Policy Options to Mitigate the Negative Environmental Impacts of Cruise Ship Tourism in British Columbia

by

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Abstract

While cruise ship tourism contributes significantly to British Columbia's (BC) economy, it has significant environmental impacts. Compared to neighboring states in the United States (US), the current regulatory regime in the Canadian province incentives ships to discharge wastewater into sensitive coastal ecosystems. This paper discusses three policy options to mitigate the negative environmental impacts of cruise ship tourism in BC: Green Incentives, Regulatory Oversight, and Trans-Boundary Harmonization. Through financial incentives, the Green Incentives suite encourages cruise companies to invest in environmentally friendly practices and cleaner technologies. The Regulatory Oversight policy suite strengthens enforcements and oversight of regulations to ensure cruise companies comply with environmental regulations. Finally, the Trans-Boundary Harmonization suite aligns cruise ship regulations with the states neighboring BC including Washington, Alaska, and California.

Keywords: Cruise tourism; oceans; sustainability; British Columbia; public policy

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List of Acronyms

AWTS	Advanced wastewater treatment systems
CLIA	Cruise Lines International Association
EGCS	Exhaust gas cleaning systems
EPA	Environmental Protection Agency
GDP	Gross domestic product
GVHA	Greater Victoria Harbour Authority
HFO	Heavy fuel oil
IMO	International Maritime Organization
LNG	Liquified natural gas
MaPP	Marine Plan Partnership for the North Pacific Coast
MOU	Memorandum of Understanding
MPA	Marine Protected Areas
MSD	Marine sanitation devices
RKW	Resident killer whales
SDG	Sustainable development goals
TC	Transport Canada
UN	United Nations
UNDRIP	United Nations Declaration on the Rights of Indigenous Peoples
VGP	Vessel General Permit
VPDC	*Vessel Pollution and Dangerous Chemicals Regulations*

Glossary

Ballast water	Water that is taken on board by ships that help to stabilize the vessel during transit
Blackwater	Wastewater that is generated from toilets and contains human waste
Bleedoff	Wastewater from closed-loop scrubbers that has a higher concentration of pollutants than hybrid or open-loop scrubbers
Discharge	Release or disposal of treated or untreated wastewater
Greywater	Wastewater generated from domestic activities (i.e., bathing, laundry, and dishwashing)
Heavy fuel oil	Dense, low-grade fuel
Oily bilge	Wastewater generated in the bilge compartment of ships or boats
Scrubbers	An exhaust gas cleaning system that is used to remove sulfur dioxide from the exhaust gases that are produced by ship engines
Sewage	Wastewater which includes blackwater and greywater
Shoreside power	A system that allows a ship or boat to draw electric power from the shore while it is docked
Washwater	Wastewater resulting from the use of scrubbers

Executive Summary

Background

The world's oceans are in urgent need of protection from human activities that threaten their health. The oceans provide essential benefits to humans, including climate regulation, carbon storage, food, and opportunities for recreation and tourism (Statistics Canada, 2021). One such activity, cruise tourism, has been gaining attention for its negative environmental impacts, particularly in British Columbia (BC), Canada. Cruise ships discharge waste streams into the ocean, which pose significant risks to the environment. Despite being a major contributor to local economies, the lack of stringent regulations in BC incentivizes cruise companies to dump high amounts of wastewater in coastal waters. This paper explores policy options to mitigate the negative environmental impacts of cruise ship tourism in BC.

Analysis Methodology

The methods used for analysis in this paper include a jurisdictional scan, analysis of existing policies and regulations, and a multi-criteria analysis to compare policy options. Prior to analysis, existing literature was reviewed which included a search of relevant public and private sector publications and academic journals. The jurisdictional scan included a review of the current laws and regulations governing cruise ship operations in BC and as well as a comparison of these regulations to those in neighboring states in the US.

Following the jurisdictional scan, a multi-criteria analysis was conducted to inform the evaluation and construction of three policy options. The analysis used three societal objectives: environmental impact, economic impact, and equity; it also included three governmental objectives: cost, stakeholder acceptance, and compliance issues. To assess the effectiveness of each policy option in achieving each societal and governmental objective, a criterion and measure were established.

Policy Options

The aforementioned research informed the construction of three policy option suites:

- *Policy Option 1: Green Incentives*
- *Policy Option 2: Regulatory Oversight*
- *Policy Option 3: Trans-Boundary Harmonization*

The Green Incentives suite aims to reduce the negative environmental impact of cruise tourism by providing financial incentives for companies to invest in cleaner technologies and sustainable practices. The suite includes a cruise ship pollution tax, a per passenger tax, and subsidies for companies investing in sustainable tourism. This suite provides a source of funding for sustainable tourism initiatives, ensures that the costs of tourism are not solely borne by local communities and the environment, and helps level the playing field for companies that prioritize responsible tourism practices.

The Regulatory Oversight suite seeks to mitigate the negative environmental impacts of cruise tourism by increasing regulatory oversight and penalties for violations. The suite includes hiring additional staff or contracting out inspections to independent organizations, increasing penalties for violations, implementing new monitoring systems, and enacting laws to support the Marine Plan Partnership for the North Pacific Coast (MaPP), Marine Protected Area (MPA) Networks, and Coastal Marine Strategy. This suite would ensure that cruise ships comply with environmental regulations, reduce their negative environmental impact, and provide a more accurate representation of the cruise industries environmental impact.

The Trans-Boundary Harmonization suite aims to address the negative environmental impacts of cruise ship tourism by ensuring consistency and coordination among different jurisdictions. This suite includes mandating federal regulations, banning the use of scrubbers or exhaust gas cleaning systems (EGCS) to meet sulfur limits, requiring advanced wastewater treatment systems (AWTS), and legally binding no-discharge zones. This policy suite would ensure that cruise ships operating in Canadian waters used the most effective and up-to-date pollution prevention technologies, reduce their negative environmental impact, and align the province’s regulations with those of neighbouring US states to hold cruise ships to the same high standards.

Recommendations

Based on the research and policy analysis, the recommendation for addressing emissions from cruise ships in BC waters is to implement short-, medium-, and long-term solutions. In the short term, the Regulatory Oversight policy option should be implemented to address noncompliance and enact laws to support the MaPP, MPA Network, and Coastal Marine Strategy. In the medium term, the Green Incentives policy option should be implemented to incentivize companies to reduce emissions and adopt sustainable practices. In the long term, the Trans-Boundary Harmonization policy suite should be implemented to create aligned regulations for cruise ships in the Pacific Northwest from Alaska to California.

Chapter 1. Introduction

The world's oceans are in urgent need of protection from human activities that threaten their health. The oceans provide essential benefits to humans, including climate regulation, carbon storage, food, and opportunities for recreation and tourism (Statistics Canada, 2021). Although Cruise tourism generates significant economic benefits, it also poses serious environmental threats. Cruise ships discharge waste streams that contain harmful pollutants such as sewage, which contains greywater and blackwater, and washwater from scrubbers, leading to environmental pollution and degradation. The negative effects of these waste streams are experienced by fresh and marine water, air, soil and land cover, sensitive habitats and protected areas, and onshore and marine wildlife, leading to local and global pollution and waste deposition (Lloret, 2021).

Cruise tourism is a significant industry in BC, with millions of cruise passengers passing through its ports each year (Port of Vancouver, n.d.a). However, BC's current regulatory regime for discharges from ships is less strict compared to neighboring US states. This can make BC an attractive location for cruise companies to discharge wastewater. The unique and sensitive aquatic organisms and coastal ecosystems of BC are particularly vulnerable to the negative impacts of cruise tourism. As such, exploring policy options to mitigate the negative environmental impacts of cruise ship tourism in BC is critical to sustain its natural environments.

Focusing on BC, this paper provides an overview of the negative environmental impacts of cruise ship tourism. It also highlights gaps in the regulatory regime that can incentivize the discharge of wastewater in BC waters. Furthermore, it reviews international best practices for regulating cruise ships, constructs policy options to address the environmental impact of cruise tourism, and conducts a multi-criteria analysis to assess the policy options. Finally, the paper concludes with recommendations for policy makers to improve the regulatory framework and mitigate the negative environmental impacts of cruise tourism in BC.

Chapter 2. Analysis Methods

The methods used for analysis in this paper include a jurisdictional scan, analysis of existing policies and regulations, and a multi-criteria analysis to compare and evaluate the policy options. Existing literature was reviewed which included a search of relevant public and private sector publications, and academic journals. The jurisdictional scan included a review of the current laws and regulations governing cruise ship operations in BC and as well as a comparison of these regulations to those in neighboring states in the US. For BC, Victoria and Vancouver were focused on as they are the largest ports in the province. The US states Washington, Alaska, and California were chosen as they are most similar to BC in that they are also part of the Pacific Northwest and have sizable cruise industries. The jurisdictional scan provided an overview of the current regulatory regime which assisted in the identification of policy gaps to be addressed by the constructed policy suites.

The constructed policy options were evaluated through a multi-criteria analysis. The analysis used three societal objectives: environmental impact, economic impact, and equity; it also included three governmental objectives: cost, stakeholder acceptance, and compliance. To assess the effectiveness of each policy option in achieving each societal and governmental objective, a criterion and measure were established. This approach allowed for a comprehensive evaluation of the three policy suites and informed the recommendations that will best address the negative environmental impact of cruise ship tourism in BC.

Chapter 3. Literature Review

3.1. Regulations

The management of the ocean's health involves various interested parties, including governments at different levels and international organizations such as the International Maritime organization (IMO). Given the rapid degradation of the world's oceans, there have been recent changes to regulations to address this critical issue. This section provides an overview of the current regulatory landscape at the international, federal, and provincial level that aim to promote the protection and conservation of the oceans.

3.1.1. International Maritime Organization

Established by the United Nations in 1948, the IMO is the authority responsible for regulating global shipping. The IMO also regulates shipping related activities to promote safety, security, and environmental protection in the maritime industry. As a member of IMO, Canada is responsible for following the guidelines and regulations set by the organization (International Maritime Organization, n.d.). The IMO regulations that apply to cruise ships operating in Canadian waters include:

- *The International Convention for the Prevention of Pollution from Ships (MARPOL):* sets measures that prevent pollution from ships, including regulations on the discharge of sewage, oil, and other harmful substances into the environment.
- *The Guidelines for the Implementation of MARPOL Annex IV*: provides guidance on the proper operation and maintenance of marine sanitation devices (MSDs) and the discharge of sewage from ships. The Annex states that ships may discharge untreated sewage if they are at least 12 nautical miles (nm) from land, moving at a speed of at least 4 knots, and have received approval for the rate of discharge.
- *The International Convention on Civil Liability for Oil Pollution Damage*: establishes the liability of shipowners for oil pollution damage and provides a system of compensation for those affected by oil spills.

In 2020, the IMO announced a sulfur restriction which limits the amount of sulfur that can be present in marine fuels used in all ships operating in international waters. The restriction provides five beneficial changes including improvements to air quality,

positive impacts to human health, higher quality fuel usage, improved compliance through changes to enforcement authorities, and adaptation of ship operators, owners, and refineries (IMO, 2020). As of January 1, 2020, the regulation requires ships to use fuels with a sulfur content of no more than 50 per cent, a 46.5 per cent increase. To meet the new sulfur limit, ships may switch to using low-sulfur fuels or install exhaust gas cleaning systems (EGCS).

3.1.2. Regulations in Canada

Transport Canada (TC) is the agency responsible for the regulation of vessel pollution. TC has enacted laws and regulations to mitigate the environmental impact of ships and to ensure safe and responsible operation. The most relevant to cruise ship operations include the *Canada Shipping Act,* 2001, the *Marine Liability Act,* the *Oceans Act*, and the *Vessel Pollution and Dangerous Chemicals Regulations* (VPDC).

The *Canada Shipping Act,* 2001 requires ships have pollution prevention equipment and provides guidelines for ships to manage and dispose of sewage, garbage, and hazardous materials (Canada Shipping Act, 2001). In the case of oil spills and other environmental damage, the *Marine Liability Act* establishes liability and compensation protocols. Operators of cruise ships must have the financial capacity to compensate for any damages they may cause (Marine Liability Act, 2001). They are also responsible for taking all reasonable mitigation and prevention measures to limit the effects of spills or other environmental damage. The *Oceans Act* provides a framework for the sustainable management of oceans and coastal areas in Canada. In 2019, the *Oceans Act* was amended to include stronger protection for marine ecosystems, Indigenous-led conservation, improved marine planning, and enhanced enforcement and compliance (Oceans Act, 1996).

Originally enacted in 2012, the VPDC regulates discharges from ships in Canadian waters. In 2017, TC announced it was amending the VPDC to reduce allowable emissions of certain air pollutants, raise energy efficiency requirements for certain vessels, and adopt the North American Emission Control Area to further align emission standards with the United States (Transport Canada, 2017). The amendments also included the addition of greywater discharge regulations and now requires cruise

ships to treat greywater prior to discharging or discharge a minimum of three nm from shore.

In April 2022, the Government of Canada announced new environmental measures to strengthen discharge requirements for cruise ships in waters under Canadian jurisdiction (Transport Canada, 2022). The new non-mandatory measures include:

- Prohibiting the discharge of greywater and treated sewage within three nm from shore where geographically possible;
- Treating greywater together with sewage before it is discharged between three and twelve nautical miles from shore to the greatest extent possible;
- Strengthening the treatment of sewage between three and twelve nm from shore using an approved treatment device; and
- Reporting to TC compliance with these measure as they relate to discharges made within Canadian waters.

The Government of Canada's Oceans Protection Plan also relates to cruise ship tourism. Launched in 2016, the plan is using a collaborative approach working with Canadians and Indigenous peoples to protect the coasts and waterways while growing the economy. The federal government, through TC, is providing $2 billion over nine years to support four key areas: safer marine traffic; better protected coastal ecosystems; stronger incident prevention and response; and stronger partnerships with Indigenous and coastal communities (Transport Canada, n.d.).

Canada also established the MPA network which is a system of marine areas that have been designated for conservation and management purposes (Department of Fisheries and Oceans, 2019). The goal of the MPA network is to protect and conserve Canada's marine biodiversity, habitats, and species, while also allowing for the sustainable use of marine resources. The federal government set a target to protect 10 per cent of coastal and marine areas by 2020. To date, Canada has conserved 14.7 per cent of its oceans and there are 14 *Oceans Act* MPAs across the country (Department of Fisheries and Oceans, 2022).

In July 2020, Canada joined the Global Ocean Alliance, which advocates for the protection of at least 30 per cent of the world's oceans by 2030. The Alliance focuses on creating MPAs and other effective area-based conservations measures to safeguard

marine life and ecosystems. The federal government also manages the country's waters in the Exclusive Economic Zone, which extends more than 200 nm offshore.

3.1.3. Regulations in BC

The province of BC has implemented regulations specific to its region. One of these include the designation of sewage areas that are located between the mainland and Vancouver Island, near the Gulf Islands. The *Canada Shipping Act,* 2001 states that in designated sewage areas, ships must pass discharge from sewage through an MSD and have a fecal coliform count no greater than 14/100 (Canada Shipping Act, 2001). However, some studies have found this highly conservative level of fecal coliform cannot be achieved through an MSD (Stand.earth & WECL, 2021). BC also has a restriction on greywater discharge for cruise ships built prior to 2014 which states that discharge must not include solids or leave a sheen on the water. However, this means the regulation only covers 12 per cent of the cruise ship fleet in the province.

In 2010, the Province of BC launched the MaPP, a collaborative partnership between 17 member First Nations, coastal communities, marine stakeholders, and government agencies in BC. The initiative resulted in the co-creation of an ecosystem-based management framework that focuses on collaboration and governance, sustainable economies, and healthy coastal communities and ecosystems (Marine Plan Partnership for the North Pacific Coast (n.d.). In August 2016, the Province and member First Nations signed marine plan implementation agreements.

In 2014, the federal government and the Province of BC announced the *Canada – British Columbia Marine Protected Area Network Strategy* (Government of Canada, 2014). The strategy included three key components: a participatory process with coastal communities, marine stakeholders, and the public, collaborative decision-making with First Nations, and a joint federal-provincial approach. It also outlined six goals that would be achieved through the establishment of an MPA network which focused on sustainability, with an emphasis on biodiversity, equity, and social and economic benefits.

The Government of BC and Canada and 15 First Nations announced in February 2023 that they are endorsing the MPA Network Action Plan for the Northern Shelf

Bioregion (DFO, 2023). Commonly known as the Great Bear Sea, the 100,000 square kilometre region encompasses Haida Gwaii and is in critical need of protection due to the biodiversity in the region. The Great Bear Sea is home to a variety of species including salmon, birds, corals, and endangered whales (DFO, 2023).

3.2. Technology

There are several technologies that have been proposed and implemented to help mitigate the negative environmental impacts of cruise ship tourism:

1. *Scrubbers*: a type of EGCS; scrubbers are devices that are installed on ships to remove sulfur dioxide from the exhaust gases produced by ships engines which help to reduce air pollution.
2. *Liquified natural gas (LNG) engines*: LNG engines use a cleaner-burning fuel that can be used with electric motors and batteries in place of fossil fuel burning engines. These engines allow ships to use electric power when operating at low speeds, reducing emissions and improving fuel efficiency.
3. *Marine sanitation devices (MSD)*: a type of equipment that is installed on a boat or ship to treat and discharge the sewage generated onboard. They help to prevent the spread of invasive species, which can have negative impacts on local marine ecosystems.
4. *Advanced wastewater treatment systems (AWTS)*: designed to treat sewage to a higher level of purity than MSDs.
5. *Shoreside power*: a system that allows a ship or boat to draw electrical power from the shore while it is docked. This enables the vessel to turn off their diesel-power auxiliary engines and plug into low-emission electrical power, reducing noise and air pollution in port.

3.3. Environmental Impact

The unique coastal ecosystems in BC make it particularly vulnerable to the impacts of cruise tourism. A major area of concern is the potential for discharges from cruise ships to harm marine life and water quality in the region. Some of the environmental and human health impacts of the cruise industry result from the placement of harmful additives such as solid waste, including marine litter & plastics, and discharges including greywater, blackwater, washwater, and ballast water into the ocean (Lloret, 2021). There are also concerns over the transfer of species and pathogens and air pollution from greenhouse gases such as nitrogen and sulfur oxides, and particulate matter (Lloret, 2021).

Discharges such as greywater, blackwater, and washwater are one of the main drivers of pollution from cruise tourism. Every year, cruise ships discharge more than 32 billion litres of sewage, greywater, and washwater into BC coastal waters (Stand.earth & WECL, 2021). Cruise ship discharges contain pollutants that negatively impact marine ecosystems. The waste streams in sewage contain pollutants such as heavy metals, polycyclic aromatic hydrocarbons, ammonia, and fecal coliform (Lloret, 2021; Stand.earth, 2021). These discharges can cause eutrophication and algal blooms, pollute filter-feeding shellfish, and suffocate fish, crabs, lobsters, and sponges. The resulting decrease in biodiversity and disruption of food webs has compounding negative impacts on the ecosystem.

As previously mentioned, air pollution from cruise ships is also area of concern as greenhouse gases and particulate matter can have negative impacts on local air quality and public health. In addition, the large size of cruise ships and the high volume of passengers and crew members they carry can strain local resources, including water, energy, and waste management systems, leading to negative environmental impacts (Cariou, P., Wolff, F.C., & Burns, 2018). There is also the risk of cruise ship discharges contaminating beaches with Escherichia coli (E. coli) which is a bacteria that can result in severe illness if ingested (World Health Organization, n.d.). For example, since 2015, there has been recurring E. coli contamination in the waters off the BC coast. Local health authorities have acknowledged that discharges from boats is a noteworthy source of E. coli in Vancouver (Vancouver Coastal Health, n.d.).

There have been technological advances made to reduce the environmental impact of ships, however some technology is not resulting in a net benefit. One such technology is scrubbers, which have been found to negatively impact the environment in a variety of ways. The scrubbing process uses harsh chemicals that can have harmful effects on marine life and scrubber washwater has been found to contain carcinogenic and other toxic substances such as polycyclic aromatic hydrocarbons and heavy metals (Stand.earth, 2021). Additionally, the process of scrubbing can produce harmful by-products, such as sludge, which can harm the environment if not properly disposed of.

The usage of heavy fuel oil (HFO) by cruise ships is also raising concern. HFO is a dense, low-grade fuel that is a thick, viscous substance made from the residue of crude oil. Ships often use HFO as it is less expensive than other types of marine fuels,

widely available, and compatible with most engines (Comer & Olmer, 2016). In March 2016, President Obama and Prime Minister Trudeau issued a joint statement that asserted the need to address the risks posed by HFO usage (The White House, 2016).

Under IMO 2020, ships have two options to comply with sulfur limits: use low-sulfur fuel or EGCS, such as scrubbers (IMO, 2020). Since then, scrubber use has grown exponentially across all maritime sectors from three ships in 2008, to over 4,300 in 2020 (ICCT, 2021). Currently, scrubber washwater is the largest source of marine pollution globally and cruise ships are responsible for 89 percent of total washwater (Stand.earth, 2021). Using low-sulfur fuel would eliminate the need for scrubbers and address the environmental impacts that are caused by permitting scrubber usage to meet sulfur limits.

One study analyzed data from ships operating off the BC coast and found that in 2017 scrubber-equipped ships emitted nearly 35 million tonnes of scrubber washwater (Georgeoff, E. Mao, X., Comer, B., 2019). Cruise ships were responsible for 90 per cent of these discharges. Waste streams also pose a significant threat to aquatic wildlife, their habitat, and the food webs on which they depend, including the threatened sea otter populations and critically endangered populations of resident killer whales (RKW) that live off the coast of BC (Georgeoff, E. Mao, X., Comer, B., 2019, Stand.earth, 2021). Approximately 10 per cent of scrubber washwater discharge in BC occurred in RKW areas and nearly 90 per cent of all ships powered by HFO pass through these areas. It is estimated that cruise ships would account for two-thirds of HFO use and washwater discharges in 2020 (Georgeoff, E. Mao, X., Comer, B., 2019).

Scrubber washwater discharge rates are high because installing scrubbers allows companies to comply with cleaner fuel discharges, but the process displaces the air pollution into coastal waters. There are three types of scrubber systems; open-loop, closed-loop, and hybrid. Open-loop and hybrid systems allow for continual discharge of contaminated washwater, but even closed-loop systems generate bleedoff. Bleedoff is toxic wastewater that has less volume than open-loop systems discharge, but has more concentrated pollutants. In 2017, 77 percent of scrubber-equipped ships operating around Vancouver Island and Haida Gwaii were cruise ships that employed either open loop or hybrid systems (Stand.earth, 2021).

3.4. Economic Impact

Given the vast coastline in Canada, marine sectors make substantial contributions to regional, provincial, and national economies. In 2018, the marine sectors collectively contributed $36.1 billion to Canadian gross domestic product (GDP) and provided nearly 300,00 jobs (Statistics Canada, 2021). The cruise ship industry represents a significant portion of the marine sector's economic benefits. These benefits are derived from direct spending by the ship's crew and their passengers, and direct and indirect employment opportunities.

When cruise ships come to port, the crew and tourists spend money which contributes to the local economy. Cruise tourists spend money on excursions, dining, souvenirs, and other goods and services. Cruise ship companies may also pay fees to use port facilities and employ local workers while in port, further supporting the local economy. In addition, the cruise industry supports Canadian jobs. Prior to the pandemic, the cruise ship industry generated over $4 billion to Canada's GDP and provided approximately 300,000 jobs, in both direct and indirect employment (Transport Canada, 2021). Crew workers and shipyard workers benefit directly from employment whereas indirect employment opportunities arise in sectors such as transportation, hospitality, and real estate.

As BC has such a large coastline, the ocean plays a significant role in the province's economy. One study estimated that in 2015 marine-related economic activity contributed nearly $5 billion to BC's GDP and generated over 100,000 jobs in the province (Teh, 2022). In 2019, the cruise industry contributed approximately $2.7 billion to BC's GDP and provided more than 17,000 jobs in the province (Mark, Judas & Robertson, 2021). BC has the highest level of cruise activity in the country. In 2019, cruise ship tourism in the province represented nearly two-thirds of the total economic benefit of cruise travel for all of Canada (CLIA, 2021).

The cruise ship industry generates significant annual input to the Canadian economy both directly, through input to GDP, and indirectly through employment opportunities. However, studies have found that the economic benefits may not outweigh the costs for some ports (Klein, 2011; Scarfe 2011). Specifically, if a port is a stopover or transit port, tourists will spend on average 10-17 times less than they would at a

destination port. Many of the ports that cruise ships visit in the province serve as stopover ports, rather than destination ports. In 2019, approximately 40 percent of cruise ship calls in BC were stopovers (CLIA, 2021). For Alaskan cruises, the ports of Prince Rupert, Nanaimo, and Victoria largely serve as transit ports while the Port of Vancouver is primarily a port of embarkation and debarkation. Given that tourist spending accounts for a significant portion of the economic benefits derived from cruise ship tourism for port cities, this can result in a negative net benefit.

3.4.1. Land-based tourism vs. cruise ship tourism

There are several economic benefits and costs associated with both land-based tourism and cruise ship tourism. Both types of tourism can bring economic benefits to port economies through the means previously discussed such as direct spending employment opportunities. Local governments also benefit from the collection of tourism-related taxes and fees. However, the infrastructure necessary to support tourism can be expensive to build and maintain, and tourism can put strain on local resources, such as water and electricity. Cruise ship companies may also pay fees to use port facilities and employ local workers while in port. However, the costs of building and maintaining cruise ships can be high, and cruise ships may also generate environmental and social impacts, such as air and water pollution and strain on local resources, particularly in smaller or less developed ports (Klein, 2011). Some studies have found that the economic benefits of cruise tourism are substantially higher for land-based tourism, compared to cruise tourism itself directly (Klein, 2011; Stand.earth, 2022).

Chapter 4. Barriers

There are several barriers to effective regulation of the cruise industry. One barrier is the administrative complexity involved in coordinating and cooperating between different levels of government, countries, and cruise ship companies. Another barrier is the existence of legal loopholes due to the variation of regulations across states and countries. There are also equity considerations such as whether the distribution of benefits is equitable, and the potential negative impacts on residents and smaller businesses. Additionally, there are high costs associated with monitoring to ensure regulations are followed, and stricter regulations could result in reduced cruise tourism.

4.1. Equity Considerations

4.1.1. United Nations Sustainable Development Goals

In 2015, Canada adopted the 2030 Agenda for Sustainable Development at the UN General Assembly. At the assembly, 17 sustainable development goals (SDGs) were put forward as a call for action for all countries to take meaningful action to end poverty and inequality, sustain natural environments, and ensure all humans experience health, justice, and prosperity (The United Nations, n.d.). Of these goals, SDG 14 speaks to life below water. It asserts that countries must conserve and sustainably use the oceans, seas, and marine resources. Canada has an obligation as part of a global commitment to achieve the SDGs outlined by the UN.

4.1.2. United Nations Declaration on the Rights of Indigenous Peoples

Adopted by the UN General Assembly in 2017, the UN Declaration on the Rights of Indigenous Peoples (UNDRIP) is a legally non-binding resolution. UNDRIP provides a framework which details the minimum standards for survival, dignity, and well-being of Indigenous peoples (UN Department of Economic and Social Affairs, n.d.b). The framework includes the right to self-determination, the right to the land and resources Indigenous peoples traditionally use, and the right to maintain their own cultures and languages. The *United Nations Declaration on the Rights of Indigenous Peoples Act*

received Royal Assent in Canada on June 21, 2021. As such, Canada has an obligation to meet align itself with the UNDRIP framework.

4.1.3. Health and Safety Risks

The negative impacts of cruise tourism are also experienced by humans in relation to their health. Due to the close quarters and population density, onboard transmissible infections such as respiratory and gastrointestinal issues, skin infections, malaria, and meningitis can spread rapidly (Lloret, 2021). Other health issues arise from onboard sexual assaults and socio-economic issues of those working in the cruise industry, and mental health issues resulting from the working and living conditions of crew and shipyard workers (Lloret, 2021). These issues can affect passengers, crew, residents living near cruise ports or dismantling docks, those in the pathways of long-range air and marine pollution, and shipyard workers.

4.1.4. Distribution of Benefits

There is evidence to suggest that the benefits of cruise tourism may not be evenly distributed, with residents and smaller communities often seeing little return on investment (McCaughey, Mao & Dowling, 2018). In some cases, the lack of taxation and regulation in the cruise industry has been found to provide marginal, or in some cases negative, economic benefits to the port communities. The involvement and investment of destination communities is also important for the realization of local benefits.

For example, a study of a cruise tourism port in Trujillo, Honduras found that while there were some gains in cultural capital and security, these were offset by negative impacts such as an increase in corruption, a diminished capacity for residents to provide for their basic needs, and increased environmental costs (MacNeill & Wozniak, 2018). Additionally, the nearest town, Cristales, saw decreases in incomes and local wealth. It is also worth noting that tourism benefits that did reach the local economy in this case seemed to be captured by elites and foreign investors, and the tourism operations took place on the traditional territory of the local Afro-Indigenous Garifuna community, which some members claim was acquired illegally by tourism developers. Overall, the costs of cruise ship tourism, including the driving up of prices of goods and

property, are often borne mainly by local communities (Barton and Leonard 2010; Hoogkamer 2013).

4.1.5. Responsible Cruise Tourism

According to Klein (2011), there are three sub-elements to consider when examining the impacts of cruise tourism. The first is “people pollution,” which refers to the point at which the carrying capacity of a port, or the maximum number of visitors that can be accommodated without damaging the environment or reducing visitor satisfaction, is exceeded. This can lead to overcrowding and potentially negative impacts on local quality of life, particularly if there is a large daily influx of passengers or instances of “pack behaviour” or irresponsible behaviour.

The second sub-element is the homogenization effect, which refers to the tendency for cruise tourism to lead to the development of similar types of shops and facilities in the port, as has been observed in Ketchikan, Alaska. Finally, there are concerns about the socio-cultural authenticity in cruise tourism, particularly where the number of tourists is disproportionately large compared to the local population and the information provided to tourists is substandard, as this can affect the extent to which visitors are able to experience local culture.

Chapter 5. Jurisdictional Scan

5.1. Major Ports in British Columbia

5.1.1. Vancouver, BC

As previously mentioned, the Port of Vancouver often serves as a destination port for cruise ship tourism. The Port of Vancouver reported that in 2019, the cruise industry generated $2.2 billion in total economic impact and each cruise ship generated an estimated $3.17 million in direct economic activity (Port of Vancouver, 2022). The Canada Place cruise terminal was the first in Canada to offer shoreside power cruise ships. More than 60 per cent of cruise ship calls in the 2022 season were expected to be shore power enabled. It is estimated that shoreside power helped reduce more than 24,000 tonnes of GHG in 2022 (Port of Vancouver, 2022). On average, shoreside power may lead to 16 tonne reduction in fuel savings, 50.6 tonnes reduction in net GHG emissions, and 1.1 tonnes reduction in criteria air contaminants (including sulphur oxides, nitrogen oxides, fine particulate matter, volatile organic compounds, carbon monoxide, and ammonia) per cruise ship call (Port of Vancouver n.d.b). The Port committed to increasing shoreside power capacity at Canada Place so that every cruise vessel operator who wants to plug-in can do so by 2030.

5.1.2. Victoria, BC

Tourism in Victoria is the city's second largest industry, and they have the highest ratio of tourists to resident of any city in Canada (Stand.earth, 2022). In 2019, there were 256 cruise ship calls at Greater Victoria Harbour Authority (GVHA) Ogden Point Facilities (GVHA, 2020). Cruise ship calls in the same area are estimated to increase by nearly 24 per cent by 2030 (GVHA, 2020). Prior to the pandemic, Victoria was Canada's busiest cruise port, the top port of call in BC, and a mandatory stop within the Alaska cruise circuit. In contrast to Vancouver, Victoria is often a stopover port for cruise ships. Being a stopover, the scope and scale of tourist activity that occurs in Victoria is substantially lower than what occurs in the US and Vancouver (Stand.earth, 2022).

One study estimated the economic benefits of cruise ship tourism in Victoria in 2009 and found there was a negative net benefit of $1 million (Scarfe, 2011). This resulted from the profits flowing elsewhere. For example, the shuttle service to downtown Victoria is operated by CVS Tours, which at the time of the study was owned by a Seattle-based company. Scarfe found that the costs borne by residents and taxpayers exceeded the financial benefits that primarily went to corporations such as cruise ship companies, the business community, and the Greater Victoria Harbour Authority. The study affirmed that the economic benefits vary significantly depending on the type of port: the economic impact in Vancouver (a destination port) was 8.5 times greater than in Victoria and 16 times greater than such a ship in other BC ports such as Nanaimo.

Tourism makes significant contributions to Victoria's economy. In 2015, cruise tourism represented 13 per cent of GDP, 10 per cent of revenue, 10 per cent of wages, and 20 per cent of employment (Teh, 2022). However, some studies have found that the economic benefits of cruises are relatively less than non-cruise tourism (Klein, 2011, Stand.earth, 2022). In 2019, disembarking cruise passengers and crew represented approximately 12 per cent of total visitors, but spent 20 times less than non-cruise tourists, or 2 per cent of tourism spending in the region (Stand.earth, 2022). The same study found that non-cruise tourism generated 20 times more in municipal taxes and created nearly 31 times more jobs.

The GVHA conducted a study and found that in 2018, hotelling accounted for 71 per cent of cruise ship emissions in Victoria (2020). Hotelling refers to vessels leaving their engines running while in port to generate power. The study estimated that a two-berth shoreside power system would have a capital cost ranging between $23.3 million to $24.8 million and be able to support approximately 75 per cent of total GVHA cruise calls. Once installed, the two-berth system would provide substantial emission reductions including a 56 per cent reduction in carbon dioxide and sulfur oxides, and a 59 per cent reduction in nitrogen oxides. Further, an independent full-scale emissions inventory found that in 2019, cruise ship emissions accounted for 96.3 per cent of all emissions at the Victoria Cruise Terminal (GVHA, n.d.). In response to these findings, the VGHA Board of Directors announced in 2020 that it will proceed with the next stage of the project but is still seeking financial support from external partners (GVHA, n.d.).

5.2. Regulatory Regime in the United States

5.2.1. Federal Regulations

In the US, the *Clean Water Act* is the principal framework for regulating vessel discharges and regulating quality standards for waters (Environmental Protection Agency, 1972). The Act controls vessels in two ways: regulating the equipment that treats or holds sewage and establishing no-discharge zones in which the discharge of sewage from vessels is not allowed. Under Section 312 of the *Clean Water Act*, the discharge of untreated or inadequately treated sewage into navigable waters off the US or within three nm of shore is prohibited. This covers the majority of West Coast cruise ships' time spent on navigable waters. Section 311 prohibits ships from discharging oil or hazardous wastes in harmful quantities in US navigable waters, adjoining shorelines, or into waters of the contiguous zone (typically 12 nm from shore).

Another law impacting cruise ship tourism in the US is the *Passenger Vessel Services Act* of 1886 (United States Congress, 1886). The Act requires that vessels travelling between US ports must call at a foreign port prior to returning to the US (US Customs and Border Protection, 2022). When it was established, the law aligned with historical global practices to protect and support the domestic maritime industry. During the pandemic, the Canadian government closed its ports to cruise ships, causing significant impacts to the Alaskan economy, which largely depends on cruise tourism. In response to this, the US approved legislation introduced by the Alaskan government which temporarily exempted cruise ships from the requirements of the VPSA for the 2021 cruise season, allowing cruise ships to bypass Canadian ports. Since then, there has been a push for US lawmakers to exempt Alaskan-bound cruises from the PVSA to prevent such an event from reoccurring. In September 2021, US Senator Lisa Murkowski introduced the *Cruising for Alaska's Workforce Act* to permanently exempt Alaska from the PVSA (Murkowski Senate, 2021).

In 2009, the Environmental Protection Agency (EPA) issued the *Vessel General Permit (VGP)*, which regulates greywater, scrubber washwater, and some other waste streams not covered by the *Clean Water Act.* It also includes discharge standards consistent with the IMO's 2009 Guidelines for Gas Cleaning Systems. The VGP mandates the monitoring and analysis of regulated pollutants and requires ships to

report their treatment system's effectiveness to the EPA. However, these reporting systems rely on self-reporting and therefore may be not provide an accurate representation of the industry. In 2013, the VGP was amended to impose stricter discharge limits, require ballast water to be treated, improve monitoring and reporting, and use alternative compliance options to meet requirements of the VGP ((Environmental Protection Agency, 2013).

Both the Province of BC and the Government of Canada have the weakest vessel water pollution regulatory regime on the West Coast of North America, stretching from California to Alaska (Stand.earth & WECL, 2021). While cruise ships operating in Alaska must obtain permission to discharge sewage and may only do so more than one nm from shore, this is not the case in Canada, where less effective wastewater treatment systems and higher fecal coliform levels are allowed. Additionally, no permission is required to use an MSD in Canadian waters. In a 6,000 square kilometer area of ocean habitat in major parts of the Salish Sea, including the Strait of Juan de Fuca and Puget Sound, the State of Washington has banned all discharges. Of all the Pacific Northwest states, California has the most stringent emission and discharge regulations. In the state, there is no sewage discharge allowed within three nm of shore, scrubbers are not permitted, and low sulfur fuels are required. This stands in contrast to Canada's lack of consistent regulation for cruise ship pollutants, with oil being the only pollutant addressed in a way that meets US standards. The *Arctic Waters Pollution Prevention Act* does play a role in regulating discharges in the waters off Canada but does not apply to BC's coastal waters.

5.2.2. Washington State

In 2018, the EPA approved a no-discharge zone for Puget Sound and certain adjoining areas in the State of Washington. There are more than 90 designated no-discharge zones in the US that aim to protect public health, water quality, and sensitive marine resources. To further protect the waters of the state, a Memorandum of Understanding (MOU) was signed between the State of Washington's Department of Ecology, the Cruise Lines International Association (CLIA) of the Northwest and Canada, and the Port of Seattle.

The MOU applies to the waters of Puget Sound, the Strait of Juan de Fuca south of the international boundary of Canada, Washington's Pacific Coast extended three miles seaward, and the Olympic Coast National Marine Sanctuary. The MOU bans the discharge of sewage and greywater from cruise ships into the waters of the state unless the wastewater has been treated by an AWTS. This system is significantly more effective at treating wastewater than the MSDs required by federal law. However, an independent study of AWTS found that over 90 per cent of the time suspended solids and fecal coliforms were 10 and 10,000 times higher than the legal limits, which was attributed to a lack of rigorous maintenance and performance testing and resulted in ships with technologically advanced systems discharging untreated sewage (Chen, 2018).

5.2.3. Alaska

Southeast Alaska is a popular destination for cruises and ranks among the busiest in North America and top six globally (Stand.earth & WELC, 2021). In Alaska, the federal limit for fecal coliform and suspended solids in sewage are significantly more stringent than both the US federal *Clean Water Act* regulations and Canadian allowances. The coliform limit is 10 times stronger, and the suspended solids limit is 18 times more stringent than Canadian allowances (Stand.earth & WECL, 2021).

After nearly 40 illegal discharges in Alaskan waters by cruise ships between 1999 and 2001, the *Commercial Passenger Vessel Environment Compliance Regulations* were established. The set of regulations establish requirements for the management of vessel sewage, hazardous materials, and garbage. Alaskan state statutes also prohibit the release of untreated sewage into marine waters within the state. Ships must be granted permission under the Large Commercial Passenger Wastewater Discharge General Permit if they want to discharge treated sewage into Alaskan waters.

In addition to state-level regulations, the federal government passed the *Murkowski Bill* to protect certain areas of federal waters in Alaska, known as "doughnut holes", from the discharge of sewage by cruise ships. These doughnut holes, which include the Alexander Archipelago, the Kachemak Bay National Estuarine Research

Reserve, and the navigable waters within the state, are prohibited from receiving untreated sewage from cruise vessels.

The Bill also prohibits the discharge of treated sewage unless the vessel is more than one nm from shore, travelling at a speed of more than 6 knots, and the discharge meets effluent discharge standards. If a cruise ship wishes to discharge and cannot meet these conditions, it must meet more stringent treatment and effluent standards and must also certify that it has completed a self-test. If all standards have been met, the ship may receive permission from the US Coast Guard to discharge.

5.2.4. California

The State of California has the strictest regulations in the Pacific Northwest aimed to prevent pollution from cruise ships. State regulations prohibit passenger ships from discharging sewage, greywater, hazardous waste, sludge, and oily bilge water. Similar to Alaska, California enacted stricter regulations in response to a massive pollution event. In 2012, the EPA established the California No Discharge Zone, which prohibits the discharge of sewage from large passenger vessels within three nm of the shore and all bays and estuaries subject to tidal influence. Additionally, California does not allow the use of scrubbers to meet the 0.1 per cent sulfur limit in state waters and within 24 nm off the California coast. Further, the state requires cruise ships to use low-sulfur fuels to reduce their environmental impact. Regardless of stringent regulations, the Port of Los Angeles still has over 100 ships and 600,000 passengers pass through each year (Stand.earth & WELC, 2021).

5.3. Cruise Lines

5.3.1. History of Noncompliance with Environmental Regulations

There have been numerous instances of cruise companies violating environmental regulations in recent years. Carnival Corporation, the largest cruise company in the world, has been repeatedly charged with violating environmental regulations resulting in fines of $1 million, $20 million, and $40 million (Friends of the Earth, 2022). Between 2017 and 2022, Carnival was fined with illegally disposing waste such as plastics and hazardous materials, discharging greywater, failing to properly train

crew members on how to handle hazardous waste, and failing to implement court ordered monitoring programs (Friends of the Earth, 2022).

In 2019, Princess Cruises, a subsidiary of Carnival Corporation, agreed to pay a $40 million fine for illegally dumping oil contaminated waste and falsifying records to cover it up. The company admitted to discharging thousands of gallons of oil contaminated waste into the ocean and making false statements to the United States Coast Guard about its practices. In 2018, Royal Caribbean Cruises was caught illegally discharging sewage and other waste into the ocean and falsifying records to cover it up. The company agreed to pay an $18 million fine and pled guilty to multiple criminal charges. Royal Caribbean also installed scrubbers on 22 of their 25 ships to displace emissions from the air to the water to meet environmental regulations. These are just a few examples of the many instances of cruise companies violating environmental regulations.

5.3.2. Cruise Lines International Association

The CLIA is the world's largest cruise industry trade association, representing the interests of the majority of global cruise lines. CLIA member lines operate ships that sail to destinations all over the world, and the organization works to promote the growth and success of the cruise industry through advocacy, research, and the promotion of high standards of safety and environmental responsibility. It also provides training and certifications for travel agents and other industry professionals.

The CLIA announced that by 2027 their fleet will include: 26 LNG powered cruise ships, comprising 16 per cent of global capacity; 231 cruise ships fitted with AWTS, representing 81 per cent of global capacity; 174 cruise ships with shoreside power connectivity, comprising 66 per cent of global capacity; and 176 cruise ships with EGCS installed, representing 81 per cent of global capacity that is not powered by LNG. It should be noted that these projections do not account for the retirement of vessels, and vessels without these technologies or unable to be retrofitted with them are more likely to be retired first.

In 2020, The CLIA published the 2020 Environmental Technologies and Practice Report (Global) demonstrating the cruise industry's increasing focus on environmental

sustainability and compliance with regulations. In 2020, the CLIA reported that 49 per cent of new build capacity would rely on LNG fuel for primary propulsion. Additionally, 69 per cent of global capacity at the time utilized EGCS, which represents a 25 per cent increase since 2018. Of new builds that were non-LNG, 75 per cent were to have EGCS installed. Nearly all new builds (99 per cent) were to be equipped with AWTS, which would bring the global capacity to 78.5 per cent. Three-quarters of new cruise ships were committed to having shoreside power installed or to be configured to have it added in the future. As of 2020, 32 per cent of global cruise ship capacity could use shoreside electricity in the 14 ports worldwide that offer this capability. This is an increase of 13 per cent since 2019.

Chapter 6. Policy Options

Cruise tourism is a significant contributor to Canada and BC's economy, but it also has a significant environmental impact. Canada's current regulatory regime incentivizes cruise ship companies to dump large volumes of wastewater in Canadian waters due to the relatively relaxed regulations compared to neighbouring states. The allowance of scrubbers to meet IMO sulfur limits is exacerbating environmental degradation from cruise ships. Another issue is that cruise ship companies have repeatedly violated environmental regulations (Friends of the Earth, 2022). It is important to see laws enacted that support initiatives such as the MaPP, the MPA network, and the Coastal Marine Strategy to make them legally binding and enforceable.

Supporting sustainable coastal economies and communities that depend on healthy coastal ecosystems is crucial and will help Canada achieve its commitments to the UN SDGs. This may be achieved through policies that aim to mitigate the negative environmental impacts of cruise tourism. The research in this paper has informed the construction of three policy options to address this policy problem: Green Incentives, Regulatory Oversight, and Trans-Boundary Harmonization. The suites use three different means to achieve the outcome including financial incentives for cruise companies to invest in cleaner technologies and environmentally friendly practices, strengthening regulatory oversight, and aligning regulations in BC with those in the neighboring states in the US. These policy suites include measures that will help BC promote sustainable tourism while also protecting its coastal ecosystems and the communities that rely on them.

The construction of these policies must utilize the framework outlined by the UNDRIP. Consultation with Indigenous peoples must occur in alignment with the UNDRIP principle of Free, Prior, and Informed Consent. This principle establishes that Indigenous peoples have the right to give or withhold their consent to any project or development that may affect their territories, rights, or resources. Additionally, the UNDRIP principle of self-determination could influence the development of agreements of co-management regimes between the Indigenous peoples of BC and government and industry, to better reflect the cultural and traditional knowledge of Indigenous peoples in the management and conservation of marine resources.

6.1. Policy Option 1: Green Incentives

The Green Incentives policy suite aims to mitigate the negative environmental impacts of cruise tourism by creating financial incentives for cruise ship companies to invest in cleaner technologies and environmentally friendly practices. This policy suite would include the implementation of a cruise ship pollution tax, a per-passenger tax, and subsidies for companies that invest in sustainable tourism practices.

The pollution tax would impose financial penalties on cruise ship companies that violate environmental regulations or exceed certain emissions or waste discharge limits. The revenue generated from this tax would then be used to fund programs that support sustainable tourism practices, such as shoreside power infrastructure and the development of cleaner technologies. Subsidies would be provided to cruise ship companies that invest in cleaner technologies and environmental management practices, such as LNG-powered ships and AWTS. Finally, the per-passenger tax would be imposed solely on cruise ships using the port as a stopover. The revenue from the per-passenger tax would go directly to local communities to help ensure they are able to experience a positive net benefit.

This suite addresses the policy problem of cruise tourism's environmental impact by creating financial incentives for companies to reduce their environmental footprint. It also provides a source of funding for sustainable tourism initiatives and helps to level the playing field for companies that prioritize responsible tourism practices. Additionally, the policy suite could help to address the issues of inequity by ensuring that the cost of tourism not is not solely borne by local communities and the environment.

6.2. Policy Option 2: Regulatory Oversight

The Regulatory Oversight policy suite seek to address the negative environmental impacts of cruise tourism by strengthening regulatory oversight and increasing penalties for violations. This policy suite would include an increase in the number of inspections and audits of cruise ships to ensure compliance with environmental regulations, and the implementation of new monitoring systems to detect and respond to violations.

Increasing the number of inspections and audits would be made feasible through hiring additional staff at regulatory agencies and contracting out inspections to independent third-party organizations. Additionally, penalties for violations would be increased and made more consistent across different countries and states to provide a stronger deterrent against non-compliance. The suite would also implement new monitoring systems, such as onboard data loggers that can automatically record and transmit data on waste discharge and emission levels. The monitoring systems will reduce strain on regulatory agencies and make it easier to detect and respond to violations. Further, it would provide a more accurate representation the cruise industry's environmental impact. This suite would also enact laws to support environmental initiatives such as the MaPP, the MPA Network, and the Coastal Marine Strategy, to make them legally binding and enforceable.

This policy suite addresses the policy problem with cruise tourism's environmental impact by increasing the oversight and enforcement of environmental regulations. It would also provide a more accurate representation of the cruise industry’s environmental impact, allowing for more effective and targeted regulation in the future. Ensuring that cruise ships are complying with environmental regulations and that emission reducing technology is operating efficiently would reduce the negative environmental impact of cruise tourism.

6.3. Policy Option 3: Trans-Boundary Harmonization

The Transboundary Harmonization policy suite aims to mitigate the negative environmental impacts of cruise ship tourism by ensuring consistency and coordination among different jurisdictions. Neighboring states in the US have substantially more stringent discharge and emission regulations relative to BC. By aligning with Washington, Alaska, And California, it would help to reduce the incentivization of cruise ships to discharge waste and pollutants into Canadian waters. The policy suite includes four components: mandating the current federal regulations in BC, banning the use of scrubbers or EGCS to meet sulfur limits, requiring AWTS, and creating legally binding no-discharge zones.

The current federal regulations in Canada state that cruise ships cannot discharge sewage or greywater within three nm of shore, but these regulations are non-

mandatory. To protect BC's sensitive coastal ecosystems, this policy suite would make the federal discharge regulations mandatory in the waters off the province's coastline. In alignment with California, the suite would also ban the use of scrubbers or EGCS to meet the IMO sulfur limits within 24 nm off the BC coast, which are often used by cruise ships but result in the displacement of emissions from the air to the ocean.

Another component of this policy would be to require cruise ships operating in BC waters to install and use the same pollution prevention technologies as required in Washington. It would also require cruise ships to use AWTS in protected areas like the no-discharge zone in Puget Sound in Washington. This would ensure that cruise ships operating in BC waters are using the most effective and up-to-date pollution prevention technologies, and banning those with known negative environmental impacts.

Overall, this policy option addresses the issue of weaker regulations in BC compared to neighbouring US states, which incentivizes cruise ships to discharge in Canadian waters. By aligning the province's regulations with those of neighbouring states, this policy would ensure that cruise ships operating Canadian waters are held to the same high standards as those in the US. It will also address the increasing practice of cruise ships using scrubbers to meet the IMO sulfur limits which is displacing harmful pollutants from the air to the water.

Chapter 7. Analysis of Criterion and Measures

To effectively evaluate and compare policy options, a multi-criteria analysis was conducted to consider a range of factors and objectives. The analysis involved the consideration of three societal objectives, namely environmental impact, economic impact, and equity. It also included three governmental objectives including cost, stakeholder acceptance, and compliance. To evaluate the effectiveness of each policy option in achieving these objectives, a specific criterion was established, and a corresponding measure was developed. The multi-criteria analysis allowed for a comprehensive evaluation of policy options to inform the recommendations.

Table 1: Summary of Criterion and Measures

Objective	Criterion	Measure
Environmental Impact	Reduction in air and water pollution	Predicted degree of province-wide reduction in cruise ship discharges that will reduce overall air and water pollution
Economic Impact	Economic benefits for local communities	Estimated net economic benefit of cruise ship tourism in local communities
Equity	The targetability of the policy	The ability of the policy to alleviate the inequitable distribution of benefits present in cruise tourism and ensure at-risk groups are protected
Cost	Cost to government	The total cost to the BC government to implement the policy
Stakeholder Acceptance (Group 1)	Support from relevant stakeholders	The anticipated level of support from environmental groups, residents, and Indigenous peoples
Stakeholder Acceptance (Group 2)	Support from relevant stakeholders	The anticipated level of support from local businesses and the tourism and cruise industries
Compliance Issues	How the policy addresses the existing compliance issues present in the cruise industry	The ability of the policy to reduce the number of cruise ship violations with respect to the measures included in the policy suite

7.1. Objective One: Environmental Impact

Environmental impact is the primary and most pressing criteria of the policy problem, and thus, it has been double weighted in the multicriteria analysis. The scale and magnitude of environmental impacts caused by cruise tourism in BC are extensive and broad reaching. Understanding the nature and extent of these environmental impacts is crucial to formulate effective policy options that can mitigate them. By double

weighting the environmental impact criteria on, it ensures that it is given due consideration in the analysis and serves as a reminder of the core policy problem. It should be noted that double weighting did not alter the ranking of policy suites in this analysis, but it underscores the significance of the environmental impact and its critical importance in considering the challenges posed by cruise tourism in BC.

Criterion: Reduction in air and water pollution.

Measure: Predicted degree of province-wide reduction in cruise ship discharges that will reduce overall air and water pollution.

Green Incentives: Good

The Green Incentives policy suite includes the implementation of a cruise ship pollution tax and subsidies for companies that invest in sustainable tourism practices, such as LNG-powered ships and AWTS. These technologies have been shown to significantly reduce air and water pollution from cruise ships (CLIA, 2020; GVHA, 2020; Port of Vancouver, 2022). The financial incentives created by the tax and subsidies will encourage more compliance with existing regulations and investments in emission reducing technologies, leading to a greater overall reduction in pollution.

Regulatory Oversight: Good

The Regulatory Oversight suite includes increased number of inspections and audits of cruise ships and implementing new monitoring systems to detect and respond to violations. While this may lead to a greater compliance with environmental regulations and a reduction in violations, it does not specifically address pollution-reducing technologies. The greatest environmental benefit will result from laws that support environmental initiatives.

Trans-Boundary Harmonization: Moderate

The Trans-Boundary Harmonization suite aims to align BC with neighbouring US states, creating consistent regulations and standards for the cruise industry across the Pacific Northwest. It has the potential to reduce air and water pollution by promoting global environmental standards for the industry. However, it may take a long time to implement and may not result in immediate reductions in pollutions.

7.2. Objective Two: Economic Impact

It is important to assess the economic benefits to understand the trade-offs that may be necessary to mitigate environmental impacts. By evaluating economic benefits, the policy analysis can identify how to balance economic benefits and environmental protection.

Criterion: Economic benefits for local communities.

Measure: Estimated net economic benefit of cruise ship tourism in local communities.

Policy Suite 1: Moderate

The Green Incentives policy suite includes a per-passenger tax to ensure local communities benefit when used as a stopover port. Subsidies for sustainable tourism practices would increase the prevalence of emission reducing technologies such as shoreside power infrastructure and the use of LNG-powered ships over time. Development of cleaner technologies could enhance the industry's image, increasing tourist visits and economic benefits for local communities.

Policy Suite 2: Moderate

The Regulatory Oversight suite aims to ensure cruise ships comply with local regulations and standards, benefiting local businesses. Laws that support environmental initiatives could lead to an increase in cruise tourism by environmentally conscious tourists. However, the additional costs for operating in the area could potentially discourage some cruise ships from utilizing BC's ports.

Policy Suite 3: Poor

The Trans-Boundary Harmonization policy suite holds ships operating in BC to the comparable regulations in the rest of the Pacific Northwest. Given that the changes to regulations will align with the other ports on the route, it will likely not affect cruise ships utilizing BC ports. As such, this suite would likely have a marginal economic effect on local communities.

7.3. Objective Three: Equity

The economic benefits generated by the cruise industry are not distributed equally and some groups bear a disproportionate burden of the negative environmental impacts. Prioritizing Indigenous peoples and other vulnerable groups in the policy process is essential to alleviating inequities. Policies that reduce emissions and protect the ocean will alleviate inequities, as Indigenous peoples' way of life depends on ocean health. It will also help protect local communities who are subject to the negative health impacts resulting from cruise tourism.

Criterion: The targetability of the policy.

Measure: The ability of the policy to alleviate the inequitable distribution of benefits present in cruise tourism and ensure at-risk groups are protected.

Policy Suite 1: Good

The Green Incentives policy suite creates financial incentives for cruise ship companies to invest in cleaner technologies and environmentally friendly practices. The per-passenger tax would ensure communities at stopover ports experience economic benefits. Subsides could be prioritized for small businesses, women and minority-owned businesses, and Indigenous peoples.

Policy Suite 2: Good

The Regulatory Oversight suite aims to strengthen regulatory oversight and increase penalties for violations which would increase accountability across the industry. Given that the MaPP, MPA network, and the Coastal Marine Strategy have been co-created with Indigenous peoples and local communities, enacting laws to support these initiatives would ensure the efforts and input provided by these groups is prioritized.

Policy Suite 3: Poor

The Trans-Boundary Harmonization suite has less capacity for targetability than the other suites and will have minimal impact to equity relative to the other two suites.

7.4. Objective Four: Cost

It is essential to understand the cost implications of implementing the policy options as it will impact the financial feasibility of each policy suite, and the government's willingness to implement the policy.

Criterion: Cost to government.

Measure: The total cost to the BC government to implement the policy.

Policy Suite 1: Good (Low)

The Green Incentives policy suite would require funding for sustainable infrastructure projects and research and development of cleaner technologies. However, the implementation of a pollution tax and per-passenger tax would generate revenue that could be used to offset these costs, making the suite cost-neutral or even cost-positive in the long run. Additionally, subsidies provided for companies investing in sustainable tourism practices could encourage private investment in environmental initiatives, further reducing the burden on the government.

Policy Suite 2: Poor (High)

The Regulatory Oversight suite will require significant investment for additional staff and resources to increase the number of inspection and audits of cruise ships, enact laws, and implement a new monitoring system. In the short term, the high costs may be offset through revenue from the penalties imposed on non-compliant cruise companies. Over time, more stringent regulations and oversight would likely result in a decrease in violations and thus revenue. However, enforcement of regulations and maintenance of monitoring systems will have on-going costs to government to maintain.

Policy Suite 3: Moderate

The Trans-Boundary Harmonization policy suite would have a moderate cost to government. Adopting the same discharge regulations as those in neighboring US states would require some initial investment and administrative costs. Additional resources would also be required to mandate existing federal discharge regulations set by the Canadian government and to make no discharge zones legally binding.

7.5. Objective Five: Stakeholder Acceptance

Stakeholders such as environmental groups, local communities, Indigenous peoples, and the tourism and cruise ship industries may have conflicting priorities. Local businesses often prioritize economic benefits, while residents prioritize environmental benefits. Understanding the views and priorities of different stakeholders and how they respond to the policy options is important in developing a policy that can garner the necessary support to be effective. Given the contrasting priorities, stakeholder acceptance has been divided into two groups. The first group includes environmental groups, residents, and Indigenous peoples. The second group includes local businesses, and the tourism and cruise ship industries.

Criterion: Support from relevant stakeholders.

Measure: The anticipated level of support from Group 1 (environmental groups, residents, and Indigenous peoples) and Group 2 (local businesses and the tourism and cruise ship industries)

Policy Suite 1: Group 1: Moderate

The Green Incentives suite is expected to receive moderate support from environmental groups, residents, and Indigenous peoples. While the financial incentives, such as the pollution tax and per-passenger tax, may be viewed positively, some stakeholders may view them as insufficient. The subsidies for sustainable tourism practices would likely be viewed more favourably, but overall, the level of support is expected to be moderate.

Policy Suite 1: Group 2: Moderate

The Green Incentives policy suite is likely to receive moderate support from local businesses and the cruise and tourism industries. The per-passenger tax will help local businesses in stopover ports capture greater economic benefits from cruise tourism. Moreover, promoting responsible cruise tourism may improve the industry's public image, potentially resulting in increased support from local businesses and the cruise and tourism industries. However, the cruise industry would be resistant towards the pollution tax and per-passenger tax which would increase operating costs.

Policy Suite 2: Group 1: Good

The Regulatory Oversight suite aims to address cruise companies' history of non-compliance and enact new laws that support initiatives informed by consultations with Indigenous peoples and environmental groups. This group will likely view it as a necessary step to ensure compliance with regulations and protect the environment. Given enactment of laws to support the MaPP, the MPA Network, and the Coastal Marine Strategy, this suite will likely receive good support from Group 1.

Policy Suite 2: Group 2: Poor

Local businesses may support the regulations as some prioritize their economic benefits. However, the Regulatory Oversight suite will increase costs and limit activities, which could harm the tourism and cruise industries. This suite, unlike the Green Incentives suite, has no component to counteract these costs. Strengthening regulatory oversight, increasing penalties for violations, and enacting laws will likely be opposed by all stakeholders in this group as it has the potential to reduce cruise tourism in BC.

Policy Suite 3: Group 1: Good

Environmental groups, residents, and Indigenous peoples are likely to appreciate the harmonization of regulations across different jurisdictions. This suite would create more consistent environmental protections and reduce the incentive for cruise ships to discharge in Canadian waters, resulting in reduced overall emissions from cruise ships. Moreover, the banning of scrubbers, making no discharge zones legally binding, mandating no discharge of sewage or greywater within three nm of shore, and requiring AWTS, would be viewed positively, resulting in good support for this suite.

Policy Suite 3: Group 2: Moderate

The Trans-Boundary Harmonization suite would have a moderate level of support from local businesses and the tourism industries. The banning of scrubbers, making no-discharge zones legally binding, mandating no discharge of sewage or greywater within three nm of shore, and requiring AWTS would have significant impacts on cruise companies. However, given that most cruise ships arriving in BC ports are already subject to these regulations on their routes in US waters, it may not have as

much opposition as the Regulatory Oversight suite. This suite would also create more certainty and consistency in the regulatory environment.

7.6. Objective Six: Compliance Issues

Compliance with environmental regulations is crucial in mitigating the negative environmental impacts of cruise tourism. Understanding how the policy options can incentivize compliance and how they may address compliance issues in the industry is critical in developing an effective policy.

Criterion: How the policy addresses the existing compliance issues present in the cruise industry.

Measure: The ability of the policy to reduce the number of cruise ship violations with respect to the measures included in the policy suite.

Policy Suite 1: Poor

The most impactful component of the Green Incentives suite is unlikely to significantly address compliance issues in the cruise industry. Incentives may encourage some cruise lines to adopt more environmentally friendly practices, but it is unlikely to be enough to change industry-wide compliance issues.

Policy Suite 2: Good

The Regulatory Oversight suite is likely to be the most effective in addressing compliance issues in the cruise industry. Increased regulations and oversight will help ensure that cruise lines are complying with environmental standard and regulations. Further, the implementation of new monitoring systems to detect and respond to violations along with making initiatives legally binding will help to reduce the number of violations and improve the overall environmental impact of the industry.

Policy Suite 3: Moderate

The Trans-Boundary Harmonization policy option can help to address compliance issues by creating more consistent environmental regulations across different jurisdictions. However, it may not be as effective as the Regulatory Oversight

suite in terms of ensuring compliance with these regulations. Additionally, it may take time to reach harmonization, and compliance may not improve until the new regulations are fully in place.

Chapter 8. Policy Analysis Summary

Table 2: Policy Analysis Summary

Objective	Green Incentives	Regulatory Oversight	Trans-Boundary Harmonization
*Environmental Impact (x2)**	6	6	4
Economic Impact	2	2	1
Equity	3	3	1
Cost	3	1	2
Stakeholder Acceptance (Group 1)	2	3	3
Stakeholder Acceptance (Group 2)	2	1	2
Compliance Issues	1	3	2
Total	**19**	**19**	**15**

Evaluation Legend: Poor = 1; Moderate = 2; Good = 3

*As the core policy problem focuses on mitigating the negative environmental impacts of cruise tourism, environmental impact has been double weighted to emphasize its priority.

8.1. Policy Option 1: Green Incentives

The Green Incentives policy suite was ranked highly on the environmental impact criterion, as it includes financial incentives to encourage cruise ship companies to invest in cleaner technologies and environmentally friendly practices, which would help reduce the negative impact of cruise tourism on the environment. The policy also ranked highly on the equity criterion as it creates financial incentives to level the playing field for companies that are already operating responsibly and ensures that the costs of tourism is not solely borne by local communities and the environment.

On the economic impact criterion, the Green Incentives policy suite was ranked moderately, as it includes subsidies for companies that invest in sustainable tourism

practices and a per passenger tax that will go directly to local communities. However, the implementation of a cruise ship pollution tax could have a negative impact on the profitability of cruise ship companies, which could have negative effects on local economies. On the cost criterion, the policy ranked moderately as the costs associated with implementing and administering the various financial incentives would need to be balanced against the revenue generated from taxes and subsidies.

This suite is expected to receive moderate stakeholder acceptance from Group 1 and Group 2. Group 1 may perceive the incentives to be insufficient, but the subsidies would likely be viewed positively. Promoting responsible cruise tourism may improve the industry's public image, potentially resulting in increased support from Group 2. However, the cruise ship industry would be resistant towards the pollution tax and per-passenger tax which would increase operating costs. Finally, on the compliance issues criterion, this policy suite ranked highly, as the financial penalties for violating environmental regulations or exceeding certain emissions or waste discharge limits would act as a strong deterrent against non-compliance. The Green Incentives ranked just below the top ranked suite, Regulatory Oversight.

8.2. Policy Option 2: Regulatory Oversight

The Regulatory Oversight policy suite ranked highly on the environmental impact criteria, as it increases the oversight and enforcement of environmental regulations, which would help reduce the negative impact of cruise tourism on the environment. The suite also ranked highly on the compliance issues criteria, as the increased number of inspections and audits and the implementation of new monitoring systems would make it easier to detect and respond to violations.

On the economic impact criterion, this suite ranked moderately, as the increased penalties for violating environmental regulations could have a negative impact on the profitability of cruise ship companies and local economies. On the cost criterion, the policy ranked moderately, as the costs associated with hiring additional staff or contracting out inspections to third party organizations would need to be balanced against the revenue generated from penalties.

Stakeholder acceptance for Group 1 is ranked good, as the enactment of laws and strengthening of regulatory oversight will address issues of non-compliance and ensure that consultations from marine initiatives are made legally binding. For Group 2, stakeholder acceptance was ranked poor as it will increase costs and limit activities, which could harm the tourism and cruise industries and unlike the Green Incentives suite, there is no component to counteract the costs. In terms of equity, the Regulatory Oversight suite ranked moderately, as it does not provide financial incentives for companies that are already operating responsibly and could disproportionately affect smaller cruise ship companies.

8.3. Policy Option 3: Trans-Boundary Harmonization

The Trans-Boundary Harmonization policy suite has the potential to reduce air and water pollution by promoting global environmental standards for the industry. However, it may take a long time to implement and may not result in immediate reductions in pollution. On the economic impact criteria the policy suite ranks poorly. The suite would require BC to hold ships operating in its waters with comparable regulations and neighboring US states, which would likely not affect cruise ships utilizing BC ports. As such, this suite would have a marginal economic impact on local communities.

The Trans-Boundary Harmonization suite would have a moderate cost to the government. Adopting the same discharge regulations as those in neighbouring US states would require some initial investment and administrative costs, additional resources would also be required to mandate existing federal discharge regulations set by the Canadian government and to make no discharge zones legally binding.

Regarding equity, the Transboundary Harmonization suite has less capacity for targetability than the other suites and will have minimal impact relative to the other two suites. The Trans-Boundary Harmonization was ranked highest by Group 1 for stakeholder acceptance as it would reduce the incentive for cruise ships to capitalize on Canada’s relatively less-stringent laws and increase the prevalence of emission reducing technologies. Although the regulations accompanying the suite are stringent, most ships are subject to them along their routes, as such Group 2 would moderately support this suite. Once the new regulations are in place, the Transboundary Harmonization policy option can help to address compliance issues by creating more consistent environmental

regulations across different jurisdictions. Overall, this policy suite was ranked the lowest of the three suites.

Chapter 9. Considerations and Limitations

As the Green Incentives suite and the Regulatory Oversight suite are ranked the same, an alternative policy option that bundles the two suites has been considered. The two suites have the same ranking for environmental and economic impact, and equity. Bundling the policy suites would likely result in an improvement to stakeholder acceptance for Group 1 as it would have substantial environmental benefits. However, the bundle would have significant impacts to cruise ship operations and may reduce cruise tourism which would decrease stakeholder acceptance for Group 2. While the changes to stakeholder acceptance would not alter the overall ranking, bundling the policy suites would substantially increase administrative complexity and the cost to government resulting in a lower overall rank. Therefore, the bundle is not included in the analysis as the short-, medium-, and long-term solutions better address the policy problem.

It is worth noting that in 2020, over two-thirds of global cruise ships were using scrubbers to meet emission requirements. While this does improve air quality, the systems can be problematic due to the displacing of emissions from air to water. Monitoring and enforcement will be essential in the coming years as the majority of ships (78.5 per cent) will have AWTS but must be serviced to ensure their efficacy (CLIA, 2020). Additionally, less than one third of global capacity (32 per cent) were fitted with shoreside power capability (CLIA, 2020). Shoreside power is a great emission reducing technology for BC in particular as the province uses hydroelectricity.

If legislation is passed exempting Alaska from the PVSA, there may be likely be a significant reduction in cruise ship tourism in BC. If this occurs, looking for sustainable ways to boost economic activities will become critical. While proposing efficient alternative economic activities is outside the scope of this paper, it may become critical in the coming years if there is a significant reduction in cruise tourism.

There are several limitations to the analysis that should be considered. The multi-criteria analysis relies on assumptions about the future, and therefore may not accurately reflect the real-world impacts of the policy options. Further, the data used to assess the economic impact of the policy options is dated and may not fully capture the

current state of the industry. As such, a more robust economic analysis should be conducted prior to implementation.

It should be noted that the analysis is susceptible to potential bias, as the research used to inform the analysis may be influenced by the perspectives and priorities of those conducting it. Additionally, the demographics of cruise passengers were not taken into account, specifically age, which could have an impact on the popularity of cruise lines in the future given that the average age of a cruise passenger in 2022 was 47.6 (CLIA, 2022). If a significant portion of passengers are elderly, the popularity of cruises may decline over time and naturally phase out.

Finally, as the global community prioritizes sustainability, it is likely that the cruise ship industry will have to adapt and implement new policies and technologies to reduce their environmental impact. This means the effectiveness of the policy options analyzed may decrease over time if they are not adapted to meet evolving sustainability standards.

Chapter 10. Recommendations and Conclusion

10.1. Recommendations

Given the urgent need to address emissions from cruise ships in BC waters, it is recommended that short-, medium-, and long-term solutions are implemented to effectively address the policy problem. In the short term, the Regulatory Oversight policy suite should be implemented as it can effectively address the issue of non-compliance with existing regulations. Enacting laws to support the MaPP, MPA Network, and Coastal Marine Strategy will ensure that cruise ships are held accountable for their actions and to help reduce the negative impact of cruise tourism on the environment. Given that these initiatives were co-created with Indigenous peoples and local communities, it will help improve the inequities present in cruise tourism. This will have broad reaching benefits, as it will improve the overall health of BC's marine ecosystems and the communities that rely on them. Inspections and audits of cruise ships will also ensure that emission control systems are being regularly serviced and functioning properly and efficiently.

After implementing the Regulatory Oversight suite to address the critical issue of noncompliance and enacting laws to support the MaPP, MPA Network, and Coastal Marine Strategy, it is recommended to follow with implementation of the Green Incentives suite a few years later. This delay will give cruise companies time to adjust their habits before imposing pollution and per-passenger taxes. The Green Incentive suite will incentivize companies to reduce their emissions and adopt more sustainable practices, ultimately reducing the negative impact of cruise tourism on the environment. It will also help transition the cruise industry to emerging emission reducing technologies such as LNG-powered ships and shoreside power connectivity. However, the environmental benefits may take longer to realize compared to the immediate impact of the Regulatory Oversight suite.

In the long term, the Trans-Boundary Harmonization suite should be implemented to create aligned regulations for cruise ships operating in the Pacific Northwest. This suite will promote consistent environmental standards for the industry, reducing air and water pollution and benefiting the environment. It may take longer to

implement but will have broad reaching benefits and will address the issue of scrubber usage.

It is essential to have short-, medium-, and long-term solutions for this policy problem, with the most urgent issue being emissions. The recommended approach of implementing the Regulatory Oversight suite first will effectively address non-compliance and lay the groundwork for the following policy suites. The Green Incentives suite will promote sustainable tourism practices and help reduce negative impacts, and the Trans-Boundary Harmonization suite will create consistent environmental standards in the long term. By implementing all three policy suites, the negative impact of cruise tourism on the environment can be mitigated, leading to a more sustainable and environmentally conscious industry.

10.2. Conclusion

This paper has examined the environmental impacts of cruise ship tourism in BC, as well as potential policy options to mitigate these impacts. The literature suggests that cruise ship tourism in BC has a range of environmental impacts, including air and water pollution, and strain on local resources. While there are economic benefits associated with cruise ship tourism, it is important to carefully consider and address these environmental impacts to ensure the sustainable development of the tourism industry in the region.

The policy options presented in this paper include Green Incentives, Regulatory Oversight, and Trans-Boundary Harmonization. Each policy suite has its own strengths and weaknesses, but all aim to reduce the environmental impacts of cruise tourism in BC. However, compliance with the UN SDGs and UNDRIP will need to be closely monitored to ensure that the policy is not having negative impacts on marginalized groups, especially Indigenous peoples. Enacting laws to support the MaPP, MPA Network, and Coastal Marine Strategy is an efficient and effective way to ensure that prior consultations with Indigenous peoples and local communities is being actioned.

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