

RESEARCH ARTICLE

Systemic risk of cruise ship incidents from an Arctic and insurance perspective

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Easier accessibility and demand for so-called last chance tourism has contributed to rapid growth in Arctic cruise ship tourism. Arctic cruising brings many benefits to remote coastal communities but also presents an array of risks. In the light of this context, this article explores the concept of systemic risk of cruise ship incidents in general, findings which are then placed in an Arctic context and consideration given of the role the insurance sector may play in addressing cruise ship incidents. The study is based on metadata, both from academic and nonacademic sources. Findings are drawn from 11 global case studies of cruise ship incidents, 5 of which are polar examples. In the worst-case scenario, an array of serious economic, business, environmental, sociocultural, and security impacts may unfold in the Arctic, presenting risks that may be considerably worse than in other parts of the world. Arctic-specific challenges include extreme weather conditions and the presence of sea-ice, navigation and communication conditions, and lack of infrastructure (port facilities, Search and Rescue capabilities). Significant knowledge gaps across the Arctic have been identified, for example, in terms of seabed mapping, how to deal with industry-related activities, and the risks and nature of environmental change. When cruise ship risks in the Arctic are considered, both passenger and shipowner risk need to be accounted for, including Search and Rescue cover. Although data are limited, there is evidence that the sociocultural risks of an Arctic cruise ship incident are insufficiently addressed, either via insurance mechanisms or cross-border, navigational safety guidelines such as the Polar Code. The academic contribution of the study is the systemic scale of the analysis, and the practical and political implications are to lay the foundation for solution discussion that is of relevance in an Arctic and insurance context.

Keywords: Arctic, Insurance, Cruise ship, Systemic risk, Incident, Worst-case scenario

Introduction

Across the world, cruise tourism has been the largest growing part of the tourism industry, experiencing a doubling in scale every 10 years since 1990 (Research Centre for Coastal Tourism, 2012; MacNeill and Wozniak, 2018). The size of the vessels has furthermore expanded in such a way that although a typical cruise ship in the 1960s accommodated between 600 and 1,000 passengers, recent class vessels can host over 5,000 tourists (Klein, 2018). Cruise ship vessels operating in polar waters are usually smaller with fewer passengers on board (Research Centre for Coastal Tourism, 2012). The cruise ships are often quite luxurious, described as floating resorts or cities (Research Centre for Coastal Tourism, 2012). This form of tourism has been defined as “a luxurious form of travelling, involving an all-inclusive holiday on a cruise ship of at least 48 h, according to specific itinerary, in which the cruise ship calls at several ports or

cities” (Research Centre for Coastal Tourism, 2012, p. 3). The types of cruises, however, differ and may include cruises in giant vessels, river cruises, theme cruises, mini cruises, world cruises, transit cruises, and turnaround cruises (Research Centre for Coastal Tourism, 2012).

New destinations are on the agenda as traditional cruise ship routes have become crowded (Research Centre for Coastal Tourism, 2012). Given the melting of ice, newly accessible routes are emerging, as well as the perception of “last chance” tourism (Veijola & Strauss-Mazzullo, 2019), which influences the “desire for tourists to witness vanishing landscapes or seascapes and disappearing species” (Lemelina et al., 2010, p. 477). This means that larger tours to more remote locations (Ocean Conservancy, 2017) are becoming increasingly popular destinations for cruise ship operators (Lasserre and Têtu, 2015; Innanríkisráðuneyti Íslands, 2016), including high-end tourism in large ships navigating Arctic waters. Seaborne tourism, especially the cruise ship industry, constitutes one of the fastest growing segments of polar tourism (Larson & Fondahl, 2015; Bystrowska and Dawson, 2017; Dawson et al., 2018; Palma et al., 2019).

Whereas there were only three zones that attracted cruise ships in 2000, Russian, Greenlandic, and Canadian,

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by 2017 there were 10 (AECO, n.d.; Têtu et al., 2019). Newly emerging routes and destinations have been prominent (Lamers et al., 2018). In Iceland, the number of cruise ship visitors increased from 265,935 in 2015 to 402,834 in 2017, an uplift of 66% (Icelandic Tourist Board, 2018). In 2019, 496,432 cruise passengers visited ports in northern Norway, which is a 33% increase since 2014. Nowadays, most of the cruises organized in the High Arctic frequent the archipelago of Svalbard (Bytrowska and Dawson, 2017). The number of cruise ship visitors to Svalbard increased from 39,000 in 2008 to 63,000 in 2017, growth of 62%. Significantly less, albeit growing, cruise ship tourism is occurring in Greenland and Canada (AMAP, 2018). The number of cruise ship visitors to Greenland increased from 20,000 to 30,000 per year between 2008 and 2017 (Bytrowska and Dawson, 2017). Cruise shipping in Arctic Russia is also gradually expanding, with Arkhangelsk a focal point (Olsen et al., 2020), partly due to its location near to the Russian Arctic National Park, established in 2009 and including Severny Island and Franz Josef Land (Pashkevich et al., 2015). Overall, cruise passenger data from the Association of Arctic Expedition Cruise Operators show the growth of visitors to the High Arctic from 67,752 in 2008 to 98,238 in 2017, an upscaling of 57% (Palma et al., 2019).

Until the year 2020, when, by June, more than 50% of Arctic cruise ships had been canceled or postponed until 2021 due to the COVID-19 pandemic (Halpern, 2020); the cruise ship industry was rapidly expanding to meet demand in the Arctic. One example of a larger cruise was when the *Crystal Serenity* cruise, a vessel with a capacity of 1,700 passengers and crew, sailed through the Northwest Passage of the Canadian Arctic's territorial waters in 2016 (Arctic Today, 2017). According to The Barents Observer (2018), by 2022 it is anticipated that 28 new, specially designed ships will be operational in addition to the 80 (in 2018) already sailing in Arctic waters. The emergent class of ships will be able to venture deeper into the Arctic than before, having a higher ice-class,¹ with some of the 28 new ships being Polar Class 5 (The Barents Observer, 2018). Despite the extent of melting summer sea ice, the season for cruise ship operators in the Arctic is likely to remain very short, from June to late August in most locations. This means that certain ports will become crowded, with much of the industry focused on a few, core locations, in places such as Longyearbyen on Svalbard, Northern Norway, Franz Josef Land in Russia, Iceland, Greenland, Canada, and Alaska in the United States (Cruise Industry News, 2018). The pressure is therefore also to increase the number of winter voyages, such as from Bergen to the town of Kirkenes in far north-eastern Norway in a 530-passenger ship (The Barents Observer, 2018).

1. Ships can be assigned one of seven Polar Classes (PC) ranging from PC 1 for year-round operation in all polar waters to PC 7 for summer and autumn operation in thin first-year ice. The Polar Classes are based on the *Unified Requirements for Polar Class Ships* developed by the International Association of Classification Societies (IACS, 2016).

There are benefits and challenges associated with cruise ship operations in the Arctic, as stated by the Arctic Council:

The Arctic Ocean is an important source of livelihood for communities along its shores. The demand for natural resources and the opening of new sea routes may bring prosperity to the region, but they will also increase the risks to Arctic inhabitants and nature. The global interest in the Arctic puts pressure on developing models for stewardship of Arctic sea areas to safeguard sustainable development of the region. (Arctic Council, 2017b, p. 5)

Economic development in the Arctic, including expanding tourism, has the potential to facilitate positive economic and social development, such as through infrastructure investments, tax revenues, and increased employment (PAME, 2015). In the Canadian Arctic, tourism ships, including cruise ships, have increased by 75% during the period 2005–2018 (Dawson, 2018), but in the Arctic region as a whole, there was a 400% increase in cruise ship traffic registered between 2004 and 2007 (from 50 to 250 ships; Ocean Conservancy, 2017). In the harbor of Reykjavík, Iceland, arrival of cruise ships increased from 77 in 2005 to 152 in 2018, and numbers of visitors from 54,795 to 144,658, respectively (Faxaflóahafnir, n.d.). Consequently, communities in some remote Arctic locations, such as Svalbard (20,000 cruise ship visitors per year in 2018) and Greenland (50,000 cruise ship visitors per year in 2018; Brigham and Hildebrand, 2018), are increasingly transitioning from subsistence to mixed economies, with nowadays a strong monetized element (Trump et al., 2018).

The development is also regarded as controversial as small Indigenous communities may be overwhelmed with large number of passengers entering small villages while not leaving much behind in terms of revenues (The Guardian, 2019; The Jakarta Post). There may also be negative impacts on social behavior and the traditions of local inhabitants and small coastal communities, disruption to fishing and hunting practices, and congestions at small ports (Research Centre for Coastal Tourism, 2012; Ocean Conservancy, 2017). Negative impacts on the natural environment—in some cases, an untouched environment—include considerable generation of gray water and sewage (Ocean Conservancy, 2017), “emissions of ‘black carbon’ (caused by soot), transport of alien species (some of which can become invasive) and chemical contamination” (Government Office for Science, 2018, p. 47). Additionally, some cruise ships operate under flags of convenience, where they might treat their crews poorly in terms of salaries and security, to name some issues (Research Centre for Coastal Tourism, 2012).

The negative impacts discussed above do not address potential negative impacts in case of significant cruise ship accidents in the region. In this context, it is worth noticing that:

It is the duty of each sovereign state to guarantee the security of its citizens, including to ensure the security of its citizens in order to prevent threats to their lifestyles and economic foundation. (Innanríkisráðuneyti Íslands, 2016, p. 9)

Given the complexity of potential cruise ship accident cases, a systemic risk-based approach is important. For this purpose, the aim of this study is to explore the systemic risk of significant cruise ship accidents in general, placing these findings in an Arctic and insurance context. The research questions proposed are as follows:

- What are the types of severe cruise ship incidents?
- What are the consequences when severe cruise ship incidents occur?
- How might the consequences of severe cruise ship incident look like in the Arctic?
- What is the role of insurance in cases of severe cruise ship incidents?

The paper is structured as follows: The literature review section addresses definitions of significant cruise ship incident, systemic and Arctic-specific risks, insurance, risk management, and safety. The research method is then explained, followed by an outlining of the findings, before discussing the implications of the findings and the paper's conclusions.

Severe cruise ship incidents, systemic and Arctic risks, insurances, risk management, and safety

Despite the best intentions of cruise ship operators, cruise ship incidents can occur. Various concepts are used to explain journey mishaps in the complex large-scale and safety-critical systems of cruise ships. These include the terms “incidents,” “accidents,” “mishaps,” and “disasters,” some of which are used in the literature as synonyms, thus making it challenging to identify the most severe cases. The term “incident” is favored in this article due to its capacity to include accidents and nonaccidents, and events which differ in terms of severity, ranging from minor to significant events. In this article, a severe incident describes cases of emergency, involving events such as a major oil spill or threat of loss of life and necessitating urgent external support, for example, from the coast-guard, navy, other Search and Rescue (SAR) services and so on (Grabowski et al., 2000; Grabowski et al., 2009; Milenski et al., 2014). The main causes of emergencies are unfavorable natural conditions, human error, and failure of equipment (Innanríkisráðuneyti Íslands, 2016). Of these, operational incidents include “fire, technical breakdown, such as failure of an engine; stranding or grounding; passenger missing overboard and not recovered; storm or wave damage; collision/allusion; and sinking” (G. P. Wild (International) Limited, 2018, p. 7). An analysis of cruise ship incidents states a lack of proper maintenance as the number one cause (60.52%), followed by human error (26.2%; Milenski et al., 2014). In the case

of Costa Concordia, which sank off the coast of Tuscany, Italy, human error played a critical role despite the adoption of strict safety precautions (Research Centre for Coastal Tourism, 2012).

Other definitions of incident highlight nonconformity to commonly agreed standards. In such cases, there is evidence indicating “a non-fulfillment of a specified requirement” (International Safety Management (ISM) Code, 2015, p. 1). In cases of major nonconformity, there is an “identifiable deviation that poses a serious threat to the safety of personnel or the ship or a serious risk to the environment that requires immediate corrective action or the lack of effective and systematic implementation of a requirement of this Code” (International Safety Management (ISM) Code, 2015, p. 1). Furthermore, severe operational incidents are defined as ones in which (G. P. Wild (International) Limited, 2018, p. 7):

- the ship suffers more than 24 h delay to the published itinerary,
- fatalities occur to either passengers or crew, or
- a serious injury occurs to either passengers or crew.

During the period 2009–2017, in total, 168 severe worldwide operational incidents were registered. The nature of these events were technical problems (70), fires (26), stranding or grounding (21), minor collisions/allusion (14), storm or rough waves (13), or other unspecified causes (24; G. P. Wild (International) Limited, 2018). Of these, some occurred in the Arctic or the Antarctic environment, including cases of stranding and running aground, extreme weather during voyages, and technical issues such as mechanical damage or failure of ship machinery, or fires or explosions on ships (G. P. Wild (International) Limited, 2018; Congressional Research Service, 2020). Additionally, collision, overloading, inclement weather, fire and explosion, and bottom damage where structural rules were not followed are incident types mentioned in Asian passenger vessel cases (Rahman, 2017). An analysis of navigational shipping incidents/accidents in the Baltic Sea has also been carried out, recognizing grounding (29%) as the main cause of accidents, followed by contact (20%), and collision (18%), where the two latter issues may be grouped together given the similarity in the nature of such cases (HELCOM - Baltic Marine Environment Protection Commission, 2014). Collision has been the major shipping accident type in the Baltic region during the period of 2014–2017 (HELCOM – Helsinki Commission, 2018).

Arctic-specific risks and systemic risks

Environmental risks imposed by climate change and polar tourism, including Arctic tourism, is a complex and interdisciplinary subject that involves a range of bio-geophysical, economic, socio-environmental, and cultural aspects concomitantly. Meehan (1995) points out the diversity of ecological pressures faced by Arctic ecosystems and societies as a result of anthropogenic activities, among

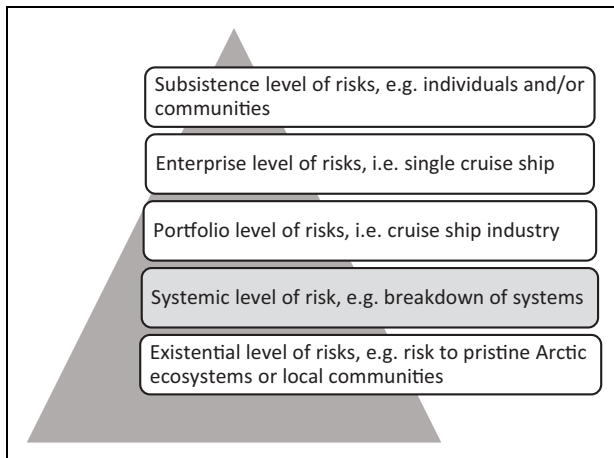


Figure 1. Scaling of risks. Model developed by authors and inspired by models developed by (Thurm et al., 2018, pp. 6, 49; Johannsdottir and Cook, 2019). DOI: <https://doi.org/10.1525/elementa.2020.00009.f1>

them those associated with polar cruising. Forbes (1995, p. 372) complements this, stating that local and regional impacts are of two orders: “acute disturbances” resulting from a single disruptive event, like the impacts of vehicles passing across tundra landscapes, and “chronic disturbances” resulting from a sustained long-term pressure upon the ecosystems like the deposition of pollutants, heavy metals, or permanent or semipermanent environmental changes.

Marine pollution, whether incremental or acute, poses major threats to humans and the natural environment (Congressional Research Service, 2020), and such risks need to be assessed. The challenge is, however, that human and environmental risk assessments are often carried out in isolation from one another (Galloway, 2006). The procedures for assessing risks in both cases include four procedures, namely identifying the hazard, assessing the exposure, assessing the dose–response, and characterizing the risk (EPA, n.d.), with the ultimate goal of protecting human health and the environment. In the former case, the goal is to protect one species, but many species and ecosystems in the latter case. Therefore, “more holistic assessments of human health and ecological risks” are proposed (Galloway, 2006). This is particularly important in the Arctic environmental, social, and cultural context where subsistence, mixed, and market economies coexist (Vammen Larsen et al., 2019). Those supporting themselves at a minimum level of subsistence, see **Figure 1**, rely on unpolluted marine food supplies for nutritional benefits for their health and well-being. Therefore, as stated by Van Oostdam et al. (2005):

Social, cultural, spiritual, nutritional and economic benefits of these foods must be considered in concert with the risks of exposure to environmental contaminants through their exposure. Consequently, the contamination of country food raises problems which go far beyond the usual confines of public health and cannot be resolved

simply by risk-based health advisories or food substitutions alone. All decisions should involve the community and consider many aspects of socio-cultural stability to arrive at a decision that will be the most protective and least detrimental to the communities. (p. 165)

There is limited research focusing on polar cruise tourism regarding its social and cultural impacts (Stefanidaki and Lekakou, 2012) or considering the systematic sociological and anthropological analysis of risks to local communities (Wood 2000; Weeden et al., 2011; Satta et al., 2014). When incidents create multicultural interactions, they can provoke intense tensions (i.e., psychological distress for both passengers and locals) because incidents or accidents may cause disruption in the daily activities of residents (Cervený, 2004; Ringer, 2010), such as hunting, fishing, herding, cultural rituals, and traditions. The tensions are motivated by the incident circumstances but also by different beliefs and behavior patterns characteristic to multicultural societies.

There are many different ways to define risks, but one way is to describe the “potential for adverse consequences from a hazard for human and natural systems, resulting from the interactions between the hazard and the vulnerability and exposure of the affected system” (IPCC, 2018, p. 33). The potential frequency of negative consequences, combined with the severity of such impacts, is of key importance, as well as the probability of the event weighed against business impacts (Jóhannsdóttir et al., 2012). These definitions of risks, however, mainly focus on individual projects, businesses or, at best, from an investor’s point of view, portfolios of investment options (Johannsdottir and Cook, 2019). Even in cases of systemic risk (see **Figure 1**), it is quite often related to shocks affecting financial markets or institutions (Danielsson & Shin, 2002; Schwarcz, 2008), or in some cases to the environment (PwC, 2014), leading to severe and widespread economic consequences (The Systemic Risk Centre, 2013). As such, this suggests a very narrow focus since in some cases, such as oil spills, the impacts may be much broader and affect economic, social/cultural, environmental, political/security, technological, and institutional systems (Johannsdottir and Cook, 2019).

The Lloyd’s of London (2012) report, focusing on opportunities and risk related to climate change and economic development in the Arctic, states a “significant level of uncertainty about the Arctic’s future, both environmentally and economically” (p. 5). Therefore, risk management plays a vital role in “helping businesses, governments and communities manage these uncertainties and minimize risks” (Emmerson and Lahn, 2012, p. 5). General risks for cruise ships are similar to the ones faced by Arctic shipping in general. These include operational risk factors, geographic electronic communications challenges, climate change–related factors, weather, icing and floating sea ice, high waves, and darkness (Emmerson and Lahn, 2012; PAME, 2015). In addition, there are risks to the environment, such as pollution from outside and within

the Arctic, and ecosystem disturbance, political and reputational risk factors, for example, reputational, regulatory, legal, domestic political, and geopolitical risks (Emmerson and Lahn, 2012). Many of these risk factors exaggerate the level of risk due to remoteness, absence of infrastructure, such as port facilities, and support services, relatively inadequate knowledge of seabed characteristics, and extreme weather conditions (Emmerson and Lahn, 2012; PAME, 2015). These conditions may cause incidents such as icing or ice contact, including icebergs; fog, mainly during summer months; damage from ice to machinery such as propellers and rudders; grounding on uncharted rocks; collision, delay, and/or lack of salvage impaired by remoteness; and lack of infrastructure such as safe ports (Emmerson and Lahn, 2012). The Ocean Conservancy (2017) assessment of Arctic vessel traffic focuses more on cost factors including “fuel costs, navigation fees and other regulatory costs, insurance costs, security concerns, ability to consistently adhere to shipping schedules, political considerations, development of local regulations and the relative costs of the ships themselves” (p. 30).

The Ministry of the Interior in Iceland in 2016 has highlighted the cases of Costa Concordia, a cruise ship with more than 4,000 passengers, M/V Clipper Adventurer, and MS Hanseatic in Arctic conditions (Innanríkisráðuneyti Íslands, 2016). In its report, the Ministry stated that despite favorable weather conditions in the Costa Concordia case, and the fact that the ship was close to shore, more than 30 people lost their lives. Cruise ships of the same size now sail close to Greenland, Iceland, and Svalbard, but given the natural conditions in the Arctic, it is expected that rescue will take a longer time than in the Costa Concordia case. When M/V Clipper Adventurer grounded, close to Kukluktuk in Nunavut in 2010, it took 2 days for the Canadian Coast Guard, using an icebreaker, to reach the ship. In the case of the grounding of MS Hanseatic in Gjoa Haven in Nunavut in 1996, it took a Russian ship almost a week to rescue the passengers (Innanríkisráðuneyti Íslands, 2016). As stated in the U.S. Congressional Research Service report (2000): “Given the location of current U.S. Coast Guard operating bases, it could take Coast Guard aircraft several hours, and Coast Guard cutters days or even weeks, to reach a ship in distress or a downed aircraft in Arctic waters” (pp. 47–48). The “long times that would be needed to respond to potential emergency situations in certain parts the Arctic” (Congressional Research Service, 2000, p. 49) may result in a major disaster in the case of a large number of civilians on board, compared to a manageable situation in a warmer climate. Given extreme weather conditions, it might also not even be possible to use lifeboats or tugs to rescue passengers. Further escalation of the problem would relate to limited “emergency response capabilities” and the “capacity to host patients, achieving situational awareness, and unsuitable evacuation and survival equipment [which would] pose major challenges for maritime safety and SAR in the Arctic” (Congressional Research Service, 2000, p. 48). Severe incidents related to Arctic cruising may, furthermore, not solely be related to the vessel itself, but also extra activities offered to the passengers, as

was the case with an excursion tour where two sightseeing airplanes collided in Alaska in 2019, resulting in deaths and injuries despite immediate rescue operations by locals (CBS News, 2019; Juneau Empire, 2019).

Insurance perspective on risks and cruise ship risks in Arctic waters

In classic risk management and the insurance literature, four main strategies deal with risks. These are to avoid, accept/retain, reduce, or share/transfer the risks (Gibbs and DeLoach, 2006; Jóhannsdóttir et al., 2012). Additionally, and more aggressively, risks can be exploited (DeLoach, 2000; Lessard & Lucea, 2006; Jóhannsdóttir et al., 2012) or even ignored (Tomlin, 2006; Jóhannsdóttir et al., 2012). A frequency-severity method is used to determine the expected number of claims and average costs of these claims (Investopedia, 2018). In case of significant cruise ship accidents, they may fall under the category of being of low frequency but high severity. The probability may also be low, while the business impacts may be high (Jóhannsdóttir et al., 2012). When estimating marine risks, the Cambridge-Lloyd’s Marine Risk Model takes into account the size and type of the ship and the jurisdiction, and the total loss would include hull damage or even total loss, such as in cases of sinking, cargo loss, wreck removal, human casualty and liability, and environmental liability (Lloyd’s, 2018). This covers the risk of the shipowner. This is still insufficient in cases of cruise ships as the passengers also need to be insured through private travel insurances covering unexpected events occurring while traveling. These insurances may, however, exclude SAR-related costs, which subsequently need to be covered separately (Burke, 2000; Trantzas et al., 2018).

In the Marine Risk Model, cruise ships are categorized as standard, super, and mega, with a financial value ranging between \$20–200 M, \$200–600 M, and \$600–1,200 M, respectively (Lloyd’s, 2018). The total cost in a severe accident, namely Costa Concordia, resulted however in an insurance cost of over \$2 B (Lloyd’s, 2018). In case of grounding of a cruise ship, the expected loss “could result in a \$4bn loss when the costs of salvage, wreck removal and environmental claims are included,” in addition to passenger and crew liabilities and litigation costs (Allianz Global Corporate and Specialty SE, 2019, p. 20).

Several insurance reports offer insights into how insurance companies perceive risks related to cruise ship operations. In a novelty report issued by Allianz Global Corporate and Specialty AG (2012), entitled “Safety and Shipping 1912–2012 - From Titanic to Costa Concordia,” the most significant emerging issues facing the industry regarding cruise ships operating in Polar waters include the following:

- **Arctic and Polar waters.** Threats related to navigation in icy waters, hostile environmental conditions, construction and design appropriate for Polar conditions, and emergency practices.

- **Cruise ship size and number of passengers.** Challenges regarding evacuation of the vessel and rescue of human lives.
- **Crew levels, language barriers and bureaucracy.** Low crew numbers, compared to the size of the ship, number of passengers, around the clock operating time, and bureaucracy increases the risk of human error, which is estimated to cause 75%–96% of marine casualties despite being the root cause of only 26.2% of cruise ship incidents. An additional risk factor is a language barrier, given multinational crews [and passengers] on board cruise ships.
- **Training and labor.** Variation in the competences of officers and crew, including crewmembers from emerging economies.
- **Risk management.** Inadequate, but strengthening of safety management systems and processes will address this issue.
- **Fire.** In cases of a large number of passengers on cruise ships offering hotel-type service, fire is a major concern (Allianz Global Corporate & Specialty AG, 2012).

Adding to the risk categories listed above are issues that could potentially intensify the negative outcomes of severe incidents or cannot be adequately assessed (Hellenic Shipping News Worldwide, 2018). These include SAR challenges in Arctic conditions due to limited resources and remoteness (Arctic Council, 2015), a salvage gap given limited salvage options in the Arctic (Lloyd's, 2017c), overreliance on single technologies, and Flag States with regard to “non-ratification of legislation, or non-enforcement of ratified legislation” (Allianz Global Corporate & Specialty AG, 2012). A severe shipping-related incident in the Arctic with pollution and consequent environmental damage and/or casualty is also likely to result in a very negative publicity (Lloyd's, 2017c).

Consequently, insurance coverage and insurance cost is relevant for Arctic shipping. This cost is, however, considered minimal compared to the cost of capital, crew, or fuel (Sarrabezolles, et al., 2016). Assessing the cost of insurance has been problematic and messages mixed on the extra premium paid for sailing in Arctic waters, as insurers do not disclose information on tariffs or policies. Additionally, risks associated with navigation in Arctic waters are, so far, not fully assessed or modelled and are thus assessed on a case-by-case basis and therefore more costly than if standardized (Liu, 2016; Sarrabezolles, et al., 2016; Trantzas et al., 2018). However, higher premium rates for sailing in Arctic waters can be limited if certain conditions are met, such as ice-class certification, risk and safety management policies and past behavior, training and experience of shipmaster and crew, and contingency plans, thus aligning with suggestions made by the Allianz Global

Corporate & Specialty AG in 2012. Such conditions, subsequently, make it difficult for newcomers to enter the market (Sarrabezolles et al., 2016).

The Polar Code of the International Maritime Organization (IMO, 2015), mandatory for all parties to the MARPOL (pollution from ships) and SOLAS (safety of life at sea) conventions, is from an insurance perspective, a significant improvement in international regulation of the Polar Regions. It requires a Polar Waters Operational Manual, to be carried onboard, which must consider the security of seafarers, protection of indigenous peoples and the natural environment (Lloyd's, 2017b). Benefits of the Polar Code include its general framework on safety and environmental protection, a risk-based approach and awareness of main risks, a compliance tool for insurability, and coverage of all main processes from the conception of the ship to training the crew, to name a few (Fedi et al., 2018). Shortcomings are also recognized, including data gaps, it does not help pricing risks, excludes fishing and leisure vessels, pollution risks are not adequately addressed, and advanced training is not required for all crew members (Fedi et al., 2018). Additionally, there are considerable concerns about the enforcement of the Polar Code given the discretion of the Arctic Council governments, maritime agencies, and ship owners in defining the exact scope and substance of the safety standards (Todorov, 2020), a feature that exemplifies long-held concerns about the weak level of authority of the IMO over maritime operators' compliance with international requirements (Helgason et al., 2020).

The role of marine insurers is furthermore seen as essential concerning the subject of transparency in underwriting, dialogue with ship owners, preemptive risk consultancy, and in promoting best practice (Allianz Global Corporate & Specialty AG, 2012), but adopting strict standards is a way for maritime insurers to mitigate their risk exposure and potential financial losses. However, what seems to be missing from the discussion is the role of insurers in sharing lessons learned from worst-case scenarios.

Risk management and safety

The Law of the Sea Convention (UNCLOS) establishes the common rule that a minimum regulatory standard for Flag State jurisdiction and maximum standard for coastal states are generally accepted as international standards and rules (Boone, 2013). To mitigate risks and ensure safer shipping in Arctic and Antarctic waters, the Polar Code specifies some conditions for passenger ships. These include a proper immersion suit or a thermal protective aid provided for each person on board in case of survival emergency, basic training for master, chief mate and officers in charge of navigation in open waters, and advanced training for master and chief mate in other waters (IMO, 2015). Reference is also made to guidelines on voyage planning for passenger ships operating in areas remote from SAR capabilities (IMO, 2015). Insurers are seen to have a critical role to play in the implementation of the Polar Code, and given difficulty and danger in shipping above the 70°N line, the Lloyd's Institute Hull Clauses

underwriters exclude such voyages (Kingston, 2016). Other similar exclusions exist, meaning that cruise ship owners need to consult insurers on a case-by-case basis, so that they can review the intentions of operators and information about the crew and planned mitigation efforts in case of emergency (Kingston, 2016). Others that need to be involved in remote area excursions are local authorities and coastguards, given that there is “no room for error in such a transit with so many people on board” (Kingston, 2016, p. 25). This is, however, not sufficient as good communications are fundamental (Research Centre for Coastal Tourism, 2012) as well as increased ability to perform SAR, and cope with pollution, in remote areas (Congressional Research Service, 2020; RUV, 2019).

Preparation and international joint SAR training and survival exercises simulating cruise ship incidents in the Arctic and involving members from the cruise ship industry, search-and-rescue responders, and academics are therefore essential (Ikonen, 2017; Trantzas, 2018; Arctic Today, 2019). Findings from such exercises bring forth potential challenges and offer recommendations for solutions (Ikonen, 2017) as safety is the main challenge to be assessed (Trantzas, 2018). This collaboration and coordination is further strengthened through a common organization, the Arctic Coast Guard Forum (ACGF, n.d.), and the Arctic Council’s Ministerial Declaration on the establishment of the Arctic Shipping Best Practice Information Forum supporting the implementation of the Polar Code (PAME, n.d.). This establishment is furthermore endorsed by insurers (Lloyd’s, 2017a). The resilience of the local communities also needs to be accounted for. As a part of a systemic approach, communities need to be prepared and have the capacity to recover and thrive during and after a shocking event (Arctic Council, 2017a) such as a severe cruise ship accident.

Despite the emergence of the Polar Code (IMO, 2015), there is also a great need for sharing of information and cooperation, such as to improve weather forecasting and sea ice prediction, creation of precise nautical maps, while also sharing information and utilizing best practice examples and appropriate technologies for Arctic conditions (PAME, 2015). Other related issues, for instance, Finland’s Arctic Council’s (2017–2019) priorities, included environmental protection, meteorological and oceanographic cooperation, and developing communication networks and services (Arctic Council, 2017b). Iceland’s priorities (2019–2021) also include a focus on the environment, as well as sustainable shipping and tourism practices, and improved connectivity (Arctic Council, 2019).

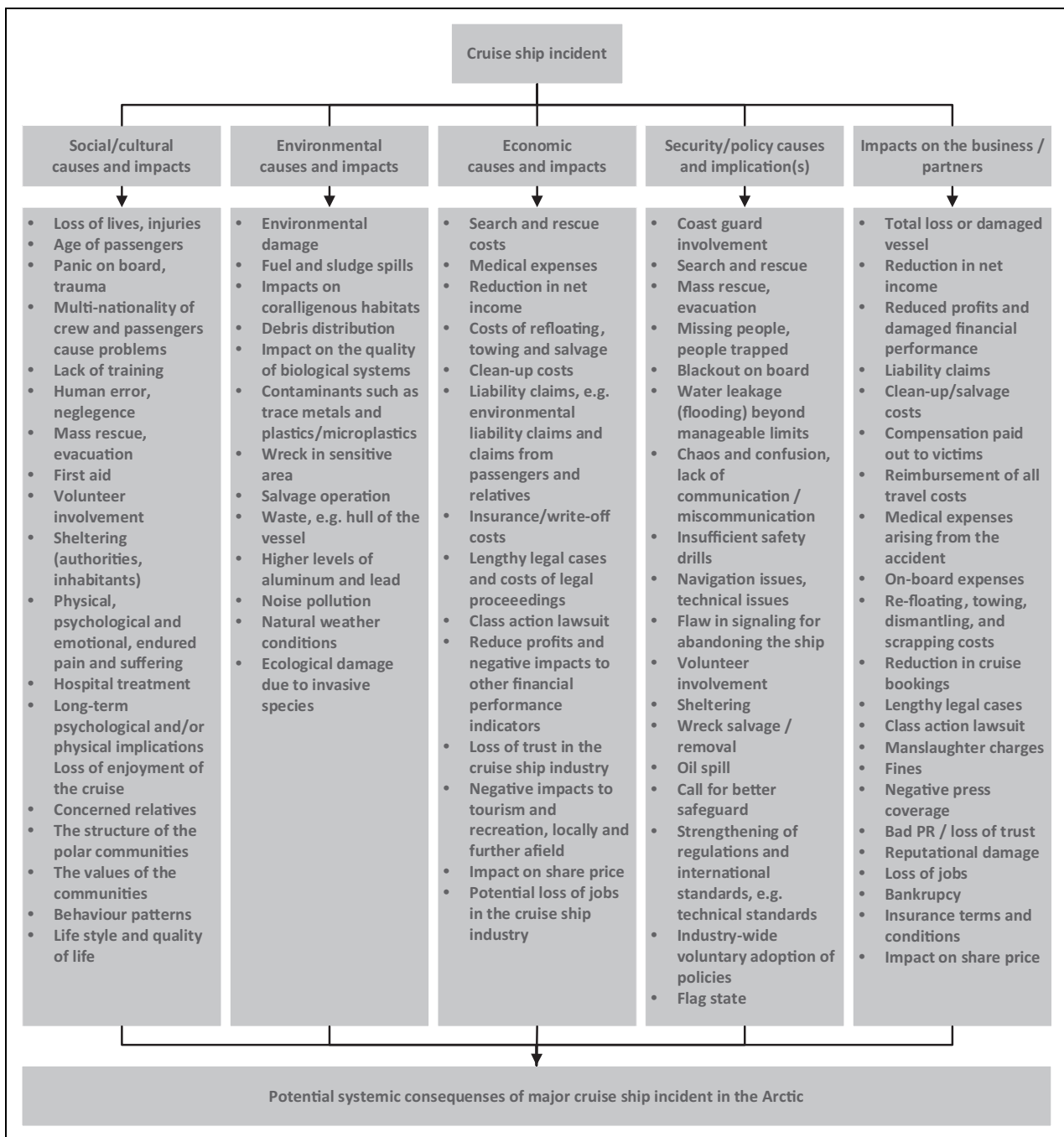
From the perspective of responsible vessel owners and operators, preventive measures and risk management need to take into account the complexity of Arctic cruise ship operations, both including the systemic level of analysis and multi-criteria risk management (Yatsalo et al., 2016; Johannsdottir and Cook, 2019) since severe incidents in the Arctic may tarnish their reputation. Therefore, the Association of Arctic Expedition Cruise Operators is of key importance as it offers various types of guidelines for operators and visitors, some of which are mandatory, such as operational guidelines for tour operators that are

members of the association (AECO, n.d.). AECO has also identified knowledge gaps and research needed to support responsible tourism management in the region, including environmental and wildlife impacts, mapping of unorganized tourism activities, volume, value, risks, and impacts of large-scale incidents on particular areas and communities (Ikonen and Sokolíčková, 2020). Lloyd’s of London also highlight the importance of a risk-aware approach to Arctic operations, risk governance, risk mitigation, and risk transfer. Risk governance frameworks would include identification, assessment and analysis of risks, risk control, planning, and reporting. A part of this includes identifying and understanding the worst-case scenario concerning prevention, responses, crisis management, and how to address potential damage to reputation (Emmerson and Lahn, 2012). Risk mitigation can include operational and safety standards and using the latest technology, processes and material designed for Arctic conditions. Risk transfer is then in the form of insurance coverage, but insurers may also provide safety and risk-related information of relevance (Emmerson and Lahn, 2012). When risk related to cruise ship operations is considered, both the shipowners risk and passenger risk need to be accounted for and addressed as insurers offering SAR coverage may limit their risk based on the age of passengers or area where the ships operate. The shipowners therefore should acquire SAR cover for all passengers on board (Trantzas et al., 2018). Furthermore, although Arctic marine insurance is subject to domestic and international regulations concerning marine safety and environmental protection (Liu, 2016), much less is discussed in relation to the social aspect, both consequences for passengers and local communities.

Requirements made by insurers in relation to Arctic shipping, such as the ones discussed in the previous section (Allianz Global Corporate & Specialty AG, 2012; Liu, 2016; Sarrabezolles, et al., 2016; Trantzas et al., 2018), subsequently influence the cruise ship operators’ response as their reaction affects the policy terms and conditions under which they operate, or even availability and eligibility for insurance plans (Liu, 2016; Sarrabezolles et al., 2016), as instances of breaching the navigation warranty contract of the ship insurers would not lead to liability for the consequences or a termination of the contract (Liu, 2016). Therefore, benefiting both the shipowners and insurers, and subsequently cruise ship passengers, would be standardized procedures and a new Arctic marine insurance and risk coverage regime with standard clauses addressing irregularities in current Arctic marine regimes (Liu, 2016).

Research method

For analytical purpose, the scaling of risk model is employed (Johannsdottir and Cook, 2019, p. 6; see **Figure 1**). This model is a starting point for further exploration with respect to the first two research questions in the paper concerning the types of cruise ship incidents and their consequences. The focus is on the systemic level, where breakdown of systems occurs after a trigger event



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Figure 2. Potential systemic consequences of major cruise ship incident in the Arctic, findings synthesis by the authors. DOI: <https://doi.org/10.1525/elementa.2020.00009.f2>

causes systemic consequences (Schwarcz, 2008; Johannsdottir and Cook, 2019). This level of analysis is not limited to economic consequences but offers a view on issues related to social aspects, security, environmental implications, business and operational impacts, and policy and legal aspects (see **Figure 2** and Appendix A). This appendix presents a simple version of the analytical framework employed, showing the main categories and some examples of consequences found. Furthermore, each case had its own spreadsheet where links to relevant documents were listed. For analytical purposes, categories in the analytical framework and new issues were added to the framework, based on new indications or

evidence found, and are presented in **Figure 2**. Complementing the figure are examples from the analysis, presented in the following section. The focus on systemic level broadens into the view of the potential worst-case scenario, which might involve an existential level of risk for pristine Arctic ecosystems and/or local communities, especially impacted subsistence economies (Johannsdottir and Cook, 2019).

Data collection and case selection

As previously explained, concepts such as incident, accident, mishap, and disaster are often used as synonyms and data are scattered, thus making it challenging to identify

Table 1. Overview of selected cases. DOI: <https://doi.org/10.1525/elementa.2020.00009.t1>

Arctic and Antarctica Cases	Location	Cause of Accident	Year of Accident	Dead or Missing	Rescued Alive
TS Maxim Gorky	Svalbard	Collision with an iceberg	1989	n/a	953
MS Explorer	Southern/Antarctic Ocean	Collision with an iceberg	2007	n/a	154
M/V Clipper Adventurer	Coronation Gulf, Nunavut	Grounding on a shoal	2010	n/a	197
M/V Akademik Ioffe	Northwest Passage –Gulf of Boothia	Grounding on a shoal	2018	n/a	162
Viking Sky	Norwegian sea	Engine shutdown; bad weather	2019	n/a	1,373
Non-Arctic and Antarctica cases					
Costa Concordia	Mediterranean Sea	Collision; grounding	2012	32	4,197
MV Estonia	Baltic Sea	Capsized	1994	852	137
M/V Al-Salam Boccaccio 98	Red Sea	Fire on board; sinking	2006	1,031	387
MS Herald of Free Enterprise (Ferry)	Port of Zeebrugge	Capsized	1987	188	351
Rabaul Queen (cargo-passenger)	Solomon Sea–Vitiiaz Strait	Capsized; large wave	2012	165	246
Oriental star (Eastern Star or Dongfang zhi Xing)	Yangtze River	Capsized; thunderstorm	2015	442	12

severe incidents of relevance to the analysis. There are some incident databases that are not of relevance, such as the one from the Stockholm International Peace Research Institute (SIPRI, n.d.), where the focus is on armament, disarmament, conflict, peace, and security, or others that have limited information about cruise ship incidents, such as the European Maritime Safety Agency Accident Investigation Publications (European Maritime Safety Agency, 2019). Various sources were used for data collection given the challenge in identifying cases and how scattered the data are. These included academic databases, such as the EBSCOhost, ProQuest, Web of Science, and Scopus, official incident/accident and/or insurance reports, and media coverage. Other sources included industry reports, ministerial reports, joint-Arctic SAR report, reports from coastal forums, and so on (Allianz Global Corporate & Specialty AG, 2012; Emmerston and Lahn, 2012; Innanríkisráðuneyti Íslands, 2016; Lloyd’s, 2018; Allianz Global Corporate and Specialty SE, 2019; Ikonen and Andreassen, 2019). Nonetheless, there is still scarcity of information related to navigational hazards in the Arctic (Liu, 2016) and the consequences of such hazards.

Table 1 shows the cases selected for analysis, which are categorized as Arctic and Antarctic, and non-Arctic and Antarctic cases. In each case, the location is identified, main cause of the incident, year when it happened, number of deaths or missing persons, and number of people rescued alive. Next, an Excel spreadsheet (see copy in Appendix) was used to track themes applicable to each case. Information was then synthesized in **Figure 2**, presented in the following section. The purpose was to deduce the possible impacts of worst-case scenarios of systemic risk of major cruise ship incidents rather than compare or contrast cases.

Potential worst-case scenario of major cruise ship incident

Figure 2 presents a holistic depiction of the worst-case scenario if a systemic risk of a severe cruise ship incident materializes. Findings synthesized by authors.

Sociocultural causes and impacts

All the non-Arctic and Antarctic cases selected for analysis resulted in injuries and casualties (Murray and Thimgan, 2016; Lloyd’s, 2018), with most casualties in the Al-Salam Boccaccio 98 accident (Soliman, 2013) and the MS Estonia case (The Joint Accident Investigation Commission of MV ESTONIA & Edita Ltd., 1997). In the Arctic and Antarctic cases, there are no record of casualties, even in near-disastrous cases, such as the Viking Sky, where people were in grave danger and some were hospitalized because of injuries (NewsinEnglish.no, 2019) including bruising, broken bones, and trauma (The Independent Barents Observer AS, 2019). The consequences are nevertheless grave given a forthcoming class action lawsuit against the cruise ship operator, where it is claimed that passengers “were subjected to severe distress both physical, psychological and emotional, endured pain and suffering along with physical and emotional injury” (NewsinEnglish.no, 2019). Minor consequences include loss of enjoyment of the cruise, although compensated for by refunding passengers’ fares, covering of their expenses after the accident and/or offering another cruise trip at a later date (NewsinEnglish.no, 2019). For longer term psychological and/or physical implications for survivors of severe cruise ship incidents, research seems to be lacking, although a study has been carried out showing more favorable psychological outcomes if survivors of marine-related incidents receive mental health support after such a drama (Kato et al., 2006).

According to statistics from the World Health Organization, the average age of cruise ship passengers are 45–45 years of age. However, there are also a significant number of senior citizens, amounting to about one third of passengers, and those who are 65 or over are most often in need of the emergency services due to illnesses (WHO, n.d.). This is important in the context of a potential emergency evacuation situation and/or SAR efforts, given the harsh Arctic conditions (The Independent Barents Observer AS, 2019).

First aid is often provided by locals (CBS News, 2019; Juneau Empire, 2019) or volunteers, such as from the Red Cross, as was the case in the Viking Sky incident, where 240 volunteers were called to action to assist in the local rescue operations. The concern here is that the further north cruise operations take place, in less populated areas, the less likely such a number of volunteers is to exist (The Independent Barents Observer AS, 2019). In the most recent case, the Viking Sky, a massive rescue evacuation took place. Due to high waves, rescue boats were not deployable; instead, passengers, mainly elderly passengers, were airlifted onto helicopters one by one (Independent, 2019). In around 24 h, only 479 people had been evacuated, leaving around 900 persons remaining on board (NPR.org, 2019). For those rescued to shore, and not hospitalized, shelters are needed, and in the case of Costa Concordia, small churches and other local buildings were used as shelters (CNN, 2012). Concerned relatives of passengers and crew may have to wait anxiously for answers about the status of their loved ones, and in some cases, they might not be found at all (BBC News, 2012).

The case of M/V Clipper Adventurer that grounded in Nunavut in 2010 is a classic example of the challenge of coordinating local infrastructure and disaster emergency services for rescue and operational support. In remote, secluded locations like Nunavut, there is no modern infrastructure (i.e., medical services) to cope with events of this magnitude. The rescue of the passengers by the coast guard icebreaker in the case of the M/V Clipper Adventurer was possible and successful (without casualties) due to favorable weather conditions of high visibility, low winds, and quiet sea (CBS News, 2019). In an adverse weather scenario, the consequences would likely be chaos and panic on board (NPR.org, 2019), loss of lives and intense psychological distress, with significant impact to the structure of communities in culturally sensitive areas. Cases of collision and grounding always impose pressure on local infrastructure, such as in the accidents involving Costa Concordia, TS Maxin Gorky, MS Explorer, MV Akademik Ioffe, and Viking Sky. Severe cruise ship incidents, such as the MV Estonia, are claimed to be traumatic for a nation (Deutsche Welle, 2019), let alone for a small local community coping with an aftermath of such a situation.

In many cruise ship incidents, human error and/or negligence are the main cause (Milenski et al., 2014; Innanríkisráðuneyti Íslands, 2016), such as in the Costa Concordia (Research Centre for Coastal Tourism, 2012), and/or may escalate the situation such as in the case of MV Herald of Free Enterprise (Praetorius et al., 2011). This may be due to the lack of training competences of officers and

crew and/or that crew members come from different countries, potentially complicating communication due to language barriers. In the case of Clipper Adventurer, the crew was from many different nations, that is, Argentina, Indonesia, Nicaragua, Panama, Philippines, Sweden, and Ukraine, using English as the working language (Calderbank, 2018). Inadequate safety and risk management systems, and/or low crew levels, and/or bureaucracy, may also be a part of the root cause of cruise ship incidents (Allianz Global Corporate and Specialty AG, 2012).

Another important impact is on the values of the community. Seen as a “floating tourist resort,” the closed physical and psychological environment of a cruise ship represents the social, physical, psychological, and built environment, separated from the surrounding environment (Cohen, 1978) and transporting tourists used to high-standard amenities to natural or cultural locations with a different infrastructure reality. When incidents create multicultural interactions, they could provoke intense tensions (i.e., psychological distress for both passengers and locals) because they can cause disruption in the daily activities of residents (Cervený, 2004; Ringer, 2010), such as hunting, fishing, herding, cultural rituals, and traditions. The tensions are determined by the incident’s circumstances but also by different beliefs and behavior patterns characteristic of multicultural incompatibilities.

Sociocultural impacts on local lifestyle and quality of life are better contextualized in the Arctic than in the Antarctic due to the presence of indigenous communities in the Arctic and sub-Arctic regions. Resource use constitutes a fundamental component of indigenous culture and the base to maintain and develop local communities (language, culture, and social life; Vammen Larsen et al., 2019). Cruise ship incidents may cause disruption to traditional ways of using resources due to the complexity of rescue operations involving casualties but also because of the degradation of resources and environmental conditions (i.e., Costa Concordia, MV Clipper Adventurer).

Environmental impacts

The dynamic nature of interaction in the complex polar environment can easily be disrupted by processes and accidental contamination by cruise ships and incidents, creating serious hazards to the local environmental systems. The extent of these polluting processes is influenced by the special geographical conditions of the site and by the environmental practices and technologies used by the cruise ship industry. The findings reveal evidence of the challenges of polar cruising and the persistent levels of pollution and toxicity caused by incidents (Congressional Research Service, 2020).

In the case of the Costa Concordia accident, water features were monitored throughout the salvage operation in order to record any alterations in physicochemical parameters. Sampling stations were selected for monitoring impacts on the marine environment, and additional operations on the seafloor and on the wreck were conducted to evaluate alterations compared to the original environment. Impacts on coralligenous habitats were detected, in this case, with clear evidence found of degradation in

habitat quality. Additional impacts on the quality of biological systems were also detected due to sediment dispersion, which is recognized as a major threat to fragile marine ecosystems (Casoli et al, 2017, p. 132). Debris distribution caused physical and mechanical damage, affecting marine structures (Bo et al., 2014; Angiolillo et al., 2015) and consequently biological features, processes, and dynamics. Another potentially significant risk concerned the occurrence of trace contaminants, such as heavy metals and arsenic, with the former (aluminum and lead) detected at levels higher than previously due to the incident (Regoli et al., 2014). In the marine environment, high concentrations of metals can alter local biological systems and be toxic to many species of algae, crustaceans, and fish (Regoli et al., 2014).

Effluents or waste streams are a serious source of pollution generated by cruise ships (during and after incidents), and they are classified as bilge water (water from the lowest part of the ship's hull and may contain oil, grease, oxygen-depleting substances, and other contaminants), sewage, gray water (waste water from showers, sinks, laundries, and kitchens), ballast water (water taken onboard or discharged from a vessel to maintain its stability), and solid waste (food waste and garbage; IMO, 2018). Contamination by waste streams is common in cases of grounding and collision (i.e., cases in **Table 1**).

Much of the recent debate concerning risk in this context has concerned what would happen in the event of a large-scale oil spill (Jóhannsdóttir & Cook, 2015; Jóhannsdóttir & Cook, 2019), such as the incident in June 2020 in a nickel mine in northern Russia, which had spilled up to 150,000 barrels of diesel oil into the Arctic Ocean (NPR, 2020). A worst-case scenario of environmental impact in the circumpolar regions is an oil leak and discharge as there is no proven way of cleaning oil spilled in ice, and thus, even a minor spillage could have devastating consequences to marine ecosystems and communities (Arruda, 2015, p. 512). The study by Nordam et al. (2017) outlined the impacts of climate change and seasonal trends on the fate of Arctic oil spills. Using numerical simulations from the OSCAR oil spill model, with environmental data for the period 2009–2012 and projected data for the period 2050–2053, the authors identified differences in the typical outcome of oil spills in a warmer future for the Arctic compared to the present, mainly due to a longer season of open water. Thus, the extent of ice cover is extremely important for determining the fate of an Arctic oil spill, and oil spills in a warming Arctic climate have greater areal coverage and shoreline exposure (Nordam et al., 2017). The evidence of cases such as the Exxon Valdez oil spill in Prince William Sound, Canada, in 1989 suggests that oil depositions in the Arctic take already many years longer to decompose than in warmer parts of the world, leading to more severe and longer term ecological impacts (Barron et al., 2020).

The case of the MV Clipper Adventurer is an example of environmental damage involving fuel and sludge spills, which caused severe change in biological metabolisms and the ecological balance (Arruda, 2014, p. 501; Gay et al, 2012). The levels of toxicity of oil spills present risks of

chronic environmental degradation, with the contamination of seafood with petroleum-related polycyclic aromatic hydrocarbon compounds enhancing impacts on the food chain and human health. The remediation process and the use of dispersants, “chemical formulations composed of solvents, surfactants and other additives that disrupt the solid surface of an oil slick,” are toxic to marine life and humans (Gay et al., 2012, p. 6), causing additional effects and risks to local ecosystems and communities.

Arctic conditions might exacerbate the negative environmental consequences in cases when it takes a long time to obtain help, such as in the cases of M/V Clipper Adventurer and MS Hanseatic (Innanríkisráðuneyti Íslands, 2016). Furthermore, during rescue activities, levels of noise pollution may increase, potentially leading to impacts such as on marine mammals (Arctic Council, 2009) and locals. Although shipwrecks should be recovered and removed from territorial seas according to the Nairobi International Convention on the Removal of Wrecks, it might not always be possible (Arctic Council, 2009) or financially feasible (Allianz Global Corporate and Specialty SE, 2019, p. 20), given limited salvage options in the Arctic (Lloyd's, 2017c). Shipwrecks may then be left in sensitive areas. This may “introduce invasive species into the local environment,” such as was the case in the Aleutian Islands where the invasion of predatory rats resulted in ecological damage to nesting seabirds (Arctic Council, 2009, p. 151).

Economic impacts

Cruise ship incidents have the potential to stimulate a multitude of economic implications, directly and indirectly related to the incident itself. These can broadly be categorized in terms of impacts with negative consequences to the cruise ship company, and spinoff effects to the industry. The former has included reduced profits and damaged financial performance, not least due to the likely scale of various liability claims and any clean-up/salvage costs, and cost of dismantling and disposing the wreck (Artemis, 2014). Broader, industry-wide impacts include a loss of public trust and likely reduced numbers of cruise ship passengers and advance bookings, particularly in the area where a recent incident occurred. These effects may entail job losses in the industry and negative consequences for other businesses reliant on cruise ship visitors, for example, small gift shops on island communities (Del Chiappa and Abbate, 2016). However, the wider and longer term impacts are often more difficult to assess, not least due to difficulties in determining the extent to which a cruise ship incident has a long-term negative impact on cruise ship tourism and linked economies.

The case of the Costa Concordia incident exemplifies many of the negative financial consequences that can impact a cruise ship company in the aftermath of a disaster. The total economic cost of the incident, inclusive of all compensation paid out to victims, and refloating, towing, dismantling, and scrapping costs, has been estimated to be in excess of 2 billion euros (The Maritime Executive, 2014). This amount was more than three times greater than construction cost of the ship of 612 million euros

(The Maritime Executive, 2014). A compensation offer was made by Costa Cruises to all surviving passengers, up to a maximum of 11,000 euros, to account for various damages (BBC, 2012). This offer covered the estimated costs of the value of the cruise, psychological distress and loss of enjoyment of the cruise, reimbursement of all travel costs linked to the cruise ship package, all medical expenses arising from the accident, and all onboard expenses incurred during the trip (The Guardian, 2012). Compensation payments and the other related costs linked to the incident led to severely negative short-term impacts on the financial performance of Carnival Corporation and Carnival plc, the joint-owners of Costa Cruises. Carnival Corporation declared the financial impact during the fiscal year of 2012 to amount to a reduction in net income of between \$85 million and \$95 million, with an estimated insurance excess of an additional \$40 million, and the incurrence of \$30–40 million in other incident-related costs (The Wall Street Journal, 2012). The reduction in net income amounted to losses equal to 0.11–0.12 euros per share (BBC, 2011), caused in part by a reduction in cruise bookings of around 15% in the 12 postaccident days (Business Insider, 2012; Safety4sea, 2012).

In other cruise ship incidents, lengthy legal cases have resulted as survivors and relatives of the deceased sought compensation for their loss. These have included claims for sizeable amounts, albeit they have not always been successful. In the case of the Rabaul Queen incident, manslaughter charges were brought against the owners of the company, which were later dropped (RNZ, 2018). Another, perhaps more prominent, example concern claims for compensation in relation to the MS Explorer, whereby survivors pursued claims of almost 41 million euros in relation to their perception of “intentional fault.” The claim was rejected by the French judiciary in July 2019 (BBC, 2019). At other times, the pursuit of compensation has been undertaken by governments rather than individuals or affected businesses. The case of the MV Clipper Adventurer in 2010 led to the Ottawa Government pursuing claims for environmental damages after the incident led to fuel and sludge spills. The owners of the cruise ship, Adventurer Owner Ltd., were required to pay CAD 500,000 in environmental costs to the government after a court verdict in February 2017 (CBC News, 2017). An unsuccessful counter-claim for CAD \$13.5 million was issued by Adventurer Owner Ltd. during the same judicial deliberations. Adventurer Owner Ltd. had cited insufficient information provision from the Canadian government as a contributing factor to the incident. Another cruise ship incident that has led to legal claims is the Viking Sky emergency. Although currently unresolved, a class action lawsuit has been filed against Viking about the onboard emergency in March 2019, during which the ship lost all power and had to be evacuated in stormy seas. This would seek compensation beyond that already paid out by Viking, which has encompassed the costs of the cruise, air fares, and other expenses during the trip (Travel Agent Central, 2019).

Other costs common to cruise ship incidents include those associated with the recovery of wrecks. These

applied in the cases of Costa Concordia, MS Estonia, MS Explorer, and MV Clipper Adventurer. In two of the cases, the Al-Salam Boccaccio and MS Herald of Free Enterprise, fines were incurred by the cruise ship. With regard to the former, fines were levied, in part due to the excess of passengers which led to the disaster (Soliman and Cable, 2011). In the case of the latter, overloading was also a central factor, as determined by the Formal Investigation Report (Department of Transport, 1987). There are also social costs of cruise ship incidents to local communities, who may have considerable demands placed on limited critical infrastructure. This includes the costs of SAR, including the coastguard, and hospital treatment for injured or scarred survivors, as were required in the case of the Costa Concordia disaster (Ministry of Infrastructures and Transport, 2012).

Security-policy implications

Immediate security implications of a cruise ship incident will be involvement of authorities, such as the national coastguards, from one or more nations, and other emergency response institutions (ACGF, n.d; Innanríkisráðuneyti Íslands, 2016.; Government of Canada, 2017), such as in the cases of Costa Concordia, M/V Clipper Adventurer, MS Hanseatic, and in some cases volunteers or volunteers' associations. Long distances, lack of infrastructure, communication problems, and few local inhabitants might affect the situation if the incident is in a remote Arctic area. This might, for instance, be critical if mass evacuation or rescue is needed. If the ship has to be abandoned, lack of communication or miscommunication may cause chaos and confusion on board, and if the safety drills (exercises) were insufficient, the situation might escalate (BBC, 2011, 2012). The age and physical condition of the passengers could also be a hindrance when applying evacuation and rescue procedures (Carron et al., 2018). Escalation might occur in cases of evacuation and rescue if there is a blackout on board and/or water leakage (flooding) beyond manageable limits. If a ship is severely damaged, capsized or if it sinks, people could lose their lives, be injured, trapped inside the ship, or go missing (BBC, 2011, 2012). This calls for first aid assistance for victims and/or medical treatment in help centers or hospitals, shelters for survivors, facilities for rescue operators, and facilities for deceased passengers. This calls for tracking of the whereabouts of all involved in the severe incident, whether they are alive, injured, or dead, so that close relatives can be informed. Search and/or rescue measures might be extensive, such as in the Costa Concordia and the Viking Sky cases, but influenced by jurisdictions and territories in case of Arctic cruise ship incidents (The Maritime Executive, 2014; Travel Agent Central, 2019). Oil spill responses might also be needed, as well as wreck salvage or wreck removal. Some issues where Arctic conditions might exacerbate the situation are weather and navigation issues, as well as technical issues such as in the Viking Sky case (Travel Agent Central, 2019). Longer term implications after a severe cruise ship incident include a call for better safeguards for the industry, strengthening of regulations and international standards, for example,

technical standards or amendment to international treaties, and/or industry-wide voluntary adoption of policies. What might complicate matters further, whether immediate actions or longer term implications in solving compensation issues and court cases, or strengthening of regulations and standards, are Flag State issues (Allianz Global Corporate and Specialty AG, 2012) related to the avoidance of safety and consumer protection laws and regulations.

Business impacts

Impacts to business correlate and heavily overlap with those pertaining to economic issues. All aspects (especially the costs of compensation, fines, court cases, and diminished revenues) that negatively affect the financial performance of the cruise ship company have the capacity to undermine business operations, especially in the short term. Equally, the serious charges that have been levied against certain cruise ship companies, such as manslaughter, and the lengthy duration of legal proceedings, have the capacity to distract the company from their main focus on the tourism industry while leading to escalating negative press coverage, bad PR, and a severe loss of trust between potential customers and the company. As the financial performance of the cruise ship company declines and/or its reputation becomes further damaged, there is the potential for a further escalation of the crisis, with job losses and even bankruptcy potential consequences of long-term diminished business.

Longer lasting economic effects on business operations are likely to include an increase in the price of insurance, although data are sketchy in this regard. This is due to the sometimes vast sums that insurance companies have had to pay out in the aftermath of the most severe incidents, such as the Costa Concordia. Estimates place the total value of payouts by the insurance industry to be from at least \$1 B (Insurance Journal, 2012; Independent, 2013) to over \$2bn (Lloyd's, 2018). Carnival plc were responsible for only a proportion of the damage to the Costa Concordia, for example, the first 30 million euros specific to the hull, with the remainder covered by a network of insurers (Insurance Journal, 2012). With regard to personal liability insurance, Carnival had a \$10 million deductible, covering any payments linked to injuries and deaths of passengers and crew, as well as any oil clean-up costs and the value of lost cargo. Carnival plc insured the Costa Concordia through two insurance clubs. The first of these, the Standard Club, was reinsured to the value of \$3 billion. Carnival plc did not have any insurance cover for the loss of the ship (Insurance Journal, 2012).

A long-term business operations consequence of the most serious cruise ship incidents concerns changes to procedures, policies, and regulations. This was evidenced quite clearly in the case of the MS Estonia disaster, which led to strengthening of a series of regulations. These are too extensive to be listed in full here; however, full examples included a requirement for all ro-ro passenger ships to be capable of maintaining positive stability in damaged condition with a quantity of water on the car deck corresponding to half a meter over the entire deck, upgraded

requirements concerning the damage stability requirement for all ro-ro passenger ships, imposition of safety standards for bow doors, and enhanced standards in relation to the integrity of the hull and superstructure of ships (Government of the Republic of Estonia, 1997). Updated regulatory standards require internal resources in cruise ship companies to be mobilized in order to ensure compliance, as well as imposing a further cost burden on businesses in terms of meeting higher technological standards.

The Arctic context of severe cruise ship incidents

The economic potential of Arctic cruise ship tourism has arguably never been greater, with rapid and intensifying climate change leading to increasingly large ice-free areas in the summer months (Falardeau and Bennett, 2019; Malinauskaite et al., 2019). However, despite an opening up of economic opportunities, multiple risks remain (Emmerson and Lahn, 2012; Jóhannsdóttir & Cook, 2015) involving its sensitive ecosystems, tourism-reliant local economies and the capacity for critical infrastructure to respond and cope with potential incidents in the region. Irrespective of whether a business is operating in the fisheries, energy, or tourism sectors, the extreme climate of the Arctic leads to dangerous and uncertain conditions, which present considerable challenges (Lajeunesse, 2012; Jóhannsdóttir & Cook, 2015). Rare and violent weather, including storms, fog, and floating ice, can leave vessels vulnerable to incidents such as the breakdown of machinery and ice damage (Marsh Ltd., 2014; Jóhannsdottir et al., 2015). A dearth of skills and experience of operating in such conditions may increase the likelihood of cruise ship incidents similar to the case studies explored in this article. However, their incidence may be compounded considerably due to the remoteness, coldness, and darkness of the Arctic region and limited infrastructure. As Emmerson and Lahn (2012) stated, “worst case scenarios may be worse in the Arctic because the ability to manage an evolving situation is limited by environmental conditions and the lack of appropriate infrastructure” (p. 35). Where port facilities and the assistance of the SAR services and/or vital medical services is unavailable or untimely, or salvaging or wreck removal is complicated, even minor or moderate cruise ship incidents could rapidly escalate, potentially leading to catastrophic outcomes for the passengers, Arctic environment, and impacted communities.

Insurance in the context of significant cruise ship incidents in the Arctic

A lack of necessary infrastructure may mean that worst-case scenarios in relation to cruise ship incidents may be worse in the Arctic because the capacity of authorities, agencies, and governments to manage evolving situations is, in many cases, more limited than in other parts of the world. Furthermore, despite the risks, the potential to secure economic gains through cruise ship tourism might persuade companies to take on greater operational risks. This is despite the risk management advancements secured through the Polar Code (IMO, 2015), which, since 2017, has required the owners of any vessel of more than

500 tons operating in Arctic waters to have in place contingency plans for all aspects of marine operations, including pollution incidents, ship structure requirements, SAR plans, and other aspects relating to the safety of navigation (Lloyds, 2017b). Although these relatively recent requirements help to mitigate risk, they cannot eliminate the residual issues of insufficient infrastructure and critical response capacities. The estimation of worst-case cruise ship incidents is already available (Lloyd's, 2018; Allianz Global Corporate and Specialty SE, 2019), although it is not specifically placed in Arctic condition where the costs factors might be much higher given the remoteness, lack of infrastructure limited salvage possibilities (Emmerson and Lahn, 2012).

Discussion

In the general context of cruise ship incidents, much is already known about immediate consequences and delayed consequences, including loss of lives, injuries, vessel damage, fire or sinking, or pollution (Grabowski et al., 2000; Grabowski et al., 2009; Congressional Research Service, 2020). Relatively little is understood about the socio-cultural impacts, such as any long-term psychological implications for locals, passengers, and the crew. This is, for instance, due to the level of analysis, where systemic risk (Danielsson and Shin, 2002; Schwarcz, 2008; Johannsdottir and Cook, 2019) is rarely studied. This suggests a very narrow focus since the impacts may be much broader (Johannsdottir and Cook, 2019). As a part of a systemic approach, communities need to be prepared and have the ability to recover and thrive during and after a shocking event (Arctic Council, 2017a), such as a severe cruise ship incident.

Given the limited medical services available in the Arctic due to the smallness of most communities, these issues may be particularly significant, not least because they would likely be the first responders to the situation (CBS News, 2019; Juneau Empire, 2019) in an area with limited—and likely insufficient—infrastructure to cope with situation. The Viking Sky incident typified the challenges for response teams. Extreme weather meant that Norwegian rescue services had been unable to deploy rescue boats, instead resorting to six rescue helicopters (Independent, 2019; Congressional Research Service, 2020). Collectively, the helicopters undertook 30 trips back and forth from the stricken vessel but required 19 h to bring the rescued passengers to Fraena in western Norway, still leaving 900 persons onboard (Independent, 2019). Although the rescue was ultimately successful in the sense that there were no fatalities, it was still a larger incident than Norway's Joint Rescue Coordination Centre had ever trained for. Other cruise ship incidents in the Arctic might require the coordination of SAR personnel from more than one nation (ACGF, n.d.), significantly exacerbating the scale of the challenge and the likelihood of systemic risk consequences.

The recent Viking Sky incident exemplified that risks in the Arctic pertain not just to its fragile environment and resource-dependent economies but also to its people and societies. In this case, 240 volunteers had been mobilized

at short notice to conduct the SAR operation (The Independent Barents Observer AS, 2019). However, this would not be possible in the more remote parts of the Arctic, which are increasingly frequented in the summer months by large cruise ships. The Polar Code (IMO, 2015) was a response by the International Maritime Organization to the challenges of expanded shipping and tourism activities in the Arctic, especially the High Arctic. Its remit covers a broad variety of issues, including vessel operation and training, ship design and safety equipment, SAR, and environmental protection. This is fairly broad and covers some of the dimensions of systemic risk; however, much of the focus of the Polar Code (IMO, 2015) is pinpointed on vessels going into the ice, whereas cruise ships tend to operate in remote Arctic waters close to ice. The MS Explorer case study provided an indication of what could happen in the Arctic. Although all passengers and crew were rescued, the lifeboats drifted for 5 h, and within 1 day the vessel had sunk. Thus, a comparable weather incident to the Viking Sky in as remote a location as Antarctica, such as the Northern Sea Route, could have led to an incident with consequences of a similar scale to Costa Concordia, or worse. Moreover, the typical age profile of cruise ship tourists would have the potential to compound the risk of incidents leading to fatalities in remote, freezing, and inhospitable environments.

With regard to the governance or management of cruise ship activities in the Arctic, although the Polar Code (IMO, 2015) sets overarching stipulations specific to all companies, there remains no single point of authority for the governance of the sector. Moreover, there are no established strategies, management plans, or sets of operational guidelines for cruise ship companies in the Arctic, beyond those pertaining to protected area restrictions. Thus, decentralized management is a feature of cruise ship business in the Arctic, leading to the potential for management gaps, unforeseen risks, and communication difficulties. Rather than pooling knowledge and learning lessons from past failures, then applying these to the Arctic context, cruise ship companies continue to conduct business as competitors in isolation from one another. A collaborative approach would also be beneficial as a means of determining the optimal locations for critical infrastructure, such as the location of rescue centers. Systemic risks are unlikely to ever be fully mitigated in the Arctic, meaning that a greater focus on strategic risk minimization and stewardship models (Emmerson and Lahn, 2012; Arctic Council, 2017b) is increasingly important, given the growth of the cruise ship industry in the Arctic in recent years. This includes that risk should not be ignored or exploited (De Loach, 2000; Lessard & Lucea, 2006; Tomlin, 2006; Jóhannsdóttir et al., 2012) unless there is an understanding of worst-case scenarios (Emmerson and Lahn, 2012).

A set of general recommendations for the management of Arctic risks relating to cruise ship activities were set out by PAME (2015), all of which endeavor to reduce the likelihood of a systemic risk event unfolding or minimizing the consequences of an incident. These include recommendations to raise awareness among member states,

particularly related to voyage planning, cultural differences, and environmental protection. Specific to voyage planning, PAME (2015) emphasized the sharing of information relating to weather and sea-ice information. Ultimately, however, the limitations of general advice and potential deficiencies in the enforcement of the Polar Code may demand the development of more stringent and legally binding guidance with regard to cruise ship activities in the Arctic.

The Arctic Council has already successfully developed a number of legally binding strategies concerning the prevention and combating of emergencies in the Arctic, including the Agreement on Cooperation on Aeronautical and Marine SAR in the Arctic (2011), Agreement on Arctic Marine Oil Pollution Preparedness and Response (2013), and Agreement on Enhancing International Arctic Scientific Cooperation (2017), respectively. However, it is important that a harmonized policy framework is developed specific to cruise ship activities in the Arctic, through the auspices of the Arctic Council, to ensure that all systemic risk dimensions are minimized. This agenda needs to balance the importance of risk mitigation with the economic opportunities for the cruise ship industry and increasingly reliant small Arctic communities. There are multiple infrastructure-related issues that would need to be addressed, including enhancing satellite and monitoring programs, establishing more deepwater ports with refueling capabilities, developing more SAR facilities, and increasing resources for national coast guards. Inevitably, the level of investment necessary to mitigate the systemic risk of cruise ship and other marine-based activities in the Arctic is likely to be vast. It is unlikely that national governments would be able to meet the challenges alone, and rather public–private partnerships, as are commonly formed for resource extractive activities in the Arctic, would perhaps be best for facilitating the development of multiuse infrastructure.

Concluding remarks

Any marine-related activities taking place in the Arctic entail considerable risks. In recent times, not least due to the increased accessibility of the Arctic during the summer months, cruise ship tourism has expanded. This article has highlighted how risks in relation to cruise ship tourism tend to be considered in isolation, often with emphasis placed on managing, through insurance mechanisms, their enterprise aspects, as opposed to systemic consequences. Through the application of a case study approach, both in general and specific to the Arctic, this article evaluated the main and wide-ranging implications of cruise ship incidents, which can involve impacts across several dimensions, including environmental, economic, business, sociocultural, security, and policy. Combined, these effects can lead to systemic risk consequences, whereby a severe cruise ship incident could precipitate the severe instability of collapse even of an industry. The risks would seem greatest in a region such as the Arctic due to its remote and harsh environment, with limited access to critical support infrastructure, rescue, and medical services. Relatively recent legal agreements, such as

the Polar Code (IMO, 2015), have advanced regulatory standards concerning safety, planning, and risk mitigation of cruise ship tourism in the Arctic. However, these are necessary but insufficient advancements on their own to offset the residual risks of conducting cruise ship activities in the Arctic region. Given the potential for systemic risk consequences to materialize in the Arctic, the insurance industry has an important role to play when rules and regulations are formulated and further refined in the future, including the raising of awareness and striving to ensure that insurance-related terms and conditions are embedded in decision-making protocols.

Data accessibility statement

No data accompany this article.

Supplemental files

The supplemental files for this article can be found as follows:

Appendix A. Analytical framework.xlsx

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Author contributions

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