industry stay competitive until other international jurisdictions develop requirements.

3.4 Ecological Design

Utilizing materials that are less harmful to marine life and the environment should be considered during the development of circular design standards or criteria and when prohibiting or mandating certain fishing gear.

3.4.1 Challenges Associated with Implementing Ecological Design

Stakeholders and interested parties indicated that the marine environment is very different from the terrestrial environment. Utilizing materials that are biodegradable in the terrestrial environment may lead to premature gear failures within the marine environment. Higher gear-failure rates may lead to increased equipment costs, losses in catch or increased escapes, as well as increases in ghost gear. If biodegradable materials are more expensive than non-biodegradable materials, gear cost could also increase.

There are no current standards or certifications for ecological design, which could limit its efficacy as an industry-led best practice. Consideration could be given to policies that require ecological design.

3.4.2 Considerations for Timeframes for Implementation in Canada

Like circular design standards, comprehensive requirements may not be realistic in the short term as further work should be undertaken to investigate which types of gear may be best positioned to transition to more sustainable materials. One workshop participant indicated that lobster bands, which are typically single use and can be accidently lost, may be a good candidate for biodegradable materials.

It should be noted that select sustainable materials may not be biodegradable, as some may break down to microplastics that can cause harm. Overall, there are competing priorities when it comes to material selection that should be taken into account when considering action on influencing gear, and policymakers will need to balance these priorities as technologies continue to advance.

3.4.3 Potential Work to Support Implementation

Regional research should be carried out that focuses on interviews with regulators, relevant gear manufacturers, and fishers and aquaculture operators regarding the types of gear that present the greatest risk to the environment and that can transition to materials that may cause less harm if released. Items such as feed bags, lobster bands and other smaller objects that could potentially be lost due to storms, accidents or negligence could be prioritized, as could single-use items that may not always be appropriately collected.

The results of this review could be leveraged to identify the types of gear that could be replaced with less-harmful alternatives at the lowest additional cost. In addition, results from interviews with fishers and aquaculture operators could be utilized to identify areas where reuse or recycling are already occurring, making substitution a less attractive alternative.

This process should be repeated as technology progresses and connections between regulators, gear manufacturers, distributors and operators are established in order to improve and standardize the gear used.

3.5 Traceability of Polymers

In Canada, all commercial non-tended gear must have identifiable markers, such as gear tags, that can be used to establish ownership of gear and reconnect lost gear with owners. Additional gear identifiers that indicate the region, target species and individual fishing area may also be required, as is seen in Atlantic Canada, where untended fixed-gear fishery ropes have identifiers woven in. This requirement is intended to maintain access to United States markets by demonstrating comparable fishery management measures between Canada and the United States. In addition to increased fishery traceability such as information on quantities used and location of use, knowing what specific materials are used in fishing and aquaculture gear is critical to being able to increase the circular economy approach to this gear. This section looks at policy and practices that would ensure the traceability of the different polymers in gear. Once fishing or aquaculture gear is in the water, it can be difficult to tell what products it comprises, or its origin and supplier. This information could be obtained by implementing policy that requires gear producers to obtain and share data on the materials within their gear along the entire reverse supply chain. This data could be applied as part of creating efficient sorting and recycling capacity so that processors have a high degree of confidence regarding the specific material they are managing. These measures could also contribute to requirements for minimum recycled content, as well as incentives for returning gear for recycling.

3.5.1 Challenges Associated with Ensuring the Traceability of Different Polymers in Gear

One major challenge with trying to ensure the traceability of polymers in gear is an appropriate labelling method. Tags have been suggested, but they can break off — especially in situations where the gear itself has been subjected to harsh conditions and has been damaged. Quick Response (QR) codes have also been suggested in some literature, but these would have to be printed onto gear in such a way that the code would not become unreadable during the life of the gear. A varied approach may be necessary, where different types of gear would need to use different strategies so marking methods last the lifetime of each piece of gear and are strategically applied so that rope and gear are identifiable even if damaged.

International competitiveness may present the most substantial barrier to advancing increased gear manufacturing requirements, as Canada-specific products would have increased capital expenses. As with all new fishing gear requirements, negotiating with gear manufacturers in coordination with other international jurisdictions would be necessary to establish manufacturer buy-in. Canada-wide oversight or guidance of provincial inclusion for material marking measures will be important so that regionally implicated infrastructure will be capable of adapting to recycling needs. This strategy could also support product marking that extends beyond the fishing industry to all other at-sea activities or in other applications.

3.5.2 Considerations for Timeframes for Implementation in Canada

There are no short-term paths to implementing a comprehensive set of polymer traceability standards in Canada. Instead, this possibility should be considered in the international context and over the long term. In the mid-term, efficiencies such as standardizing some gear types will be necessary to make manufacturing easier and increase the likelihood of compliance by manufacturers. Such actions should be undertaken on a case-by-case basis, and with caution to avoid unintended consequences.

3.5.3 Potential Work to Support Implementation

Connecting with other jurisdictions, including the EU, that are currently working toward circular fishing gear design standards will increase compliance from gear manufacturers and ensure a Canadian perspective is considered. Similar efforts should be undertaken with regulatory bodies in the United States and other countries that Canadian fishers and aquaculture operators compete with, thereby maintaining equality within fishing sector requirements and increasing market demand for fishing gear traceability requirements.

When looking to cooperate with these international bodies, Canada should be prepared with evidence-based methods and priorities for increased gear traceability. Supporting research will need to be accomplished in collaboration with fishers, aquaculture operators, waste managers, and gear manufacturers and distributors to identify gear and materials that are most suitable to modification and to ensure sector buy-in.

3.6 Prohibition or Mandating Gear Types

Certain types of fishing and aquaculture gear have been found to be more easily lost into the environment than others, such as gear made from polystyrene or polyurethane. Expanded polystyrene, for example, is a material that has been found to easily get released to the environment and cause harm. It is prohibited in some jurisdictions, while other jurisdictions have requirements for its use, such as a hard outer shell that will prevent releases. An example of this type of prohibition is Washington State, which enacted a law in April 2023 that, as of January 2024, prohibits the sale and installation of overwater structures — including docks, floats and walkways — containing expanded or extruded plastic foam that is not fully enclosed.

3.6.1 Challenges Associated with Prohibiting or Mandating Certain Fishing Gear Types

Stakeholders and interested parties rated this policy relatively well, but also clearly felt that any prohibitions or mandates would need to be carefully considered to prevent unintended side effects. Stakeholders and interested parties indicated that prohibiting certain equipment could result in: (i) illegal waste disposal practices and dumping to prevent being caught; (ii) widespread non-compliance; (iii) an increase in homemade and customized gear so that desired types of gear can continue to be used despite import restrictions; and (iv) potential competitiveness issues for Canadian operators, who could be forced to buy gear that is more expensive than that used by operators outside of Canada.

Stakeholders and interested parties indicated that prohibiting certain gear was not advisable unless there were well-developed alternatives that were cost-competitive with the prohibited product and widely available. Additionally, stakeholders and interested parties noted that there was a preference for phasing in any mandates or prohibitions, as this would give fishers and aquaculture operators time to adapt their gear and would give manufacturers and distributors time to go through any stock of items that would eventually be prohibited and switch their production to alternatives. Finally, several stakeholders and interested parties indicated that prohibitions or mandates would require significant enforcement, and some jurisdictions may struggle with the additional staff and monitoring that this would require.

Stakeholders and interested parties discussed the challenges associated with gear mandates or prohibitions and highlighted concerns that gear prohibitions can disproportionately impact small-scale fishers and aquaculture operations, which have more limited resources and cannot absorb extra costs like larger entities can. They also noted that any prohibitions or mandates should be Canada-wide in scope to maintain a level playing field.

The introduction of mandates or prohibitions would also require the introduction of mechanisms to monitor compliance. Certain requirements have already been included in licenses under the Department of Fisheries and Oceans in British Columbia, but challenges around implementations and the timing have arisen. It is also important for regulators to keep up with gear innovation.

In discussions regarding mandates on the use of biodegradable materials, there were concerns regarding mandating a weaker gear type that could lead to greater amounts of lost gear. Other concerns include that these materials can reduce recyclability, that they could increase the release of microplastics into the marine environment, and that combining a non-biodegradable net with biodegradable rope could cause the net to be lost.

3.6.2 Considerations for Timeframes for Implementation in Canada

Any short-term prohibitions or mandates would be for materials that have already been identified as problematic, have cost-competitive alternatives already available, and that have already been prohibited or restricted in other jurisdictions (i.e., exposed expanded polystyrene). Any potential prohibitions or gear mandates that do not meet these criteria would need to be considered in the mid- or long-term timeframes, preferably with an additional cushion of a phased approach that gives fishers and aquaculture operators plenty of warning and time to adapt.

3.6.3 Potential Work to Support Implementation

Suggestions from stakeholders and interested parties centred around targeting gear for which there are already affordable alternatives available and focusing licensing requirements on these gear types. Stakeholders and interested parties also suggested that prohibitions should be phased in and supporting policies should be considered. Stakeholders and interested parties encouraged options for accepted materials as opposed to one or two options.

3.7 Partnerships

This policy is closely related to the infrastructure development policy, as it is based around ways to encourage ports and harbours, existing waste-management infrastructure, and recyclers to work together to establish better methods of collecting, processing and recycling EOL gear. Stakeholders and interested parties frequently indicated that no single infrastructure solution could be uniformly applied across Canada due to varying local conditions including harvester density, as developing infrastructure capable of handling several types of gear might not be cost-effective due to low volumes. This is where collaboration could help, with certain facilities specializing in specific gear types and forwarding other gear to nearby partner facilities.

3.7.1 Challenges Associated with Pursuing Collaboration Between Ports and Harbours and Other Parties

The primary challenges identified by stakeholders and interested parties were the complexities associated with collecting diverse gear types distributed over a large geographical area of varying density and the level of coordination required to collaborate among all parties in such a setting. The lack of knowledge regarding waste generation and the limited waste-management infrastructure that is designed to handle this specific type of waste also pose a challenge. The Ghost Gear Fund has supplied funding to address some waste-management shortcomings, but the long-term method to address EOL materials requires a substantial change in the current economic model to create independent economic drivers to fund various waste-management processes.

3.7.2 Considerations for Timeframes for Implementation in Canada

The policy and practices to address the issues will be implemented in a timeline of phases. In the short term, a study (or collection of regional studies) could be undertaken to identify gaps and opportunities for efficiencies. The results of these studies could then be leveraged to develop interconnected local systems that could prepare and process various EOL gear. In the medium term, stakeholders and interested parties managing existing infrastructure could be engaged regarding next steps for increasing capability to address more types of locally created EOL gear, while improving integration into established local waste-management networks. The full implementation of local networks of ports and harbours, processors, waste managers and recyclers working together to process and recycle all EOL gear will be a long-term objective.

3.7.3 Potential Work to Support Implementation

As noted above, a series of regional-level studies that identify gaps and opportunities for collaborative relationships and mutual benefits would be a strong place to start. Any additional steps would need to be informed by these studies.

3.8 Gear Tracking

Generating the data used to estimate the amount of EOL fishing and aquaculture gear that enters the waste sector each year in Canada in support of this study was very challenging. Data from a number of different sources were used, and estimates were developed partially through data, but also by applying a variety of factors to the data identified through literature. No strong datasets were identified that accurately quantified the amount and types of EOL gear entering the waste stream in any region of Canada each year. Interviews with the FGCAC, OLF and other organizations across Canada confirmed the lack of such datasets. Developing an EPR program or developing the infrastructure necessary to process and recycle EOL gear requires a relatively accurate dataset of gear through its full life cycle.

3.8.1 Challenges Associated with Tracking, and Developing an Inventory of Fishing and Aquaculture Gear, Particularly for Plastics

The main challenge associated with filling this data gap is that reporting would need to start with fishers and aquaculture operators. Stakeholders and interested parties had varying views on the capacity of fishers and aquaculture operators to comply with current regulatory requirements and cooperate in new information-gathering and waste-tracking activities. The willingness to comply with additional government reporting likely varies by jurisdiction and potentially by facility or operation type. Further jurisdictional engagement with relevant parties could clarify where additional EOL gear-management tracking could be undertaken.

It is important to note that some fishers and aquaculture operators may be engaging in illegal dumping, either in bodies of water or on land, and may not provide accurate figures when detailing their waste generation. This can impact the accuracy of data-gathering.

Conversations with the FGCAC revealed that some fishers indicated that they may simply cut loose any trap that they pull up that appears to be broken, as storing the broken traps in a separate area on their boat, bringing them into port and then taking them to a waste transfer station involves significantly more effort and cost compared to simply cutting a rope (interview with FGCAC, May 1, 2023). It may be that the ongoing scale of illegal dumping in bodies of water is significant, and policymakers have no idea because there is no waste-generation data to verify any potential shortfalls of waste arriving at transfer stations.

Some stakeholders and interested parties indicated that gear-tracking requirements could be integrated into licensing requirements. In some jurisdictions, construction, renovation and demolition waste must be dropped off at specific transfer stations and is tracked in order to prevent illegal dumping. If the number of traps in the water were tracked as part of licensing, and the number of new traps purchased each year were tracked via purchasing, then transfer stations or other waste-receiving facilities could theoretically identify those operators for whom shortfalls in transfer station disposal are consistent. However, there are several barriers to this strategy, and significant compliance issues and regulatory gaps remain — such as the fact that transfer stations do not often track EOL gear waste, with many of them simply categorizing all waste from fishing and aquaculture operations as mixed commercial waste.

3.8.2 Considerations for Timeframes for Implementation in Canada

Many of the other policies suggested within this study (such as infrastructure development and EPR) would require a good waste-generation dataset before they could be appropriately implemented. Unfortunately, developing an accurate dataset of annual EOL gear generation in Canada (based on real-world tracking versus estimates) is likely a long-term goal. New practices would need to be adopted at facilities that receive waste in order to begin tracking, and new requirements would need to be added into licensing for fishers and aquaculture operations in order to encourage tracking earlier in the gear's life cycle — and these changes would still not solve current problems associated with non-compliance and illegal dumping/release.

3.8.3 Potential Work to Support Implementation

Working with more waste receivers that accept EOL gear from fishers and aquaculture operations would be a strong first step in trying to develop a better inventory of annual EOL gear generation. To move toward a more accurate waste-tracking system, work with fishers and aquaculture operators could be undertaken to better understand how to cooperate on inventory tracking while minimizing administrative burden and additional costs to operators.

3.9 Green Procurement

Governments have the ability to utilize their own procurement strategies to encourage the private sector to offer products or services that incorporate environmental considerations. Traditional green procurement focuses on driving sustainable product development by identifying preferred products based on their attributes or certifications. Specifying the incorporation of certain materials, management practices or certifications could encourage some parties to comply with their requirements in order to earn business. For example, governments procure food services for institutions and events. Jurisdictions could require that seafood products be from operations that meet prescribed gear-management standards. This could be done in parallel with green standards or certifications that require responsible EOL gear-management practices. Incorporating existing certification labels into procurement specifications, such as ENERGY STAR for equipment, Electronic Product Environmental Assessment Tool (EPEAT) for electronics and Leadership in Energy and Environmental Design (LEED) certification for new buildings, is one of the most widely adopted practices in green procurement.

3.9.1 Challenges Associated with the Implementation of Green Procurement

The primary challenges associated with green procurement policies are selecting the appropriate contracts to include green procurement requirements and preparing the requirements in a way such that bids are still received by the departments requesting goods or services. Departments and agencies developing procurement documents should connect with large and small potential suppliers regarding their capabilities and ensure that the requirements are attainable.

3.9.2 Considerations for Timeframes for Implementation in Canada

Green procurement policies could be incorporated with each new procurement document or could be implemented through centralized supply arrangements. Jurisdictions may also wish to consider piloting certain types of requirements to inform future procurements.

There are unlikely to be any substantial oversight barriers that would prevent a government department from incorporating green procurement policies within their procurement documents.

3.9.3 Potential Work to Support Implementation

Government departments preparing procurement documentation for select sectors should investigate using green procurement requirements.

Government departments should also consider engaging with the private sector for options to incorporate green procurement. This strategy would foster relationships with potential vendors and could be done through, for example, industry days, requests for information or industry collaborations.

3.10 Certification Standards

A number of non-profit organizations, such as the international Marine Stewardship Council, develop and offer certification standards that focus on environmental and social responsibility for seafood products. Certification under these programs offers guidance, structure, validation and recognition that a company operates in an environmentally and socially responsible manner. The certifications that are generally recognized and sought after in Canada include measures to minimize gear loss and mitigate the impact of any lost gear. However, these certifications have not yet incorporated standards for EOL fishing and aquaculture gear. Jurisdictions could put pressure on or work with certification organizations to include EOL standards.

3.10.1 Challenges Associated with Exerting Pressure on Environmental Fishing Standards to Include Responsible Gear Disposal

The thresholds adopted in these standards strike a balance of environmental and social responsibility, while also considering achievability for clients from the perspective of business feasibility, competition or financially viability. Although standards vary based on organization, the extent that EOL gear-management requirements will be incorporated will depend on whether enough fishers and aquaculture operators can achieve the standards.

The primary external pressure to adopt and maintain these certifications is market-oriented and can come from consumers as well as from larger corporate seafood buyers, such as grocers. These certifications are not legally enforced through regulatory operating licences, so there is no current path for government bodies to use these certifications to enforce or monitor the waste-management activities of those businesses that are certified. The certifications most referenced in Canada's

seafood sector include auditing; however, depending on the certification, there may be no auditing or monitoring for compliance. In these situations, non-compliance may be possible.

Many seafood harvest and grower operations in Canada invest in third-party certification as it adds market value to products, especially in jurisdictions where certifications are often used by buyers to screen out select suppliers. If third-party certifiers were to include more progressive management of EOL fishing and aquaculture gear, it would put pressure on companies in the sector to find solutions for EOL gear to increase the value of their products. However, it may be challenging to implement criteria through these programs that exceed regulatory requirements or are not achievable through existing infrastructure.

3.10.2 Considerations for Timeframes for Implementation in Canada

This strategy is suitable to implement immediately. However, the inclusion of EOL management gear in standards is up to certification bodies. There are no significant barriers preventing jurisdictions from reaching out to certification organizations to begin conversations about possible additions to standards or the importance of EOL management.

3.10.3 Potential Work to Support Implementation

Jurisdictions should identify the certification programs that may apply to Canadian fishers and aquaculture operations and understand any requirements regarding EOL management.

4.0 SUMMARY

The purpose of this document is to help guide federal, provincial and territorial governments in the consideration of options to increase the collection and EOL management of fishing and aquaculture gear. The report first estimates the weight of fishing and aquaculture gear currently being disposed of, stockpiled and recycled in Canada. It then describes a shortlist of policy options and best practices for jurisdictions to consider to increase the collection and EOL management of gear resulting from engagement with stakeholders and interested parties and analyses conducted throughout 2023.

Projecting the total amount of EOL fishing and aquaculture gear in Canada was challenging due to the absence of established methods for tracking and accounting of materials. This resulted in significant information gaps, and a reliance on methods that either extrapolate the total amount of the material using limited datasets, or that apply estimates from other places in the world. Regardless, the amounts presented in this report help provide context that could support the development of policy options and best practices in Canada. Decisions to implement one or more of the options discussed could require a more comprehensive dataset. This is emphasized where policy options require investments in infrastructure or services.

The shortlist of ten policy options that stakeholders and interested parties felt should be prioritized to increase the collection and EOL management of fishing and aquaculture gear included infrastructure development; EPR; circular design standards; eco-design; traceability of polymers;

prohibition or mandating of gear types; partnerships; gear tracking; green procurement; and certification standards. Each policy or practice includes a discussion of the challenges to implementation, as communicated through the engagement with stakeholders and interested parties; the potential timeframe for considering aspects of the policy or practice; and finally, a brief description of work that stakeholders and interested parties identified as important or complementary to initiate or implement the policy or practice.

Through the engagement, stakeholders and other interested parties emphasized the challenging nature of implementing policies and best practices for EOL fishing and aquaculture gear, including the sensitivities around international competition, the composition and durability of the materials, the degree of contamination present given the environment in which gear operates, the availability of existing infrastructure for EOL management and the availability of existing end markets. Some of the policies or practices identified would have a larger impact on the EOL management of gear but would require more considerations of these challenges and more effort and time to implement, such as EPR or circular design standards, while others can be implemented more easily, such as green procurement. This report is not a prescriptive "how-to" guidance document, but rather a toolbox of options. Every jurisdiction is different in terms of its location, size, infrastructure, existing programming, priorities and waste policy situation, and jurisdictions may choose policy options or practices based on their unique circumstances.

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APPENDIX: WORKSHOP PARTICIPANTS

February 8, 2023, workshop

Aquaculture Stewardship Council (Netherlands)

Ashored Inc. (Nova Scotia)

Atlantic Groundfish Council (Nova Scotia)

British Columbia Ministry of Environment and Climate Change Strategy

Burin Peninsula Regional Service Board (Newfoundland and Labrador)

CCME Secretariat

Central Newfoundland Waste Management (Newfoundland and Labrador)

Cheminfo Services (Ontario)

Comité ZIP Côte-Nord du Golfe (Québec)

Comité ZIP des Îles-de-la-Madeleine (Québec)

Department of Fisheries and Oceans (including Small Craft Harbours) (Canada)

Department of Land and Environment (Prince Edward Island)

Eastern Regional Service Board (Newfoundland and Labrador)

Econext (Newfoundland and Labrador)

EnviroCulture Consulting (Nova Scotia)

Fishing Gear Coalition of Atlantic Canada (Nova Scotia)

Fundy North Fishermen's Association (New Brunswick)

Global Ghost Gear Initiative (United States)

Multi-Materials Stewardship Board (Newfoundland and Labrador)

Natural Resources Consultants (United States)

New Brunswick Department of Environment and Local Government

Newfoundland and Labrador Department of Environment and Climate Change

Newfoundland Aquaculture Industry Association

Newfoundland Department of Fisheries, Forestry and Agriculture

PAC Recycling (British Columbia)

Prince Edward Island Aquaculture Alliance

Prince Edward Island Fishermen’s Association

qRD (qathet Regional District) / Let's Talk Trash (British Columbia)

Robin Hood Bay Regional Landfill (Newfoundland and Labrador)

Southwest New Brunswick Service Commission

Steveston Harbour Authority (British Columbia)

Surfrider Foundation Canada (British Columbia)

Sustane Technologies (Nova Scotia)

Ulnooweg Development Group (Nova Scotia)

Western Regional Service Board (Newfoundland and Labrador)

February 22, 2023, workshop

British Columbia Ministry of Environment and Climate Change Strategy

British Columbia Ministry of Forests - Aquaculture

British Columbia Ministry of Water, Land and Resource Stewardship

CCME Secretariat

Cheminfo Services (Ontario)

Department of Fisheries and Oceans (Aquaculture; Pacific Region; Resource Management; Small Craft Harbours) (Canada)

Department of Land and Environment (Prince Edward Island)

Environment and Climate Change Canada -

Ministère de l’Environnement, de la Lutte contre les changements climatiques, de la Faune et des Parcs (Québec)

Multi-Materials Stewardship Board (Newfoundland and Labrador)

Natural Resources Consultants (United States)

New Brunswick Department of Agriculture Aquaculture and Fisheries

New Brunswick Department of Environment and Local Government

Newfoundland and Labrador Department of Environment, Climate Change and Municipalities

Newfoundland and Labrador Department of Fisheries, Forestry and Agriculture

Northwest Territories Department of Environment and Natural Resources

Nova Scotia Department of Fisheries and Aquaculture

Nunavut Department of Environment, Environmental Sciences

Yukon Government