

Environmental sustainability: a strategic value in guiding cruise industry management

Environmental
sustainability

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Abstract

Purpose – In a systemic approach, a ship is a system in which people and organizations interact directly and indirectly in all processes from construction, during the route and at the destination, throughout its useful life, until eventual scrapping or disposal process. The purpose of this paper is to take on the UN 2030 Agenda – Goal 14 to propose a management model that meets environmental guidelines for assessing impacts caused by the cruise ships.

Design/methodology/approach – To verify the proposed model, a quantitative survey using non-probability purposive sampling was conducted among ports, environmental sustainability experts and ocean cruise companies. The empirical data were analyzed using descriptive statistics and structural equation modeling.

Findings – Findings have confirmed five environmental requirements that shipping companies must manage on their cruise ships to meet Goal 14: input management, waste management, air quality, energy management and water management. Adopting and disseminating sustainable development models provides transparent information about actions taken and results of environmental management, and it may change the perception of the organization's image, which is relevant to win and maintain environment-friendly customers, adding intangible value to the tourism product.

Research limitations/implications – One of the limitations of the study is the research sample, especially ocean cruise companies, which can have biased results, as they are potential sources of environmental impacts. However, this was not the case, since the answers were similar to those of the other two groups surveyed.

Originality/value – The originality of the study is justified by researchers who argue that information provided by shipping companies on sustainability is very limited, as according to previous research, the convergence between strategy formulation model and environmental sustainability as a principle to be incorporated into the management of oceangoing vessels has not been studied.

Keywords Cruise industry, Sustainable development, Environmental sustainability, Strategy formulation, 2030 Agenda, Cruise ships

Paper type Research paper

Introduction

Since ancient times, a variety of strategies have been adopted to solve different kinds of conflicts (Mintzberg *et al.*, 2007), and over the years, many improvements have been made. This trend is apparent in the way corporate management deals with known and unknown environments and unexpected situations. In this sense, everyday activities, whether in politics, competition between companies or even in the event of environmental disasters, generate knowledge that can influence the formation of strategies in the corporate world.



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Therefore, according to Mintzberg *et al.* (2007), companies must implement decision-making strategies that are not based on general and loose understandings. So, it is necessary to set standards by which these strategies are assessed. With a view to guide governments and organizations, the United Nations (UN) has held conferences to raise awareness regarding ways to achieve growth targets with the least possible impact (Schmalzbauer and Visbeck, 2017; United Nations, 1992, 2000, 2002, 2010, 2012a, b; UNWTO, 2015).

In a meeting held in September 2015, a new agenda for global development was put forward. In the occasion, heads of State and Government gathered in New York, USA, and approved the 2030 Agenda and its 17 Sustainable Development Goals (SDGs) and 169 targets to provide a governance framework for governments and various sectors of the economy for the next 15 years as of 2015 (Schmidt *et al.*, 2017; United Nations, 2016).

The SDGs have the aim of maintaining the natural capital (Daly, 1990) and the effective management of the productive resources, respecting the rights for a better life standard of the people, in order to reduce the social gap in their many living standards (Barbieri and Cajazeira, 2009). Given the object of this study, the ocean cruises, Goal 14 is of particular interest, as it refers to “conserve and sustainably use the oceans, seas and marine resources for sustainable development” (United Nations, 2015).

The Brundtland Report, named Our Common Future, published in 1987 by the UN, defines sustainable development as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (United Nations, 1987). This means there is an issue to be solved and the organizations urgently need to adopt sustainable practices to save the planet from the adverse impacts, in a proactive approach for the next generations. This approach should aim to qualify economic growth, respecting social justice and efficiency in using the natural resources.

The tourism industry influences and is influenced by sustainable development (Doran and Larsen, 2014; Marzo-Navarro *et al.*, 2015; Roe *et al.*, 2014; Rosalind Jenkins and Karanikola, 2014; Whitfield *et al.*, 2014), as much as the cruise companies represent one of the most important sectors in tourism, the cruise industry (UNWTO, 2016), which have their ships as potential sources of pollution and environmental impacts (Friends of Earth, 2019; Hall *et al.*, 2017; Klein, 2009, 2010, 2011; Lindgren *et al.*, 2016; Stefanidaki and Lekakou, 2014); thus, they also need to implement strategies focusing not only on profit, but also on the needs of the planet.

However, this is not just a strategic matter but also a necessity, as most of the cruise companies are not transparent in providing information about their environmental practices (Jones, Comfort and Hillier, 2016; Jones, Hillier and Comfort, 2016; Ramoa *et al.*, 2018). Therefore, with the intention to highlight the necessity in protecting the marine environment, this study aims to recommend the requirements to guide these companies in their way to adopt best practices in environmental sustainability matters.

Thus, the general objective of this research was to propose an integrated model of strategic management, based on the environmental requirements that should, as a priority, serve to assess environmental sustainability of cruise ships. For this purpose, the research was carried out in two stages: first, a comprehensive literature review has been conducted to identify the environmental requirements that shipping companies must implement on their cruise ships to evaluate if their tourism products are environmentally sustainable.

Based on such requirements and their environmental variables, the proposed model was validated in the second stage through a survey of stakeholders that influence or are influenced by the environmental impacts of ships, namely ports, expert environmental organizations and shipping companies.

Aligning cruise tourism and environmental impacts in the ocean, a complementary research has been made, supported by shipping industry regulations, issued by the UN, International Maritime Organizations (IMO), International Standard Organization (ISO), Global Reporting

Initiative (GRI) and other internationally recognized standards, expecting to find all the necessary theoretical foundation to support the model.

In the cruise industry context, the operation of the 300 cruise ships that carried around 25m passengers in 2017 worldwide (Cruise Market Watch, 2018), including the shipment of 418,504 cruise shippers in Brazil in the summer season 2017/2018 (CLIA Brasil, 2018), where the research took place, also contributed to cause environmental impacts related to the SDG 14. After all, in a ship operation, it is supposed that internal and external stakeholders can interfere directly or indirectly in generating waste and in fuel, water, food and energy consumption influencing the protection and balance of the marine ecosystem along the way to the final destination.

Particularly, concerning Brazil, it is relevant to consider that its coastline measures more than 8,500 km, which offers to the country a vulnerable continental margin to impacts caused by ocean ships, requiring orientation on avoiding impacts caused by their operation, contributing to up-to-date knowledge in the field of the environmentally sustainable tourism.

Literature review

Environmental sustainability as a value strategy

Strategies arise from the organizational culture, over time, from the actions and attitudes of the people who have expertise in the company, according to Mintzberg *et al.* (2010), and who sometimes incidentally take actions without evaluating the consequences.

Strategy formulation should not be based on random decisions, but on the knowledge and conscious attitudes of managers, and it must be aligned with the goals and objectives of sustainable development (ICSU, 2017; United Nations, 2015, 2016), preserving the biodiversity and respecting people and the planet, based on shared principles, values and responsibilities among government, organizations and society (United Nations, 2016), in order to build a positive agenda in the development process of the organization, not only by strengthening financial results, but also by meeting the planet and its inhabitants' needs (Elkington, 2012).

Porter presented in his generic strategies (Dülger *et al.*, 2014; Porter, 1999) three options that companies can develop to gain competitive advantage over competitors: cost leadership, focus and differentiation.

This study focuses on differentiation, a strategy that cruise companies should follow to incorporate environmental sustainability dimension as a strategic value. Differentiation strategy is used when organizations seek to stand out from competitors through some specific competitive advantage. By adopting environmental best practices as a differentiation factor, companies contribute both to the sustainable development of the market and to the development and growth of the organization.

In this sense, a differentiation strategy based on the UN guidelines for sustainable development objectives (United Nations, 2002, 2015) could be a competitive advantage (Kim and Mauborgne, 2005) and a key component in corporate image building. However, it is emphasized, as a matter of principle, that sustainability is not an alternative, but a fundamental strategic factor that aims to support the development of organizations that focus on added value benefits from sustainable development (Gössling *et al.*, 2012; Melissen, 2013; Moriarty, 2012), which, eventually, will reflect on the company's growth and market share.

In this context, the study focuses on environmental sustainability, a dimension that aims at the conservation of the natural capital, which consists of water, land, air, minerals and ecosystem services (Daly, 1990; Goodland, 2002) and is one of the three sustainability pillars, along with the economic and sociocultural factors of a system (Elkington, 2012; United Nations, 1987).

An image of environmental responsibility can be a strategic factor in changing consumers' expectations and perceptions of companies and tourism itself. An image associated with the best practices in sustainability may lead tourists to engage in positive

word of mouth, since, according to Beltrán-Bueno and Parra-Meroño (2016), the image is a key factor for tourists, who are major contributors to the formation of a destination (Flores and Mendes, 2014) and are increasingly influenced by environmentally sustainable practices (Fodness, 2016; Lin, 2017; Pires, 2012).

As in a tourist destination, a cruise ship (Gibson, 2012; Lohmann and Panosso-Netto, 2012; Mancini, 2011; Najafipour *et al.*, 2014) may also be perceived by tourists as a sustainable environment; thus, a strategy formulation is proposed, which includes environmental factors that could potentially cause impacts. These factors, as in a systemic model, should consider the inputs and outputs of materials and products consumed and discarded, considering the consumption of passengers and crew on board and their interactions in the various activities, leisure, feeding or operation and maintenance on each ship.

Based on the literature review, Table I presents a summary of the environmental requirements and variables that should primarily be managed on cruise ships, based on

| Environmental requirements | <i>n</i> | Environmental variables | |
|----------------------------|----------------|---|---|
| 1. Input management | 1 | Consumption of environmentally sustainable products ABNT (2014, 2015), GRI (2016a, b), ISO (2016a) | |
| 2. Energy management | 2 | Energy efficiency (efficient use) ABNT (2011, 2014, 2016), GRI (2016c), GSTC (2013), ISO (2016b), Pires (2012) | |
| 3. Water management | 3 | Water efficiency (water usage efficiency) ABNT (2014, 2016), Friends of Earth (2019), GRI (2016d, e), GSTC (2013), ISO (2014), Klein (2009), Pires (2012) | |
| 4. Waste management | 4 | Waste water - black water: (human sewage from toilets) ABNT (2014, 2015, 2016), Friends of Earth (2019), GRI (2016e), GSTC (2013), IMO (1983, 2006, 2016e), Klein (2009), Pires (2012), United Nations (1982a) | |
| | 5 | Waste water – gray water (waste water from sinks, showers, galleys, laundry, and cleaning) | |
| | 6 | Sewage sludge (sludge originates from the process of treatment of waste water) | |
| | 7 | Solid waste (non-hazardous solid waste (plastic, paper, wood, cardboard, food waste, cans, glass, others) ABNT (2014, 2015, 2016), Friends of Earth (2019), GSTC (2013), IMO (1983, 2006, 2016a), KLEIN (2009), PIREs (2012), UNITED NATIONS (1982a) | |
| | 8 | Hazardous waste (chemical products, dry cleaning waste, used paint, solvents, expired chemicals, and pharmaceuticals, fluorescent and mercury vapor light bulbs, batteries, others) GRI (2016e), IMO (1983) (2006), Klein (2009) | |
| | 9 | Oily bilge water (water with fuel, oil e wastewater from engines; solid wastes such as rags, metal shavings, paint, glass, cleaning agents, others) IMO (1983, 2016b), Klein (2009) | |
| | 10 | Ballast water (ballast water used to stabilize the ship which introduces non-native species to the destination) Friends of Earth (2019), IMO (2016d, 2017a), Klein (2009) | |
| | 5. Air quality | 11 | Air Pollution – Gases (air pollutants contained in ships exhaust gas and shipboard incineration) ABNT (2014, 2015), Friends of Earth (2019), GRI (2016f), GSTC (2013), IMO (2016e), Klein (2009), Pires (2012) |
| | | 12 | Air Pollution – Noise (machinery noise) ABNT (2014, 2015), GSTC (2013), IMO (1980), Pires (2012) |

Table I. Environmental sustainability requirements and variables managed on cruise ships

Source: The authors

parameters, to support the development of performance indicators that, after the evaluation is done, can indicate if these places can be considered as environmentally sustainable destinations.

The proposed requirements and variables in this study are based on sustainability-related regulations, particularly on the environmental dimension. The requirements and variables that have been identified and should be managed by shipping companies on their cruise ships are the following: input management, energy management, water management, waste management and air quality. It is suggested that the adoption of a management model based on these aspects is essential for shipping companies to independently and transparently manage and control on each ship any impacts they may have on the environment.

However, it must be considered that these environmental requirements may be dependent on each other, such as the materials and inputs used on board, which could directly influence energy and water consumption, waste issues and emissions. Therefore, shipyards should seek, throughout the construction of the systems, technological solutions that reflect high efficiency, generating the least possible impact. However, this should happen from the beginning of the project, in all activities and stages, up to the end of the life cycle.

The measurement of results guided by variables and indicators of environmental sustainability will allow establishing corrective actions, aiming to adopt the best preventive environmental practices for the protection of the oceans and sustainable development of the marine environment. Hence, to become an environmentally sustainable organization, according to the Global Sustainable Tourism Council (GSTC, 2018), it is required to practice and contribute to the quality of the environment in the long term, taking advantage of renewable or non-renewable resources without harming the environment.

Therefore, when managing the environmental requirements and variables along the ship construction and the inputs throughout its operation, it is considered that, from a natural resource-based point of view, ship companies would be connected to three key strategic factors: pollution prevention, product and service management and the sustainable development, providing profitability, but with impact prevention, and ensuring that the cruise industry adds strategic value linked to environmental sustainability, with a positive impact on its image (Hart and Dowell, 2011).

Methodology

The organizational vision of environmental responsibility may affect people's perception of environmental risk of companies, products and services. Thus, adopting and disseminating sustainable development models may change the perception of the organization's image, which is relevant to gain and maintain environment-friendly customers (Chiu *et al.*, 2013; Lin, 2017; Pires, 2012; Tiago *et al.*, 2016).

However, researchers argue that the information provided by shipping companies on sustainability is very limited (Hall *et al.*, 2017; Jones, Comfort and Hillier, 2016; Jones, Hillier and Comfort, 2016; Ramoa *et al.*, 2018); therefore, to assist companies in environmental management, this study offers guidelines for environmental best practices, seeking a convergence between strategy formulation model and environmental sustainability as a principle (Fodness, 2016; United Nations, 2016) to be incorporated into the management of oceangoing vessels.

Research overview

This research identified in the literature the requirements and variables of environmental sustainability that can serve as guidelines for management model formulation and identification of environmental sustainability indicators, through publications encompassing two dimensions, cruises and sustainability, in a set of keywords related to the dimension of cruises, "cruise" or "cruise ship" or "cruise industry" or "cruise tourism" or "maritime cruise" or "maritime tourism" or "nautical tourism" or "ocean cruising," and

using a Boolean search formula including the dimension of “sustainability” looking for convergence of the strategic best practices concerning the ocean cruise ship operations and the environmental sustainability.

Data collection

After analyzing 373 papers, published in the fields of “Business, Management, and Accounting,” “Social Science,” and “Environmental Science,” in the Scopus database, between July 18 and August 14, 2017, 12 articles were selected (Acciaro, 2014; Bouman *et al.*, 2017; Carić and Mackelworth, 2014; Hearin *et al.*, 2015; Jones, Comfort and Hillier, 2016; Jones, Hillier and Comfort, 2016; Schembari *et al.*, 2012, 2014; Strazza, Magrassi, Gallo and Del Borghi, 2015; Strazza *et al.*, 2016; Strazza, Del Borghi, Gallo, Manariti and Missanelli, 2015; Tribou and Swain, 2015). Their theoretical implications were analyzed in order to find any environmental requirement related to the impacts on the ocean caused by the cruise ships, thus supporting the findings. These 12 studies were selected, as they were the only ones that presented aspects related to sustainable development and sustainability, particularly concerning the environmental sustainability and the impacts caused by ocean ships on the environment.

The second stage of research was conducted to confirm the requirements selected. To verify the proposed model, quantitative research was conducted, using non-probability purposive sampling, to obtain opinions on research topics (Martins and Théophilo, 2009). The technique and the sampling method were chosen due to the international nature of this study and the difficulty of surveying the entire population. Participants were identified with the help of one of the researchers, who has academic and professional background in the cruise industry, environmental sustainability and marine environment experts (Aaker *et al.*, 2004).

The survey sample, composed of 196 organizations, was purposely selected among three different groups of respondents to ensure the reliability of the results (Veal, 2011): 90 ports and terminals worldwide, members (CLIA, 2019) and partners (CLIA, 2018) of Cruise Line International Association (CLIA) and 18 Brazilian ports (ANTAQ, 2018); 62 non-governmental organizations recognized for their involvement in issues related to the marine environment, here called “experts”; and 26 CLIA member cruise lines (CLIA, 2019). The criteria in selecting these three groups considered that cruise lines are potential sources of impacts; ports may suffer the impacts from ships; and experts are able to analyze the environmental practices adopted by organizations.

Ocean and river environments were dissociated because the object of study of this research is ocean cruises, not river cruises. Nonetheless, environmental sustainability is considered a strategic value that must be adopted by organizations, regardless of activity or working environment (United Nations, 2012b, 2015; WEF, 2014; World Bank, 2016).

The survey questionnaire consisted of seven close-ended questions, of which five were multiple choice and two were importance scale questions, a variation of Likert scale questions (Martins and Théophilo, 2009). For each statement, participants were asked to rate their perception of importance: (4) very important, (3) important, (2) little important, (1) unimportant or (0) no opinion/prefer not to answer. The purpose of these two questions was to measure the importance of each variable according to research topics, strategy formulation environmental sustainability and the attitudes organizations consider to be relevant regarding research topics (Dencker, 2003; Martins and Théophilo, 2009). For data analysis, the levels of importance were grouped as follows: 1 and 2, low importance; 3 and 4, high importance; and 0, neutral (Sampieri *et al.*, 2013).

Data analysis

Initially, data analysis used descriptive statistics (frequencies and means), seeking to draw conclusions from questionnaire data. The analysis was performed by calculating absolute

frequencies (af) of variables, represented by the number of respondents in each surveyed group, and relative frequencies (rf), which is the ratio between the absolute frequency (af) and the number of valid answers (f). In addition to the analysis of the answers to scale questions, weighted means were calculated to identify central tendency of scale. Reliability was assessed through evaluation of Cronbach's α , which is the most common measure of internal consistency reliability of scale items (Hair *et al.*, 2009).

Variable reduction, related to environmental requirements, was carried out in a second confirmatory–descriptive step using SmartPLS software (Ringle *et al.*, 2015), which is adequate for the formulation of constructs and theories (Hair *et al.*, 2014; Julien and Ramangalahy, 2003) and for small sample calculations (Fornell and Bookstein, 1982; Hair *et al.*, 2014) as is the case of this study.

The model and the definition of environmental requirements were based on the systemic model (Lohmann and Panosso-Netto, 2012; Vasconcellos, 2013), as it considers the relationships between the marine environment and cruise ship inputs, outputs and interactions with internal and external stakeholders (IMO, 2016a; Klein, 2009).

Results

Environmental management model for ocean cruise ships

The qualitative analysis identified, in the literature review, the five priority requirements suggested for evaluating environmental processes in ocean vessels. These requirements form the integrated model of strategic management (Figure 1) proposed to cruise companies aimed at the sustainable development of their tourism product.

According to Figure 1, the continuous management and adoption of environmental best practices will allow shipping companies to minimize environmental impacts of their cruise ships. To that end, the model considers the management of five environmental requirements. The first requirement refers to input, that is everything that is consumed on the ship, including materials and packaging, food, fuels, lubricants, cleaning products and medicines, among others (ABNT, 2014; ISO, 2016a), so that everything processed on

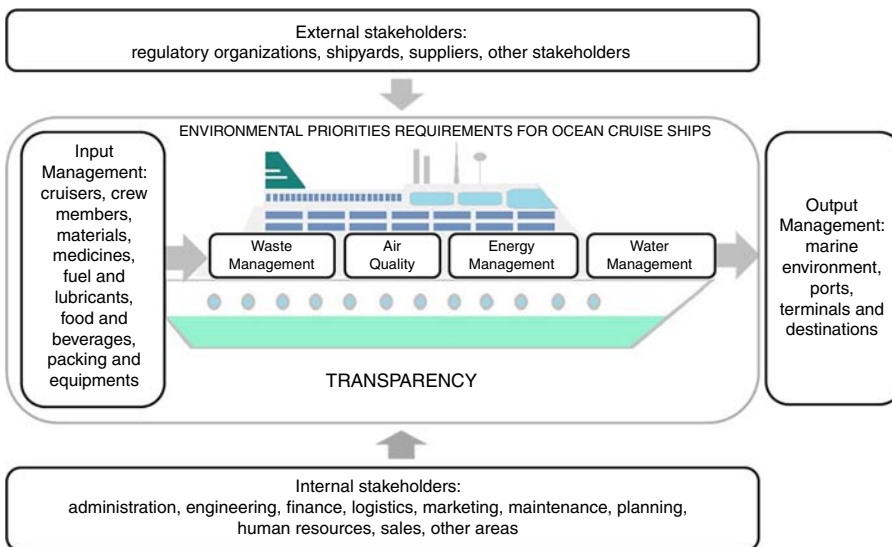


Figure 1. Value management strategy model based on environmental sustainability requirements for ocean cruise ships

Source: The authors

board has the least possible impact on the marine environment, ports, terminals, communities and destinations along the way.

In addition to proper processing of inputs, the importance of liquid and solid waste management (ABNT, 2014; Friends of Earth, 2019; IMO, 1980, 1983, 2006, 2016a, b, c; Klein, 2009; United Nations, 1982a), the second requirement, is highlighted in order to avoid improper disposal directly into the ocean. Proper treatment or storage for subsequent disposal means compliance with current regulations such as UN IMO guidelines, established in 1948 to define a global standard for the safety and environmental performance of international maritime transport (IMO, 2017a).

One of the variables to be managed, in addition to solid wastes (black water, gray water, sewage sludge, hazardous waste and oily bilge water), is ballast water, which is covered by one of the IMO regulations that addresses the use of water to maintain vessel stability (IMO, 2016d). Additional care must be taken when discharging ballast at a destination other than where the fuel was supplied, because this liquid residue may contain different organisms from the environment in which it was shipped, thus causing marine contamination (Klein, 2009).

The third requirement considered by the model is the maintenance of air quality; it requires not only corrective actions such as the use of filters and protections, but also preventive actions aimed at minimizing the impacts of gas or sound pollution, particularly those caused by ships' engines (ABNT, 2014; Friends of Earth, 2019; IMO, 2016e; Klein, 2009).

One of the environmental factors that can help in this regard is energy management, the fourth requirement, by using energy-saving lamps and energy-efficient windows and walls, as well as using sunlight and shore power when the ship is at berth, actions that contribute to the reduction of fuel consumption and consequently to the reduction of atmospheric emissions (ABNT, 2014; ISO, 2016b).

The fifth requirement is the management of water needed for consumption, hygiene and cleaning, which is also extremely important in the operation of a ship and, as with ballast water, this is a process that can directly impact any environment, whether the origin, where the water was shipped, or the marine environment itself, where it could be discharged (ABNT, 2014; Friends of Earth, 2019; ISO, 2014; Klein, 2009).

The management of these environmental requirements and the evaluation of performance indicators allow, depending on the results obtained, to classify a cruise ship as environmentally sustainable or not (Klein, 2009). However, these results only become a strategic value for winning and keeping customers if the company is transparent (OECD, 2005), with information easily available to all stakeholders. In this way, the shipping company is perceived positively by the market, as a responsible organization, contributing to the sustainable development of the environment where it is inserted.

Validation of the environmental management model for ocean cruises

To meet the research objective, a quantitative study was realized. The aim was to verify the environmental requirements presented in this study and, thus, assist shipping companies in their assessment of cruise ships regarding UN 2030 Agenda in its Goal 14, one of the 17 SDGs (United Nations, 2015). Goal 14 includes the need to contribute to "increase scientific knowledge, develop research capacity and transfer marine technology [...] in order to improve ocean health and to enhance the contribution of marine biodiversity."

As mentioned, an international survey was conducted with 196 organizations, including 90 ports and terminals worldwide (CLIA, 2019), CLIA members or partners (CLIA, 2018), 18 Brazilian seaports (ANTAQ, 2018), 62 organizations specializing in marine environment issues, here called "experts," in addition to 26 CLIA member ocean cruise companies (CLIA, 2019).

The questionnaire, in English and Portuguese, was e-mailed using Survey Monkey to addresses obtained directly from corporate websites. The relevance and topicality of the subject led us to believe that companies would be motivated to provide information on their

environmental policies. However, among the organizations surveyed, providing a channel of communication specifically related to sustainability was not a common practice. In the case of the cruise companies, only the companies Aida Cruises, Costa Cruise Lines, Royal Caribbean and Tui Cruises indicated a channel of communication in specific pages on the sustainability dimension.

The lack of channels to inform the market about the adoption of sustainable practices does not necessarily mean that companies do not have them. However, a possible lack of interest in providing that information may explain the low response rate to the survey. With the return of 101 questionnaires, only 72 valid answers were counted, that is 36.73 percent of the surveyed 196 organizations positively answered the following question: Do you have any knowledge about the scope of sustainable development or sustainability, or environmental sustainability?

The questionnaires were answered by the three groups consulted: ports (36 ports, 40 percent), experts (24 expert organizations, 38.71 percent) and ocean cruise companies (12 ocean cruise companies, 46.15 percent).

The importance, in the cruise industry, of the companies that have answered the questionnaire should be noted, both in number of passengers carried and volume of sales. These 12 companies represent 67.60 percent of global passengers carried in 2015, including four companies in the Carnival Corporation group, with a market share of 48.1 percent and revenue of 42.2 percent, and three of Royal Caribbean International, with 23.1 percent and 22.1 percent of market share and revenue, respectively (Cruise Market Watch, 2018). Both groups are transparent in their reports on sustainability (Carnival Corporation, 2018; Jones, Comfort and Hillier, 2016; Jones, Hillier and Comfort, 2016; Royal Caribbean, 2016a, 2018).

In what follows, the results of the analysis of the quantitative survey data are reported. First, the level of knowledge of the respondents on issues related to sustainable development was evaluated by asking the following question: Do you have any knowledge about the scope of sustainable development or sustainability, or environmental sustainability? If the answer was “no,” respondents were thanked for their participation and the questionnaire ended there.

The second question was about the UN 2030 Agenda (United Nations, 2015): Are you familiar with the 17 SDGs (UN) of the 2030 Agenda for sustainable development to be implemented by all countries? Concerning this question, 72 valid answers were obtained, with 25.00 percent being “fully aware,” 50.00 percent “partially aware” and 25.00 percent “not aware.”

Analyzing the first two sets of answers separately by group of respondents, it was found that among the 25.00 percent “fully aware,” 38.89 percent represented the ports, 33.33 percent were experts in environmental marine sustainability and 27.78 percent were shipping companies. Of the 50.00 percent “partially aware,” 52.78 percent were ports and terminals, 30.56 percent experts and 16.67 percent cruise companies.

The analysis of these percentages shows that most respondents do not have in-depth knowledge of the 2030 Agenda, adopted by the UN (United Nations, 2015) in September 2015. However, it is noticed that this knowledge is greater among ports and marine terminals, in comparison with the other groups surveyed.

The following question specifically focused on the central dimension of this article, that is environmental sustainability. It was assessed whether the adoption of measures to minimize environmental impacts was important. This question was adapted from dos Santos *et al.*'s (2017) criteria. The authors carried out a study on the management of factors related to sustainable hotel development, which allowed the adaptation of environmental requirements to cruise ships, given that these may also be regarded as lodging establishments (Agarwal, 2002; Papatheodorou, 2004; Walton, 2009). Respondents were asked to indicate their perception of the importance of each of the 16 factors presented to

minimize air, land, and water pollution and to assist in the conservation of biological diversity and natural heritage.

The factors presented to the respondents were, broadly, the requirements and environmental variables of the model of strategic value management defined by this study for cruise ships, including input control, choice of environmentally responsible suppliers, waste management, air quality, energy and water management used on board, as well as undertaking preventive actions such as equipment maintenance and environmental education of stakeholders, in order to change the environmental behavior of all those involved in the operation, maintenance and use of cruise ships.

The analysis of the answers showed that all variables presented a confirmation level above 87.50 percent, similar to previous answers (Sampieri *et al.*, 2013), confirming the positive importance of managing environmental factors in a cruise ship, from the entry of materials to waste management, air quality and energy and water management as measures to minimize air, land and water pollution and to assist in the conservation of biological diversity and natural heritage. This suggests the need not only for formulating a strategy aimed at the adoption of the best practices in the context of environmental sustainability, but also for an actual implementation that allows companies to grow within a sustainable development of business.

The model presented by this study included the environmental variables that should be managed by cruise companies on their ships in the following statement: environmental requirements must be met to prevent and reduce the pollution caused by cruise ships, helping to maintain the environmental waste assimilation capacity. The variables composing the set of environmental requirements were presented in sequence and could be chosen freely on the basis of knowledge about the theme. Respondents could choose one or more, or none of the variables.

The analysis of the 72 answers identified a positive trend (Sampieri *et al.*, 2013) in environmental attitudes of the organizations in the sample, since most respondents validated the five environmental requirements that cruise companies should adopt to prevent and reduce environmental impacts: input management, waste management, energy management, water management and air quality.

Confirming the proposed model, the study is reliable with an acceptable level of internal reliability coefficient, Cronbach's α , within international standards (Hair *et al.*, 2009; Maroco and Garcia-Marques, 2013).

In addition to environmental requirements for the sustainable development of the cruise ship tourism product, the study verified the importance of training and engaging managers in environmental issues, so that they can meet the planet's sustainable development challenges with the commitment of all on behalf of a common goal.

The study also verified that cruise companies should adopt best practices on environmental sustainability as a value strategy, managing the environmental requirements set forth herein individually on each of their cruise ships.

Confirmatory factor analysis

To reduce environment variables and confirm them, empirical research data were submitted for a second analysis, called confirmatory-descriptive step, using SmartPLS software. For this analysis, a model with ten variables was used. These were related to the five environmental requirements proposed by this study: the latent variables input management, energy management, water management, waste management and air quality.

Before running the PLS, in order to validate the test, the minimum sample size was calculated using G*Power 3.1.9.2 software (Faul *et al.*, 2009). Following the recommendation of Hair *et al.* (2014), the test power (Power = $1 - \beta$ err prob) as 0.80 and effect size (f^2) of 0.15 were adopted as parameters. The result showed need for a minimum sample of 68

responses, which is lower than the 72 valid questionnaires obtained in the survey. It is, however, suggested that samples two or three times larger should be used to obtain a more consistent model (Ringle *et al.*, 2014).

After the validation of the minimum sample size, PLS was run. The complete structural model (Figure 2), analysis and results are presented below.

It is identified in Figure 2 that the inputs, like crew, cruisers, workers, materials, medicines, fuel and lubricants, food and beverages and packing and equipment (ABNT, 2014, 2015; GRI, 2016a, b; ISO, 2016a), have a high influence on the water consumption and the waste generation. It means that everything is a potential impact factor to the marine environment making the ship a system that must be completely controlled in all over its operations. The same caution applies to water management and its relationship to waste generation: the more the consumption of water, the more liquid waste is generated. In the case of waste management, there will be major influence related to air quality when it has incineration process on board: when there is more incinerated process, then there will be more impact on air quality (Klein, 2009).

SmartPLS presents *t*-test value and not *p*-value. So, in the results, values above 1.96 mean *p*-values ≤ 0.05 (between -1.96 and $+1.96$ means 95 percent probability and out of this interval 5 percent, in a normal distribution) (Ringle *et al.*, 2014).

The thickness of arrows indicates that environmental requirements presented are consistent with variables related to them, with a greater influence of input management in relation to waste management ($\beta = 0.370$, $t = 1.96$, $p = 0.05$) and, mainly, water management ($\beta = 0.557$, $t = 1.96$, $p = 0.05$), which, in turn, has a significant impact on waste management ($\beta = 0.378$, $t = 1.96$, $p = 0.05$). Furthermore, the significant influence of waste management on air quality should be noted ($\beta = 0.426$, $t = 1.96$, $p = 0.05$), which can be partly explained by waste incineration on board (Klein, 2009).

In addition, the relations between these latent variables also presented statistical significance (*P*) higher than 0.05. These results, with the analysis of the observed variable relationships, show that the presented model indicates a significant link between all the variables. Thus, the poor management of inputs affects the operation of the ship, which may have an impact on the marine environment.

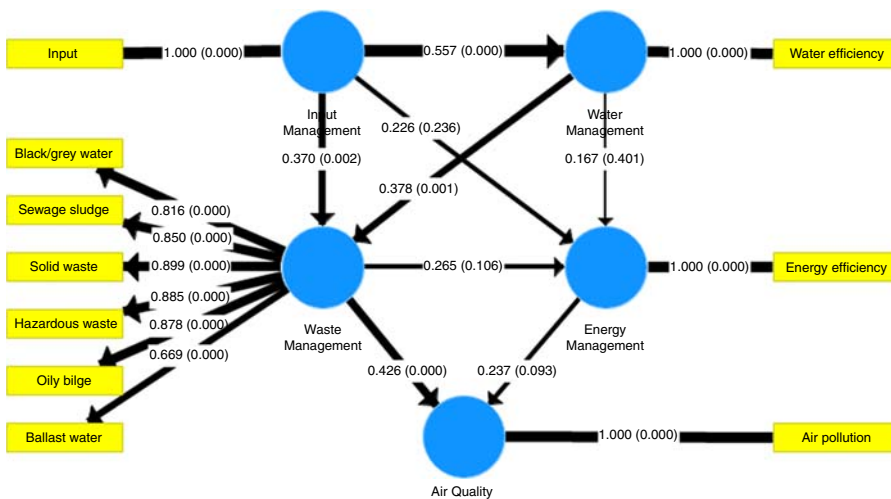


Figure 2. Complete structural model

Source: The authors

The analysis of the presented results confirms the viability of the model since the tested constructs established values of composite reliability (CR) and average variance extracted (AVE) higher than the expected minimum of 0.7 and 0.5, respectively (Ringle *et al.*, 2014) (Table II).

Table II shows that validity criterion suggested by Henseler *et al.* (2009, p. 300) was met: “validity is examined by noting a construct’s convergent validity and discriminant validity. Support is provided for convergent validity when each item has outer loadings above 0.70 and when each construct’s average variance extracted (AVE) is 0.50 or higher.”

Concerning the reliability coefficient rho_A, which is an estimate for the squared correlation of the PLS construct score with the true one, scores higher than 0.70 are recommended as acceptable (Henseler *et al.*, 2009), so the results were very satisfactory, ranging from 0.91 to 1.0 for all the five requirements.

The discriminant validity – the extent to which the construct is empirically distinct from other constructs – was assessed by the Fornell and Larcker (1981) criterion. The method considers that the construct shares more variance with its indicators than with any other construct: “the AVE of each construct should be higher than the highest squared correlation with any other construct” (Hair *et al.*, 2014, p. 111). It can be verified in Table III.

Continuing data analysis of structural equation, related to data quality, the coefficient of determination R^2 of endogenous latent variables in the inner path model was calculated. The results (Table IV) can be described as moderate using Chin criterion (Henseler *et al.*, 2009) or

Table II.
Measures of model fit

| | Cronbach's α | rho_A | Composite reliability (CR) | Average variance extracted (AVE) |
|-------------------|---------------------|-------|----------------------------|----------------------------------|
| Air quality | 1.000 | 1.000 | 1.000 | 1.000 |
| Energy management | 1.000 | 1.000 | 1.000 | 1.000 |
| Input management | 1.000 | 1.000 | 1.000 | 1.000 |
| Waste management | 0.912 | 0.914 | 0.933 | 0.700 |
| Water management | 1.000 | 1.000 | 1.000 | 1.000 |

Source: The authors

Table III.
Discriminant validity

| | Air quality | Energy management | Input management | Waste management | Water management |
|-------------------|-------------|-------------------|------------------|------------------|------------------|
| Air quality | 1.000 | | | | |
| Energy management | 0.448 | 1.000 | | | |
| Input management | 0.625 | 0.473 | 1.000 | | |
| Waste management | 0.543 | 0.494 | 0.581 | 0.837 | |
| Water management | 0.395 | 0.448 | 0.557 | 0.584 | 1.000 |

Source: Survey data applied to the Fornell–Larcker criterion (Henseler *et al.*, 2009)

Table IV.
Coefficient of determination R^2 and R^2 adjusted

| | R^2 | Adjusted R^2 |
|-------------------|-------|----------------|
| Air quality | 0.338 | 0.319 |
| Energy management | 0.313 | 0.282 |
| Waste management | 0.436 | 0.419 |
| Water management | 0.310 | 0.301 |

Source: The authors

high effect using Cohen criterion (Ringle *et al.*, 2014). R^2 adjustment did not change the result of the analysis.

To know whether the level of influence of a latent variable (f^2) is at the structural level, Hair *et al.* (2014) considered, respectively, 0.02, 0.15 and 0.35 as weak, medium or large. The result in Figure 3 shows the largest influence in a cruise ship concerning the environmental impact on the ocean. It can be seen that the core impact is in the input management and that the core point is to control everything that enters in a cruise ship in order to avoid producing waste or even wasting water. Managing these environmental requirements can also help produce less waste or control emissions.

Figure 3 confirms findings on the literature review and the survey results on the importance of managing all the ship inputs as a best practice in minimizing impacts on the marine environment, particularly minimizing waste generation and air quality. It means the largest amount of waste you find on board, more caution and action must be taken to ensure that they are not thrown into the ocean or on the coast, lessening the incineration process, which also affects air quality. The same concern should be considered true for the water management, which impacts the generation and amount of liquid waste.

Finally, convergent validity analysis showed that PLS values indicate that the model is accurate, and the requirements and their variables are relevant; thus, it may be suggested that the model be used by cruise line companies as a guidance in their environmental practices according to the proposal of this study.

Discussion and conclusions

Based on the literature review, the model considers that, once on board, the inputs consumed by passengers and crew and the operation and maintenance of ships generate outputs in the form of liquid and solid waste disposal and in the form of gases and noises (Friends of Earth, 2019; IMO, 2016b, c, d, e; Klein, 2009). In this operation, there will be water and energy consumption, which creates the necessity to control the whole process, in measuring, monitoring and optimization, aiming their reduction. Any solution will be efficient when it results in mitigating impacts to reduce air pollution, water and energy consumption and the reliance on fossil fuels (GSTC, 2013; ISO, 2016b, 2018).

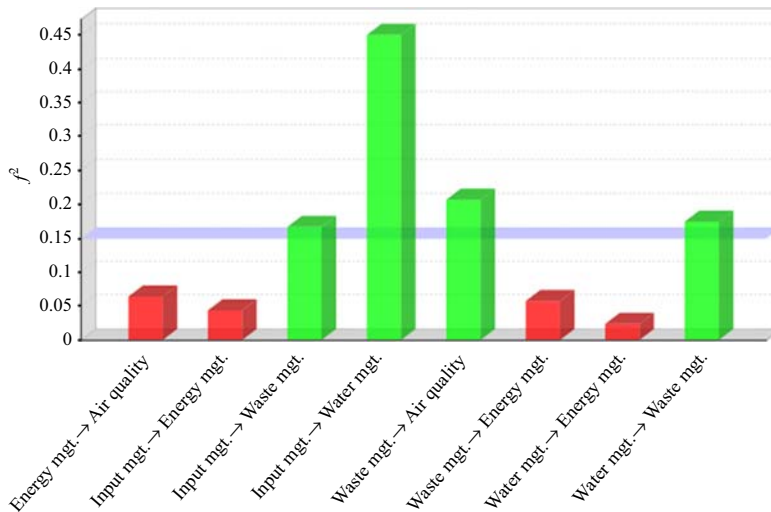


Figure 3. Effect size (f^2)

Source: The authors

The interactions between these factors lead to a relationship that, optimally managed, aims to minimize the impacts on the marine environment. In this sense, this management needs to be measured and disclosed in a transparent manner to all stakeholders.

However, few cruise companies disclose their sustainability indicators (Hall *et al.*, 2017; Jones, Comfort and Hillier, 2016; Jones, Hillier and Comfort, 2016; Ramoa *et al.*, 2018). Among the leading companies (Cruise Market Watch, 2018), only the Carnival Corporation (Carnival Corporation, 2018) and the Royal Caribbean Cruises (Royal Caribbean, 2015a, b, 2016a, b, 2017, 2018) groups publish complete reports including social, economic and environmental dimensions. Other companies, such as the Norwegian Cruise Lines, MSC Cruises, Disney Cruises, Thomson Cruises, Star Cruises and Silversea, also publish information on the subject, but in a limited way (Jones, Comfort and Hillier, 2016; Jones, Hillier and Comfort, 2016; Ramoa *et al.*, 2018).

The few environmentally aware companies emphasize the importance of managing impact factors (IMO, 2016a, c, f, g; Klein, 2009). This process is essential in the search for the causes and solutions to minimize the impacts, and as a source of knowledge of image formation and company transparency, achieved through the information to stakeholders about environmental initiatives (De Conto *et al.*, 2013; Neiman *et al.*, 2012; Pedrini *et al.*, 2015; Zhang *et al.*, 2013).

At a time when discussions about sustainability beyond the biosphere are occurring, for space tourism purposes or even to ensure the viability of our species (Spector *et al.*, 2017), it is here on Earth that we find solutions for the present and future problems urgently.

In this sense, organizations can become sustainable if they are able to meet the 2030 Agenda goals for sustainable development while satisfying both customers' and the planet's needs, so profit will depend on their social and environmental responsibility. This means even if the Agenda is not a legal obligation, it has become an ethical imperative, a moral obligation.

In this way, companies must include environmental sustainability in their strategy and management as a core value, along with social and economic responsibility, to meet the wants and needs of current and potential customers and be perceived in the market as responsible and active organizations on behalf of the planet and future generations.

In line with this reasoning, the study acknowledges the importance of engaging managers and stakeholders in a value strategy process. This strategy should be based on environmental best practices by adopting environmental performance indicators to monitor and reduce the impacts of liquid and solid waste, the quality of air produced and the optimization of energy and water consumption on board. Moreover, the process should be transparent to engage customers as partners in their environmentally sustainable actions.

In this context, this study confirmed the integrated model of strategic management, based on the requirements, which should, as a priority, measure environmental sustainability in cruise ships, considering also that companies must be transparent and communicate their best practices in meeting the 2030 Agenda goals and needs of people and the planet. In this way, the mix of value delivered, based on sustainability requirements, will affect the perceived image of the company (Jevtić *et al.*, 2012; Kotler and Keller, 2012; Okumus *et al.*, 2010; Ramoa *et al.*, 2015; Schultz and Dev, 2012). Besides transparency, the research also confirmed that environmental education is an important factor that must be considered in the process of adopting best environmental practices (De Conto *et al.*, 2013; FEE, 2017; OECD, 2005).

It should be noted that, despite the focus of this study on cruise ship tourism product, the model can be adapted, after a thorough feasibility analysis, to other objects of study such as river cruises and cargo ships, or even to industries other than tourism or in other environments.

The reliability of the results is presented by the direction of the questionnaire answers to and by the different groups of respondents (Veal, 2011), allowing to confirm the model presented, mainly because the survey was carried out with three distinct groups: cruise

lines, which are potential sources of impacts; ports, which are environments that may eventually suffer the impacts of ships; and experts, who judge and scrutinize the environmental practices adopted by organizations.

As theoretical contribution, this study complements Klein (2010, 2011) and Friends of Earth (2019), including the input management, energy efficiency and noise pollution in their cruise ship evaluation report, in complementing advises from ABNT, GRI, IMO, GSTC and their regulations, thus converging the environmental factors in protecting the oceans impacts.

In a systemic approach, as practical contribution to mitigate the environmental impacts on the oceans, this study intends to be used not just as a guidance to the organizations to manage the ships operations but also as an alert to the shipyards to design their ships, considering the ship as an environmental system that must not cause impact throughout its useful life in all processes and also in an eventual scrapping or disposal process when its life cycle finishes.

It is also expected to help companies' image, having customers choosing their products instead of competitors by choosing environmentally sustainable companies.

In addition to the strategy model, cruise lines need to adopt globally recognized environmental indicators, such as the GRI guidelines, recommended by the United Nations Environment Program (GRI, 2018; UNEP, 2013). In doing so, the organization adopts a strategic positioning that highlights transparency by informing stakeholders of its environmental initiatives. Therefore, the company adds value to its image by positioning itself as environmentally sustainable (Jones, Comfort and Hillier, 2016; Jones, Hillier and Comfort, 2016; Klein, 2009) and with the least possible impact on the marine environment, ports and destinations (Portopia, 2016).

One of the limitations of the study is the research sample, especially ocean cruise companies, which can have biased results, as they are potential sources of environmental impacts. However, this was not the case, since the answers of cruise lines were similar to those of the other two groups surveyed. Considering another limitation, for future research, the application of this model should be applied to a greater number of environmental sustainability experts, preferably with recognized expertise in marine environment. Besides this group, it is suggested that the research model should be evaluated by cruisers to know and analyze their perceptions regarding environmentally sustainable practices adopted by shipping companies on cruise ships.

Finally, it is desired that the findings can contribute to the adoption of environmental initiatives as a principle by the ship companies, encouraging further research works on environmental sustainability, concerning the conservation and sustainable use of the oceans, seas and marine resources.

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