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Tourism Impact on Environmental Sustainability: A Focus on the Cruise Industry

Kirkland Robert Anderson

Abstract

The growth of the Global Economy and in particular the Caribbean Islands has been for the last two decades fueled by the cruise shipping industry. However, the growth in this industry gives rise to the expansion in ship size and the number of destinations. Unfortunately, the cruise line industry is responsible for the largest volume of waste, pollutants and destruction to marine lives when compared to other maritime industry sector. This chapter seeks to highlight the correlation between the industry and the growing global need for vibrant economies, a high quality of life, while protecting the environment and sustaining the world's natural resources. A review of several literature has shown that within the last twenty years, the cruise lines have invested a lot of time and money correcting the negative environmental impacts created. Several proactive and green shipping initiatives designed to improve environmental management were successfully implemented by the industry. These diverse initiatives are group as follows: Research and Innovation, Corporate Social Responsibility (CSR) and Marketing, Awareness raising/environmental education initiative, and Green technologies. Emanating from these initiatives are: reduce or obviate of harmful environmental emissions and environmental management improvements and ultimately an environment that is experiencing an increased level of sustainability and economic activities.

Keywords: pollution, green technologies, global economy, environmental management, dynamic positioning

1. Introduction

1.1 Overview of the cruise industry

The Cruise Shipping Industry has evolved tremendously over the years. It experienced changes - from the era of transoceanic transportation and tropical vacations for the wealthy, privileged elites of society only, to the multimillion tourism and leisure industry today, offering affordable vacation options and comfort to match the average citizen. With the increasing growth of the cruise industry comes the expansion in ship sizes and the variety of destinations to meet the demand of customers. As such, the grandeur of the destinations, and their natural beauty are critical to the increasing demand. The cruise industry is definitely linked to environmental performance and compliance. However, studies show that the cruise line industry generates significantly more volume of waste and pollutants than any other maritime industry sector. The industry carries thousands of people around the world in just a single voyage and

these people generate a lot of sewage, gray water, oily bilge water, solid and hazardous waste. Unfortunately, the waste is hazardous to the fragile marine environment. Even the least harmful substance can damage the flora and fauna in its surrounding [1].

With the high level of waste and pollution that is produced, comes the need to implement methods of sustaining the industry's environment. The central notion of sustainability is that the goals of environmental preservation and the goals of business need not be disparate and conflicting. Throughout its history, the cruise industry has responded to vacation desires of its guests and embraced innovation to develop new destinations, new ship designs, new and diverse onboard amenities, facilities and services, plus wide-ranging shore side activities. Cruise lines have also offered their guests new cruise themes and voyage lengths to meet the changing vacation patterns of today's travelers [2].

Shipping is indeed the most significant international transport substructure in the world. It fuels the Global Economy and helps in the development countries. The cruise industry has grown significantly over the last two decades. *"In fact, between 2012 and 2017, it grew by 20.5 per cent with 2017 been a record breaking year of 25.8 million global ocean cruise passengers a 4.5 per cent increase over 2016, which had a record high of 24.7 million. This growth in cruise passengers results in both Florida-Caribbean Cruise Association (FCCA) and Cruise Lines International Association (CLIA) member cruise lines added nearly 22,000 lower berths through six new ocean-going vessels in 2017."* Growth in the industry continues through exciting features, a more personalized guest experience, customizable onboard technologies, media initiatives including even television shows and movies to display what cruising offers [2].

2. Marine environment: international laws and conventions that governs its protection

International Maritime Organization (IMO) is the world most influential organization on the prevention and control of marine pollution. IMO is guided by international conventions, protocols, guidelines and recommendations such as the International Convention for the Prevention of Pollution from Ships (MARPOL), and its annexes. Although, the International Maritime Organization does not have a set of regulations for cruise vessels, it provides requirements for ships, which have also become applicable to cruise vessels [3].

The International Convention for the Prevention of Pollution from Ships, 1973 as modified by the Protocol of 1978 (MARPOL 73/78), regulates and prevents pollutions arising from the operations of vessels. Its main concern is that of mitigating oil spills whether it is operationally or accidentally caused. MARPOL 73/78 comprises of six annexes which are used to prevent all possible forms of pollutions from vessels [3].

- Annex I prevention of pollution by oil & oily water
- Annex II control of pollution by noxious liquid substances in bulk
- Annex III prevention of pollution by harmful substances carried by sea in packaged form
- Annex IV pollution by sewage from ships
- Annex V pollution by garbage from ships
- Annex VI Prevention of air pollution from ships.

Sewages is defined by MARPOL 73/78 “as any drainage and other wastes from any form of toilets and urinals, drainage from medical premises (dispensary, sick bay, etc.) via wash basins, wash tubs and scuppers located in such premises” [4]. Sewage is known to contain harmful viruses, bacteria and pathogens, all of which are harmful to the well-being of human beings. Sewage is rich in nutrients such as nitrogen and phosphorus, which helps algal to grow much faster. The growth in algal reduces oxygen in the water and cause eutrophication which kills fishes and destroys the aquatic life at sea. In most cases of enclosed or semi-enclosed seas where the water exchange rate is slow and the discharge amount of sewage is high, the eutrophication is faster and harmful to the marine life [4].

MARPOL Annex IV regulates the discharge of sewage. Except in situations where the ship is at a minimum distance from the nearest land, or has in operation an approved sewage treatment. Furthermore, the discharge rule does not apply when ships are under the jurisdiction of a state which has less stringent discharge requirements [3]. MARPOL 73/78 has prohibited the disposal of Annex V (pollution by garbage from ships) within the Caribbean waters due to the fact that it consists of a sensitive ecosystem and heavy maritime traffic.

The cruise lines also emit ‘Gray Water’. This includes “drainage from shower, dishwasher, washbasin drains, bath and laundry. However, drainage from toilets, and urinals are excluded. Gray Water contains a mixed composition of different components such as; detergents, oil and grease, metals, organics, petroleum hydrocarbons, food waste, nutrients, fecal coliform bacteria and medical, dental waste. Gray Water represents ninety per cent (90%) of the total liquid waste generated by cruise ships [5]. Because of its high level of faecal coliform bacteria, and the oxygen-demanding materials, Gray water is dangerous for human and marine life [5].

MARPOL Annex V regulates the discharge of gray water and provides separate provisions for ‘Special Areas’. Solid waste disposal by cruise vessels has also been an issue, one that needs to be properly censored. Daily operations of the cruise ship generate solid waste in the form of packaging materials, food waste, transportation and storage products. Some solid waste can be recycled while others are non-recyclable. This can be very dangerous to marine life if they become marine debris. It will result in an alteration to the composition of the ecosystems, interference to gas exchange between overlying waters and benthos, degradation of quality at surface waters and beaches, physical injuries to humans and the ingestion of particles by marine animals [6].

MARPOL implements regulations for garbage disposals in order to mitigate gray water pollution and to achieve sustainability. One such regulation stipulates that ships of less than 400 gross tonnages should make entry of procedures in either the Garbage Record Book, or in the ship’s official log-book [5].

Finally, Annex III of the MARPOL convention elaborates on the Prevention of Pollution by harmful substances carried by sea in packaged form. This Annex makes provisions for the issuing of detailed standards on packing, marking, labelling, documentation, stowage, quantity limitations, exceptions and notifications. Annex 111, defines harmful substances “as those which are identified as marine pollutants in the International Maritime Dangerous Goods Code (IMDG Code), or which meet the criteria in the Appendix of Annex III.” Hazardous substances are said to be corrosive and toxic. These are produced from activities such as dry cleaning, equipment cleaning and photo processing. Other hazardous waste can result from paint waste, crushing of aerosol can, incinerator ash, batteries, pharmaceuticals and used fluorescent and mercury vapor light bulbs [7].

It is through the executions of these conventions that all vessels, including cruise ships will perform their daily operations keeping in mind that the

marine environment is of utmost importance. Adhering to the rules and requirements of these conventions, environmental sustainability can be achieved and maintained [7].

2.1 Theoretical framework on sustainability

The International Maritime Organization, outlines sustainable development as a form of development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It further states that, *“it contains two key concepts: the concept of needs, in particular the essential needs of the world’s poor, to which overriding priority should be given; and the idea of limitations imposed by the state of technology and social organization on the environment’s ability to meet present and future needs.”*

Theories of sustainability attempted to prioritize and integrate social responses to cultural and environmental problems. There are different theories of sustainability, each prioritizing its own component of what must be sustained. The ecological model of the sustainability framework is essential to this literature, henceforth, this model alludes to biological diversity and ecological integrity [3].

Sustainability covers largely the environmental dimension of the triple bottom line (social, environmental and economics). On the one hand, some forms of environmental degradation are both relatively easily reversed and highly noxious in the present (many forms of air and water pollution) (Baker, 2016) [8]. It is a process that helps create a vibrant economy and a high quality of life, while respecting the need to sustain natural resources and protect the environment. It is based on the principle that future generations should live in a world that the present generation has enjoyed, but not diminished [9]. Ecological models propose means to sustain biological diversity and ecological integrity. Rather than focusing on opportunity or capital as the key unit of sustainability, they focus directly on the health of the world. There are two major ways of deciding which ecological goods to sustain. From an anthropocentric point of view essential natural resources should be sustained, as should those ecological systems and regenerative processes on which human systems rely. From an eccentric point of view, species should be sustained for their intrinsic value, as should ecological systems as generators of creatures with intrinsic value [10].

2.2 The importance of the cruise industry to the local economy

Since the last two decades, the Caribbean Region has been one of the most favored cruise destination. It accounts for more than a thirty- five per cent (35.4%) of the global deployment capacity market share. The region’s yields and ticket pricing continue to increase respectively, aided by a strong United States economy and consumer sentiment.

Globally, but especially the Caribbean Region, individual governments invested large amounts of money to erect high quality infrastructures to meet the demands of increase colossal ships that dock at ports in the region, and the thousands of passengers that arrive at these destinations. It is suggested that the cruise industry has the potential to provide many economic benefits to the port’s state, which arise from five principal sources [11]:

- a. spending by cruise passengers and crew;
- b. the shore side staffing by the cruise lines for their headquarters, marketing and tour operations

- c. expenditures by the cruise lines for goods and services necessary for cruise operations;
- d. spending by the cruise lines for port services;
- e. expenditures by cruise lines for maintenance.

“During the 2011/2012 period cruise ship calls brought 15.44 million passenger visits and 2.7 million crew to the thirty-five participating destinations, which generated revenue of US \$1.48 billion and US\$261.9 million in spending respectively. In addition, cruise-related expenditures generated directly 45, 225 jobs throughout the studied destinations. Cruise generated jobs paid US\$728.1 million in wage income to the residents. There is also increased job opportunities in areas indirectly related to tourism, due to the provision of new facilities. Local shops are replaced by new ones. the interactions between residents and cruise passengers results in the exchange of culture, it offers the residents the possibility of learning about the world, and explore new life perspectives” [12].

Records demonstrated a substantial increase in all the above data during the 2014/2015 financial period. *“Cruise ship calls brought 23.63 million passenger visits and 4.5 million crew to the thirty-five participating destinations, which generated revenue of US \$3.16 billion and US\$302.2 million in spending respectively. Cruise-related expenditures generated directly 75, 050 jobs throughout the studied destinations. Cruise generated jobs paid US\$976.5 million in wage income to the residents” [13].*

In addition, tourism of which the cruise shipping industry is a large part has been found to be a significant driver in the creation of positive environmental externalities such as environmental care and the protection of nature [14].

2.3 Negative impacts of the cruise industry on the local environment

The previous section highlights the economic merits of the cruise lines to regional and global economies. However, it is worth reiterating that literature documents that the industry is most damaging to the marine environment. Impacts on the environment ranges from the construction of the port infrastructure to its operation [15]. Activities having the greatest impact on the marine environment include: discharge of ballast water; dredging and the disposal of dredged waste (spoil); physical damage to marine habitats by ships' hulls (e.g. grounding); use of antifouling paints; noise emissions; disposal of waste materials and sewage; oil spills from routine activities or accidental incidents [16].

In order to facilitate the Royal Caribbean's new mega-ships at the Falmouth Cruise Ship Pier, Jamaica, some thirty-five million (35,000,000) cubic feet of coral reef, and two square miles of mangroves was buried under the now pulverized reef material. Additionally, in order to accommodate the mega ships, the developers had to create a twenty chain-wide opening in an offshore barrier reef. Both living and dead coral were dredged, along with the rock substrate, after which the materials were taken inland by trucks to a two-square-mile dump site; situated on the outskirts of town that was once a thriving red mangrove swamp, to the demise of marine life [17].

Dredging is a port operations activity carried out so as to construct or maintain harbors, docks and channels. Dredged materials, or spoils, are either uncontaminated, if materials are dredged in areas remote from pollution sources, or contaminated if material is dredged from urbanized or industrial harbor in which there are heavy metals and a variety of organic compounds. The dredged materials are disposed of in one of three ways: on land; at or near the dredged site; or at sea. Therefore, there is no doubt that the impacts of dredging can affect the

environments of both the port and ocean. The potential impacts of dredging include: *“smothering seabed organisms; clogging fish and invertebrates’ gills; reducing the light available to plants; releasing nutrients and toxic trace metals from contaminated sediments; bio accumulating toxins from contaminated material in organisms and possibly the food chain; depleting dissolved oxygen in the water column; and reducing water quality”* [18].

Interestingly, it is said that even the enduring boom of the industry has a negative impact on the environment of the cruises themselves. The more people that go on a cruise, the more ships will be sailing on the seven seas, thus generating even more waste, and causing more damage. The cruise ships carry large numbers of humans, and this generates significant piles of waste for which there is not much space. The regulation of waste disposal at sea is limited, partly because the cruise industry is not subject to the same environmental standards as land based industries and because it is hard to control or enforce [19].

The average cruise ship produces the following immense amount of pollution every day: *“25,000 gallons of sewage from toilets; 143,000 gallons of sewage from sinks, galleys and showers; 7 tons of garbage and solid waste; 15 gallons of toxic chemicals; and 7,000 gallons of oily bilge water. These wastes, if not properly treated and disposed of, can be a significant source of pathogens, nutrients, and toxic substances with the potential to threaten human health and damage aquatic life. One simple example of the pervasive nature of this pollution is that a plastic bottle thrown overboard may take up to 400 years to break down, and during that time such pollution can move great distances and cause negative impact to marine life”* [20, 21].

Ballast water is critical to the safe and efficient operation of shipping, it provides balance and stability for the ships. The disposal of this water, pose a risk to the marine ecosystems as it results in the introduction of new marine species in other parts of the world. For example, in the 1980s, the disposal of ballast water in the Black Sea resulted in the introduction of new species such as zooplankton and fish-egg feeding comb jellyfish. Since then there has been dramatic changes in the pelagic system of the Black Sea, which impacted in a significant way the food chain, resulting in the collapse of commercial anchovy fisheries. The introduction of exotic marine species to the local marine environment, and the translocations of existing marine pests to new locations are major hazards associated with the discharge of contaminated ballast water. The establishment of exotic species can result in the alteration of an entire ecosystems and habitat and the extinction of indigenous species by predation or competition [22].

Cruise ships are insulated on the inside for noise and vibration. Unfortunately, there is no insulation on the outside, thus disrupting the communication and sonar of sea mammals. Research shows that the noise produced by ships can travel long distances, and marine species who may rely on sound for their orientation, communication, and feeding can be harmed by what is called sound pollution. Furthermore, wildlife collisions marine mammals, such as whales and manatees, risk being struck by ships, causing injury and death. *“For example, if a ship is traveling at a speed of only 15 knots, there is a 79 per cent chance of a collision being lethal to a whale”* [16].

A ship generally has a damaging impact on the oceans and its sea life. Ninety (90) countries worldwide have reported severe damage to their coral reefs due to anchorage, and sewage disposal. *“An anchor drop for just one day can destroy as much as 3100 square meters of coral reef. No doubt, it is extremely, necessary to maintain comfort and profit, while simultaneously decrease harm to coral reef. The cruise line has also impacted the air quality of the environment due to the fact that shipping has traditionally relied on heavy diesel fuels which result in the emission of significant quantities of pollutants. A large percentage of ocean liners run on giant diesel engines; this equipment,*

along with smaller auxiliary engines, can emit dangerous levels of Sulfur dioxide.” By curbing these emissions millions of premature, air pollution-related deaths could be prevented by 2020. This means that all players must take appropriate steps to minimize the emission of greenhouse gases and adapt to the potential impacts of climate change [23]. The world two largest ships (*Oasis of the Seas* and *Allure of the Seas*), have been touted by the Royal Caribbean International as environmentally friendly ships, yet they burn bunker fuel, which is the dirtiest and most dangerous fuel in the world. This is essentially a tar-like refinery by-product in which the non-combustible particles blacken the sky and pose a major health hazard to everyone within a hundred-mile radius [20]. In order to prevent the discharge of wastewater into the sea, governments or its agencies must enforce the guidelines for the discharging of waste by ships stopping at its ports as was outlined at the Ballast Water Management convention, adopted in 2004. A number of guidelines have been developed to facilitate the implementation of the Convention.

The Convention will require all ships to implement a Ballast Water and Sediments Management Plan. All ships will have to carry a Ballast Water Record Book and will be required to carry out ballast water management procedures to a given standard. Existing ships will be required to do the same, but after a phase-in period [3]. Additionally sustainable environment can be further enhanced if the appropriate government agencies enforce green practices in all operations relating to transport such as minimize consumption of non-renewable resources to the sustainable yield level, reuses and recycles its components [24].

2.4 Sustainable practices employed by the industry and its major cruise lines

Sustainability in the cruise industry is a result of making optimal use of environmental resources that constitute a key element in tourism development, maintaining essential ecological processes and helping to conserve natural heritage and biodiversity. The Sea Trade Insider made it absolutely clear that sustainable transport is recognized as one of the biggest challenges of the 21st century. Whilst shipping is relatively safe and clean, compared with other transport modes, the industry does have a significant impact on the environment. Within the last few decades several proactive efforts to encourage environmental management improvements within the shipping industry were successfully implemented (Sea Trade Insider, 2010) [25]. These have been referred to as sustainable or green shipping initiatives, which are diverse, but can be grouped as follows:

Research and Innovation - these are initiatives which aim to reduce or eliminate harmful environmental emissions. It includes investments into research aim to develop new technological design for safer and more sustainable ships. R and I initiatives are divided into high and low investment for specific solutions, that could be applied to many ships in order to reduce their negative environmental impact.

Corporate Social Responsibility (CSR) and Marketing – this area helps companies to integrate social and environmental concerns in their business operations and in their interaction with their stakeholders on a voluntary basis.

Awareness raising/environmental education initiative- this aims at encouraging environmental management improvements across the sector. Nonetheless, *Green* cruising might seem like an oxymoron for an industry that some say pays little attention to the natural resources that fuel its success, but it is indeed the path to achieve sustainability [25].

Green technologies such as solar panels, exhaust scrubber systems that help minimize emissions, advances in hull design that let ships cut through the water more efficiently, cooking oil conversion systems and energy efficient appliances are being incorporated into newly built ships and are also retrofitted into older

ones. It is further explained that some cruise lines also collaborate with nonprofit organizations and government agencies to collect data about the ocean's health and climate changes. Cruise lines continue to make important strides to improve their environmental policies. Some lines do so more extensively than others. Whereas, recycling, incinerating and waste-processing were cutting edge on cruise ships just over a decade ago, such processes today are basic and expected. The Carnival Cruise Line, Disney Cruise Line, and Royal Caribbean, for example, are some of the most popular lines that make attempts in achieving sustainability [25].

The carnival cruise line has made steps in achieving sustainability, by offloads a multitude of materials (plastic, glass, aluminum, scrap metal, cooking oil, petroleum oil, toner cartridges, electronics, refrigerants and photo processing liquids) from its ships for disposal on land. Ships process and incinerate solid waste onboard whenever possible or send it to an approved shore side facility for treatment, recycling or disposal. Even oily bilge water is subjected to its own three-step engineering process. Furniture, linens, small appliances, kitchenware and clothing are some of the two dozen items donated to charities instead of sent to landfills [24]. There has also been a shift in the cruise line usage of eco-friendly detergents for its linens and dry cleaning, and developing a new, energy-efficient and non-polluting engine for its newer ships. The larger Carnival Corporation (which incorporates Carnival Cruise Line along with brands like Holland America and Princess) has installed exhaust gas cleaning systems (EGCS) technology on 60 ships in its fleet as early as 2017; more than 85 vessels will be outfitted with EGCS by 2020. This exhaust gas cleaning technology utilizes a proprietary technology to remove the oxide of sulfur that come from combustion of fuels that have sulfur, is a win for the environment and a win for the company and the environment [25].

Carnival Cruise lines established a Health, Environment, Safety, Security & Sustainability Policy & Governance (HESSS). This policy drives the cruise lines commitment to environmental protection. Like other critical business matters in the cruise industry, assigning this policy and governance is of top priority to the cruise lines. Fuel is the primary source of energy consumed for ship propulsion and generation of on-board hotel power. *“As such Carnival Imagination, Carnival Inspiration and Carnival Miracle use shore-power technologies while in port in Long Beach, California. By connecting to the Port’s electrical grid, air emissions are managed and regulated under the emission control requirements at the power plant supplying it. Unfortunately to date only five ports worldwide are currently utilizing this practice and there are an additional three ports with shore power projects under construction”* [26].

In additional to onboard policies employed by the cruise line, crew members also undertake various sustainability initiatives. Carnival Cruise Line employees regularly attend training sessions relating to waste management while on board. In collaboration with the International Sea Keepers Society, Carnival Cruise has installed scientific devices on four of its ships mainly; Legend, Miracle, Spirit and Triumph). The aim of these devices is to monitor ocean water quality and other climatic information. The data generated by this practice are shared via satellite with Environmental groups, various governmental agencies and universities worldwide. The data provided by the cruise line are analyze by the various recipients in order to determine; ocean pollution, climate change and weather patterns. Carnival Vista is the cruise line's first ship to receive the ECO Notation designation from the maritime classification society Lloyd's Register, which recognizes that the Vista exceeds current maritime environmental regulations. Sustainability efforts have also been extended to the passengers. The cruise line participates in beach cleanups and other community programs through its affiliation with the Florida Caribbean Cruise Association [25]. Specially marked containers are placed strategically throughout each ship in the fleet in order to encourage recycling by cruisers. These designated

bins are located in areas such as; steward stations, galley, crew areas, room service, pantries and bar pantries in order to collect items of food, glass, aluminum and plastic products [26, 27].

“Disney Cruise Lines processed more than 1,900 tons of metal, glass, plastic and paper for recycling or reuse since 2014. All of the recyclables are separated and made ready for unloading in the ships garbage room. The Cruise Line used cooking oil from the galley which has been collected in special containers each week; and whenever the ship arrives in ports, the oil is taken to the backstage area and mixed, then used as fuel for small vehicles in the respective islands.” One hundred per cent of used cooking oil is offloaded and recycled each week, some of which is used to create biodiesel fuel for a fleet of vehicles in the Bahamas [25]. Other initiatives focus on energy, water-saving efforts and fuel efficiency [15]. Excess heat from power generators is rerouted to power evaporators that help turn seawater into drinkable water. Even the condensation from air-conditioning units is reclaimed and reused to wash the decks, saving more than thirty million gallons of freshwater each year. On Castaway Cay, which is a private Bahamian island owned by Disney, solar panels are used to heat water for their crew members residing there. The ships are also equipped to plug into shore power, whenever it's available in port [25]. Results depict that the utilization of renewable energy in logistics operations will reduce emissions, improve; the health of citizens, environment and economic growth [28].

All four ships used the service of onboard environmental officers who oversee shipboard recycling and waste minimization efforts. The officers also supervise shipboard environmental safety programs for crew. Furthermore, Disney encourages cruisers to help conserve water and energy by reusing bath towels, and to recycle with marked bins provided in staterooms and on deck. The line also shows a “Behind the Waves” video series that educates passengers on the line's various environmental practices and ways in which they can assist in helping those efforts during their voyage [24]. Passengers and crew members are asked to support the Disney Wildlife Conservation Fund, which provides support for the study of wildlife, protection of habitats, development of community conservation and education programs in critical global ecosystems. Additionally, the fund provides special grants to connect children with nature. The fund has raised an amount exceeding US\$45 million, which was used to support more than 330 nonprofit organizations in 115 countries worldwide [26, 27].

Royal Caribbean Cruise Lines has improved substantially its environmental performance. *“They qualified for both ISO14001 and ISO9001 certification, which established an environmental management plan. Ships also have environmental managers aboard and environmental training for all staff, requiring them to be able to explain the environmental policies to all guests”* [26]. The cruise line is currently using Dynamic Positioning on two of its vessels (*Oasis of the Sea, and Allure of the Sea*), which is a new alternative for anchors. *Oasis of the Seas*, which can accommodate 5400 passengers is powered by liquefied natural gas fueled engines. These engines are equipped with pollution scrubbers that completely eliminate all Sulfur emissions, cut nitrogen oxide emissions and CO₂ by more than 20%. It is one of the first cruise ship to have a large tropical park filled with thousands of plants and natural features [27].

The Royal Caribbean Cruises family, Royal Caribbean, Celebrity and Azamara participate in an above and beyond compliance policy, geared toward optimized environmental practices. This includes the Save the Waves Program, which, at its core, employs an advanced wastewater purification system that treats wastewater onboard to levels that regularly exceed international standards. The company recently introduced a line of designated sustainable shore excursions, in partnership with Sustainable Travel International, which highlight outings that emphasize

destination stewardship and sustainable tourism [24, 25]. Over the past five years, the major cruise lines have spent an average of US\$2 million dollars per ship in order to upgrade vessels with better systems for dealing with waste management and emissions. Decades ago, the cruise industry paid very little attention to the environment. Today cruise lines have made a 180 degree turn. They are now spending large amounts of time and money cleaning up their act, and in essence are helping to bring sustainable practices to a wider group of players in the travel industry [27, 29].

3. Conclusion

In investigating the impact of the cruise shipping industry, it is interesting to note that its educational value is immense. There are several theories relating to the sustainability of the marine environment. Nonetheless, this cannot be attained unless users of the marine ecology make it a top priority. The cruise industry provides an efficient global network for the supply chain. With that being said, we must be cognizant of the fact that there is a great need to strive toward sustainable development; that each dimension (social, economic and environmental) must work in unison. While the marine environment continues to play a vital role in our food security and coastal protection, the cruise ship industry must and in many cases have taken necessary mitigating steps to protect the environment on which it also depends. The operations of vessels and hence environmental sustainability are governed by international conventions such as:

- a. The International Maritime Organization – is the United Nations specialized agency with responsibility for the safety and security of shipping and the prevention of marine and atmospheric pollution by ships (IMO)
- b. The Law of the Sea Convention or the Law of the Sea treaty (UNCLOS)
- c. The international treaty for the prevention of pollution from ships, 1973, as modified in 1978 (MARPOL 73/78)

In the final analysis, this chapter gives a clearer understanding as to how the cruise shipping industry impact environmental sustainability. However, this chapter is limited to the fact that a larger per cent of the information garnered is over five years old. It is therefore, the desire of the researcher to pursue future studies in the area by the analysis of primary data. The outcomes of such study will assist policy/decision makers both public and private to establish and implement plans that will environmental sustainability a concern of the past.

Acknowledgements

I would like to say thanks to God Almighty for His physical and Spiritual strength. Thanks to my wife Juliet and daughter Kristen for their continuous support and to my final year students who assisted me with information.

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Author details

Kirkland Robert Anderson
Economics, Management and Finance, Caribbean Maritime University, Kingston
Jamaica, West Indies

*Address all correspondence to: kanderson@cmu.edu.jm

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References

- [1] Wind Rose Network. The cruise industry. Accessed 2017, <http://www.windrosenetwork.com/The-Cruise-Industry>.
- [2] Florida-Caribbean Cruise Association. Cruise Industry Overview. Accessed 2013, <http://www.f-cca.com/downloads/2013-cruise-industry-overview.pdf>.
- [3] International Maritime Organization. *International Convention for the Prevention of Pollution from Ships (MARPOL)*. Accessed 2017, [http://www.imo.org/en/about/conventions/listofconventions/pages/international-convention-for-the-prevention-of-pollution-from-ships-\(marpol\).aspx](http://www.imo.org/en/about/conventions/listofconventions/pages/international-convention-for-the-prevention-of-pollution-from-ships-(marpol).aspx)
- [4] Kairis, S. Ships' Garbage Management under Revised MARPOL Annex V. Officer of the Watch, 2017, <https://officerofthewatch.com/2012/11/07/ships-garbage-management-under-revised-marpol-annex-v/>
- [5] Karim, M. Prevention of Pollution of the Marine Environment from vessels: *The Potential and Limits of the International Maritime Organisation*. Ebook. Springe International Publishing, (20 15).
- [6] Dayioglu, S. (2010). Marine environment regulations on cruise ships: a special focus on the influence of EU candidacy of Turkey. Accessed 2010, <http://lup.lub.lu.se/luur/download?func=downloadFile&recordId=1698583&fileId=1698586>
- [7] Taryela, J. International Maritime Organization. *Slideshare.net*. Accessed 2016, <https://www.slideshare.net/jaytaryela/imo-its-org>
- [8] Baker, S. Sustainable development. Abingdon, Oxon: Routledge, (2016).
- [9] Hollweck, M. What is sustainability? *Slideshare.net*. Accessed 2017, https://www.slideshare.net/mariahollweck/what-is-sustainability?qid=e3baec5a-4c34-44cb-8135d77498efa4ba&v=&b=&from_search=1
- [10] Jenkins, W. Global ethics, Christian theology, and sustainability. *Worldviews: Global Religions, Culture, and Ecology*, 12, (2008). 197-217.
- [11] Florida-Caribbean Cruise Association. Cruise Industry Overview. Accessed 2013, <http://www.f-cca.com/downloads/2018-cruise-industry-overview.pdf>
- [12] Aguirre, S., & Brida, J. The impacts of the cruise industry on tourism destinations. Accessed 2008, <https://pdfs.semanticscholar.org/3c1e/6bbd22d8456b609954658b26e6d70fcdb6f.pdf>
- [13] Florida-Caribbean Cruise Association. Cruise Industry Overview. Accessed 2018, <http://www.f-cca.com/downloads/2018-cruise-industry-overview.pdf>
- [14] Arshian, Sharif. "Revisiting the role of tourism and globalization in environmental degradation in China: Fresh insights from the quantile ARDL approach." *Journal of Cleaner Production* 272, (2020, November 1): 1-28. Accessed 2020, <https://www.sciencedirect.com/science/article/abs/pii/S0959652620329516>
- [15] Ferretti, K. Cruise presentation. *Slideshare.net*. Accessed 2016, https://www.slideshare.net/CarlaNicoleFerretti/cruise-presentation?qid=6216c349-d3bb-468da094-d6917874f363&v=&b=&from_search=3
- [16] Roberts, J. *Marine environment protection and biodiversity conservation*. Berlin: Springer, (2007).

- [17] Behar, M. Can the cruise industry clean up its act? *On Earth*, (34), 1-2. Accessed 2012, <http://archive.oneyearth.org/article/dreamboat?page=1>
- [18] Obrien, J. The Impact of Shipping. Accessed 2001, <https://www.environment.gov.au/system/files/resources/8453a2da-8717-40f88ce7636ae3ec64cf/files/impacts-shipping.pdf>
- [19] Walker, J. Royal Caribbean's new port in Falmouth, Jamaica - At what cost to the environment? *Jim Walker Cruise Law News*. Accessed 2012, <http://www.cruiselawnews.com/2012/07/articles/pollution-1/royal-caribbeans-new-port-in-falmouth-jamaica-at-what-cost-to-the-environment/>
- [20] Desai, K. (2011, November 30). Sea can be protected from ship garbage. *The Observer*. Accessed November 30, 2011, http://www.jamaicaobserver.com/Sea-can-be-protected-from-ship-garbage_10283291
- [21] Elks, J. Disney Scores the Only 'A' on Cruise Industry Environmental Report Card |Sustainable Brands. *Sustainablebrands.com*. Accessed 2013, http://www.sustainablebrands.com/news_and_views/communications/jenniferelks/disney-scores-only-cruise-industry-environmental-report-
- [22] Bullock, J., & Manchester, S. (2000). The impacts of non-native species on UK biodiversity and the effectiveness of control. *Journal of Applied Ecology*, 37(5), (2000), 845-864. <http://dx.doi.org/10.1046/j.1365-2664.2000.00538.x>
- [23] Moodie, A. How environmentally friendly is your cruise holiday? *The Guardian*. Accessed April 21, 2017, from <https://www.theguardian.com/sustainable-business/2016/jun/12/cruise-ships-environment-ocean-liners-emissions-waste>
- [24] Syed Abdul Rehman Klan et al. "Is tourism really affected by logistical operations and environmental degradation? An empirical study from the perspective of Thailand." *Journal of Cleaner Production* 227, (2019, August 1): 158-166. Accessed 2019, <https://www.sciencedirect.com/science/article/abs/pii/S0959652619312442>
- [25] Seatrade Insider. CLIA issues environmental. *Seatrader Insider News*. Accessed 2010, <http://www.cruisecommunity.com>
- [26] Garay, E. & Paloti, M. Green Cruising - Cruise Critic. *Cruisecritic.com*. Accessed 2018, <http://www.cruisecritic.com/articles.cfm?ID=528>
- [27] Attamante, T. Eco sustainability: Coral Reef & Cruise Ships. Accessed 2012, <https://www.youtube.com/watch?v=MGkAxrR8k14>
- [28] Syed Abdul Rehman Klan et al. "Measuring the impact of renewable energy, public health expenditure, logistics, and environmental performance on sustainable economic growth." *Sustainable Development* 28, (4) (2020, August/July): 833-843. Accessed 2020, <https://onlinelibrary.wiley.com/doi/abs/10.1002/sd.2034>
- [29] Underwood, K. 7 Ocean-friendly eco cruises hitting the high seas. *TreeHugger*. Accessed 2009, <https://www.treehugger.com/natural-sciences/7ocean-friendly-eco-cruises-hitting-the-high-seas.html>