An assessment of the environmental regulatory framework regarding increasing tourism activity in Antarctica

Emiliano Miguel Cavallo

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AN ASSESSMENT OF THE ENVIRONMENTAL REGULATORY FRAMEWORK REGARDING INCREASING TOURISM ACTIVITY IN ANTARCTICA

By

EMILIANO MIGUEL CAVALLO
Argentina

A dissertation submitted to the World Maritime University in partial Fulfilment of the requirements for the award of the degree of

MASTER OF SCIENCE
In
MARITIME AFFAIRS
(MARITIME EDUCATION AND TRAINING)

2019

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DECLARATION

I certify that all the material in this dissertation that is not my own work has been identified, and that no material is included for which a degree has previously been conferred on me.

The contents of this dissertation reflect my own personal views and are not necessarily endorsed by the University.

(Signature): ......................................................................................................................
(Date): ............................................................................................................................

Supervised by: Professor Dimitrios Dalaklis
Supervisor’s affiliation: Associate Professor of Maritime Safety & Environmental Administration (MSEA) Specialization, World Maritime University
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To my wife Carolina and our lovely kids Tomás and Agostina, all my love and gratitude are with you because without your support, patience and affection, this task would have been much harder than it was.

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ABSTRACT

Title of Dissertation: An Assessment of the Environmental Regulatory Framework Regarding Increasing Tourism Activity in Antarctica

Degree: Master of Science

The “Antarctic Treaty System” (ATS) was signed by several States and established this region as an international area dedicated to science and research. It is true that tourism in Antarctica is a well-established and profitable industry which contributes significantly to the economic development of the countries involved. However, this increasing activity in Antarctica could endanger the fragile environment in the case of a catastrophic maritime accident. This research examined the regulatory framework relating to the environmental protection of the region, by evaluating past accidents and at the same time factorizing the increasing presence of cruise ships in this pristine polar area. To do that, it is important to understand how this activity is regulated, what are the factors that jeopardize the environment, which are the instruments created by IMO and private parties to deal with this issue, and finally assess if these regulations are enough to ensure safe operations. A thorough literature review regarding the extended regulatory framework (IMO, IAATO, Antarctic Treaty) was conducted. In addition, examining the level of conformity of the operators and the effectiveness of the inspection realized by member States of the ATS was also included. Twenty-five vessels were inspected by the observers under the Antarctic Treaty regulations, MARPOL and IAATO regulations, on matters like crew experience and training, navigation and communication equipment, oil pollution and waste management, and environmental protection. The results indicate that the regulations have a positive impact on the operations assuring best-practices to protect the environment. However, certain incidents demonstrate the need to enhance safe operations in Antarctica. The issue of manning levels is clearly standing out as an issue of further investigation in order to safely and effectively conduct high manning levels operations in this hostile environment, with very adverse weather conditions.

KEYWORDS: Antarctica, Tourism Activity, Environmental impact, The International Convention for the Prevention of Pollution from Ships (MARPOL), International Association of Antarctica Tour Operators (IAATO).
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<tbody>
<tr>
<td>AECO</td>
<td>Arctic Expedition Cruise Operations</td>
</tr>
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<td>ARA</td>
<td>Armada República Argentina</td>
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<td>ASOC</td>
<td>Antarctic and Southern Ocean Coalition</td>
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<td>ATCM</td>
<td>Antarctic Treaty Consultative Meeting</td>
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<td>ATS</td>
<td>Antarctic Treaty System</td>
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<td>CCAMLR</td>
<td>Commission for the Conservation of Antarctic Marine Living Resources</td>
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<tr>
<td>DNV</td>
<td>Det Norske Veritas</td>
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<tr>
<td>DWT</td>
<td>Dead Weight Tonnage</td>
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<tr>
<td>EIA</td>
<td>Environmental Impact Assessment</td>
</tr>
<tr>
<td>ECDIS</td>
<td>Electronic Chart Display Information System</td>
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<td>ENC</td>
<td>Electronic Nautical chart</td>
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<tr>
<td>GPS</td>
<td>Global Position System</td>
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<td>GRT</td>
<td>Gross Register Tonnage</td>
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<td>GT</td>
<td>Gross Tonnage</td>
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<tr>
<td>IAATO</td>
<td>International Association of Antarctica Tour Operators</td>
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<td>IMO</td>
<td>International Maritime Organization</td>
</tr>
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<td>MARPOL</td>
<td>The International Convention for the Prevention of Pollution from Ships</td>
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<tr>
<td>MEPC</td>
<td>Marine Environment Protection Committee</td>
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<tr>
<td>NLS</td>
<td>Noxious Liquid Substances</td>
</tr>
<tr>
<td>NM</td>
<td>Nautical Miles</td>
</tr>
<tr>
<td>Acronym</td>
<td>Description</td>
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<tr>
<td>NOAA</td>
<td>National Oceanic and Atmospheric Administration</td>
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<td>POLAR CODE</td>
<td>The International Code for Ships Operating in Polar Waters</td>
</tr>
<tr>
<td>PSC</td>
<td>Polar Ship Certificate</td>
</tr>
<tr>
<td>PWOM</td>
<td>Polar Waters Operational Manual</td>
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<td>RADAR</td>
<td>Radio Detection and Ranging</td>
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<tr>
<td>SAR</td>
<td>Search and rescue</td>
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<td>SCAR</td>
<td>Scientific Committee on Antarctic Research</td>
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<tr>
<td>SOLAS</td>
<td>The International Convention for the Safety of Life at Sea</td>
</tr>
<tr>
<td>STCW</td>
<td>The International Convention on Standard Training, certification and Watch keeping for Seafarers</td>
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<tr>
<td>WGS84</td>
<td>World Geodetic System 1984</td>
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CHAPTER ONE

INTRODUCTION

1.1 Background and context

In 1959, the Governments of Argentina, Australia, Belgium, Chile, France, Japan, New Zealand, Norway, South Africa, Russia, the United Kingdom and the United States of America signed the Antarctic Treaty and other related agreements. Collectively called the “Antarctic Treaty System” (ATS), this treaty established the region under discussion as an international area dedicated to science and research. The Antarctic Treaty (1959) states that the continent “shall continue forever to be used exclusively for peaceful purposes and shall not become the scene or object of international discord.” In addition, the Treaty contains 14 articles which establish key elements essential to peaceful international coordination on the continent. As an example, it includes a forbiddance of military activity, promotes peaceful scientific research and international information exchange from research on the continent, no territorial sovereignty claims by the signatories, and the application of the treaty to all areas south of the 60-degree latitude line in the southern hemisphere (The Antarctic Treaty, 1959). Furthermore, in 1991 the parties of the Antarctic Treaty adopted the Protocol on Environmental Protection to the Antarctic Treaty (The Madrid Protocol). This Protocol provides comprehensive protection of Antarctica establishing environmental principles for the conduct of all activities, the establishment of a Committee for Environmental Protection, requiring to the parties the development of contingency plans to respond to environmental emergencies and providing for the elaboration of rules relating to liability for environmental harm (Australian Government, Department of the Environment and Energy, 2016).

As the Antarctic continent has become an object of interest to the entire humanity, it is not surprising that year after year more people are tempted to visit this place.
Tourism in Antarctica is a well-established and a profitable industry which contribute to the economic development of the countries involved in the activity. To understand the dimension of the tourism activity, the International Association Antarctica Tour Operator [IAATO] (2019) state that by the 1991-92 season 6,400 tourists visited Antarctica, and by the season 2013-14 the count ascended to 37,000 visitors. Nevertheless, in the last years the growth of this activity has triggered debates among policy-makers, the tourist industry and other stakeholders about its possible consequences in relation to safety and environment protection. A series of gaps, inconsistencies and deficiencies regarding the regulation of tourism operations were identified, focusing on requirements rather than regulation or restrictions (Lamers, 2009). Therefore, it is important to investigate the possible environmental impacts associated with the increasing tourism activity in Antarctica, and if the current regulations are adequate to protect this region.

Classification of tourism in Antarctica

According to the IAATO (2018), the geographic range of tourism activities in the Antarctic Peninsula region can be divided into several sub-areas:

- South Orkneys Including Laurie, Coronation Islands;
- Elephant Island including nearby islands;
- The South Shetland Islands Including Deception, Livingston, King George, Low and Smith Islands;
- Northeast Antarctic Peninsula from Cape Dubouzet (63 16'S, 57 03'W) to James Ross Island;
- Northwest Antarctic Peninsula from Cape Dubouzet (63 16'S, 57 03'W) to the north end of Lemaire Channel;
- Southwest Antarctic Peninsula from the north end of Lemaire Channel to the area of Marguerite Bay (67 34'S).
Figure 1.1 shows a map of Human Footprint across Antarctica where it is possible to identify the area most visited by humans (Pertierra et al., 2017)

![Figure 1.1 Spatial Mapping of Human Footprint across Antarctica. Retrieved from www.journals.plos.org](image)

Regarding the type and duration of the Antarctic tourism options to travel, it is possible to classify them as:

- Antarctic Peninsula trips from port to port in South America such us Ushuaia (Argentina) and Punta Arenas (Chile); longer trips sail to South Georgia and/or the Malvinas Islands;
- Antarctica Peninsula trips fly from South America over the Drake Passage and joining the ship in Antarctica. There are two modes of travelling: fly both ways or sail one and fly the other;
• Eastern Antarctica trips depart from and return to Australia or New Zealand, sometimes from one to the other (Ward, 2018).

Regulating tourism in Antarctica

To manage effectively all these complex touristic activities, in 1991 seven Antarctic tour operators started to work together dedicated to advocate, promote and practice environmentally responsible private-sector travel to Antarctica. The outcome of this collaboration was the creation of the International Association of Antarctica Tour Operators (IAATO). Actually, there are more than 100 member-organizations representing different countries around the world and the number continues increasing. Furthermore, the mission of IAATO was to create guidelines served as the basis for developing Recommendation XVIII-1 of the ATS, which includes a guidance for Antarctic visitors (including contents about protection of Antarctic wildlife, respect for protected areas, respect for scientific research, how to be safe and how to keep Antarctica pristine) and for non-governmental tour organizers (Key obligations on organizers and operators, and procedures to be followed by organizers and operators). In addition, IAATO provides a forum for Antarctic tourism stakeholders to work together and develop the highest standards and best practices management to reach the best protection of the Antarctic environment (IAATO, 2018).

The Antarctic Treaty System

Activities in Antarctica and its surrounding waters are regulated by an aggregate of agreements between nations known as the Antarctic Treaty System (ATS):

• The Antarctic Treaty, 1959;
• The Convention for the Conservation of Antarctic Seals, 1972;
• The Convention of the Conservation of Antarctic Marine Living Resources (CCAMLR), 1980;
These agreements are legally binding and purpose-built for the unique geographical, environmental and political characteristics of the Antarctic and form a sturdy international governance framework for the region. Furthermore, legal liabilities apply to all countries signatories to the agreements including freedom of scientific investigation and the exchange of scientific findings, non-militarization of Antarctica and the Southern Ocean, and accommodating the positions of all Parties on issues of sovereignty. The Madrid Protocol was created as a supplement to the Antarctic Treaty and has established a basis for environmental protection in the area. Furthermore, it provides meaningful guidelines for responsible touristic visits to Antarctica. In addition, under the protocol mineral resource exploration, mining and oil drilling is banned indefinitely and the environment must be a fundamental consideration in the planning and conduct of all activities in Antarctica (Australian Government, Department of the Environment and Energy, 2016).

Despite the fact that the Protocol has been criticized because it is too broad and open to different interpretations, Article 3 sets environmental principles and requires that any activities carried out there are “planned and conducted so as to limit adverse impacts on the Antarctic environment and dependent and associated ecosystems” (The Madrid Protocol, 1991), including avoiding adverse effects or significant changes to nearly all aspects of the natural and physical environment. Moreover, Section 4 of this Article states that tourism activities in Antarctica must take place in a mode consistent with the Article 3 and shall be modified or canceled if they have the potential to result in impacts on the Antarctic environment. Furthermore, Article 8 of the Protocol specifically mentions tourism activities and provides the details for a system of Environmental Impact Assessment; consequently, all tourism operators associated (by flag state or other means) with ATS signatories’ countries are bound by the Environmental Impact Assessment procedures previously mentioned (Maher, 2005).
It is well known that the global warming has been affecting in different ways the environment across the world. One of the most famous is the ice melting on the Poles of the Earth, which creates an opportunity to find more easily open waters for navigation (Dalaklis & Baxevani, 2016; Dalaklis & Baxevani, 2017). As an example, the ice melting in the Arctic has created an “open window” for commercial shipping activities due to the new maritime routes across the pole region. Moreover, this opportunity is also exploited by the tourism operators who take advantage of the less ice concentrations in Antarctica (particularly during summer season in South Hemisphere) to increase the cruise vessel activities in the area. Due to these increasing activities, the IMO has developed the International Code for Ships Operating in Polar Waters (the Polar Code), as a regulation to avoid a possible environmental impact and increase the safety operations level in Polar regions (Dalaklis, Ölçer, Balini & Dewitz, 2017; Dalaklis & Baxevani, 2018; Dalaklis, Baxevani, & Siousiouras, 2018).

The Polar Code was designed to cover the full range of shipping-related matters (ship design, construction, and equipment relevant to navigation) in waters surrounding the poles; moreover, it provides operational and training concerns, search and rescue matters, and the protection of the unique environment and eco-systems of the polar regions. This Code covers the full range of design, construction, equipment, operational, training, search and rescue and environmental protection matters relevant to ships operating in the inhospitable waters surrounding the two poles. In addition, the Polar Code includes mandatory measures covering safety, (part I-A) and pollution prevention (part II-A) and recommendatory provisions for both (parts I-B and II-B). This Code was developed by IMO due to the fact that vessels operating in the Antarctic environments are exposed to a number of unique risks. For instance, poor weather conditions and the relative lack of good charts, communication systems, and other navigational aids pose challenges for masters and seafarers. Furthermore, the
remoteness of the area makes rescue or cleanup operations very difficult and expensive.

1.2 Problem statement

The increase in tourist activities in Antarctica can irreversibly affect a fragile and pristine ecosystem. This is an issue that has been debated for several years between the scientific community and the tourism stakeholders. As an example, the IAATO (2004) claimed that: “In 35 years of Antarctic tourism there is very little discernible impact from tourist activities at any of the landing sites in the Antarctic”; on the other hand, the Antarctic and Southern Ocean Coalition (ASOC) is putting forward the notion that although the tourism industry claims that there has been no environmental impact since the tourism activity begun several years ago, the real impact of this activity is not well known. To define which issues are to be taken care of by regulating tourism, it is important to define its impacts over the three holdings developed by the ATS, which are the environment, science, and peace (Harcha, 2006).

To illustrate, Maher (2005) stated that it is possible to identify several common issues concerning the different types of tourism impact:

● Physical damage to the landscape;
● Interference with wildlife;
● Introduction of foreign diseases into penguin colonies;
● Marine pollution and the introduction of foreign marine organisms;
● Safety issues.

Considering that the objective of this research is to assess the actual environmental regulatory framework regarding increasing tourism activities in Antarctica, to understand the possible environmental impacts in Antarctica, it is possible to classify the potential impacts of shipping activities as follows (Maher, 2005):
● Damage to marine seabed communities due to repeated anchoring at the same position;
● Fuel and oil spills;
● Irregular sewage dumping and waste;
● Noise from the ship and small-boat activities;
● Interference with wildlife;
● Pollution caused by ship engine emissions.

As an example of marine pollution and environmental impacts due to tourism activities in Antarctica, on January 28, 1989 the Argentine Polar Transporter and Tourism Vessel Bahia Paraiso ran aground two miles from Palmer Station. The vessel was on route to resupply the Argentine stations in the vicinity and had called on Palmer Station to allow the tourists on board an opportunity to visit the scientific station. Another incident was the sinking of the M/V Explorer, which suffered a hull break while was sailing in an ice field on November 23, 2007 in the Bransfield Strait (Ford, 2009). These two examples clearly demonstrate how the lack of experience sailing in Antarctic waters or an excess of confidence can cause irreversible damage to the fragile Antarctic ecosystem (Dalaklis & Ölçer, 2019).

1.3 Research aims and objectives

This research effort will assess the regulatory framework related to the environmental protection of the region by factorizing the increasing tourism activity in the Antarctica. The starting point will be to highlight the importance of keeping Antarctica pristine, and how the increase of human activities in that region will impact the environment. Furthermore, the objective of this research is to evaluate if the tourism vessels visiting Antarctica are increasing, and all the factors that jeopardize the operation in Antarctica like the limited help services needed in a critical situation. Moreover, to discuss how are the different controls that are carried out on the vessels that navigate these waters
and review some incidents that could have irreversibly affected the Antarctic environment. Finally, an attempt will be made to evaluate whether all of the measures taken to protect the Antarctic environment are sufficient or whether it would be advisable to introduce additional measures.

1.4 Research questions

Despite the various regulations previously mentioned, it seems difficult to identify an author that holds the view that the current system is appropriate. In addition, Maher (2005) puts forward the notion that “…there is no systematic and comprehensive legal regime in place to manage Antarctic tourism”. Furthermore, the same author believes that the purpose of the ATS regarding Antarctic tourism management is not clear or well understood, so he summarized a list of shortcomings of the current regulatory framework:

- Lack of strategic overview;
- Uncertain legal foundation;
- Lack of management planning / comprehensive protected area network;
- Flaws in the Environmental Impact Assessment (EIA) system;
- Lack of monitoring;
- Lack of a regulatory institution of tourism management.

Although the Antarctic Treaty and Madrid Protocol have good intentions, the most challenging obstacle to adding to and updating the legislation over the years has been the consensus-based process required by the Treaty. Furthermore, each member of the ATS has their own ideas about how activities should be administered in Antarctica. Several proposals regarding tourism activities have been presented at ATS; however, very few measures have been adopted. In particular, the consensus around strategic policy directives specific to tourism has been very difficult. As such, new tourism
promotions have been developed in a purposely trend, the result being a divided regulatory framework for tourism activities in Antarctica (Butters, 2017).

The research questions are:

- How are the Antarctic tourism activities regulated?
- What are the factors of the tourism activities that jeopardize the Antarctic environment?
- Which is the IMO regulatory framework to cope with this issue?
- Are these regulations enough to ensure safe operation?

1.5 Research methodology and methods

The primary research methodology for this dissertation will be a qualitative literature review of the issues regarding the tourism activity in Antarctica and how this activity can threaten the environment. A complete review of the respective regulatory systems (IMO, IAATO, Antarctic Treaty) will also be done. In addition, the research will identify the level of conformity by operators and determinate the effectiveness of the inspection realized by inspectors of member states of the ATS. Moreover, this research will evaluate the regulatory framework and try to determine if it is adequate (or not) to ensure safe operations in Antarctica.

1.6 Anticipated outcomes

It will be determine if the increasing tourism activities in Antarctica jeopardize the environment and wildlife, and if the actual regulatory system is enough to ensure effective pollution control in Antarctica or if it needs to be updated. Moreover, the analysis of reports could determine if the vessels operating in Antarctic waters can accomplish with the regulatory system. The information collected will be essential to understand the issue and determine further steps to achieve awareness about the environment in Antarctica. The analysis of past incidents will allow determining most
common reason and contributing factors. Then, by examining current regulations, legislations and guidelines, is intention to understand if the causes of accidents are effectively mitigated.
CHAPTER TWO

LITERATURE REVIEW

2.1 Protocol on Environmental Protection to the Antarctic Treaty (The Madrid Protocol)

In the previous Chapter, the Antarctic Treaty System and the Protocol on Environmental Protection have been discussed very briefly. In this Chapter, the principles of environmental protection under this protocol will be analyzed at a greater level of detail. The specific Protocol was signed in 1991 under the premise that the development of a comprehensive regime for the protection of the Antarctic environment and dependent and associated ecosystems is in the interest of mankind as a whole. In its Article 2 Objective and Designation, it is stated that the parties agree to appoint Antarctica as a “natural reserve, devoted to peace and science.”

In addition, Article 3, Environmental Principles stipulates that

the protection of the Antarctic environment and dependent and associated ecosystems and the intrinsic value of Antarctica, including its wilderness and aesthetic values and its value as an area for the conduct of scientific research, in particular research essential to understanding the global environment, shall be fundamental considerations in the planning and conduct of all activities in the Antarctic Treaty area,

and into this activities is included the tourism activity. To achieve this, the Protocol encourage parties to regulate the activities in Antarctica in order to limit all the negative impacts to the environment and related ecosystems. Furthermore, the
activities shall be planned and conducted to avoid adverse effects on climate, air and water quality; changes in all the environments (atmospheric, terrestrial, glacial and marine); changes in the distributions patterns and population of flora and fauna, specially avoiding activities that could jeopardize all species; degradation or endangered of biological areas, and historic and scientific locations.

One of the most important provisions set by this Protocol is the Article 14 Inspection, where it is stated that to comply with the provisions of this Protocol regarding the protection of the environment and associated ecosystems, the parties of the Antarctic Treaty shall arrange inspections to be made in accordance with the Article VII of the Antarctic Treaty considering that the quality assurance increase the level of safety. Although inspections alone cannot prevent accidents, then it is necessary to promote the safety culture. In addition, this Article stipulates that the inspectors shall have access, within others, to all vessels discharging or embarking general cargo or personnel in Antarctica. Moreover, Article 14 of this Protocol also determines that the reports obtained from the inspections shall be sent to the parties whose vessels are covered. Regarding this Article, some examples of the inspections and results will be addressed later.

The Protocol is also composed by six Annexes to complement the general provisions. A brief description of those Annexes follows next:

**ANNEX I: Environmental Impact Assessment**

Procedures and considerations regarding environmental assessment of the different activities in Antarctica. In order to determine if any activity in Antarctica has some impact on the environment, an Initial Environmental Evaluation should be conducted. If this Initial Environmental Evaluation shows that the activity is likely to have less than a minor or transitory impact, the activity may proceed with monitoring and impact assessment verification.
ANNEX II: Conservation of Antarctic Fauna and Flora
Annex II states the necessity of a permit if any activity will interfere with Antarctic flora and fauna. It stipulates the manner to determine the protected species and includes the prohibition of the introduction of non-native species. In this annex it is important understand that the tourism activity without regulation could result in the introduction of micro-organisms like viruses, bacteria, yeasts and fungi every time that the passengers visit different locations. In addition, tourism vessels operating in Antarctic waters could “accidentally” discharge ballast waters which could contain aquatic micro-organism or larvae that will affect the ecosystem equilibrium.

ANNEX III: Waste Disposal and Waste Management
Annex III establishes the necessity to develop waste management plans to be carried out by the parties operating in the Antarctic Treaty Area. In addition, this annex indicates the requirements to manage actual and historic waste, and the removal and clean-up of the installations.

ANNEX IV: Prevention of Marine Pollution
This annex regulates the discharge of oil or oil mixture according to Annex I of MARPOL 73/78; discharge of noxious liquid substances, sewage and plastics. Moreover, it stipulates the necessity for preventive measures and the development of an emergency preparedness and response plan to deal with accidental spills.

ANNEX V: Area Protection and Management
This annex establishes the level of protection of Specially Protected Areas, Antarctic Specially Managed Areas, and Antarctic Specially Managed Areas and Historic Sites and Monuments.

ANNEX VI: Liability Arising from Environmental Emergencies
In this annex, the Protocol establishes the necessity of preventative measures to reduce the risk of environmental contingencies, which may include specialized structures or
equipment of means of transportation, specialized procedures into the operation of the transportation, and specialized training of personnel. Furthermore, each Party operating in Antarctica should establish contingency plans for responses to incidents which could affect the environment and the ecosystems. This contingency plan should include:

(a) Procedures for conducting an assessment of the nature of the incident;
(b) Notification procedures;
(c) Identification and mobilization of resources;
(d) Response plan;
(e) Training;
(f) Record keeping; and
(g) Demobilization.

This Annex also includes the response action to be adopted by Parties operating in the Antarctic region to take prompt and effective response action to environmental emergencies derived from the operation. In addition, Article 6 of this Annex states that an operator that fails to take prompt and effective response action to environmental emergencies derived from its activities, shall be liable to pay the costs of response action taken by Parties pursuant to Article 5(2) of this Annex to such Parties. This means that the Party whose operator is involved in an environmental incident and do not have a prompt and effective response, has to pay the amount of money to cover the costs of the contingency response to the third Party that deals with the incident. However, Article 8 states that a Party shall be exempted from liability if it proves that the environmental incident was caused by actions related to safe human life or safety, or due to a natural disaster, where it was not possible the take preventive actions to reduce the risk of environmental impact. Article 9 states the limits of liability according to the tonnage of the vessels, and encourages the Parties operators to maintain an adequate insurance or other financial security to cover the liability (Article 11).
An example is the wreckage of the Argentine *M/V A.R.A. Bahia Paraiso*, which ran aground in January 1989 resulting in a spill of 600,000 liters of fuel and lubricants into the water. This incident was before this Protocol, and the cleaning process was started by the Governments of the United States and Argentina because their nearest base, Palmer Station, and the nearest ecosystem was affected, but without a complete success. On the positive side, after the signature of this Protocol (1991), the governments of the Argentina and the Netherlands signed on February 1992 a Memorandum of Understanding where both governments started a joint effort to clean and remove all the oil remaining inside the vessel (Ford, 2009).

### 2.2 The International Convention for the Prevention of Pollution from Ships (MARPOL)

The International Maritime Organization (IMO) adopted on 2 November 1973 this convention to cover the prevention of pollution of the marine environment by vessels from operational or accidental causes. Regarding the topic, in Resolution MEPC.42 (30) adopted by the Marine Environment Protection Committee on 16 November 1990, the Committee stipulates the designation of Antarctic area as special area under Annexes I and V of MARPOL 73/78. This Convention, unlike the Antarctic Treaty and the Madrid Protocol, is mandatory for all the Member States of the IMO, which could be or not signatories of the Antarctic Treaty.

This Protocol, in Annex I Regulation 10, *Methods for the prevention of oil pollution from ships while operating in special areas* states that specially in the Antarctic area, any discharge into the sea of oil or oily mixture from any vessels shall be prohibited. In addition, it stipulates that no “discharge into the sea shall contain chemicals or other substances in quantities or concentrations which are hazardous to the marine environment or chemicals or other substances introduced for the purpose of circumventing the conditions of discharge specified in this regulation.”
Annex II of this Convention Regulations for the Control of Pollution by Noxious Liquid Substances in Bulk and Unified Interpretations of Annex II in Regulation 5 states that into the Antarctic area the discharge of noxious liquid substances or mixtures containing such substances is strictly prohibited. In addition, under Regulation 8 – Measures of control, the government of each Party to the convention shall authorize surveyors for the purpose of the implementation of this regulation. This is important to be regulated by the Parties carrying inspections to the vessels operating in Antarctica.

Another important issue regarding tourism activities in Antarctica is the garbage production and the pollution related with this problem. To cope with this problem MARPOL stipulates in the Annex V – Regulations for the Prevention of Pollution by Garbage from Ships that the disposal into the sea of all plastics including but not limited to synthetic ropes, synthetic fishing nets, plastic garbage bags and incinerator ashes from plastic products which may contain toxic or heavy metal residues; and all other garbage, including paper products, rags, glass, metal, bottles, crockery, dunnage, lining and packing materials is forbidden.

MARPOL is one of the most important IMO document to deal with the issue of the environmental impact of the vessels operating in Antarctica, particularly regarding the discharge of oil and oily waters, and garbage. Considering the extensive provision of this convention, the specific legal intervention has a very positive contribution regarding the issue of Antarctic environment protection.

### 2.3 The International Code for Ships Operating in Polar Waters (POLAR CODE)

This Code is another instrument established by IMO to regulate the different issues that could endangerer the Antarctic environment. While MARPOL regulates how to
prevent water pollution from oil, hazardous discharges and garbage derived from vessel operations in special areas, the Polar Code was developed to provide tools to ensure safe vessel operations and the protection of the polar environment. However, in the Part II-A Pollution Prevention Measures, this Code states operational and structural requirements for the vessels operating in polar waters divided in Chapter 1-Prevention of pollution by oil; Chapter 2- Control of pollution by noxious liquid substances in bulk; and Chapter 4-Prevention of pollution by sewage from ships. In addition, the pollution measures stated in this Code are complementary with those stated by the MARPOL regulations, with the difference that this Code regarding pollution prevention stipulates specific measures for vessel categories and the different ice concentration areas.

The Polar Code identifies several issues related to the navigation in polar waters that could jeopardize the safety of the operations such as:

1. Ice concentration that could affect the structure, mechanical and navigation systems, safety.
2. Topside icing that could affect stability, mechanical equipment exposed to ice, safety operations.
3. Low temperature conditions that could affect the human working environment without proper equipment, mechanical equipment, safety.
4. An accentuated difference between daylight and darkness hours depending on the season and latitude that could affect the human performance and navigational features.
5. High latitudes affect navigation system, communication and information reception, GPS reception, wellbeing communication.
6. Lack of hydrographic information and nautical chart accuracy due to poor navigation information to generate upgrades with “notice to mariners.” Remoteness and lack of information jeopardize the operations and increase the possibility of grounding, with the addition of the limited SAR response to reach the area.
7. Operations in polar waters require crew experience, being this issue a potential factor for human error.

8. Operations in extreme conditions need optimum emergency response equipment, where the remoteness could affect the possibility of replacing and recharging the equipment after its use.

9. Polar operations are exposed to severe, extreme and rapidly changing weather conditions, thus affecting the risk level.

10. Operating in environment protected areas, special attention for the crew is needed in order to comply with the international regulation.

This Polar Code states mandatory provisions covering safety measures in the part I-A and pollution prevention measures in the part II-A which apply to new ships built after 1 January 2017. However, vessels built before this date are also required to achieve the relevant requirements of this code in order to comply with the regulation.

Regarding safety provisions, the Polar Code stipulates the following:

**Equipment**

- Windows on bridge must be able to bear with melted ice, freezing rain, snow, mist, spray and condensation.
- All lifeboats shall be partially or totally enclosed type.
- All the crew are required to have adequate thermal protective clothes. Moreover, on passenger vessels an immersion suit or a thermal protective aid for each one is required.
- Special equipment for ice removal like electrical and pneumatic devices, special tools like axes or wooden clubs are required.
- Regarding firefighting safety, extinguishing equipment operable in cold temperatures, should be protected from ice, be suitable for persons wearing bulky and cumbersome cold weather gear.
Design & Construction

- This Code states three categories of vessels which may operate in polar waters, based on:
  
  Category A: vessels designed to operate in polar waters in at least medium first-year ice that may include old ice.
  
  Category B: vessels not included in Category A, designed to operate in polar waters in at least thin first-year ice that may include old ice incorporation.
  
  Category C: Vessels designed for open waters or ice conditions less severe than stipulated in categories A and B.
  
- In order to comply with this code, vessels must assure sufficient stability in intact condition when subject to ice accreditation and the stability calculations must take into account the icing allowance.
  
- Vessels intended to operate in low air temperature must be constructed with materials suitable for operation at the ships polar service temperature.
  
- In ice strengthened vessels, the structure of the ship must be able to resist both global and local structural loads.

Operations & Manning

- All vessels operating in polar waters must have navigation aids to receive information about ice conditions.
  
- This Code requires training and certification of bridge watchkeeping officers and senior officers, according to the regulations of the STCW Code as amended. In the case of passenger vessels, the Polar Code requires for open-waters including ice operations a basic training for Masters, chief mate and officers in charge of a navigational watch; and for other-waters including ice an advanced training for Master and chief mate, and basic training for officers in charge of a navigational watch. Regarding certification, this Code requires that the vessels operating in polar waters should have the Polar Ship Certificate (PSC) which is issued by their administration and must contain
Another provision of this Code is the Polar Waters Operational Manual (PWOM), which provides the operator and crew members information regarding vessel capabilities and limitations in order to assist the operation in polar waters. This manual must include:

1. Ship-specific capabilities or limitations
2. Specific procedures for normal operations or to avoid exceeding ship capabilities
3. Specific procedures to deal with incidents
4. Voyage planning to avoid ice or cold temperatures
5. Ice information reception arrangements
6. Awareness of and means to deal with lack of or limitations in hydrographic, meteorological and navigational information
7. Special measures for equipment maintenance and operation in low temperatures, prevention and mitigation of icing while operating in sea ice.

Regarding pollution prevention measures the Polar Code states:

**Oil**

- Discharge into the sea of oil or oily mixtures from any vessel is prohibited.
- Double hull and double bottom are required for all oil tankers including those less than 5,000 DWT.
- The use of heavy fuel is banned in the Antarctic area and vessels are encouraged not to use or carry heavy fuel oil in the Arctic area.
- Vessels should consider using non-toxic biodegradable lubricants or water-based system in lubricated components outside the underwater hull with direct seawater interfaces.
Invasive species

- This Code provides measures to be taken to minimize the risk of invasive aquatic species through vessels’ ballast water and biofouling.

Sewage

- The discharge of sewage in polar waters is prohibited, except under specific circumstances. Sewage not comminuted or disinfected can be discharged at a distance of more than 12 NM from any ice shelf or fast ice. Comminuted and disinfected sewage can be discharged more than 3 NM from any ice shelf or fast ice.
- Sewage discharge is permitted if the vessel has an approved sewage treatment plant, and discharges treated sewage as far as practicable from the nearest land, any fast ice, ice shelf, or areas of specified ice concentration.

Garbage

- Regarding plastics this Code prohibits all disposal.
- Discharge of food wastes onto the ice is prohibited. However, food wastes which have been comminuted or ground, no greater than 25 mm, can be discharged only when vessel is not less than 12 NM from the nearest land, nearest ice shelf, or nearest fast ice.
- The discharge of animal carcasses is strictly forbidden.
- Cargo residues, cleaning agents or additives in cold washing water may only be discharged if they are not harmful to the marine environment; both departure and destination ports are within Arctic waters; and there are no adequate reception facilities at those ports. The same requirements apply to the Antarctic area under MARPOL regulations.

Chemicals

- Discharge of noxious liquid substances (NLS) or mixtures containing noxious liquid substances is prohibited in polar waters.
As it is possible to identify, the pollution prevention measures set by this Code are complementary to those provisions stipulated by the MARPOL. Besides, part I-A of the Polar Code is very important to plan navigation and operations in polar waters due to the extreme conditions in which the operations will be carried out.

Regarding the issue of safe operations in polar waters, it is important understand the conditions and factors that could endangered the navigation and influence upon the conduce of operation. Although navigating in polar waters will not suppose navigation in heavy traffic areas, there are other important aspects that could make the operations difficult, which is lack of traffic, the condition that generates insufficient navigational aids to operate in polar waters. Moreover, the extreme weather conditions will generate several issues on the sailing conditions. Due to the lack of traffic in polar waters and more specifically in the Antarctic area, where the traffic is only related to tourism, research operations and logistic operations, one issue that could jeopardize the operations is the different type of nautical charts necessary to operate in the area. As an example, in Antarctica it is possible and necessary to use nautical charts from different countries, which are supposed be familiar with the different projections and units. While some countries uses Mercator projections, others use Lambert Conformal projections.

Moreover, some countries use fathoms to express the depth and others use meters. This means an extra attention demand from the navigation officer and the Master during the voyage planning because several times it is necessary use different charts across the conduct of the journey. Another important piece of information is to pay attention to the datum of the chart because some paper charts do not have WGS84 datum, which is necessary to fix the position with GPS and demand the introduction of corrections the GPS fix in order to obtain an accurate position. Another chart issue, particularly in Antarctica, is the lack of depth information and soundings. It is normal to see in many charts several track lines of soundings where the vessels normally follow to navigate (Snider, 2018).
The easy determination of the course to follow while navigating in polar regions is also affected. It is well known that magnetic compasses are useless in polar regions due to the proximity to the magnetic pole. In addition, the gyrocompass is also affected by the high latitude; corrective actions are need while the vessel is increasing the latitude. This issue is presented not only in the traditional gyrocompass models, but also in the modern fiber-optic equipment (Snider, 2018).

Furthermore, one of the most important navigation aids used to navigate in polar waters is the RADAR. Performance of this system is also affected by the conditions in the area, particularly by the low temperature. The extreme temperature conditions affect the RADAR performance generating changes in the shape of the beam with the consequent return lost. Another important factor is the correct use of the RADAR tools like gain, sea and rain clutters. Training drills and simulator runs can fix this issue. It is indispensable that the watch officer should know how to use the RADAR aid to the perfect detection and identification of the ice present at sea, and on the coast line (Snider, 2018).

Operating a vessel in extreme conditions does not only increase attention at the bridge but also in the engine room and at the deck operations. Normally, operating in ice conditions, the bridge watch should be enhanced with the presence of another officer to support the watch. The premise is to add as many visual lookouts as possible in order to assure maximum coverage of all the navigation aids and the sea. In addition, the bridge watch should have clear statements when to call the Master and should include the first sighting ice, ice or weather conditions changing unexpectedly, risk or occurrence of icing, vessel encounters any condition not expected, and when visibility becomes reduced, among others. In addition, engine room watch should also be prepare for the navigation in polar waters due to the necessity of prompter response when the bridge needs it. Moreover, the engine watch should be prepared to respond to any alarm that could appear for fire or for collision with ice. Regular revisions of the deck operating system should be
carried out because in extreme temperatures the icing will affect systems like anchor maneuver, firefighting equipment and lifesaving equipment. Therefore, deck watches should be increased to be able to observe any unusual conditions to be informed to the bridge officer. In addition, it is important to be sure that the deck watch has the appropriate clothes and should be supervised every time while the crew is outside (Snider, 2018).

Upon completion of the discussion of navigating in Antarctica, the following will shift toward past accidents in the region. The reason for doing this is identify most common causes of accidents to understand the importance of the safety operations in Antarctica, a list of vessels incidents will be examined. According to the Antarctic and Southern Ocean Coalition (ASOC) (2019) the following is a list of vessel incidents registered in the Antarctica and southern oceans:

**M/V “NELLA DAN”**

This was an Australian research vessel built in 1961 in accordance with the Australian Antarctic Division, she had the capacity for 42 passengers with 75.5 meters in length and 14.3 meters in breadth. The vessel had and ice breaker stern, ice fins and ice knife, with double hull in the engine room and holds. In December 1987 bad weather blew up during resupply operations at Macquarie Island. The vessel dragged anchor and was driven aground over the island, the hull was holed in several places and sea water flooded the engine room. There were no casualties or injures to the crew or researchers. Although initial plans were put forward to save the vessel, due to the prevailing weather conditions she was finally scuttled and sunk in deep waters close to Macquarie.
Figure 2.1 M/V “Nella Dan” ran aground at Macquarie Island in December 1987. Retrieved from www.antarctica.gov.au

M/V “BAHIA PARAISO”

This was an Argentinian polar vessel used for tourism and research purposes. It was built in Argentina in July 1980 with a length of 132.70 meters, a breadth of 19.60 meters and a draught of 9.70 meters; with capacity for 124 crew members and 82 passengers. On 28 January 1989, the vessel ran aground in front of Ambers Island at Arthur Harbor, Antarctic peninsula, close to the United States Station Palmer due to human error. The disaster resulted in the spill of 510 tons of diesel oil affecting the birds and marine ecosystem in the area, being one of the worst environmental disaster that occurred in Antarctica. The National Science Foundation organized an emergency spill response team composed of experts from the U.S. Navy, NOAA, the U.S. Coast Guard and private contractors. In 1993 the operation to recover the oil remaining inside
the fuel tanks of the vessel was carried out successfully. The vessel sunk in the position of the incident and the hull is still visible in lower tide (Hooke, 1997).

Figure 2.2 M/V “Bahia Paraiso” ran aground at Arthur Harbor on December 1989. Retrieved from www.histarmar.com.ar

**M/V “LYUBOV ORLOVA”**

This was a Russian Antarctic cruise vessel built in 1975 with a length of 4,251 GT, 90 meters, a beam of 16 meters and a draught of 4.6 meters; and it was built to ice class 1A to resist impacts with ice. The vessel ran aground on 27 November 2006 at Deception Island, South Shetlands Islands. The Master called for help and the R/V “Las Palmas” from the Spanish Navy assisted the vessel. After an evaluation, the Master decided to wait until next high tide to gain floatage due to no hull wreck was noted. The R/V “Las Palmas” towed the M/V “Lyubov Orlova” to deeper waters and the cruise vessel returned to navigate under its own propulsion to Argentina. No casualties or environmental damage occurred.
Figure 2.3 *M/V “Lyubov Orlova”* ran aground at Deception Island on 27 November 2006. Retrieved from [www.cruiseshipsinking.com](http://www.cruiseshipsinking.com)

_M/V “NORDKAPP”_

This vessel was a Norwegian cruise ship built in 1997, with 11,386 GT, a length of 123.30 meters, a beam of 19.50 meters and a draught of 4.90 meters; with capacity for 460 passengers. The vessel was classified for light ice conditions, and ran aground on 29 January 2007 at Port Foster, Deception Island, South Shetland Islands due to several weather conditions. No casualties and minor hull damage were reported; however, scientists from the Spanish base Gabriel de Castilla in Deception Island reported traces of oil detected after the incident. The owner, Norway’s Hurtigruten Group, denied the existence of oil spill due to the fact that the double hull was not broken. The M/V “Nordkapp” was assisted by her sister cruise vessel M/V “Nordnorge” to transfer all the passengers, and continue their navigation to the continent.
Figure 2.4 M/V “Nordkapp” ran aground at Deception Island on 27 January 2007. Retrieved from www.hurtigruten.com

**M/V “EXPLORER”**

This was a passenger vessel built in Finland in 1969, with Monrovia as a Port of Registry. The M/V “Explorer” was classed by DNV as 1A1 to operate in polar waters. The vessel was 76.2 meters in length, 14 meters in beam, 5.6 meters in draught, with capacity for 100 passengers, and was operated by Great Adventure People (GAP) of Canada. On 23 November 2007 the vessel suffered a hull break while sailing in an ice field. The Master decided to enter the ice field because he believed that the vessel would not suffer any damage; however, the ice pilot who made the assessment of the passenger video during the investigation stated that the ice was thicker and harder than the Master’s evaluation. Human error generated that the Explorer sunk in a position 25 NM southeast of Penguin Island, Bransfield Strait near South Shetland Islands. After the evacuation, all passengers and crew members were rescued by the Norwegian M/V “Nordnorge”. The vessel was carrying 210 m³ of oils, lubricants and petrol; however, no spills were detected around the vessel, and there was no evidence of
pollution to the ecosystem. There were no casualties during the incident and the rescue operations (Ford, 2008).

Figure 2.5 M/V “Explorer” sank at Bransfield Strait on 23 November 2007. Retrieved from www.nytimes.com

**M/V “USHUAIA”**

This was a steel hulled and ice-strengthened vessel built in 1970 and operated by Antarpyp Expeditions. She had a length of 85 meters, a beam of 15.5 meters, a draught of 5.5 meters, and with capacity for 84 passengers and 38 crew members. On 4 December of 2008 the vessel ran aground at Wilhelmina Bay, Gerlache Strait due to severe weather conditions. The M/V “Ushuaia” reported serious hull damage and diesel oil leak from the breached tanks, and was assisted by a United Kingdom Coast Guard vessel, the Russian icebreaker Grigoriy Mikheev, and the Chilean Navy vessels “Achiles” and “Lautaro”. On December 8 the vessel was refloated and continued sailing under its own propulsion to the continent. No casualties were reported, and the cleaning process was conducted by the Chilean Navy vessels.
Figure 2.6 M/V “Ushuaia” ran aground at Wilhelmina Bay, Gerlache Strait on 04 December 2008. Retrieved from www.gcaptain.com

_M/V “OCEAN NOVA”_

This was a passenger vessel built in 1992 with ice-strengthened hull and operated by Quark Expeditions, with a length of 72.8 meters, a width of 10.99 meters, a draft of 3.40 meters, and with capacity for 98 passengers and 34 crew members. M/V “Ocean Nova” ran aground on 17 February 2009 in Marguerite Bay, close to Argentine research station San Martin, due to rough sea and adverse weather conditions. The M/V “Clipper Adventure” assisted the M/V “Ocean Nova” during passenger evacuation, without casualties or hull damage registered. Several hours later the vessel was freed and started the return sailing to the continent escorted by the M/V “Clipper Adventure”.

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Figure 2.7 M/V “Ocean Nova” ran aground at Marguerite Bay on 17 February 2009. Retrieved from www.komar.org

M/V “Polar Star”

This was a cruise vessel built in 1969 in Finland as a Class Ice 1A and double hull according to DNV classification; with a length of 86.5 meters, a beam of 21.2 meters, a draft of 6.2 meters and 3,500 GRT. With a capacity to accommodate 80 passengers and 35 crew members, it was operated by Polar Star Expeditions Company. On 31 January 2011, M/V “Polar Star” hit an unchartered rock during anchoring maneuvers north of Detaille Island damaging the outer hull. This is an example of how the low quality of charts affected the operations safety. An underwater survey showed several hull damages and decided to transfer all the passengers to another vessel and return to the continent. No casualties or environmental damage were registered.
Figure 2.8 M/V “Polar Star” hit an unchartered rock at Detaille Island on 31 January 2011. Retrieved from www.cruiselawnews.com

M/V “MAR SEM FIM”

This was a yacht owned by a famed Brazilian journalist and entrepreneur who was filming in Antarctica with four other crew members. The vessel was shipwrecked in Maxwell Bay, Ardley Cove on 7 April 2012 due to severe weather conditions and ice compression. The crew made a distress call and were rescued by the Chilean Navy in the Bahia Fildes Base. The vessel sunk and stayed 30 feet underwater until early 2013 when it was refloated and moved to the shore. No casualties or environmental damage were registered.
As a summary of the incidents with vessels realizing tourism activities in Antarctica, the following Table 1 shows a summary of dates, causes, location and consequences.

Table 1 Summary of Details

<table>
<thead>
<tr>
<th>VESSEL NAME</th>
<th>DATE</th>
<th>LOCATION</th>
<th>CAUSE</th>
<th>CONSEQUENCES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nella Dan</td>
<td>Dec. 1987</td>
<td>Macquarie Island</td>
<td>Dragged anchor under severe weather conditions. Ran aground over the island</td>
<td>No casualties or environmental impact. The vessel was sunk in deep waters after the rescue</td>
</tr>
<tr>
<td>Bahia Paraiso</td>
<td>28/01/89</td>
<td>Arthur Harbor, Ambers Island</td>
<td>Ran aground due to overconfidence</td>
<td>No casualties. 510 Tons of diesel oil spilled. The vessel sunk at the incident location</td>
</tr>
<tr>
<td><strong>Ship</strong></td>
<td><strong>Date</strong></td>
<td><strong>Location</strong></td>
<td><strong>Event</strong></td>
<td><strong>Outcome</strong></td>
</tr>
<tr>
<td>---------------</td>
<td>------------</td>
<td>------------------</td>
<td>----------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Lyubov Orlova</td>
<td>27/11/2006</td>
<td>Deception Island</td>
<td>Ran aground</td>
<td>No casualties or environmental impact. The vessel continues under their own propulsion after high tide.</td>
</tr>
<tr>
<td>Nordkapp</td>
<td>29/01/2007</td>
<td>Deception Island</td>
<td>Ran aground due to severe weather conditions</td>
<td>No casualties and minor hull damage reported. The shipowner denied oil spill despite that local scientist discovered traces of oil after the sinister. The vessel continues under their own propulsion.</td>
</tr>
<tr>
<td>Explorer</td>
<td>23/11/2007</td>
<td>Bransfield Strait</td>
<td>Hull break while was sailing in ice field due to an incorrect Master’s ice field evaluation.</td>
<td>The vessel sunk after passenger evacuation. No casualties or environmental damage.</td>
</tr>
<tr>
<td>Ushuaia</td>
<td>04/12/2008</td>
<td>Gerlache Strait</td>
<td>Ran aground due to severe weather conditions</td>
<td>No casualties but serious hull damage and diesel oil leak. The vessel continues with their own propulsion after evacuation.</td>
</tr>
<tr>
<td>Ocean Nova</td>
<td>17/02/2009</td>
<td>Marguerite Bay</td>
<td>Ran aground due to rough sea and adverse weather conditions</td>
<td>No casualties or hull damage. The vessel continues sailing under own propulsion.</td>
</tr>
<tr>
<td>Polar Star</td>
<td>31/01/2011</td>
<td>Detaille Island</td>
<td>The vessel hit an unchartered rock during anchoring maneuvers</td>
<td>No casualties or environmental impact. Several outer hull damages. The vessel continues sailing.</td>
</tr>
</tbody>
</table>
As it is possible to identify, the most common accident cause is vessels grounding (7 of 9). On the other hand, sinking events occurred only in 3 cases and fortunately there were no human casualties. In addition, it is notorious how the assistance provided by other vessels and stations helped to create a quick response avoiding major danger to the crew, passengers and the environment. Regarding environmental impact, the most significative was the M/V “Bahia Paraiso” which demonstrated that the containment and cleaning process after an oil spill incident is very difficult to be developed due to the severe operational conditions. Despite that the human error was present in this incident, actually the polar operations are influenced by the Polar Code.

### 2.4 The International Association of Antarctica Tour Operators (IAATO)

In addition to the details provided in Chapter 1, IAATO provides a forum for Antarctic tourism stakeholders to work together and develop the highest standards and best practices management to reach the best protection of the Antarctic environment, ensure safe operations and avoid accidents.

The objectives and mission of IAATO are very clear regarding the regulation of tourism activities in Antarctica, with the clear statement of the environment protection as a premise. To assure an optimum tourism activity control, the association should apply the international regulations like SOLAS, MARPOL, the Polar Code, among others. However, if an operator is not a member of the IAATO,
this does not mean that the operator is exempt to comply with the international regulations. Currently, IAATO have 47 touristic operators registered as members, and with the provisional operators and associates parties, the membership directory arise to more than 100 companies. Regarding member vessels associated to IAATO during 2019, the association counted 87 vessels divided into four different categories:

- C1: Category 1 (vessels between 13-200 passengers);
- C2: Category 2 (vessels between 201-500 passengers);
- CR: Cruise only (vessels 500+ passengers);
- YA: Yachts (up to 12 passengers).

For all those operators who are members, IAATO (2019) states the next obligations for operations in Antarctica:

1. Provide prior notification of, and reports on, their activities to the competent authorities of the appropriate Party or Parties;
2. Conduct an assessment of the potential environmental impacts of their planned activities;
3. Provide for effective response to environmental emergencies, especially with regard to marine pollution;
4. Ensure self-sufficiency and safe operations;
5. Respect scientific research and the Antarctic environment, including restrictions regarding protected areas, and the protection of flora and fauna;
6. Prevent the disposal and discharge of prohibited waste.

All these obligations are set in accordance with the international regulations regarding environmental protection in protected areas. In addition, the
Administration set special visitors guidelines to be followed for the operators and visitors:

1. **Guidelines for Visitors to the Antarctic**: adopted in 2011 by Treaty Parties at the Antarctic Consultative Meeting (ATCM XXXIV, Buenos Aires, Argentina). (Appendix A)

2. **Visitor Guidelines Recommendation XVIII-1**: adopted in 1994 at the Antarctic Treaty Meeting at Kyoto, Japan. (Appendix B)

3. **Clean Seas Guidelines**: adopted on 3 May 2019 in the annual meeting realized in Cape Town, South Africa. These new guidelines introduce new regulations to reduce plastic use and waste of the vessels during Antarctic operations. (Appendix C)

Regarding plastic and waste contamination in Antarctica, during the XLII Antarctic Treaty Consultative Meeting celebrated in Prague, Czech Republic on 31 May 2019, the IAATO and the Association of Arctic Expedition Cruise Operators (AECO) got engaged in reducing single-use plastics and waste generated by polar tourism presenting the new guideline for visitors called “Reducing Waste – Guidelines for Visitors to the Antarctic” with the purpose to share information between organizations and help to reduce the use of plastics in Antarctica. The program was agreed between IAATO and AECO includes:

- Auditing ongoing efforts, interest and willingness to develop further;
- Sharing ideas, innovation, best practices and experiences with the wider polar communities. This includes IAATO joining the Scientific Committee on Antarctic Research (SCAR) Action Group on plastics;
- Developing appropriate guidelines for target audiences in multiple languages;
- Continuing to supporting research into understanding the effects and impacts of plastic pollution;
Motivating enhanced industry involvement in marine debris removal efforts. IAATO will formally participate in the CCAMLR Marine Debris Programme, commencing in the 2019-2020 season;

Developing a joint communications strategy to raise awareness and inform about IAATO and AECO efforts and inspire others to follow suit;

Developing an IAATO environmental policy for greening offices and meetings that will include a brief to send to potential meeting venues and delegates highlighting IAATO expectations for eliminating single-use plastics.

2.5 Conclusions

In the present Chapter, various regulatory instruments have been addressed. Firstly, as the first regulatory framework regarding operation in Antarctica, the Protocol on Environmental Protection (The Madrid Protocol) was presented. This Protocol, was signed by the member states of the Antarctic Treaty in 1991 with the objective of the development a regulatory framework for the protection of the Antarctic environment and its associated ecosystems. It is important to understand that this Protocol is intended to be accomplished by the Member States signatories of the Antarctic Treaty only, for all the operations in Antarctica, including tourism activity. One of the most important provision of this Protocol is the inspection system established by Article 14, whereby inspectors shall have access to all vessels operating in Antarctica like passengers vessels. In summary, the Protocol states the importance of an environmental impact assessment, marine pollution prevention and waste management, protection areas, and the liability derived from eventual environmental emergencies. Although this protocol is mandatory for member states only who comply with all the regulations, the inspections executed and analyzed in the next chapter will demonstrate the high level of compliance.
On the other hand, two important instruments developed by the IMO and analyzed in this section were the MARPOL and the Polar Code. The first one, MARPOL, which was adopted on 1973 is intended to prevent the pollution of the marine environment derived from vessels operations or accidental causes. Despite the fact that MARPOL is mandatory for all IMO member states’ vessels, to prevent the pollution in general, the MEPC.42 adopted and designated in 1990 (one year before the adoption of the Madrid Protocol) the Antarctic area as special area under MARPOL. This protocol states the methods to prevent the oil, waste, and noxious substances pollution derived from vessel operations in the special areas. Moreover, the Madrid Protocol in its Annex IV - Prevention of Marine Pollution uses as basis the Annex I of MARPOL to regulate the discharge of oil, sewage, plastics and noxious substances from vessel operations in Antarctica. However, it is important to evaluate the necessity to incorporate regulations regarding the number of drills to enhance the ability to respond to an oil spill incident.

Regarding safety operations in polar waters, the IMO instrument, the Polar Code entered into force on 2017 to protect vessels, crew and passengers in severe conditions of the waters surrounding both poles. This Code stipulates different issues related to the navigation in polar waters and states safety provisions regarding equipment, vessels construction, vessels operation and manning. In addition, this Code is complementary to the provisions stated by MARPOL regarding oil, invasive species, sewage, garbage and chemicals pollution. Moreover, in the chapter many different issues were described that could jeopardize the operations in polar waters. As examples of the importance to ensure safe operations in Antarctica, between 1987 and 2012, nine incidents with passenger vessels were registered, of which three ended sunk with different environmental impacts. Another important aspect of this instrument is the manning and training. This matter is addressed in chapter 12 were the code states that every crew member shall be familiarized with all the requirements of the Polar Water Operational Manual (PWOM). However, the mentioned chapter only applies for Masters and Officers, whereby PWOM must be
used by all the crew. This training should include medical issues to deal with the Antarctic environment (Karahalil & Özsoy, 2018). In addition, another issue arising from Antarctic navigation is the SAR operations. Due to several weather and ice conditions, a rescue operation in Antarctica could be difficult and probably unsuccessful. Unlike in the North Pole where the Arctic Search and Rescue Agreement deal with SAR operations without jurisdiction interference, in the Antarctica few navy vessels (from Argentina and Chile) operate as SAR vessels, in the Antarctic peninsula during summer season. Moreover, simulators are far from replicate the operation conditions in Antarctica, making the navigation experience indispensable for the Master and crew to operate in safe conditions (Dalaklis & Baxevani, 2018).

With respect to the tourism activities specifically, in 1991 (after that the Madrid Protocol entered into force) some Antarctic tour operators created the IAATO to advocate, promote and practice environmentally responsible operations from the private-sector tourism operators. Currently, more than 100 tourism operators from different countries are members of the IAATO, which increases the number of monitoring systems in order to comply with the international regulations.

Considering that the mayor environmental impact regarding vessel incidents in Antarctica was in 1989 (M/V Bahia Paraiso), the provisions stated by the Madrid Protocol, MARPOL, Polar Code and IAATO show that the regulations had a positive impact on the operations assuring best-practices to protect the environment. However, the incidents that occurred between 2006 and 2011 demonstrated that the importance to ensure safe operations in Antarctica is essential due to the severe operations conditions. In addition, the Polar Code is intended to cope with the issue of ensure safe operations in Antarctica.
CHAPTER THREE
EVALUATING THE EFFECTIVENESS OF INSPECTIONS REGIME

3.1 Introduction

In this Chapter, the main aim of the research is to analyze the results of the inspections carried out by the Parties of the Antarctic Treaty to ensure that all the provisions and objectives of the Treaty are attained. These inspections are realized under Article VII of the Antarctic Treaty and Article 14 of the Protocol on Environmental Protection to vessels operating in Antarctica. The first inspection report is from the season 1966-1967 and the last one is from the season 2014-2015. It is important understand that these reports present information regarding inspections of installations, facilities, protected areas and vessels involved in the Antarctic activities which occur annually. However, for the purpose of this research only the inspections of the tourism vessels will be analyzed considering that inspections of this type of vessels do not occur every year.

3.2 Antarctic Treaty Inspections Programme Reports

Season 1966-1967

Inspections were conducted by United States Observers designated by the Secretary of State with the intention to promote the objectives and to assure the observance of the provisions of the Antarctic Treaty. Regarding vessel operations, the inspectors visited the M/V “Thala Dan”, a cargo vessel chartered by the Antarctic Division, Department of External Affairs, Melbourne, Australia, and she carried general cargo to the Wilkes Station. The vessel was commercially configured and unarmed. As a
conclusion of the report, there was no evidence of any violation of the provisions stipulated by the Antarctic Treaty. In addition, the observers stated that all activities carried out in Antarctica were being used for peaceful purposes.

Season 1986-1987

This report was realized by the Chilean Antarctic Institute on behalf of the Minister of Foreign Affairs to certify the provisions stated in Article VII of the Antarctic Treaty. Chile sent two observers to different Antarctic bases and two vessels operating in the area.

The first vessel inspected was the M/V “Professor Besnard” whose purpose was biological, oceanographic and fishery research. She belonged to the Sao Paulo University – Brazil, and had been developing this research in Antarctic before. As a result of the inspection, the observers determined that the vessels only had capacity to develop scientific projects and research activities, without capacity of commercial fishery activities. In addition, the vessel was unarmed and used for peaceful purposes. Finally, no violations to the Antarctic Treaty were reported.

The second vessel inspected was the M/V “Nuevo Alcocer”, a Spanish fishing prospecting vessel and specifically about krill. The vessel belonged to the Secretary of Fishery, the Ministry of Agriculture, Fishery and Food from Spain. The observers found elaborated and frozen krill from the fishery activity in Antarctica. However, no scientific equipment was visualized on board. As a conclusion, the activities carried out by the vessel were developed under the provisions stipulated by the Antarctic Treaty, without any irregularity reported.
Season 1989-1990

This report was realized by the Chilean Antarctic Institute on behalf of the Minister of Foreign Affairs to certify the provisions stated in Article VII of the Antarctic Treaty. In this season, eight Antarctic stations were inspected, one protected area, and only one vessel, the M/V “Orion” from Ecuador. However, there is no report from this season into the Secretariat of the Antarctic Treaty Inspections Database to research the findings from the inspection.

Season 1992-1993

In this season the report was created from a joint inspection under Article VII of the Antarctic Treaty by United Kingdom, Italian and Korean observers. The inspection included eleven permanent stations, five summer-only stations, and three tourist vessels.

Regarding vessel inspections, the first one was the M/V “Explorer”, which was a tourism vessel registered in Monrovia and its tour operators were members of IAATO. The inspectors found that the vessel were well equipped with a wide range of modern equipment, well qualified crew members on board with prior Antarctic and Arctic experience. With respect to waste management and disposal, the inspectors concluded that the vessel operated in accordance with MARPOL and IMO regulations and during Antarctic operations no waste was dumped. However, waste stored on the after-deck was poorly secured against heavy weather. In addition, the vessel crew members were not aware of the Environmental Protocol to the Antarctic Treaty. Regarding the prevention of oil pollution, the vessel argued that an oil spill contingency plan was in preparation but no booms or equipment to deal with spills were carried on board although the vessel was flagged in a MARPOL State and was aware of the special IMO Antarctic provisions. With regard to the emergency response plan and vessel safety the inspectors found that there was neither any formal emergency response plan.
nor specific backup. However, the vessel had the necessary information to allow contact to be made with all tour vessels and stations in the area. The vessel was found well for operations in Antarctica and carried a range of updated nautical charts. However, some issues with the employment of navigational aids were noted by the observers. Moreover, the open lifeboats were not ideal for survival in Antarctic waters, but survival suits were carried for the crew and passengers. Finally, the inspectors stated that the vessel’s crew and passengers demonstrated a commitment to the Antarctic Treaty and its regulations.

The second vessel inspected was the M/V “Akademik Sergey Vavilov”, an oceanographic research vessel registered in Russia and operated by the Russian Academy of Sciences. The crew presented adequate experience in Antarctic navigation, and the vessel was equipped with modern navigational equipment. Regarding waste management and disposal, the crew were aware of the MARPOL provisions, and although they did not have full appreciation of the special IMO provisions for the area, the vessel was acting in accordance with these. With regard to the prevention of oil pollution, the vessel presented an oil spill contingency plan; however, no booms or other equipment were carried on board. With respect to the emergency response plan and vessel safety, the inspectors noted that no plan was known to exist on board but it was argued that the vessel was able to contact other vessels in the area. Moreover, another issue related to safety was the use of the Russian language for all the notices on board instead of the English language. In addition, the vessel had enclosed lifeboats and appropriate associated equipment. As a conclusion, the inspectors noted that the vessel was crewed by competent persons, with appropriate technology and aware about the Antarctic environment.

The last vessel inspected was the M/V “Europa”, a Germany cruise liner where neither the shipowner nor the tourism operator were affiliated to the IAATO. Although the crew had experience operating in the Artic, that was the first time for the vessel to operate in Antarctica which represented a lack of experience operating in the area.
Regarding waste management and disposal, the observers noted that there were awareness of MARPOL; however, the vessel did not have a copy of the Environmental Protocol to the Antarctic Treaty. With respect to the prevention of oil pollution, the vessel regularly entered United Stated waters and meet all the regulations. With regard to emergency response and vessel safety, the inspectors found that there was no evidence of emergency response plan tailored to Antarctic conditions on board. As a conclusion of the inspection, the observers detected that the vessel was not specially ice-strengthened for Antarctic conditions; some navigational aides like radars and nautical charts were not appropriated; the lack of experience of the crew was a mayor issue to operate in the area; the lifeboats were not ideal for survival in Antarctica. Finally, the observers concluded that they strongly recommended that a vessel of this size (294 crew members and 530 passengers) should be discouraged from operating in the Antarctic Treaty Area.

**Season 1998-1999**

In this season the report was created from a joint inspection under Article VII of the Antarctic Treaty by governments of Belgium and France in Eastern Antarctica. In this case three stations were inspected, one abandoned station and one vessel.

The vessel inspected was the M/V “Aurora Australis”, an Australian special purpose icebreaker designed for the special operations in the Southern Ocean. The vessel belonged to the Australian Antarctic Division with the purpose conducting of logistic and scientific research operations. The inspectors observed that the Master and his crew were generally not very well aware of the provisions of the Antarctic Treaty System. However, the fact that they managed the vessel according to procedures and guidelines established by the Australian Antarctic Division, ensured that the vessel was operated in compliance with the Antarctic Treaty System regulations. In addition, the inspectors noted that the vessel was equipped with modern communication and
navigation systems. Regarding fuel storage and handling, the related pollution prevention was stated as a good example of best practices for fuel handling and storage in Antarctica, showed an arrangement that allowed minimizing the risk of oil spill in case of hull damage. Even though the vessel carried a comprehensive oil spill contingency plan, very limited oil spill response equipment was observed on board. Another observance from the inspectors was the repeated disturbance of the wildlife due to the very close passing through animal concentrations, which also showed the absence of bridge procedures or guidelines concerning the avoidance of wildlife disturbance by the vessel. With respect to the documentation, the Masters presented updated copies of all the relevant documents regarding the Antarctic Treaty System. As a conclusion of the inspection, the observers noted that the vessel activity was according to the regulations of the Antarctic Treaty System; however, further attention should be given by the operators to the impact on Antarctic wildlife of vessels operating in Antarctica.

Another inspection was developed jointly with United Kingdom and German observers on the Antarctic Peninsula. The first vessel inspected was the M/V "Akademik Ioffe" a Russian research/tourism vessel chartered by the tour operators from Canada and the United States, both IAATO members. The inspectors found updated nautical charts and modern navigation and communication equipment according to the necessities of the operations. In addition, the crew was observed as experienced persons. Regarding waste management and disposal, the vessel operated in full compliance with MARPOL regulations. Despite a clear understanding of the Antarctic Treaty Environmental Protocol, the observers did not found evidence of documentation on board. With respect to the prevention of oil pollution, the inspectors noted that the oil contingency plan was in place and specific crew trained; however, the provision of oil response equipment and materials was limited. As a conclusion of the inspections, observers noted that the vessel was conducting Antarctic activities complying fully with both IAATO and Antarctic Treaty regulations.
The other vessel inspected was the M/V “Marco Polo”, a Bahamas registered tourism vessel which was a non-Treaty party and not a member of the IAATO. The observers found appropriate navigation equipment, communication systems, and updated nautical charts. In addition, the UK Admiralty Pilot was present. Regarding waste management and disposal, the vessel operated in full compliance with MARPOL regulations. In respect of the prevention of oil pollution, the inspectors found that oil pollution containment booms and clean-up dispersants were held on board and the crew trained in the relevant emergency procedures. With regard to emergency response plan and vessel safety, comprehensive on-going emergency response training was given to the crew and passengers prior to sailing. Moreover, the vessel had 10 semi-enclosed lifeboats. As a conclusion, the observers noted that the vessel was well found, ice strengthened, well trained crew, and efficient in the ice operations; however, the vessel presented serious difficulties in the case of an emergency because the search and rescue maneuvers would have been endangered due to the number of passengers (850) on board.

Season 2004-2005

In this Season the report was created from a joint inspection under Article VII of the Antarctic Treaty by the governments of the United Kingdom, Australia and Peru. In this case twenty four stations, five protected areas and one vessel were inspected.

The vessel inspected was the M/V “Professor Molchanov” a Russian flagged vessel chartered by a United States tour operator member of the IAATO. The observers found modern communication and navigation equipment, with a well experienced crew regarding Antarctic operations. Regarding waste management the vessel complied with all the MARPOL regulations. With respect to the prevention of marine pollution the observers noted that the vessel showed an in-date oil record book and the shipboard oil pollution emergency plan. As regards the vessel safety and emergency response
plan, the vessel was well equipped to operate in Antarctic waters. As a conclusion, the observers stated that the vessel had copies of the Antarctic Treaty documentation available for the crew and passengers and the operation was under the regulations of IAATO and Antarctic Treaty Guidelines.

**Season 2006-2007**

In this season the report was created from an inspection under Article VII of the Antarctic Treaty by the government of the United States of America. In this case seven stations and three vessels were inspected.

The first vessel inspected was the *M/V “National Geographic Endeavour”*, with flag from Bahamas and chartered by a tour operator from the United States of America who was a full member of IAATO. The inspectors found that the Master was a qualified ice pilot and the crew presented considerable Antarctic experience, following all SOLAS and IAATO requirements. All the legal documents regarding Antarctic Treaty System were presented by the Master. In addition, the vessel showed modern navigation and communication equipment according to the requirements of the Antarctic operations. Regarding oil pollution, the vessel had a shipboard oil pollution emergency plan, and spill response materials and equipment were found on board. However, the inspectors observed that the vessel had limited capacity to respond to an oil spill by another vessel. With respect to safety, the vessel had optimal equipment like motor life boat, life rafts, life buoys, life jacket (adults and children), immersion and thermal protective clothes. As a conclusion, the observers noted that the vessel had been operating under the regulations of MARPOL, Antarctic Treaty System and IAATO regulations regarding oil pollution, waste management, non-indigenous species control, and environmental conservation in protected areas.
The second vessel inspected was the *M/V “Lyubov Orlova”*, a Malta flagged vessel chartered by a United States tour operator which was member of IAATO. The inspectors noted that it was very difficult to speak properly with the crew due to the lack of the English language among the crew members who explained that they had enough experience operating in Antarctica. In addition, the Master showed that all the regulatory documentation was on board. Regarding navigation aids, the inspectors noted that the vessel had a standard suite of navigation equipment together with a proper communication equipment, but without internet connection. With respect to the pollution control and safety, the observers stated that the vessel had uncovered lifeboats and rafts, the fire emergency plan was presented, the shipboard oil pollution emergency plan was carried on board and the vessel had enough absorbents and clean elements. Moreover, the Master showed that the vessel had a search and rescue plan in place. It is important to note that this vessel had run aground in Antarctica earlier this season, and after the inspections in Argentina, the vessel continued with the voyage (see Chapter 2). As a conclusion, the observers noted that the vessel has been operating under the regulations of MARPOL, Antarctic Treaty System and IAATO regulations regarding oil pollution, waste management, and environmental conservation.

The third vessel inspected was the *M/V “Explorer II”*, a passenger Bahamian flagged vessel owned by an United Kingdom tour operator and IAATO member. The observers noted that the Master and crew had plenty of experience operating in Antarctic waters, showing all the regulatory documents and visitors guidance from the Antarctic Treaty System and IAATO specifications, in different languages. Regarding navigation aids, the inspectors observed that the vessel had a standard suite of navigation equipment together with a proper communication equipment, but without internet connection. With respect to the pollution control and safety, the observers stated that the vessel had covered lifeboats, the fire emergency plan was presented, the shipboard oil pollution emergency plan was carried on board and the vessel had enough absorbents and clean elements in two different places on board. Moreover, the Master showed
that the vessel had a search and rescue plan in place. As a conclusion, the observers noted that the vessel had been operating under the regulations of MARPOL, Antarctic Treaty System and IAATO regulations regarding oil pollution, waste management, non-indigenous species control, and environmental conservation in protected areas.

Season 2012-2013

In this Season the report was created from a joint inspection under Article VII of the Antarctic Treaty by governments of the United Kingdom, the Netherlands and Spain. In this case, fourteen stations, three protected areas and four vessels were inspected.

The first vessel inspected was the M/V “Ocean Diamond”, a tourism cruise ship flagged in the Bahamas and chartered by a United State tour operator, member of IAATO. The observers noted that the Master and crew were well versed in the requirements and responsibilities regarding Antarctic Treaty and IAATO, and showed that the necessary documents regarding safety, Antarctic Treaty and environmental considerations were on board. The vessel had a contingency plan for pollution or oil spill, with enough material to deal with the issue. However, the procedures and drills had not been executed recently. In addition, the vessel operated under the regulations of MARPOL regarding oil pollution and waste management. The safety elements were adequate and fire exercises registered in the log book. As a conclusion, the observers noted that the vessel has been operating under the regulations of MARPOL, Antarctic Treaty System and IAATO regulations regarding oil pollution, waste management, and environmental protection.

The second vessel inspected was the M/V “Plancius”, a Dutch flagged tourism cruise ship, IAATO member. The inspectors stated that the Master and crew were well experienced operating in Antarctica and well informed in the requirements and responsibilities regarding Antarctic Treaty and IAATO, and showed that the necessary
documents regarding Antarctic Treaty and environmental matters were on board. The vessel had a contingency plan for pollution or oil spill, with enough materials to deal with a contingency. However, the procedure and drills had not been exercised recently. In addition, the vessel operated under the regulations of MARPOL regarding oil pollution and waste management. The safety elements were adequate and fire exercises registered in the log book. As a conclusion, the observers noted that the vessel has been operating under the regulations of MARPOL, Antarctic Treaty System and IAATO regulations regarding oil pollution, waste management, and environmental protection.

The third vessel inspected in this season was the *M/V “Silver Explorer”*, a Bahamas’ flag cruise vessel chartered by an IAATO member tour operator not named in the report. The observers noted that the crew had experience operating in Antarctica and the Master showed all the documents regarding Antarctic Treaty and IAATO on board, like the environmental plan and education programme for the passengers. The vessel had a contingency plan for pollution or oil spill, with enough materials to contain any spill incident. In addition, the vessel operated under the regulations of MARPOL regarding oil pollution and waste management. The safety elements were adequate and fire exercises registered in the log book. As a conclusion, the observers noted that the vessel has been operating under the regulations of MARPOL, Antarctic Treaty System and IAATO regulations regarding oil pollution, waste management, and environmental protection; manned by a professional and well drilled crew.

The last vessel inspected in this season was the *M/V “Corinthian II”* a tourism cruise flagged in the Marshal Islands chartered by a United States tour operator, IAATO member. The observers noted that the Master and crew had experience operating in Antarctic waters, showing all the regulatory documents and visitors guidance from the Antarctic Treaty System and IAATO specifications. The vessel had a contingency plan for pollution or oil spill, with enough materials to contain any spill incident. As a conclusion, inspectors stated that the vessel was well equipped, trained, and prepared
for passenger operations in the Antarctic area, respecting all the MARPOL and IAATO regulations.

Season 2014-2015

In this Season the report was created from a joint inspection under Article VII of the Antarctic Treaty by governments of the United Kingdom and the Czech Republic. In this case thirteen stations, and seven tourism vessels were inspected.

The vessels inspected were the follows:

- *M/V “Ushuaia”*, a Comoros flagged tourism vessel chartered by a Canadian tour operator, IAATO member;
- *M/V “Hanse Explorer”*, an Antigua and Barbuda flagged tourism vessel chartered by a German tour operator, IAATO member;
- *M/V “Sea Adventurer”*, a Bahamas flagged tourism vessel chartered by a United States tour operator, IAATO member;
- *M/V “Bremen”*, a Bahamas flagged tourism vessel chartered by a German tour operator, IAATO member;
- *M/V “Expedition”*, a Liberian flagged tourism vessel chartered by a Canadian tour operator, IAATO member;
- *M/V “Akademik Sergey Vavilov”*, a Russian Federation flagged research vessel chartered by a Canadian tour operator, IAATO member;
- *M/V “National Geographic Explorer”*, a Bahamas flagged tourism vessel chartered by an United States tour operator, IAATO member;

According to the report, all the vessels had well trained crew members with vast experience operating in the Antarctic environment. With respect to oil pollution and waste management, all the vessels operated under the MARPOL, Antarctic Treaty and IAATO regulations regarding control and final disposition. In addition, the operators
showed according to the equipment to afford an accidental oil spill and the appropriate oil pollution emergency plan. All the navigation and communication equipment was modern, according to the requirements to operate in Antarctica. Regarding environmental protection, all the vessel had operated under the regulations of the Antarctic Treaty and IAATO, and given information of the regulations to all the passengers during the visits. As a conclusion of the visits, the inspectors concluded that all the vessels had adequate equipment and training to operate in Antarctic waters. Moreover, all the vessels operated under Antarctic Treaty regulations.

3.3 Conclusion

In this Chapter all the reports from the Antarctic Treaty System have been researched and analyzed regarding the inspections executed since 1966 to 2015. With respect to tourism vessels, in this period ten inspection reports, totaling twenty-five vessels visited and inspected, were analyzed. All the inspections were carried out by observers of Antarctic Treaty parties, and the reports were drawn up by the different Ministries of Foreign Affairs. The inspectors had observed the accomplishment of the Antarctic Treaty regulations, MARPOL and IAATO regulations inspecting matters such as crew experience and training, navigation and communication equipment, oil pollution and waste management, and environmental protection. However, conforming to regulations did not prevent the vessels sinking due to human error. In this case, more training is necessary.
CHAPTER FOUR

FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

In this research effort, various regulatory instruments have been presented. Considering the Protocol on Environmental Protection as a very influential regulatory framework regarding operations in Antarctica, it was discussed at a sufficient level of detail. It was signed by the member states of the Antarctic Treaty in 1991 with the objective of the development a regulatory framework for the protection of the Antarctic environment and its associated ecosystems. It is important to understand that this Protocol is intended to be accomplished by the Member States signatories of the Antarctic Treaty only, for all the operations in Antarctica, including tourism activities.

In summary, the Protocol states the importance of an environmental impact assessment, marine pollution prevention and waste management, protection areas, and the liability derived from possible environmental emergencies. Despite this protocol is mandatory for member states only who comply with all the regulations; on the positive side, the inspections executed and analyzed have demonstrated a high level of compliance. However, due to the tourism business being a constantly increasing activity, the signatory members of the Antarctic Treaty may consider to discuss the inclusion of new member States into the Antarctic Treaty System. This is especially important for those operators using tourism vessels under “flag of convenience” operating in Antarctica.

Furthermore, two important instruments developed by the IMO, the MARPOL and the Polar Code, were analyzed under the wider framework of the current research. MARPOL is intended to prevent pollution of the marine environment derived from vessel operations or accidental causes. This protocol states the methods to prevent
the oil, waste, and noxious substances pollution derived from vessel operations in the special areas. However, it is important to evaluate the necessity to incorporate regulations regarding the number of drills to enhance the ability to respond when facing an oil spill incident. In addition, it is important to understand that both, MARPOL and SOLAS/Polar Code are instruments at the strategic level. States are responsible for the implementation and supervision, and in that level more can be done.

Regarding operations in polar waters and in an effort to boost the level of safety, the Polar Code was developed to protect vessels, crew and passengers in severe conditions of the waters surrounding both poles. It is important to understand that this instrument was developed under the SOLAS framework and it is considered as a proactive regulatory framework not only to ensure safety operations in polar waters but also to protect the fragile environment of the region. This Code stipulates different issues related to the navigation in polar waters and states safety provisions regarding equipment, vessel construction, vessel operations and manning. However improvement should be expected in the near future.

In addition, this Code is complementary to the provisions stated by MARPOL regarding oil, invasive species, sewage, garbage and chemical pollution. Moreover, many different issues that could jeopardize the operations in polar waters were described, for instance navigation and communication equipment, use of radar and updated nautical charts. As examples of the importance to ensure safe operations in Antarctica, between 1987 and 2012, nine incidents with passenger vessels were registered, of which three ended sunk with different environmental impacts. Another important aspect of this instrument is the manning and training. This matter is addressed in chapter 12 where the code states that every crew member should be familiarized with all the requirements of the PWOM. However, the mentioned chapter only applies for Masters and Officers, but PWOM must be useful for all the crew. This training should include medical issues to deal with the Antarctic
environment. In addition, it is important to establish an adequate SAR agreement between the different states operating in Antarctica. One example is the combined patrol between Argentine and Chile, where both States have vessels in stations around Antarctic peninsula and Shetland Islands to cover SAR operations between December and April every year.

Even though all the regulatory framework analyzed showed its importance to ensure safety operations in Antarctica, there are other issues related to the operations such as technological equipment and training. As has been pointed out in Chapter 2, one of the most important issues that jeopardize the Antarctic operations is the nautical chart quality. Different States interested in Antarctica means different map information and grades, and although all the modern vessels have Electronic Chart Display Information System (ECDIS) not all countries have Electronic Nautical Charts (ENC) available to be acquired by the operators.

It is recommended that all the operators should have the most adequate and updated nautical charts, and all the ENC available as much as possible. In addition, it is essential that the crew should be trained in using nautical charts and ENC handling, particularly for Masters and navigation Officers. Another recommendation is the inclusion of all the stakeholders in the Long Range Identification and Tracking (LRIT) system. The objective of this system is to provide identification and tracking for all the vessels operating in Antarctica. With the implementation, it is possible to assure safety and environmental protection because tourism vessels, tour operators, Antarctic Treaty member States and the Antarctic stations could be linked with the information of all the vessels operating in Antarctica. In case of an incident, all the vessels and stations in the vicinity will be informed about the issue, so it could be possible to react and assist the incident in an efficient manner. As an example of linked operations, IAATO maintains close contact between tourism vessels operating in Antarctica.
With respect to the tourism activities specifically, the IAATO promotes and practices environmentally responsible operations from the private-sector tourism operators. At the moment, more than 100 tourism operators from different countries are members of the IAATO, which increases the number of monitoring systems in order to comply with international regulations. However, this system only applies for operators who are members of the Association and this means that any tourism vessel operating outside the Association will not be reached by the control and report system. IAATO set some special visitors guidelines to be followed for the operators and visitors like Antarctic protection (Appendix A and C), waste reduction (Appendix B), and how to avoid the introduction of non-native species in Antarctica (Appendix 4).

Regarding the inspections executed by State members according to the Antarctic Treaty provisions, the inspectors had observed the accomplishment of the Antarctic Treaty regulations, MARPOL and IAATO regulations inspecting matters like crew experience and training, navigation and communication equipment, oil pollution and waste management, and environmental protection. However, the principal issues found was the insufficient oil spill materials on board, lack of training regarding oil spill response drills, and lack of English language (particularly in Russian vessels). To deal with this issue, the operators should assure an increase of the crew training; not only regarding drills, but also in English language in concordance with the STCW Convention.

To summarize, currently the vessel operation in Antarctica is composed of operations mostly for tourism and a reduced number of voyages related to logistic and fishing operations. The tourism activities showed an increasing rate year after year and it appear as it will continue to grow, considering that the climate change allows to go more deeply into the continent. Actually, the regulatory framework seems to be adequate to deal with the issue of the increasing tourism activities in Antarctica. However, it is important to considerer with further research on the issue
of how this increasing activity in Antarctica will have an impact the environment. Additionally, it should be essential to research how crew training, traffic control and SAR operations could be improved in order to minimize the risks of tourism vessel operations in the Antarctica, which could jeopardize this fragile environment.

As a final conclusion, the provisions included with the Madrid Protocol, MARPOL, Polar Code and IAATO show that the regulations had a positive impact on the operations assuring best-practices to protect the environment. However, the incidents occurring between 2006 and 2011 demonstrated that the importance to ensure safe operations and high manning levels in Antarctica is essential to deal with the operations in this hostile environment with severe weather conditions. To achieve this objective, it is important to assure the correct implementation of all the regulations addressed in this research. Furthermore, it is especially important to generate a culture of cooperation between States to ensure an adequate response in case of disaster to minimize environmental risks and maintain the Antarctica as pristine as possible.
REFERENCES


APPENDIX A

Guidelines for Visitors to the Antarctic

All visits to Antarctica should be conducted in accordance with the Antarctic Treaty, its Protocol on Environmental Protection, and relevant Measures and Resolution adopted at Antarctic Treaty Consultative Meetings (ATCM). Visitors must ensure prior approval by the relevant national authority.

These Guidelines provide general advice for visiting any location with the aim of ensuring that the visit does not cause adverse impacts on the Antarctic environment, or on its scientific and aesthetic values. ATCM Site Guidelines for Visitors provide additional site-specific advice for some locations.

Read these guidelines before you visit Antarctica and plan how to minimize your impact.

If you are part of a guided visitor group, pay attention to your guides, and follow their instructions.

If you have organized your own visit, you are responsible for abiding by these guidelines. You are also responsible for identifying the features of the sites you visit that may be vulnerable to visitor impacts, and for complying with any site-specific requirements, including Site Guidelines, Antarctic Specially Protected Areas (ASPA) and Antarctica, Specially Managed Areas (ASMA) management plans, or station visit guidelines. Guidelines for particular activities or risks (such as aircraft only, or avoiding the introduction of non-native species) may also apply. Management plans, a list of historic sites and monuments, and other relevant information can be found at www.atc.org/guides.html. Site Guidelines can be found at www.atc.org/guides_other_siteguidelines.html.

PROTECT ANTARCTIC WILDLIFE

Threats to wild, native Antarctic wildlife are prohibited except in accordance with a permit.

WILDLIFE
- When in the vicinity of wildlife, walk slowly and carefully, keep noise to a minimum, and maintain an appropriate separation distance. Consider the topography of the site, as this may have an impact on the vulnerability of wildlife to disturbance.
- Observe wildlife behavior. If a wildlife changes its normal behavior, stop moving, and slowly increase your distance.
- Avoid close contact with individuals or groups of a colony. Observe wildlife from a distance.
- Always give animals the right of way and do not block their access routes to the sea.

VEGETATION
- Vegetation, including mosses and lichens, is fragile and slow growing. Do not damage the vegetation by walking, driving, or trampling on any moss beds or lichen-covered rocks.
- Where low-lying fog is present, stay on established tracks whenever possible to minimize disturbance or damage to the soil and vegetated surfaces. Where a track does not exist, use the most direct route and avoid vegetation fragile ridges, snow patches, and ridges.

INTRODUCTION OF NON-NATIVE SPECIES

In order to prevent the introduction of non-native species and disease, carefully wash boots and clean all equipment including clothing, bags, technical tools and cooking equipment before leaving the Antarctic. Pay particular attention to boot treads, velcro fastenings and pockets which could contain soil or seeds. Vehicles and aircraft should also be cleaned.

- The transfer of species and disease between locations in Antarctica is also a concern. Ensure all clothing and equipment is cleaned before moving between sites.

RESPECT PROTECTED AREAS

Activities in Antarctic Specially Protected Areas (ASPA) or Antarctic Specially Managed Areas (ASMA) must comply with the provisions of the relevant Management Plan.

Many historic sites and monuments (HSs) have been formally designated and protected.

SPECIALY MANAGED AND
HISTORIC SITES
AND
MONUMENTS
AND OTHER STRUCTURES

- A permit from your national authority is required for entry into any ASPA. Carry the permit and stay in permit conditions at all times while visiting an ASPA.
- Check the location and boundaries of ASPA and ASMA in advance. Refer to the provisions of the Management Plan and abide by any restrictions regarding the conduct of activities in or near these areas.
- Historic sites and structures can be in some cases be used for tourism, recreational and educational visits. Visitors should not use them for other purposes except in emergency circumstances.
- Do not interfere with, deface or vandalise any historic site, monument, or artifact, or other building or emergency refuge (whether occupied or unoccupied).
- If you come across an item that may be of historic value that authorities may not be aware of, do not disturb. Notify your expedition leader or national authorities.
- Before entering any historic structure, clear your boots of snow and grit and remove snow from clothes, as these can cause damage to structures or artifacts.
- Take care not to tread on any artifacts which may be obscured by snow when moving around historic sites.
RESPECT SCIENTIFIC RESEARCH

Do not interfere with scientific research, facilities or equipment.

OPERATORS
- Obtain permission before visiting Antarctic stations.
- Renew scheduled visits no less than 24-48 hours before arrival.
- All visitors must comply with any site-specific rules when visiting Antarctic stations.

VISITORS
- Do not interfere with, or remove, scientific equipment or markers, and do not disturb experimental study sites, field camps or stored supplies.

KEEP ANTARCTICA PRISTINE

Antarctica remains relatively pristine. It is the last wilderness area on earth. Please leave no trace of your visit.

WASTE
- Do not drop any litter or garbage on land or discard it into the sea.
- Artifacts or camps should only be designated areas, to avoid litter and risk of fire to structures. Collect all litter and other waste.
- Ensure that waste is managed in accordance with Annex II and IV of the Protocol on Environmental Protection to the Antarctic Treaty.
- Ensure that all equipment and supplies are removed at all times in such a way as to prevent damage to the environment through high winds or wildlife foraging.

WILDLIFE
- Do not disturb or molest birds, mammals, or other wildlife (e.g., by feeding or touching them). Use equipment or feed any fish or other animals.
- Do not feed seals, penguins, or other marine mammals.
- Do not enter buildings or structures that contain wildlife.

BE SAFE

Be prepared for adverse and changeable weather. Ensure that your equipment and clothing meet Antarctic standards. Remember that the Antarctic environment is inhospitable, unpredictable and potentially dangerous.

SAFETY
- Follow your creature and the dangers posed by the Antarctic environment, and act accordingly. Plan activities with safety in mind at all times.
- Have a safe distance from dangerous wildlife for seals, birds and other wildlife. Keep at least 500 m away, where practicable.
- Keep a safe distance from dangerous wildlife for seals, birds and other wildlife. Keep at least 500 m away, where practicable.
- Do not travel alone or without proper equipment and training.
- Do not walk on glaciers or large snow fields without proper equipment and training. There is a real danger of falling into hidden crevasses.
- Do not expect a rescue service. Self-sufficiency is increased and risks reduced by sound planning, quality equipment, and trained personnel.
- Do not enter emergency refuges except in emergencies. If you use refuge or shelter, inform the nearest research station or national authority before the emergency is over.
- Respect any existing restrictions. Use of combustion style lanterns and raised flames in snow around historic structures is strictly forbidden. Take great care to safeguard against the danger of fire. This is a real hazard in the cryogenic environment of Antarctica.

LANDING AND TRANSPORT REQUIREMENTS

Act in Antarctica in such a way as to minimize potential impacts on the environment, wildlife and associated ecosystems, or the conduct of scientific research.

TRANSPORT
- Do not use aircraft, vessels, small boats, hovercraft or other means of transport in ways that disturb wildlife, either at sea or on land.
- Refueling of fuel tanks for small boats should take place in such a way that ensures any spills can be contained, for example around a sheet of polythene.
- Small boats must be free of any nets, plants, animals or animal products and must be free of any net, plants, animals or animal products prior to the commencement of any trip or research operations.
- Small boats must at all times maintain their course and speed near to minimize disturbance to wildlife and to avoid any collisions with wildlife.

SHIPS
- Only one ship may visit a site at any one time.
- Vessels with more than 250 passengers shall not make landings in Antarctica.

LANDING OF PASSENGERS FROM VESSELS
- A maximum of 100 passengers may be ashore from a vessel at any one time, unless site-specific advice requires fewer passengers.
- During landings from vessels, maintain a 2:50 pillion to passenger ratio at all sites, unless site-specific advice requires more guides.
Reducing Waste - Guidelines for Visitors to Antarctica

Be part of the solution
When travelling to Antarctica, there are steps you can take to reduce the amount of plastic and other waste produced. Waste is removed from Antarctica by ship or air and taken to ports outside the region for disposal, but these may have limited facilities depending on their location.

Your operator is working towards reducing single-use plastic in its operations. You could support their efforts and help leave no lasting signs of your visit by reducing the number of disposable items you bring, use and dispose of during your trip. There are also steps you can take to stop litter and harmful plastics from ending up in the environment.

Before traveling
- Travel with reusable items such as water bottle, coffee cup, reusable bag, reusable cutlery, etc. that you can bring home with you.
- Consider bringing a reusable waterproof bag to protect your camera from the elements.
- When packing toiletries, choose eco-friendly alternatives such as cosmetics free of microbeads.

When traveling
- When possible, avoid using disposable cups, straws, bottles, food containers and other items.
- Do not throw any non-organic items in the toilet, including wet wipes.
- Make sure all your belongings are well secured when outside. A moment of inattention and a gust of wind can easily blow light bags and other items away.
- Choose products with non-plastic packaging such as soap and shampoo bars. Your accommodation may also be equipped with refillable dispensers. If you need to use plastic bottles and containers, use reusable ones.
- Synthetic clothing sheds small plastic fibers. We recognize that it may not be possible to entirely stop using synthetic clothing but reducing the amount we use is a great first goal.
- Enquire about local environmental initiatives and how you can reduce your plastic footprint to support the community you visit.
- Talk to other travelers and staff – not everyone has the same experience and knowledge, so it is a good opportunity to learn from and inspire others.
Continue at home

- **Reduce**: By consuming less and using reusable items you can help reduce the total amount of waste.
- **Reuse**: Extend the life of your belongings. If you no longer need it, give it away.
- **Recycle**: Learn about the cycle of your waste at home and sort out your waste accordingly to maximize the chances of material recovery.

**Special note**

Products labelled as 'degradable' or 'biodegradable' will degrade faster than regular plastic items but may still contain fossil fuels, thus creating microplastic particles. To effectively reduce waste, avoid using these alternative options and choose reusable items instead.

**Please help keep these out of nature**

- **Cigarette butts**
  - because the filters contain plastic.
- **Chewing gum**
  - because most gum is synthetic.
- **Eye contact lenses**
  - because they are made of plastic.
- **Paper cups**
  - because they are lined with plastic to remain waterproof.
- **Tea bags**
  - because most are sealed with plastic glue.
- **Wet wipes**
  - because they contain plastic fibers.

**What the travel industry is doing**

The International Association of Antarctica Tour Operators (IAATO) and the Association of Arctic Expedition Cruise Operators (AECO) have joined the United Nations Clean Seas campaign. Together with their members, they are working to systematically reduce the use of disposable plastics and other items. Operators are also involving guests in beach cleanups worldwide and remove tons of marine litter every year. Through information to crew, staff and guests, and through sharing of best practices IAATO and AECO are involved in raising awareness and involvement in safeguarding of the environment, at sea and on land.

**Are you an Antarctic Ambassador?**

Join the conversation:

[Facebook](https://www.facebook.com/AntarcticAmbassadors)
[Instagram](https://www.instagram.com/AntarcticAmbassadors)
[Twitter](https://twitter.com/ANT_Ambassadors)
[Hashtag](https://www.loveantarctica.org)

To learn more about visiting Antarctica responsibly, please visit [www.iaato.org](http://www.iaato.org)
APPENDIX C

PENGUIN: AFRICAN WILDLIFE

Takings

- Threat: Accidents, especially in Popular, that may be attributed to various factors.
- Resource: Any resource that can be harvested or extracted.
- Habitat: Any habitat that can be altered in one way or another.
- Outcome: Any outcome that can be affected in one way or another.
- Observations: Any observations that are made.

PENGUIN: SCIENTIFIC RESEARCH

- Recent advances with scientific research methods.
- Observations: Any observations that can be made.
- Habitat: Any habitat that can be affected in one way or another.
- Observations: Any observations that are made.

BLACK

- Observations: Any observations that can be made.
- Habitat: Any habitat that can be affected in one way or another.
- Observations: Any observations that are made.

ADVICE FOR OTHERS TO THE AMERICANS

- Observations: Any observations that can be made.
- Habitat: Any habitat that can be affected in one way or another.
- Observations: Any observations that are made.

APPENDIX C

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- Observations: Any observations that are made.

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