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Building Back Sustainably: COVID-19 Impact and Adaptation in Newfoundland and Labrador Fisheries

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Abstract: The coronavirus pandemic, which started in late 2019, is one of the devastating crises that has affected human lives and the economies of many countries across the globe. Though economies have been affected, some sectors (such as food and fisheries sectors) are more vulnerable and prone to the deleterious impacts of the COVID-19 pandemic. This paper highlights the various disruptions (safety at workplace, loss of harvest and processing activity, loss of export opportunities and income) faced by the Newfoundland and Labrador fisheries due to several restrictive measures (especially on mobility, social distancing, quarantine, and, in extreme cases, lockdown) to curtail the spread of the virus. Additionally, this paper makes a case that Newfoundland and Labrador fisheries can be managed sustainably during and after the pandemic by suggesting practical recommendations borrowed from two sustainability frameworks (Canadian Fisheries Research Network and the EU Setting the Right Safety Net framework) for managing fisheries in Canada and the European Union.

Keywords: NL fisheries; sustainability; coronavirus; food security; policy; CFRN framework; SRSN framework

Citation: Asante, E.O.; Blankson, G.K.; Sabau, G. Building Back Sustainably: COVID-19 Impact and Adaptation in Newfoundland and Labrador Fisheries. *Sustainability* **2021**, *13*, 2219. https://doi.org/10.3390/su13042219

Academic Editor: Just Bayle-Sempere

Received: 26 January 2021
Accepted: 15 February 2021
Published: 19 February 2021

1. Introduction

The year 2020 began with the global emergence of a new Covid-19 virus that had first caused a wide spread of the coronavirus disease in China, specifically Wuhan province, at the end of December 2019 [1]. Since then, the virus has spread fast across the globe and has greatly affected development by its health and economic shocks [2]. The World Health Organization (WHO) declared the disease as a global health emergency, following the extent of the spread of the virus and its high mortality rate, on 30th January 2020 [3]. The virus is known to be highly transmissible among humans [2]. Intensive research is currently on-going with promising results to develop a vaccine for the virus [4,5]. Prior to the development of a vaccine, high profile health bodies, including the US Center for Disease Control and Prevention and WHO, issued some preventive practices in order to reduce the spread of the virus. Some of the recommended practices included bans on travel to high-risk areas, avoiding contact with individuals with related symptoms, hand washing measures, and wearing of face masks [3].

The coronavirus disease (Covid-19) pandemic has spread rapidly to almost every nation around the world, and countries including Canada are struggling to implement strategic measures to reduce and prevent the spread of the virus [6,7]. This pandemic has caused numerous alterations in the lives of Canadians and has produced extensive effects on the economic and social aspects of the economy, following the various restrictive measures (especially on mobility, social distancing, quarantine, and, in extreme cases, lockdown) to curtail the spread of the virus. Although the whole economy is affected, there are some sectors (such as the food and fisheries sectors) that are more vulnerable and prone to the devastating effects of the Covid-19 pandemic [8]. Fisheries play an important

role in the food sector and contribute to food security; hence the negative impacts of the pandemic on fisheries could have a ripple effect on the food industry. The Canadian fish and seafood industry which is highly export-oriented, exporting about 75% of its production, has suffered significantly throughout the pandemic, especially due to the collapse of the fish and seafood market resulting from the travel restrictions and lockdown regulations in China and the United States of America. The government of Canada is pulling out all innovative measures through research, participation, and funding packages to support the fish and seafood industry in the country. This paper focuses on the impacts of the Covid-19 pandemic on the Newfoundland and Labrador fish and seafood industry, explores the various response options in place to revive the sector, and further provides some recommendations towards building a more sustainable Newfoundland and Labrador post-pandemic fishery.

2. Literature Review

2.1. Covid-19 Impacts on Global Fisheries

The global fish and seafood market is one of the largest and most highly integrated markets in the world, with long supply chains and thousands of participants. The global fish and seafood market size is projected to reach USD 194 billion by 2026, from USD 159 billion in 2020, expected to grow at a Compound Annual Growth Rate (CAGR) of 3.4% during 2021–2026 [9]. The size and complexity of the global seafood and fish market show the importance of fisheries to the economy and the need to assess the impact of Covid-19 on global fisheries. In Bangladesh, the Covid-19 pandemic has placed a toll on the country's major agricultural subsectors (crop, livestock, fisheries). According to [10] the implementation of lockdown measures during the pandemic has resulted in a loss of BDT 2 billion (CAD 30.1 million / USD 23.6 million) per day in the agricultural sector of Bangladesh. In Myanmar, a greater percentage of fish wholesalers discontinued their operations due to ordered curfews announced in Yangon [11]. A significant impact of Covid-19 on fisheries in Myanmar is falling prices because of low demand and high cost of production leading to a reduction in fish harvests [11]. There is also a lack of imported seed and feed for aquaculture, due to shipping bans aimed at reducing the spread of the virus [12]. In Europe, according to [13], the France Water Authority announced that there are traces of the coronavirus in their waterbodies which could be deadly to fish and other aquatic organisms.

Small-scale fisheries have been impacted greatly during the pandemic. For example, in Namibia, the small-scale fisheries sector was forced to close totally because of its little contribution to the national economy [8]. The market dynamics associated with the pandemic (i.e., reduced demand, falling prices, shipping bans, etc.) have affected the livelihoods of people involved in small-scale fisheries [8]. Most people who work in the fisheries industry have lost their jobs and incomes these past few months, especially in India, where fisheries employ most of its citizens [13]. Also, Indonesia experienced a plummeted sale of fish as demand for fish waned since the spread of the coronavirus [14]. This situation threatens the livelihood of people engaged in aquaculture and the seafood industry. According to [14], Covid-19 has disrupted the fish market and supply chains in the Malaysian coastal communities due to the seizure of operations by middlemen and low demand for fish products. All these highlighted impacts from various countries confirm the threat Covid-19 poses to the fish and seafood industries across the globe.

2.2. Covid-19 Adaptation in Fisheries

Amidst the negative effects of the pandemic on fisheries, governments around the world employed different strategies and response options to deal with the challenge of ending the health crisis and protecting their fish and seafood industry. In Cambodia, the government banned the export of some fish and rice products in order to keep them available for local consumption, thus ensuring food security [10]. A financial intervention by the government of Bangladesh was launched to provide refinance for farmers in the

agricultural sector including fisheries to make up for the impacts of the pandemic [10]. The government of Malaysia permitted activities in the agriculture and fisheries supply chain to continue normally, despite the lockdown measures—similar to the case in the Philippines [10]. The Philippine government invested in a loan facility amounting to Philippine peso (PHP) 2.8 billion (CAD 74.3 million) to support the agri-fisheries industry. The Indonesian Ministry of Maritime Affairs and Fisheries prohibited the import of fish and other seafood products from China to reduce the spread of the virus [15]. In Jakarta, the capital of Indonesia, strict measures have been employed in monitoring imported frozen fish into the city [16]. The Singapore Maritime Authority has instituted extra precautionary measures, such as compulsory temperature checks at sea point terminals, tracking the movement of staff to China, and suspending shore leave for personnel in China during the pandemic [15].

According to [8], some countries have demonstrated positive initiatives towards supporting small-scale fisheries during the pandemic. These action responses include food sharing, change in distribution models by selling to a more localized market, and a collaboration between governments and fisheries organizations or groups. The lockdown measures have prevented fishing in some communities which is seen as an opportunity for fish stock recovery [8]. Furthermore, the decline in releasing industrial waste and toxic chemicals into waterbodies because of the pandemic has increased the quality and biodiversity of water in different regions [17]. For example, a study conducted on the status of phytoplankton (primary food for fish species) in the Hooghly river in India showed an increase in phytoplankton in the river during the lockdown, which is obviously due to less pollution [18]. This indicates that fish will have a better environment to reproduce and increase their population leading to an increase in fish stocks. The Indian Council for Agricultural Research (ICAR) launched a GIS-based information system to monitor fish landing centers in proximity to Covid-19 hotspot communities [19]. This helped authorities to make decisions on which precautionary measures to take in every fish landing center and prioritize them. The ICAR also released Covid-19 mitigation advisories for Indian fisheries including fishing, landing sites, fishing harbors, fish markets, and seafood processing units. A careful review of the advisories shows that the objective was to ensure proper hygiene in the fisheries supply chain to reduce the spread of the virus. It was expedient to release the advisories because citizens pushed the government to revert its decision of shutting down fisheries in India when the pandemic had begun [8]. In the US, the federal government pumped USD 300 million into the seafood industry, purchased seafood products from fishers around the Gulf of Mexico, and established an Executive Order to make the industry more resilient during the pandemic [20].

The complex nature of the Covid-19 pandemic, thus, emerging as a health crisis that transcended into an economic crisis and has the potential to result in a food crisis, needs contextual and multifaceted approaches or measures to respond to its effects. It is on this premise that this article analyzes the responses adopted in order to support the Newfoundland and Labrador fishery during the pandemic. It uses the Canadian Fisheries Research Network (CFRN) framework and the European Union (EU) Setting the Right Safety Net (SRSN) framework to suggest practical recommendations for sustainably managing fisheries during and after the pandemic.

3. Newfoundland and Labrador Fishery

The lives of people in Newfoundland and Labrador have been inseparably tied to fishing. Fishing brought the Europeans to Newfoundland, the province's settlement pattern was informed through fishing, and it was the same, catching, drying, salting, and marketing of fish, that dictated the structures and forms on which the society was built [21]. Fishing over the years has played an important role in Newfoundland and Labrador (as an economic, social, and recreational activity) and continues to be a great contributor to the province's economic development. Even if agriculture, forestry, fishing, and hunting account for only 1.9% of the province's GDP [22], the fish and seafood sector is a significant

player in a globally competitive sector. In 2018, the total value of fish and seafood production was USD 1.3 billion, with Newfoundland and Labrador fish and seafood products exported to 40 countries. The sector also significantly contributes to food security in the province and coastal livelihoods [23]. Fishing, mining, and manufacturing employ the greatest proportion of residents in Newfoundland and Labrador. Over 15,000 people were employed in the fishing sector in the province in 2019 [24]. This total comprised both commercial fish harvesting and processing activities. Commercial fish harvesting employed about 9130 people and processing activities employed 6120 people at 90 active processing plants [24]. Comparing these figures to other Canadian fishing industries, it is presumed that Newfoundland and Labrador (NL) employs more of its local workforce, compared to others who rely on foreign workers. According to the seafood industry report for 2019, the NL fishery served as a source of livelihood for about 400 coastal communities and the value of the seafood product in the province amounted to about USD 1.4 billion [24]. NL fishery can be grouped under commercial (offshore), small-scale (inshore), and recreational fishery. These categories are a result of diverse configurations, both in size and fishing gears used [21]. Newfoundland and Labrador have an emerging fish farming sector with a total market value of USD 277 million in 2016. The sector employs 2500 people in both direct and indirect jobs.

Newfoundland and Labrador fish and seafood industry over the years has dealt with a series of challenges in the industry, for instance, the collapse of the codfish stocks (1992), a change in the ecological structure of the fishery from groundfish to shellfish, a reduction of fish stocks, competition from the oil and gas industry, and an aging workforce; however, the challenge faced by the industry due to the pandemic is different [25,26]. The Covid-19 pandemic has significantly placed a challenge on the NL fishery—ranging from addressing safety at the workplace, responding to massive decline in demand for fish and seafood both at home and abroad, coordination across sectors, and supply chain disruptions.

3.1. Impacts of Covid-19 on the Newfoundland and Labrador Fishery

All the Canadian industries have been impacted by the Covid-19 pandemic; however, such impact is exacerbated in the NL fishery due to various reasons, including the delays in opening the fishing seasons, loss of harvest and processing activity, and loss of export opportunities. The NL fishery experienced delayed openings of the snow crab and lobster seasons due to fear and anxiety to prevent the spread of the coronavirus in communities, fishing fleets, and fish processing plants, as well as the close working conditions associated with the season [27]. The sector faced a great challenge focusing on ensuring safe fishery by looking into fishing vessels and dockside and then safety in plants. According to Candace Hamlyn, the Food and Fish Allied Workers (FFAW-Unifor) union representative at the shrimp processing plant at Port au Choix, NL, the shrimp fishing season was exciting, and the processing plant was very busy throughout the year 2019 [28]. She added that, at the end of the season, she and her co-workers had enjoyed about 15 to 21 weeks of work without worrying about qualifying for employment insurance benefits or other benefits. However, the same story cannot be said for the year 2020 because processing plants reduced the number of workers to ensure effective social distancing practices and there was a major decline in fish values.

In light of the upended impacts associated with the Covid-19 pandemic, the NL fishery has suffered a loss of fishing enterprise viability [29]. This is attributed to the risk of little to no income in many fishing fleets, loss of market, and labor, as well as the decline of demand [29,30]. According to the Food and Fish Allied Workers (FFAW-Unifor) union, the decline in the total landed value is expected to increase and even exceed USD 150 million in NL for all species caught by the province's inshore (under 90 feet) fleet in 2020. This revenue decline is projected to adversely impact the economic viability of the fishing enterprise in the province [31].

The enforcement of nationwide and international lockdowns caused a severe reduction in domestic demand for seafood and international seafood trade. Seafood to be consumed

in restaurants, casinos, and cruise ships reduced drastically. This was attributed to the fact that most restaurants and casinos were affected by lockdown regulations and no cruise ship was traveling or ordering seafood products. The pressure on retail shops in the province was unbearable because seafood in the province that otherwise would have been purchased and consumed by restaurants, casinos, and cruise ships were now being consumed only in retail shops [26]. The reduced prices of seafood due to decreased demand from restaurants and hostels reduced fishing activity in the province drastically and adversely affected the income and livelihoods of individuals who depended on the sale of seafood for a living [30]. Moreover, international lockdowns affected the country's and the province's exports. Following the lockdown in China and the United States of America (Canada's major export markets), the demand for seafood reduced, and markets collapsed for the province and the country [8]. For instance, due to the lockdown in the United States which is the main market for crab fishery for NL and Canada, grocery shops were the only available markets, where crab is often sold at a reduced price. This resulted in a drop of half the price (USD 2.90) in NL compared to the average price of USD 5.14 in 2019 [27].

3.2. Responses and Adaptation in NL

There is no doubt that the NL fish and seafood industry has been severely impacted by the Covid-19 pandemic, but the degree of this impact remains uncertain as new challenges keep evolving [25]. The FFAW-Unifor and the Newfoundland and Labrador Department of Fisheries and Land Resources offered recommendations on how to address the challenges posed by the pandemic, and also provided support for workers in the fishing industry [24,31]. Employment insurance fishing beneficiaries' claims were extended until the fishing season was opened, the department also ensured that employment insurance fishing beneficiaries, whose claims expired from the beginning of 2020, were made eligible for the Canada Emergency Response Benefit (CERB) and guaranteed that the Canada Pension Plan and Old Age Security monthly payments were not clawed back from CERB payments [24]. The department recommended employment extension programs and income replacement initiatives for consideration to curtail the challenges caused by the pandemic. The Federal Department of Fisheries and Oceans increased the quota for the snow crab fishery by 10% for the NL region. This increase aimed to allow the region to grow its market and also develop the crab fishery [27]. The government of NL launched the Seafood Marketing and Innovation Support Program with a fund base of USD 400,000 to help the marketing of seafood products by identifying and establishing other markets than the retail markets due to the pandemic impacts on the closure of restaurants. The program focused on market development through market information, research, and innovation [32,33]. Although efforts were made by the NL department and the fishers' union, proposals were sent to the federal government to solicit additional support for the industry.

The Food and Fish Allied Workers-Unifor union received a fund of about USD 470 million in grant and wage subsidies from the federal government to support fisheries, especially fish harvesters who have been impacted by the pandemic. The government included an additional USD 267.6-million benefit that covered about 75% of the losses, up to about USD 10,000 for fishing enterprise owners and crews whose incomes dropped 25% in the pandemic [34]. Moreover, a USD 10,000 non-repayable grant was included to support the fishing license holders who dealt with fixed costs, and the fish harvesters by making adjustments to the employment insurance system to enable fish harvesters to qualify for the grant based on income from previous years [34]. In addition, the federal government has instituted the Canadian Seafood Stabilization Fund (USD 62.5 million) to support processing industries across the country. This fund aims to enable processors to provide a healthy and sound working environment to workers by putting adequate health and safety measures in place at work premises to help protect employers against Covid-19 and to maintain Canadian jobs [32]. The fund is also meant to increase the capacity of processing plants and to provide new adaptive ways to bridge the changing consumer demands and market challenges to support the local supply chain system in Canada [32]. In May 2020, the NL government announced

funding in the amount of USD 6 million to support local businesses impacted by the pandemic, including aquaculture. Measures specific to aquaculture include the elimination or offer of rebates on aquaculture license fees; deferral of annual Crown Lands fees for aquaculture sites; and waiving of payment of water use charges for 2019 due in the 2020–21 fiscal year [35].

4. Analytical Framework

The COVID-19 pandemic has posed a threat to human health and many industries, including fisheries, which have a long history of suffering due to overfishing. A FAO report, The State of World Fisheries and Aquaculture 2018, shows that 59.9% of the major commercial fish species that FAO monitors are now being fished at biologically sustainable levels, while 33.1% are being fished at biologically unsustainable levels—a situation that the report describes as "worrying." The other 7% are underfished [36].

Although the pandemic and its associated lockdown measures could lead to a recovery of fish stocks, the livelihoods of people involved in fishing and the fisheries supply chain have been impacted significantly. This plight requires fisheries support policies and actions to respond to the impacts of the pandemic and to envision better ways of organizing the post-Covid-19 fisheries. The big question here is to identify policy initiatives that will make an even higher percentage of the fisheries sustainable in such a way that they can contribute both to food security and human nutrition, and they can be implemented in a socially just manner. Sustainability in fisheries should take into consideration four elements: ecological, economic, social, and institutional; however, in managing Canadian fisheries much attention has been placed on the ecological dimension while downplaying or even ignoring the other aspects [37]. With this at the back of our mind, any policy geared towards post-Covid-19 fisheries governance should equally incorporate the four components mentioned above.

The theoretical frameworks adopted for this study are the "Canadian Fisheries Research Network" (CFRN) framework [37], and the EU "Setting the Right Safety Net" framework [38]. The "CFRN" framework was developed by a team of interdisciplinary academics, industry, and government representatives in Canada to provide a comprehensive evaluation framework for fisheries' sustainability. On the other hand, the "Setting the Right Safety Net" was developed by several partner non-governmental organizations in the European Union as a framework for fisheries support policies during the pandemic.

4.1. The "CFRN" Framework

There is evidence indicating that numerous policies and legislations in Canada aim to meet national and international conditions of sustainability. For instance, the "Federal Sustainable Development Strategy", the 2011 Report of the Commissioner of the Environment and Sustainable Development, and the Fisheries and Oceans Canada's (DFO) "Sustainable Fisheries Framework" emphasize the need of integrating the four aspects of sustainability [37]. However, studies show that policies and legislations to manage fisheries in Canada are usually directed towards ecological/biological conservation (ecosystem-based management) with little or sometimes no attention to the other aspects of sustainability: economic, social, and institutional [37]. Against this backdrop, the Canadian Fisheries Research Network (CFRN) determined to develop a holistic framework for fisheries sustainability in Canada.

In this paper, the definition for sustainable fisheries, and the framework for evaluating sustainable fisheries by CFRN are highlighted and applied in discussing the actions taken by the Newfoundland and Labrador government in managing their operations during the pandemic, and possible ways of building the fisheries more sustainably after the pandemic. According to the CFRN team, a sustainable fishery is defined as one that "respects the ecological integrity of the ocean and its resources; is ethical, responsibly governed, economically viable and technologically appropriate; supports communities; draws on local culture, heritage, and diverse knowledge systems; and enhances health, well-being and the public good" [37] (p. 482). Taking a critical look at the definition, it

paints a clear picture of all four aspects of sustainability being addressed. According to [37], each aspect of sustainability (i.e., ecological, economic, social, and institutional) should consist of key candidate objectives that every policy for managing fisheries should seek to address. The real challenge of any policy decision-making is how to integrate the four components in order to achieve a sustainable fishery.

4.2. The "SRSN" Framework

This framework highlights critical factors that contribute to a sustainable fisheries policy, good policy development and implementation, and building back better fisheries with regard to actions executed by European Union countries to manage fisheries during the pandemic. The foundation for the "Setting the Right Safety Net" (SRSN) framework emanates from 10 principles designed to help the formulation of policies, and actions taken in response to managing fisheries during the Covid-19 crisis. According to [38], the 10 principles are concurrent crisis response, efficiency, rationality, speed, institutional integrity, anti-abuse, consultation, clarity and transparency, conditionality, and integration. These principles are significant not only for an effective response policy dealing with an existing crisis but also for any policy aiming to secure long-lasting sustainability of fisheries in normal times. This is especially true for the principles of efficiency (the costs of the proposed actions should not outweigh the benefits), consultation (of all stakeholders affected by the policy), clarity and transparency, institutional integrity (the proposed actions must respect the existing policy processes and institutions), and integration (a proposed policy should aim to eliminate or limit the unintended consequences on existing policies). Although these principles are crucial in formulating fisheries support policies during a pandemic, they are not a single window for assessing policies, because conflicts may arise in the attempt to meet all 10 principles [38]. To exemplify how the principles can shape the policy-making and implementation processes for sustainable fisheries, the SRSN framework divided the fisheries support policies into seven categories. Each of the policies is analyzed using the 10 principles to evaluate its practicability and sustenance [38]. The policies are described as follows.

4.2.1. Policies to Ensure Safe and Controlled Fisheries

Safety of the working environment is one of the priority checklists for operating during the pandemic. Owners of fishing vessels, fishing captains, and fishermen wondered how they were going to operate whilst keeping a safe and sound environment for all to reduce the spread of the virus. It became urgent that support be given in terms of getting the required protective materials (masks and gloves) needed to ensure safety in their operations whilst adhering to the guidelines provided by public health. This is because without protective materials fishing activity could increase the spread of the virus. This caused a great reduction in both the number of fishing vessels operating and fishers on board, as some fishing fleets were not going to sea due to safety concerns. With this policy, public funds were put to good investment and this policy also promoted the concurrent crisis response principle, thus, ensuring that safe and controlled fisheries not only improved the health status of fishers but also improved the fisheries' environmental and social goals.

4.2.2. Policies to Increase the Resilience of Seafood Supply Chains and Create New Ones

The lockdown imposed by countries has affected the global seafood supply chain. Many countries had to resort to alternative markets for seafood products and the available alternative markets were the local markets, following the ban on travel. Focusing on a more localized supply chain through different strategies, such as promoting direct sales, can bring innovation and create new supply chains. This provides some benefits by improving the environment and aids in reducing some of the impact of climate change through innovation. This is because a localized market means less travel and hence fewer transport emissions from exports of seafood products and, ultimately, a reduction in greenhouse gas emissions. Studies show that investing public funds into supporting innovations in

local food systems is a good choice as it can increase their resilience [38,39]. To increase the resilience of a local food system in agriculture, many advocates are pushing for investment in on-farm storage, processing, and local distribution capacity to transform value chains to enable a more robust response to similar disruptions in the future—and to capture more of the added value for the farm [39]. Such a resilience-building strategy may also work for fish and seafood systems. However, the SRSN study warns that whilst improving local supply chains, it is expedient to consider any associated problems with promoting local sales, especially for when things go back to normal and fish and seafood trade in international markets returns [38].

4.2.3. Policies to Provide Financial Support for Lost Income

One of the main problems caused by the pandemic is the loss of income to workers in fisheries. Looking at the mode of transmission of the virus and how it has spread rapidly, fishing had to be controlled to reduce the spread of the virus. The number of fishing vessels had to be reduced as well as the fishers in such vessels. The working hours of many fishers had to be cut in order to follow the public health guidelines. Therefore, a policy to provide financial support through an introduction of income support programs to help fisheries became urgent and necessary. This policy is both rational and efficient and thus worth investing public funds into it. Providing income support to fishers is likely to reduce fishing efforts. When there is less fishing activity, it gives room for the fish population to reproduce, therefore increasing fish stocks whilst protecting the marine environment. Implementing this policy requires controlled fishing activity in the fisheries sector as described by the rational principle [38].

4.2.4. Policies to Provide Financial Support for Fixed Business Costs

The introduction of support programs for lost income has raised lots of concerns from enterprise owners who had to deal with fixed costs. Providing financial support for fishing business costs (vessel costs) is likely to be inefficient, as it may increase the capacity of fishing fleets which can result in overfishing and thus depleting fish stocks long term. It is equivalent to a harmful subsidy [40], defined as fishing support running the risk of increasing fishing capacity and fishing effort [41]. This is because, as this policy tends to respond to the impact of Covid-19, it should remain effective (sustainable) even after the pandemic. Hence, governments, provinces, or states need to carefully analyze where to channel such support and what form such support should take. For instance, support in terms of providing low impact fishing gear, stunning equipment or remote electronic monitoring will sustain fishing business whilst protecting the marine environment. It is therefore advisable to weigh where to channel this kind of support and its impact on other policies. Such concern is in line with the United Nations 2030 Agenda for Sustainable Development, specifically Target 14.6 which states the intention to "by 2020, prohibit certain forms of fisheries subsidies which contribute to overcapacity and overfishing, and eliminate subsidies that contribute to IUU fishing, and refrain from introducing new such subsidies" [41,42].

4.2.5. Policies to Provide Price Support

Another policy to support fisheries during the pandemic is to provide price support as an alternative response to the income support policy. This approach is usually used to tackle market power, by setting a minimum price for fish. This often leads to fewer sales and thus it may not be an appropriate policy to respond to Covid-19 impact on fisheries. Therefore, the SRSN study presented this policy to be less efficient as compared to the income support policy. A price floor being a support for producers has the tendency to increase fishing activity, thereby, depleting fish stocks. It is expected that allowing fish populations to grow due to economic activity lockdowns during the pandemic can have a positive impact on prices (better prices), as well as increasing effective local supply chains which could also improve fish prices without government controls.

4.2.6. Policies to Change Regulations and Regulatory Processes

This policy response to tackle the impacts of the pandemic on fisheries is typical of EU fisheries. There were several concerns for deregulation policies in the fisheries sector in Europe. One of the significant deregulation policies proposed was to increase the interannual total allowable catch (TAC) flexibility from 10% to 25% for the 2021 fishing year. According to [38], some of these proposals have no bearing with Covid-19 and might be damaging to fishery sustainability in the long run. The author explains that the interannual flexibility would have been set at 25% if it was ecologically feasible, and Covid-19 has the propensity to increase fish populations in the short-term. Another criticism of this policy approach is that it could lead to abuse. When TACs are not extinguished in a particular year the remaining quotas are transferred to the next year. In this case, providing income support and increasing the TAC when the previous TAC is under-used would breach the principle of anti-abuse [38]. However, the concern for deregulation or changing regulations was not evident in the case of Newfoundland and Labrador fishery.

4.2.7. Policies to Provide Recovery Stimulus

These types of policies are focused on both the long-term sustainability of fisheries and short-term crisis response. According to [38], "there is a clear need for the marine environment to build back better through ecosystem restoration" (p. 15). In view of this, over 100 environmental organizations in Europe jointly developed the "Blue Manifesto—The Roadmap to a Healthy Ocean in 2030" with the aim of ensuring a protected and healthy marine environment by 2030 [38]. It is also necessary that all issues including but not limited to labor, supply chains, and safety are catered for in the short-term. This approach to managing fisheries satisfies the principle of concurrent crisis response because it looks into the future.

4.3. Comparing the Two Frameworks

One common theme that runs through the two frameworks is sustainability. Table 1 presents the similarities and differences between the CFRN and SRSN frameworks.

Table 1. Summary of similarities and differences between the CFRN and SRSN frameworks.

	CFRN	SRSN
Similarities	Recommends the consideration of all four aspects of sustainability Its application may lead to trade-offs	Emphasizes the need to build back better (becoming more sustainable) Conflicts may arise in its application
Differences	Has a broader scope More adequate in the long run Considers altering existing institutional arrangements	More specific with well-defined policy typologies and very practical Adequate for crisis response and in the short-term Recommends respect for current institutions and does not require alterations in the governance structure

The "CFRN" framework emphasizes the need to move beyond the ecosystem approach to managing fisheries in Canada and recommends an integrated approach where the four pillars of sustainability are addressed in an effective manner [37]. This recommendation is based on the fact that fisheries are socio-ecological systems and require sustainable ways of governance—which may be difficult and complex in ordinary times [43] and even more difficult to handle in crisis times when any disruption can induce an adaptive cycle dynamic [44]. Adaptive cycles of rapid growth, maturity, release, and reorganization are ubiquitous in social-ecological systems. Ecological resilience refers to the degree of disturbance a system can buffer before entering the collapse/release and reorganization phases [39]. This is the reason why the Canadian and the NL fisheries have been actively protected during the Covid-19 pandemic.

The "Setting the Right Safety Net" (SRSN) framework, on the other hand, proposes that response measures during Covid-19 should not only address the short-term crises brought about by the pandemic, but also aim to ameliorate the health of the marine environment and alleviate social injustices [38]. Also, a dominant feature of the "SRSN" framework is the necessary requirement for the fish and seafood industry to build back better after the pandemic, thus looking into the future. The highlighted tenets of the "SRSN" framework capture some of the ideas for managing fisheries sustainably which reveals a link between the two frameworks. For instance, the policies on recovery stimulus in the SRSN framework emphasize the need to protect the ocean and its resources, ensuring a robust labor force, and proper representation of fisheries workers during the policy development process, which is nuanced in the sustainability elements (ecological, social, economic, and institutional) of the CFRN framework also. Another similarity between the two frameworks is that their application and implementation are not considered a panacea for fisheries management [43] assuming that trade-offs [37] and conflicts [38] may arise.

However, the CFRN framework requires a longer time period for its implementation compared to the SRSN framework due to the challenge of acquiring information, the use of expertise, and the overall cumbersome process [45]. The CFRN framework proposes that its implementation may require a new governance structure [37], which could alter the existing institutional arrangement for managing Canadian fisheries. On the other hand, the SRSN framework recommends respect for existing institutions and processes according to its principle of institutional integrity. In terms of the scope of each framework, CFRN has broader objectives that require narrowing from the implementation teams based on scenarios, while the SRSN framework is focused on principles and typologies needed for assessing fisheries support policies. Despite the differences between the two frameworks, they possess qualities that are essential and practical in managing fisheries sustainably in Newfoundland and Labrador, and in Canada during and after the pandemic.

5. Discussion

The impact of the Covid-19 pandemic on the NL fish and seafood industry has revealed that the industry is highly vulnerable and requires sustainable management practices to ensure its resilience. To achieve this, it is necessary to take stock of activities in the fish and seafood industry during the pandemic and assess what needs to be done in the future. In this section, some of the lessons learned from the impacts of the Covid-19 pandemic on the NL fishery and the responses, as well as some suggested recommendations are discussed accordingly.

Firstly, global crises such as the Covid-19 pandemic can affect seafood supply chains negatively. In the case of Newfoundland and Labrador, major export markets for fish and seafood products in the US and China were shut due to the outbreak of the coronavirus. This necessitated the search for other alternative markets to consume and sell fish in order to sustain the economic growth in the fishing industry. The take-away point from this impact is to reduce the over-reliance of the NL fish and seafood industry on export markets and create alternative markets that are robust in strengthening economic activity in the fishing industry during and after the pandemic.

The lockdown measures affected the incomes and livelihoods of workers involved in the NL fisheries. The government provided various types of support to deal with this issue. However, this leads to the next lesson which postulates that measures to respond to a crisis should not only be short-term but aiming to build more sustainability in the fish and seafood industry. Sustainability is key in managing fisheries hence actions adopted to respond to the impacts of the pandemic should not only consider the present situation but also aim to look into the future. Typically, providing income support to fishers who have lost their incomes or jobs as a result of the pandemic may not be sustainable given the hefty sums of money involved, and if the pandemic should continue over a longer period of time. That said, government support should also be mindful not to promote harmful subsidies.

Lastly, the most important lesson from this pandemic is the need to embrace a more comprehensive approach to managing fisheries by using sustainability frameworks [43,46].

The CFRN and the SRSN frameworks are typical examples of frameworks that have taken into consideration the various components of sustainability in the management of fisheries. The principles embedded in the SRSN framework in particular serve as a guide for developing appropriate and effective policies, and the CFRN framework throws light on critical elements of sustainability that need to be integrated in fisheries management and governance.

In view of this, policies designed and implemented for a stronger and sustainable fishery in Newfoundland and Labrador should seek to maintain a balance between ecological sustainability and prosperity by investing in the health of the marine environment. The government needs to continue channeling funds towards marine protection through policies and regulative measures. For example, the government may prepare an ecosystem restoration plan to protect marine species beyond the 13.81% of Canada's protected marine and coastal areas; it may institute a marine and fisheries fund to aid in the implementation of sustainable marine-related projects and invest in electronic monitoring to track activities in the ocean. Undergoing research projects, such as the Ocean Frontier Institute (OFI), a transnational hub for interdisciplinary research of the ocean, can provide facts-based advice for safe and sustainable ocean policies.

More resilient labor models in marine fisheries are needed in the province of Newfoundland and Labrador. Models must include labor representation for non-contracted fishers, wage guarantees, co-ops schemes, and sick pay [38]. They should also provide funding to support training for alternative livelihoods for workers in the fishery industry: examples may include skills training in harvesting and processing, in production of compost for agriculture, gardening, etc. from fish waste, or pharmaceutical products from fish skin and fat.

The government needs to provide support for initiatives that diversify and adjust harvest technologies to the state of the fish stock. Fishing cod with hook and line for a smaller but higher quality harvest can protect both the cod stock and consumers interested in fresh, high-quality fish, locally produced. The example of Fogo Island Fish, a social business "dedicated to reinventing the fish business to serve community, chefs and Canadians" should be extended to all Canadian provinces [47]. Also, investing in high-end processing technologies that aim to use 100% of the fish should be considered, as well as extending certification and tracing schemes both for exported fish and seafood and for fish and seafood sold in local markets. The federal government should also consider introducing selective payment for access and use of resources. Commercial large-scale fishers with access to large fishing quotas must pay for the access to a limited public resource (i.e., resource rent), and for environmental damages (i.e., negative externalities) [38].

Subsidies are good; however, they may have unintended consequences depending on their application. For instance, support for cheaper fuel, gear, and shipping vessels may increase fishing activities which deplete fish stocks. Therefore, the government should direct subsidies towards programs such as increasing operational skills of fishers, enhancing access to working capital for small fishing businesses [48] and young fishers, and consider a shift from financial support to a cost recovery system, where the prosperous industry pays a fair share for the costs of fisheries management. Sustainable integrative business initiatives in aquaculture, such as aquaculture operations powered by renewable energies, or integrated poultry and fish farms and other Integrated Multi-Trophic Recirculating Aquaculture (IMTRA) systems [49] should be supported by the government.

6. Conclusions

The fish and seafood industry in Newfoundland and Labrador plays a key role in the economy and the lives of the people in the province. The outburst of the coronavirus has impacted this industry negatively and there is a stringent need to adopt appropriate and adequate policy responses to ensure the long-term sustainability of the fishery. Several policy responses (employment extension programs, income replacement initiatives, the Seafood Marketing and Innovation Support Program) have been executed in the province

to deal with the pandemic challenges, but more sustainability-oriented approaches are needed in order to secure a vibrant fishery which is a source of food and livelihoods not only for this generation but for future generations too. In light of this, this paper suggests that the highlighted impacts of the pandemic on the fishery may have long-term effects on the economy if fishery recovery policies are developed without considering the concept of sustainability. Policymakers should note that a policy may help or prevent the successful implementation of another policy. Hence, policies should be strategically developed to know their positive and negative effects on other policies. Furthermore, fisheries management policies should emphasize the four elements of sustainability (as explained in the CFRN framework) and provide practical ways (see policy typologies in the SRSN framework) that promote a stronger and healthier fishery that is able to survive and thrive now and in the future.

Author Contributions: Conceptualization, G.S.; Supervision, G.S.; Writing—original draft, E.O.A. and G.K.B.; Writing—review & editing, E.O.A. and G.K.B. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: This study did not require ethical approval.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Conflicts of Interest: The authors declare no conflict of interest.

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