

What Price Luxury? Ethical Issues in the Cruise Ship Industry

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Introduction

When Carnival Corporation's *Costa Concordia* foundered on rocks near the tiny Italian island of Giglio in 2012, the world was aghast that a ship with such sophisticated navigational devices could run aground in an area so highly charted. Surprise turned to anger when subsequent investigations revealed that the fault lay with a captain who was navigating by sight and grandstanding to impress passengers. And anger turned to outrage when courtroom testimony exposed the captain's ubiquitous lies and abrogation of his duties as master of his ship, resulting in the loss of 32 passengers and crew members.

For an ethics instructor, such occurrences are serendipitous and translate into teachable moments. Using the *Costa Concordia* as a case study, this paper examines the main environmental ethics issues associated with the cruise ship industry, which is exploding internationally at a remarkable rate. Hundreds of cruise ships ply the world's waters, discharging raw sewage and other waste streams directly into the oceans; they burn a crude fuel that emits millions of tons of sulphur into the atmosphere daily, and companies register their vessels in third-world countries to avoid environmental restrictions and tax obligations. Specifically, this paper examines the *Costa Concordia* incident as an illustration for the information to follow: questionable registration practices; pollution issues; and integration in technical classes, specifically, the field of environmental engineering.

Background

Interest in the environmental effects of the cruise ship industry is relatively a recent, dating back about 20 years, which corresponds to the physical growth of the ships and the explosion of consumers in search of exotic vacations. Between 1980 and 2013, the number of passengers increased from 1.4 million to 21.5 million,^{1,2} with an estimated 24 million to sail in 2016.¹ Consequently, the size of ships has increased to accommodate higher passenger loads: in 1995, Royal Caribbean's *Grandeur of the Seas* measured 915 feet (slightly longer than the *Titanic*), weighed 74,000 gross tons, and carried 3,206 passengers; by 2009, the line's *Oasis of the Seas* measured 1,181 feet, weighed 148,548 gross tons, and could accommodate 7,500.² The newest cruise ships have a population the size of small cities: Royal Caribbean's *Allure of the Seas* measures 1,187 feet, weighs in at a hefty 225,282 gross tons, and can carry 6,318 guests and 2,384 crew members; it features a zip line, two 43-foot climbing walls, 25 restaurants, several casinos, the first floating Starbucks, and a full-sized theatre capable of maintaining a Broadway-style production.³

It's not rocket science to realize that more than 8,500 people flushing a toilet just once a day will produce an appalling amount of black water during a week-long cruise. Indeed, overall waste statistics are shocking; according to Commoy et al., an average 5,000-person cruise ship in 2005 produced the following during a one-week trip:

Wastewater	Black	262,500 gallons
	Grey	2,275,000 gallons
Solid waste		70 tons
Hazardous waste	Liquid	393 gallons
	Solid	227 pounds ⁴

Waste streams from larger ships and longer trips will increase correspondingly, all of which amounts to an almost unimaginable volume of waste being dumped into the world's waterways.

Since 2000, numerous studies released by such organizations as the Environmental Protection Agency, the Sustainable Accounting Standards Board, and several industry watchdog groups (e.g., Friends of the Earth, Oceana) have revealed the cruise industry's dirty little secret: although it represents but a sliver of all ocean-going traffic, it accounts for 25% of all marine pollution.⁵

The loss of Carnival's behemoth *Costa Concordia* brought the issue to the forefront of public attention: beached on rocks guarding Giglio, the ship lay for two years in a pristine marine reserve, Europe's largest "maritime sanctuary,"⁶ raising public and scientific concern about a potential environmental catastrophe.

***Costa Concordia* Incident**

The grounding of the *Costa Concordia* provides an apt illustration of both human error and the potential of significant environmental harm to a biologically sensitive marine area. By 11:45 p.m. on January 13, 2012, the enormous ship—Europe's largest cruise liner in 2006⁷—lay on its side, mortally wounded, with 3,784 passengers and 1,023 crew members floundering about inside.⁸

The Carnival Corporation, founded in 1972 as Carnival Cruise Lines, is the world's largest cruise ship business and dominates the market, with such recognizable lines as Cunard, Holland America, and Princess; it operates more than 100 vessels worldwide.⁹ Its mission, as stated on its website, is "to take the world on vacation . . . at an outstanding value unrivaled on land or at sea,"⁹ and its ships are lavishly equipped with every amenity imaginable.¹⁰

For a week-long hop around the Mediterranean, a ship the size of the *Costa Concordia* would be well-stocked to equip its 5 restaurants and 13 bars:¹¹

- 24,000 lbs. of fish
- 5,500 lbs. of cheese
- 1,500 gallons of ice cream
- 24,000 lbs. of pasta
- 2,000 lbs. of onions
- 2,000 pots of jam
- 18,000 bottles of wine
- 22,000 cans of Coke
- 10 bottles of communion wine¹²
- 17,000 lbs. of raw beef
- 11,000 eggs
- 815 lbs. of rabbit meat
- 2,346 hot dog buns
- 1,000 gallons of milk
- 17,000 teabags
- 1,000 bottles of olive oil
- 46,000 mini-bottles of spirits

The route followed was one established in 2006, departing Rome's port city of Civitavecchia, with stops in various Mediterranean ports: Savona, Marseille, Barcelona, Palma de Mallorca, Caligari, and Palermo.¹¹

All sorts of incidents regularly occur on cruise ships; they experience the same types of events as the small cities they resemble. Internationally, in 2015 there were more than 400 reported events, with an unknown number unreported, ranging from canceled/delayed cruises, illness, assault and robbery, to the very strange case of blood pouring down through an elevator.¹³

The *Costa Concordia* grounding was not the first accident involving a Carnival ship. In addition to a number of events that the company is not responsible for, such as sexual assault, robbery, illness, and passengers falling or jumping overboard, Carnival liners have experienced a rather alarming number of physical incidents over the past few years; these include concerns with propulsion systems, engine trouble, electrical and water outages, fires, and several notable collisions. In 2009, for example, the *Legend*, carrying more than 2,000 passengers,¹⁴ suffered considerable damage in Cozumel when high winds pushed it into the Royal Caribbean's *Enchantment*. Two collisions occurred in 2010: the *Classica*, a smaller ship with 624 cabins,¹⁴ hit a Belgian freighter on the Yangtze River, carving a 60-foot gash in the side of the ship and injuring several passengers; and, later that year, the *Europa*, with a passenger capacity of 2,516,¹⁴ was docking in an Egyptian port during a storm when it rammed a pier, killing three crew members and injuring three passengers. The following year, two collisions between Carnival liners and loaded fuel barges resulted in minimal damage, although the potential for catastrophe was certainly present.^{15, 16}

The 2012 *Concordia* incident is the line's largest and the only one involving appreciable loss of life. It occurred just three hours into the first leg of a week-long jaunt around the Mediterranean, prior to the mandatory lifeboat drill. According to news reports, the ship left the Italian port of Civitavecchia at 6:18 p.m., enroute to Savona, Italy. About two and one-half hours later, it veered towards Giglio, as the captain wanted to "salute" the home of a colleague, apparently a common cultural gesture. At 9:45, the ship hit rocks overlooked by the captain, who was navigating by sight rather than instruments, tearing a 160-foot gash in the hull below the portside waterline, and the ship began to list 7° to port. The lights winked out, and a PA announcement warned passengers about the blackout. Three compartments were confirmed as flooded.^{17, 18, 19}

From that point on, the captain actively employed lying and deception: he reported the situation to Costa operations center but indicated only two compartments as flooded; Civitavecchia search-and-rescue personnel contacted the ship but received only information about the blackout, not the accident. Shortly after 10 p.m., the ship began to drift towards the island, reversing its earlier movement into open water, and a second PA announcement ordered passengers to their lifeboat stations. At 10:33, a general emergency was announced, and lifeboat launching commenced at 10:55, with the order of "abandon ship"—an hour after the initial collision. Twenty minutes later, Captain Schettino left the bridge and was later caught on video, nattily dressed and stepping into a lifeboat. By then, the ship was listing to an irrecoverable 45°; less than an hour later, it increased to 80°.^{17, 18, 19}

Sometime after his departure, Schettino engaged in a heated, hour-long exchange with a furious Italian Coast Guard commander, Gregorio del Falco, blatantly and repeatedly defying orders to re-board the ship and direct the evacuation; according to the transcript, del Falco shouted at one point, “You go aboard: That’s an order. Don’t make any more excuses. You declared abandon ship, now I’m in charge. You go aboard. Is that clear?”²⁰

Inside the overturned ship, chaos reigned, although for more than an hour, both the PA system and crew repeatedly reassured passengers that the problem was limited to the electrical system and that “everything was under control.”²¹ Some passengers were eating dinner when the accident occurred: Joan Fleser, New York, recalls, “I immediately felt the ship list severely to port. Dishes went flying. Waiters went flying all over. Glasses were flying. Exactly like the scene in *Titanic*.” Following their intuition, many passengers hurried to their lifeboat stations rather than obey the crew members’ advice to return to their cabins. They waited another hour for the boats to be released, but by then, the 20° list to port made launching difficult; some passengers simply jumped overboard and swam to shore. When the ship began to roll, it “fell gently,” according to the ship’s doctor.²¹

As the ship settled on its side, hundreds of panicked passengers were still trapped inside. Ian and Janice Donoff, on their honeymoon cruise, managed to board a lifeboat but were removed due to the severe list. Interviewed by the media after the accident, Ian said, “There was this mad scramble for a ladder. People got crushed, pushed and goodness knows what—it was like a free for all.” They finally left the ship at 4:30 a.m., a six-hour ordeal.²² Passenger Sandra Rogers lamented the lack of civility: “There was no ‘women and children first’ policy. There were big men, crew members, pushing their way past us to get into the lifeboats. It was disgusting.”²³ Evacuation was finally completed at 6:41 a.m., with a number of passengers unaccounted for.^{17, 18, 19}

Considering the chaotic conditions within the ship and the leadership vacuum, it is remarkable that only 32 lost their lives. The last victim, waiter Russel Rebello, whose body lay crushed beneath overturned furniture on deck 8, was retrieved in November 2014 during salvage operations and returned to his family in Mumbai.²⁴

After the grounding, other dramas began unfolding. First, investigators discovered various discrepancies in the captain’s story of that evening, which contradicted audio evidence from the bridge black box and aroused public ire. The press labelled Schettino as “Captain Coward”²⁵ and “the cringing chicken of the sea”;²⁶ the public expressed its wrath by flaunting tee-shirts emblazoned with de Falco’s final warning: “Vado a bordo, cazzo” (“Get back on board, for f---’s sake”).²⁷ After trials lasting nearly two years, Schettino was sentenced to 16 years in prison, convicted of manslaughter, causing a maritime disaster, and leaving his ship.²⁸

Meanwhile, the carcass of the *Costa Concordia* lay moldering in the seabed of Tuscan Archipelago National Park. While 2,400 tons of engine fuel and oil were removed within months after the incident, the foodstuffs, chemicals (including paint and insecticides), restaurant equipment, mattresses, and all matter of other items “[swirled] around in a giant stew of debris,”²⁹ and divers who entered the wreck weeks after the accident, looking for victims’ bodies, dubbed it a “‘toxic stew’ of spilled oil, rotting food and floating tableware”³⁰

Two years after the incident, the *Costa Concordia* was finally removed and towed to a pier in Genoa. Safeguards, such as a floating skirt, proved to be effective in containing potential pollutants, quelling environmentalists' fears that the 29,000 cubic meters of contaminants could foul surrounding waters.²⁹ The dismantling process will occur in four phases lasting 22 months, with stripping of the interior slated for Phase 4, including removal of tons of foodstuffs.³¹

Although the ship is gone, vestiges remain in the form of pilings and platforms. Nearly 30,000 bags of concrete and grout were used to create a foundation for a stabilizing cradle, to prevent even more damage to the fragile environment.³² After the removal, rather than tearing out these structures, the island's residents have petitioned the Italian government to preserve the platforms as "an artificial reef and underwater memorial for the 32 passengers and crew who lost their lives in the shipwreck."³³

Ironically, the loss of the *Costa Concordia* occurred just three months prior to the centenary of the *Titanic* disaster. As Schröder-Hinrichs et al. note, while marine technologies have vastly improved since 1912, the two accidents happened for many of the same organizational and operational reasons, including the following: human factors, captains who were experienced and "aware of the potential dangers" but nevertheless felt in control; management approval of favoring "performance over safety"; decision-making practices and distribution of authority; and a resistance "to revise their initial assessments in response to new evidence."³⁴ And, like its predecessor, the *Concordia* event raises a number of ethical issues. The remainder of this paper examines those concerns related to environmental factors.

Registration Practices

Like many cruise lines, Carnival, headquartered in Miami, registers under a flag of convenience (FOC), "a practice that allows companies to flag their ships from countries other than the location of ownership."³⁵ According to Caitlyn Burke, University of Florida, registration in foreign lands allows US-based shipping companies to skirt US taxes and labor laws (2014), and, by extension, any restrictive environmental regulations.³⁶ "Cruise companies," notes industry critic Elizabeth Becker, "register and flag their ships wherever it [is] best for their bottom line."³⁷

Most cruise lines register in the Bahamas, Panama, and Bermuda. Only one ship, Norwegian Cruise Lines' *Pride of America*, is registered in the US and only because its routes are limited to Hawaii.³⁸ Under an FOC, ships are subject to the rules and regulations of the state of registry, not necessarily the laws of the country in which it is headquartered. This can result in an exploitation of labor³⁵ and an increase in acceptable pollution risks: according to maritime industry critic Arthur Miller, "FOC ships make up two-thirds of all ocean pollution case cited by the U.S. Coast Guard [which is responsible for enforcing pollution laws within the three-mile US nautical limit]. In one year the U.S. Coast Guard cited 78 cases of ship pollution from Panama FOC ships; only 18 were investigated by Panama and 10 were fined."³⁹

Registering in the Bahamas⁴⁰ allows Carnival to hire inexpensive labor from India, Indonesia, and The Philippines; some 38 different nationalities were represented on the *Costa Concordia*,⁴¹ prompting an Italian newspaper to refer to the ship as the "Babel at sea";²⁹ crew members struggled to understand each other and the captain. As Squires notes, lack of a common language

may have contributed to the confusion regarding evacuation procedures.²⁹

Pollution Issues

A more serious ethical consideration is the substantial environmental pollution wrought by cruise ships. Although several US states (Alaska, Maine, Washington, and California) have restricted discharges within their coastlines and the International Maritime Organization (IMO) forbids dumping of plastics in oceans, there is currently no comprehensive international plan for dealing with what is becoming an increasingly vexing problem. “Beyond three nautical miles, there are very, very few rules,” notes a *Seattle Times* story.⁴² Cruise ships are exempted from the Clean Water Act,⁴³ and even the MARPOL Annexes (International Convention for the Prevention of Pollution from Ships), which attempt to control unrestricted discharges within four miles of a coastline, allow for dumping in the open seas; in addition, the most current Annex amendments date from 2012, and ships have greatly increased in size in the past few years.⁴⁴ Indeed, most legislation is outdated, occurring before the current explosion of the cruise ship trade.

Another reason for lax regulations may involve the amount of money that a cruise ship visit infuses into local and regional economies; ports of call may be reluctant to enforce strict environmental regulations for fear of losing these very lucrative visits. According to Australian researchers Dwyer, Douglas, and Livaic, one cruise ship visit to Cairns, Queensland, in 2004 injected \$243,000 (\$342,000 in 2016 dollars) into the town’s coffers;⁴⁵ the 125 trips that year resulted in additional income of more than \$30 million, or nearly \$43 million in 2016 dollars. A more recent (2014) study investigating ports of call in the Vanuatu Islands, South Pacific, indicates an economic boon of \$35.5 million.⁴⁶ Domestically, cities on cruise tours benefit from even short visits: in Charleston, South Carolina, tourist ships in 2010 accounted for nearly \$37 million and supported 407 full-time jobs.⁴⁷

Despite the obvious financial incentive, some cities, such as Charleston, are reconsidering their perspective on the environmental impact of cruise ship visits. As Cyrus Buffum, Charleston representative of the Waterkeeper Alliance (a group that advocates internationally for clean water)⁴⁸ explains, “We have an opportunity to put out the welcome mat for this industry, but also to mandate that they better wipe their feet before they come in.”⁴⁷

Marine Pollution

According to Memorial University, Newfoundland, professor Ross Klein, who has widely published in the area of the cruise industry’s environmental impact, cruise ships contribute six distinct waste streams to the world’s waterways (Table 1).

Discharging any of the items listed in Table 1 has negative effects on the environment, marine life, and people. Coral reefs, for example, are being damaged or destroyed by sewage discharges and ship anchors. Carnival, in fact, was fined \$100,000 in 2015 for destroying more than 1,000 square meters of live coral in the Cayman Islands, due to an errant anchor drop. While the amount of the fine seems significant, it will take an estimated 60 years for the area to recover.⁴⁹ Fragile marine environments can also be damaged by the release of ballast water, some 21 billions gallons a year, according to a NOAA report,⁵⁰ transporting about 10,000 species daily.

Table 1. Cruise ship waste streams* ⁴³

Type	Composition	Amount (per week)**
Black water	Sewage, sewage sludge, medical wastes	328,000 gallons
Graywater	“Wastewater from sinks, showers, galleys, laundry, cleaning agents”	350,000 gallons
Solid waste (non-hazardous)	Passenger waste: “plastic, paper, wood, cardboard, food waste, cans, glass”	8 tons
Solid waste (hazardous)	“Photo processing chemicals, dry cleaning waste, used paint, solvents, heavy metals, expired chemicals and pharmaceuticals, waste from the print shop, hydrocarbons and chlorinated hydrocarbons, used fluorescent and mercury vapor light bulbs, and batteries”	264 gallons
Oily bilge water	“Fuel, oil, wastewater from machinery; may also include solid wastes such as rags, metal shavings, paint, glass, and cleaning agents”	25,000 gallons
Ballast water	“Plants, animals, viruses and bacteria”; invasive species	Variable

* Adapted from text information

** “Amount” is based on a 3,000-passenger cruise ship, such as the Royal Caribbean’s *Explorer of the Seas*.

While many of these tiny stowaways die due to unsuitable conditions in their new homes, others flourish, wreaking havoc on indigenous species. Some are even dangerous to humans, such as the bacteria responsible for cholera or the Chinese mitten crab that is host to liver flukes. As Bax et al. note, invasive species can also cause social and economic disruptions in fisheries and aquaculture facilities.⁵¹

Discharging black and graywater threatens all life forms, marine and human. Although some ships treat their sewage with marine sanitation devices, this is a minimally effective older technology, dating to the 1970s.⁵² Even after treatment, the remains contain “significant amounts of fecal bacteria, heavy metals, and nutrients in excess of federal water quality standards.”⁵³ Black water concentrates in shellfish and can sicken humans; it can also cause algal blooms, resulting in fish kills.⁴

Graywater is typically untreated, even though it contains “fecal coliform bacteria, detergents, oil and grease, metals, organics, petroleum hydrocarbons, nutrients, food waste and medical and

dental waste.”⁵⁴ The IMO has indicated that graywater, with its high levels of contaminants, “may pose greater threats to public health” than sewage.⁴ Other than filtering graywater to separate out plastics, many ships directly discharge it.

Of the waste streams listed in Table I, non-hazardous solid waste receives the most attention; workers sort out recyclables and store them for disposal at the next port. The rest is typically incinerated or ground up and the residue dumped at sea.^{55, 56} Although this sounds like cruise lines are responsibly dealing with the tons of solid waste generated each day, just last September MSC Cruises was fined \$635,000 for dumping garbage bags along a stretch of Brazilian coastline.⁵⁷ And if the ash includes incinerated plastic packaging, it may contain dioxin by-products, which could have “catastrophic effects,” especially if introduced into relatively closed systems, such as the Adriatic.⁵⁸

Treatment of hazardous waste, which may carry carcinogens, is controlled by in the US by the Resource Conservation and Recovery Act.⁴³ However, it is unclear which provisions pertain to cruise ships. Internationally, the IMO has developed a series of guidelines, including incineration of hazardous wastes or storage for disposal at port, and has called for voluntary compliance. However, notes an Ocean Conservancy report, “effectiveness of these procedures are hard to measure,”⁵⁹ and holding wastes for onshore disposal sounds promising but only, as Klein states, “when the itinerary includes a port with reception facilities.”⁶⁰

Oily bilge water is another common, and prolific, by-product of the cruise ship industry; it collects in the bottom of the ship and may contain “various oxygen-demanding substances, volatile organic compounds, semi-volatile organics, soaps, detergents, solvents, dispersants and degreasers.”⁶¹ Current regulations require the use of an oil-water separator and limit discharges within the three-mile nautical limit to 15 ppm oil content; beyond that, discharges are allowed up to 100 ppm. However, as John Papparone notes, assessing an OWS’s efficacy is challenging,⁶¹ and many “fail to produce satisfactory results.”⁶² The units are also very expensive, up to \$750,000 apiece.⁶³ Furthermore, a 2013 California task force investigating the issue concluded that in bilge water containing cleaning solvents, the solvents are not separated out and are “routinely discharged with liquids into the ocean.”⁶¹

As the world witnessed during the 1989 Exxon Valdez oil spill in Alaska’s pristine Prince William Sound, oil residues have devastating effects on all forms of marine life. Commoy et al. explain, “marine mammals can develop gastrointestinal tract hemorrhaging, renal failure, liver toxicity, and blood disorders. . . . They can develop skin and eye lesions and their swimming ability may be inhibited. . . .”⁴ Oil settling on seabirds and otters causes feathers to lose their water repellent qualities and fur its insulating properties, which may result in hyperthermia. “Adult fish,” according to NOAA, “may experience reduced growth, enlarged livers, changes in heart and respiration rates, fin erosion, and reproduction impairment.”⁶⁴

Overall, the shipping industry, including cruise ships, releases 100 million gallons of various oil-based products in the world’s oceans annually, which is nearly “10x the volume of oil” in the Exxon Valdez incident.⁶⁵ One creative company even engineered a solution to the bilge water dilemma by installing an illegal bypass pipe, to pump the water around the OWS and into the sea.⁶⁶

Air Pollution

In addition to fouling the water, cruise ships also release an appalling amount of pollutants into the air, both during cruises and when they are docked in port. Large vessels, including cruise ships, burn bunker fuel, an inexpensive “viscous, bottom-of-the-barrel residue of petroleum distillation”⁶⁷ that emits “a trail of potentially lethal chemicals” responsible for an estimated 64,000 deaths worldwide in 2009. In Britain alone, 2,000 died that year from “funnel fumes,” with one million deaths worldwide predicted by 2018.⁶⁸

In one day, a cruise ship emits as much sulphur dioxide as 13 million cars and as much soot as one million vehicles; 16 ships emit the equivalent of the entire world’s fleet of cars.⁶⁸ Other chemicals released include “nitrogen oxides, sulphur oxide, carbon dioxide and diesel particulate matter”;⁶⁹ the latter is particularly damaging to human respiratory systems. Emissions continue while ships are berthed, unless they take advantage of “cold ironing,” which allows the ship to plug into shore-side power and turn off auxiliary engines that supply the ship’s electrical needs. It comes with substantial costs, however, including retrofitting the ship, renovating shore infrastructure, transporting the power, and ensuring frequency compatibility.⁷⁰ In 2011, for example, the Port of Seattle partnered with Princess Cruises and Holland America to implement cold ironing for five vessels. For a total cost of \$7.5 million, emissions were reduced by 29% per call.⁷¹

With the exception of ships in port, there is little regulation of sulphur content, as shipping and aviation industries are exempt from the Kyoto Protocol, and the International Maritime Organization is more of an advisory, rather than enforcement, body.⁶⁸ A hopeful sign emerged in 2013, as Carnival agreed to install scrubbers and filters to reduce emissions while berthed in US ports, a move that cost the line \$180 million to outfit 32 ships.⁷²

While both of these solutions come with large price tags, it would seem that the companies could afford to implement one or the other: in 2014, Carnival recorded profits of nearly \$16 billion, Royal Caribbean profits were \$8.07 billion, and MSC garnered \$1.65 billion.⁷³

Classroom Usage

Creative instructors can develop a number of activities involving the ethics of the cruise ship industry. Several examples are detailed below:

Solutions

Having students research potential solutions to the problem of cruise ship pollution is very fruitful, as many of these are technological in nature and would appeal to students in environmental and mechanical engineering classes. For example, looking at current problems with oil-water separators and examining alternatives allows students to apply both their mechanical knowledge and their critical-thinking skills in determining viable options. And asking students to research the effectiveness of aerated waste treatment systems to deal with the enormous issue of sewage will help impress upon them the necessity of keeping oceans clean and

therefore increasing awareness of public health issues that ensue from dumping untreated or minimally treat human waste into the oceans.

While the newest liners are equipped with more eco-friendly technology (with environmental officers to monitor it), some “40% of the fleet plying the waters today are older vessels with 35 year old waste-treatment systems.”⁷⁴ Currently, cruise ships dump a total of 1 **billion** gallons of sewage annually.⁷⁵ GIGO, as the saying goes.

To engage students in other engineering majors, having them examine chemical remedies for oily bilge water is an eye-opening experience. Biodispersion, for example, is a very viable solution for oil. These products are, as Ganti and Wille note, non-corrosive, non-toxic, residue-free, effective, and environmentally safe.”⁶³ They are also apparently not used.

Legislation and Enforcement

The area of regulation is also a topic where young minds can fruitfully wander. Why, students ask, are cruise ships allowed to do what they do? Where is the international plan to protect our oceans? Why does regulatory authority end at territorial boundaries? Introducing current practices regarding plastics is an interesting—and very timely—starting point.

As noted before, the only item forbidden for ocean disposal is plastics—the entire world has agreed to this. However, as the great garbage patches in the Pacific Ocean evidence, this prohibition is obviously not being followed or enforced. Furthermore, a report released in January by the World Economic Forum indicates that the ocean is taking in plastic at an alarming rate: to date, some 150 million metric tons are floating around, and annually, “8 million tonnes of plastics leak into the ocean—which is equivalent to dumping the contents of one garbage truck into the ocean every minute. If no action is taken, this is expected to increase to two per minute by 2030 and four per minute by 2050. Estimates suggest that plastic packaging represents the major share of this leakage.”⁷⁶ By that year—during the lifetimes of our students—the weight of plastics in the ocean will exceed that of fish, a truly disturbing scenario.

Codes of Ethics

Another illuminating exercise is to ask students to examine corporate codes of ethics and compare them with actual performance. A portion of Carnival’s code states,

We are committed to using environmentally sound practices to ensure protection of the surrounding environment. Environmental regulations may include rules governing the use, control, transportation, storage and disposal of regulated materials that may reach the environment as a part of wastewater, air emissions, solid waste or hazardous waste. Even non-regulated materials must be managed in a responsible and sustainable manner, as many of these materials can also have adverse environmental impacts if mishandled.⁷⁷

This statement applies to employees of all Carnival lines: Holland America, Princess Cruises, Seabourn, Cunard, P&O Cruises, Aida, Costa, P&O Australia, and Fathom. This amounts to about 3,500 shore workers and another 28,000 on cruise ships.⁷⁸ If all Carnival employees

adhere to the corporate code of ethics, why is the situation reaching a crisis point? Why can passengers shoot video footage, now posted on YouTube, of crew members actively dumping trash within the three-mile nautical limit, as occurred in Brazil?⁷⁹ Apparently, actions contradict words.

In addition, Carnival is a member of the Cruise Line International Association (CLIA), which pledges its members to follow “best practices” in waste management, “in accordance with sound environmental principles and in compliance with all regulatory requirements.”⁸⁰ CLIA members include some 62 different cruise lines, 275 executive partners, 20,000 travel agencies internationally, and more than 30,000 travel agents.⁸¹

In examining just the ethics statements, it would appear that Carnival is attending to appropriate environmental stewardship. A look at past performance, however, indicates that actions do not support the elevated rhetoric: the company is still accruing violations (four between 2010 and 2013 for water quality violations in Alaska). Prior to that time, Carnival ships received nearly 70 citations for environmental violations, including water pollution, air pollution, and filing false audit reports.⁸² In 2013, Princess ships alone received 29 wastewater citations in Alaska.⁸³

Annually, Friends of the Earth, an environmental advocacy group, issues a performance report card of 16 cruise ship companies, focusing on four criteria: “sewage treatment, air pollution reduction, water quality compliance, and transparency.” In 2014, Disney Cruise Lines rose to the top of the list, with an overall performance of C+. However, the largest companies, Carnival and Royal Caribbean, both received Ds. All companies received Fs for transparency, indicating the degree of difficulty FOE experienced in obtaining information regarding the other criteria.⁸⁴

As Klein suggests, the cruise ship industry values profits over environmental principles and sustainability: “They have been adept at avoiding legislation and regulations. . . by significant spending on lobbyists in Washington, DC.”⁸⁵ In doing so, they directly contribute to the degradation of the sea and the air. Carnival ads promise vacations out of the ordinary, “fun for all, all for fun,” and sell the allure of a pristine paradise with the latest “Come to the sea” campaign.⁸⁶ What the company delivers to the environment, however, is filth.

Conclusions

With the successful retrieval of the *Costa Concordia*, the Mediterranean and environs dodged a bullet. But what if the hull had ruptured further? Or if the lifting devices failed? Or if the ship slipped off of the narrow shelf it was lying on and into deeper water? The damage to the delicate archipelago ecosystem would have been substantial, affecting birds, larger marine animals (dolphins, whales, and the very rare monk seal), and exotic corals and plants.⁸⁷

“The future of the cruise industry,” notes the Windrose website, “depends on and is inextricably linked to environmental performance and compliance.”⁸⁸ Cruise ship companies that foul their own nests are damaging their reputations, the marine environment, and, ultimately, the public health in pursuit of almost obscene profits. And collateral damage wreaked on ports of call, laments Elizabeth Becker of *The Saturday Evening Post*, is turning quaint areas into “strip malls.

St. Mark's Square in Venice is now a field of kiosks selling cheap imports and lines of tourists waiting to visit the basilica.”⁸⁹

Engineering students can benefit from studying this rather exotic form of pollution by learning the important role that technology can play in safeguarding our fragile environment. Indeed, that role is written into the engineering ethics canons: “Engineers should be committed to improving the environment by adherence to the principles of sustainable development so as to enhance the quality of life of the general public.”⁹⁰ In other words, practicing responsible stewardship of the planet's oceans is a moral imperative.

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