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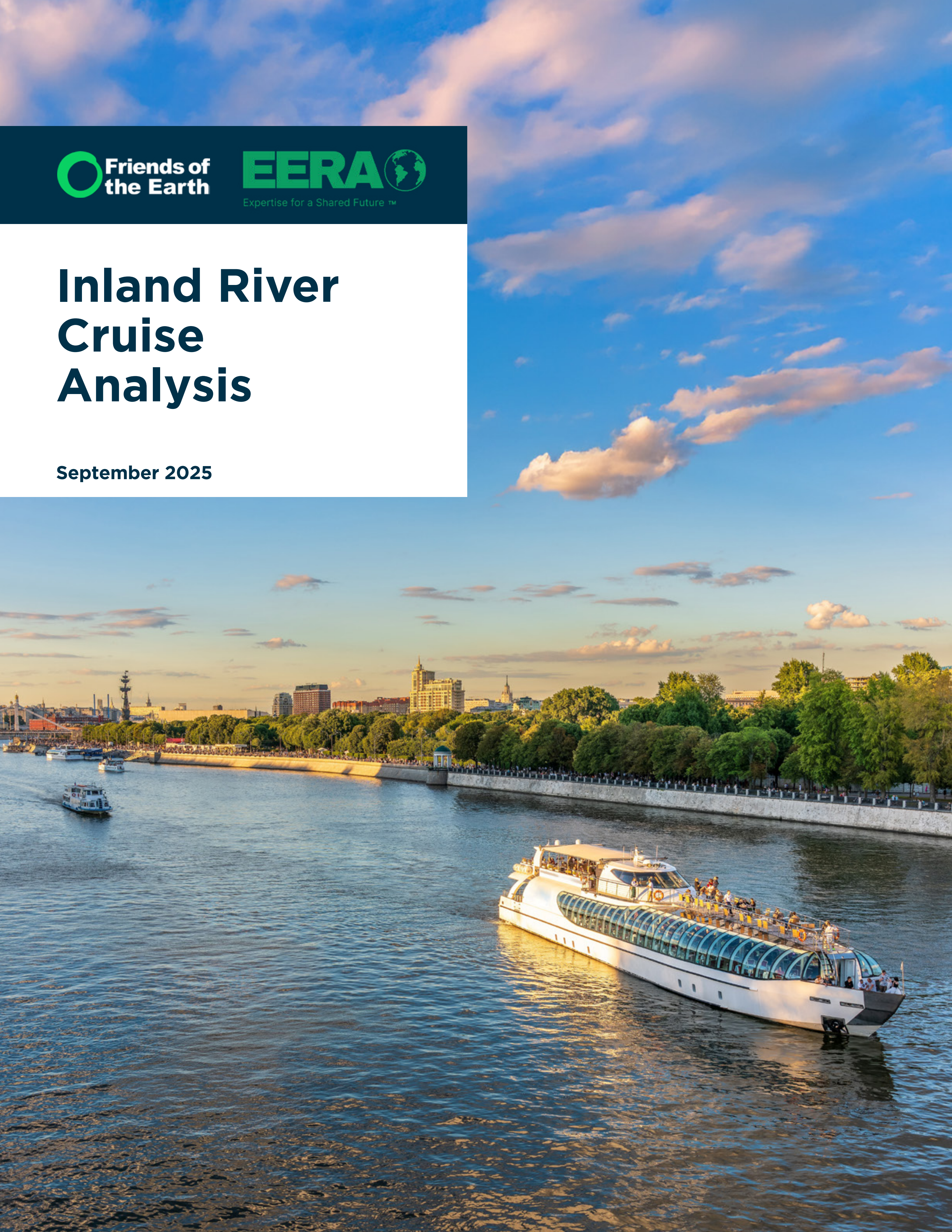
Inland River Cruise Analysis

September 2025



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INTRODUCTION AND PURPOSE

Cruise ships have been rapidly growing in size since 2000,[1] and today's largest cruise ship holds nearly 10,000 passengers and crew and weighs nearly 250,000 gross tonnes.[2] Projections estimate that approximately 35 million passengers will embark on cruise vacations in 2024, representing a 6% increase from pre-pandemic levels.[3] Meanwhile, growth in the inland river cruise sector is surpassing the growth of ocean cruises, anticipated to increase by 12% by 2028.[4] Despite this expansion, inland river cruises have received substantially less attention regarding their practices. Given that river cruises operate closer to populated areas, it is important to understand their impact on air and water quality.

Inland river operations offer smaller vessels, lower power requirements, and more frequent port calls than oceangoing cruises. Inland river cruises may also have greater access to onshore waste treatment facilities (e.g., sewage and garbage disposal). The environmental impacts of the inland river cruise sector are not as well-understood as the ocean-going sector.

In this report, we develop a foundational profile of the operational inland river cruise fleet, compiling metrics such as vessel age, tonnage, engine size, flag and operator information. Then, we evaluate the inland cruise industry's sustainability and environmental reports, assessing transparency and progress toward broader climate and sustainability targets.

1 https://www.theguardian.com/environment/article/2024/aug/07/cruisezilla-passenger-ships-have-doubled-in-size-since-2000-campaigners-warn

2 https://www.ship-technology.com/features/the-top-10-biggest-cruise-ships-in-the-world/

3 https://www.theguardian.com/environment/article/2024/aug/07/cruisezilla-passenger-ships-have-doubled-in-size-since-2000-campaigners-warn

4 https://travelweekly.co.uk/news/tour-operators/river-cruise-growth-to-outstrip-all-travel-sectors-in-next-five-years

CHARACTERIZATION OF THE CURRENT INLAND CRUISE FLEET

EERA analyzed data on the inland cruise vessel fleet available from S&P Global's Seaweb portal.[5] Data available in Seaweb include ship details and technical specifications for over 200,000 vessels over 100 gross tons (GT). For this study, we identified all vessels that were listed as ship type "Cruise Ship, Inland Waterways."

As of this writing, in total this query yielded 398 vessels, of which 366 are listed as "In Service/Commission," 26 as on "On Order/ Not Commenced," 4 as "Launched", 1 as "In Casualty or Repairing" and 1 as "Under Construction."

Fuel type is a sparsely filled field in the SeaWeb data, with 58 vessels listing "Distillate Fuel" as their primary fuel type, and 340 not specifying the primary fuel. Distillate fuel typically refers to marine diesel oil (MDO), marine gas oil (MGO), or ultra-low sulfur diesel (ULSD). In the absence of detailed data, an assumption could be made that distillate fuels are the primary fuel choice for the full fleet. These distillate fuels are likely used across the fleet because they are widely available and meet current domestic inland fuel standards, with lower sulfur content than heavy fuel oil (HFO).

None of the inland cruise vessels have scrubbers installed, nor are any listed as having Tier III emission control technologies installed. None are listed as having shore power installed, nor are any Green Award Certified.

Fleet Size and Age

The current inland cruise fleet stands at 366 vessels in service/commission. Around 50% of those vessels were built after mid-2012, with significant growth seen in the fleet from 2011 - 2020. Of the vessels in operation, the mean vessel age is 16.9 years and the median vessel age is 12.3 years. The oldest vessel in the inland waterway fleet, the Road to Mandalay, flagged and operating in Myanmar, is over 60 years old.

The growth between 2011 and 2020 reflects

5 https://maritime.ihs.com/Areas/Seaweb

increased consumer interest in experiential tourism and inland river cruises, likely driving a market for newer and more advanced vessels. New builds could reflect regulations to reduce emissions, but are unlikely to be the driving force in this period. Emission standards for inland engines across the EU and the U.S. during this period did not introduce a "phase-out period" for older engines. There may be some exceptions, such as specific state-level regulations (i.e., California) or the introduction of emission control areas (ECAs) in China,[6] though the data do not show any Inland Cruise vessels flagged in China.

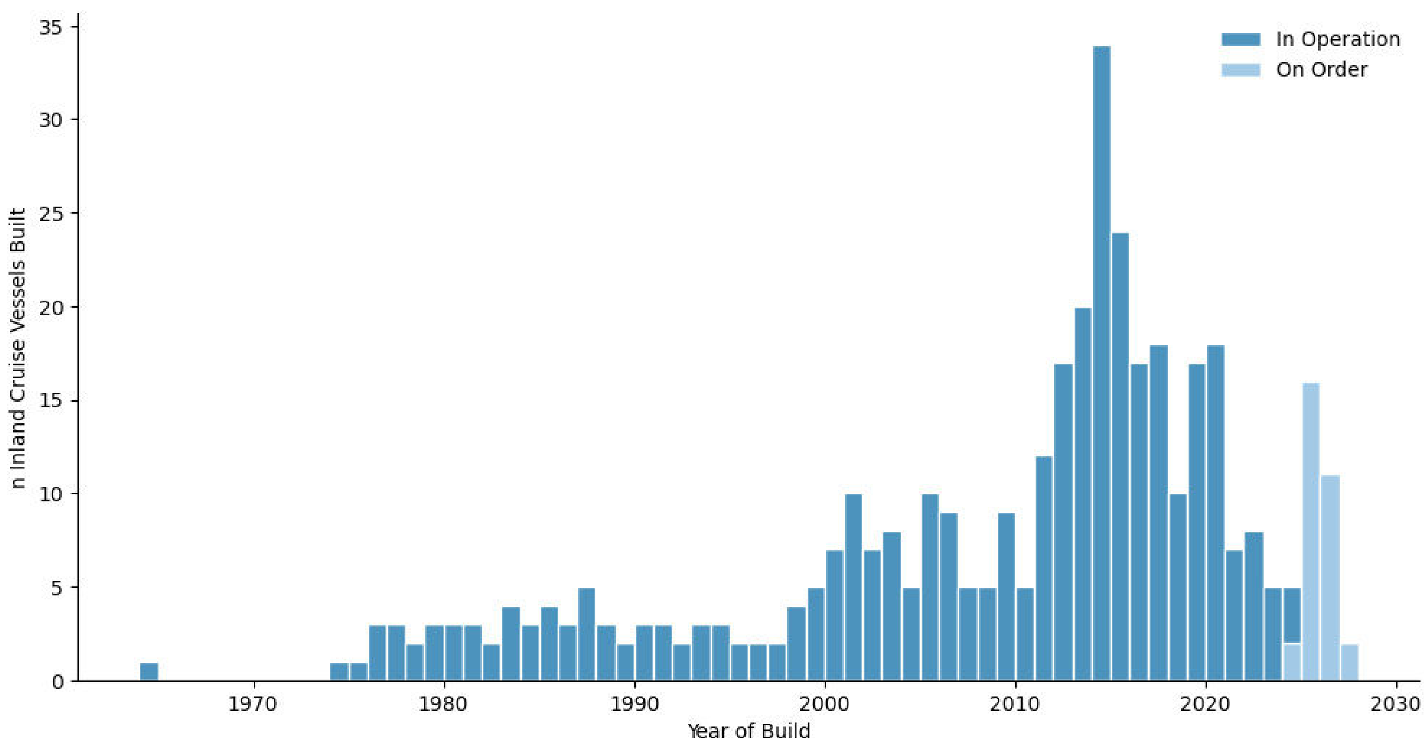
Deadweight

Vessel size constraints directly impact the ship design, including placement of the engine and fuel tanks. Deadweight tonnage (DWT) represents the total weight a vessel can safely carry, including fuel, engines, passengers, and cargo. The Deadweight field is sparsely populated in the Seaweb data, with data only available for 93 vessels. This again reflects a lack of industry transparency and reporting requirements. The absence of clear reporting and transparency within the industry continues to be highlighted.

For the vessels where data are available, DWT of inland cruise vessels falls into a relatively narrow band up to 2,656 DWT. This is intuitive given the constrained nature of the waterways on which they operate. There is a slight trend towards larger vessels in recent years, though clear classifications persist and vessels under 500 DWT are still being built. The mean DWT across existing and on-order vessels is 603 DWT, and the median is 480 DWT. Across the whole fleet, 75% of Inland Cruise vessels are less than 555 DWT.

Figure 1

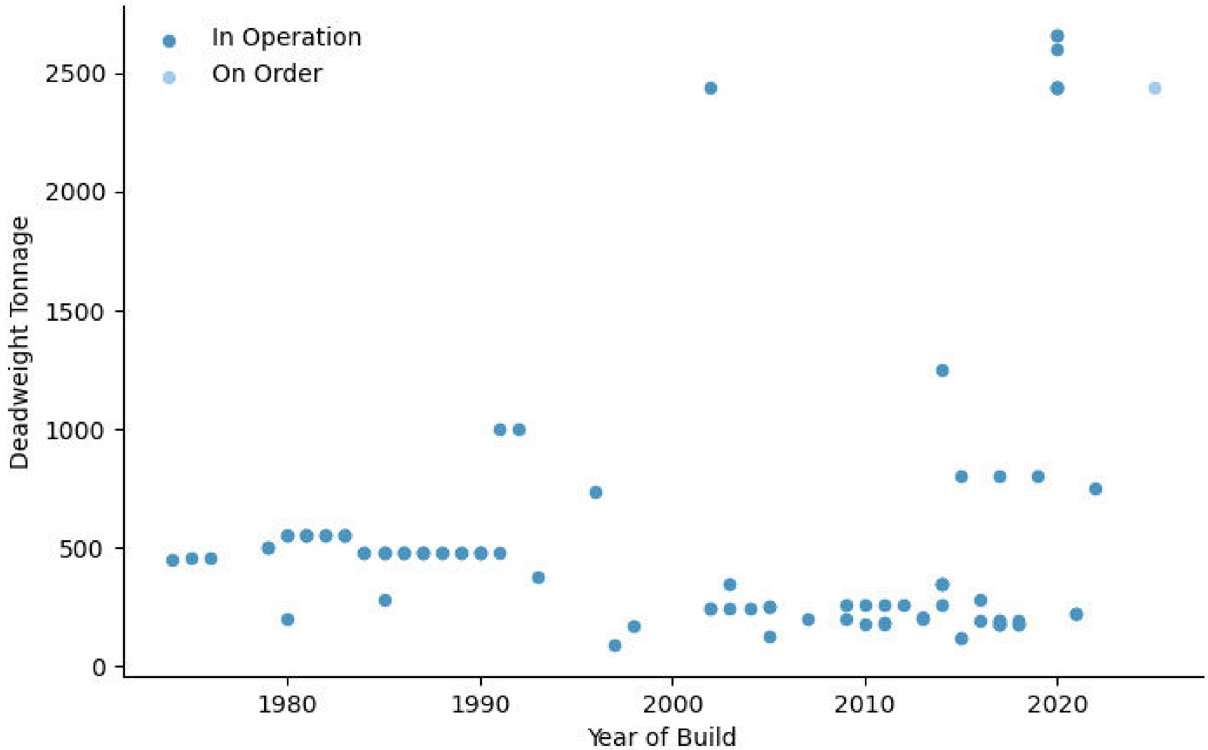
New and on-order vessels by year of build



6 E.g., China introduced Emission Control Areas for the Yangtze River Delta, Pearl River Delta, and Bohai Rim Area in December 2015 as part of its national efforts to reduce air pollution from shipping.

Figure 2

Inland Cruise vessels by year of build and deadweight



Main Engine Power

As with deadweight, inland cruise vessel power falls into a narrow band compared to the ocean going fleet, with median main engine power of 1,640 kW, and a mean of 2,063 kW for the 302 vessels with main engine power data available. Across the observable fleet, 99% of vessels have main engine power less than 3,600 kW. A single vessel, the American Empress built in 2003, has installed power greater than 3,600 kW, with 7,500 kW installed. There is a weak trend towards lower powered vessels in recent years, driven by a band of vessels built with installed power between 1,200 and 2,000 kW since the year 2000.

A trend towards lower powered vessels in recent years could reflect cruise operators seeking better fuel efficiency and lower operational costs. It could also reflect an attempt to improve the passenger experience with quieter engines that still meet the slower-paced sailing requirements of the industry.

Figure 3

Inland Cruise vessels by year of build and main engine power (kW)

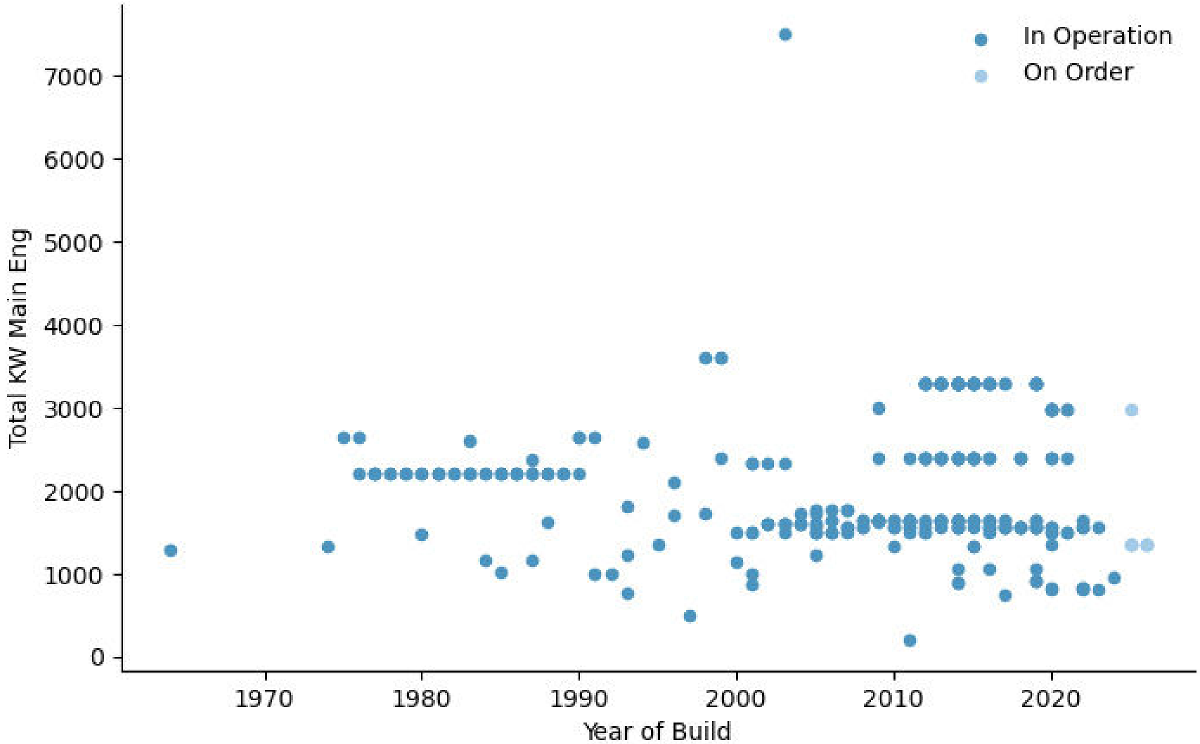
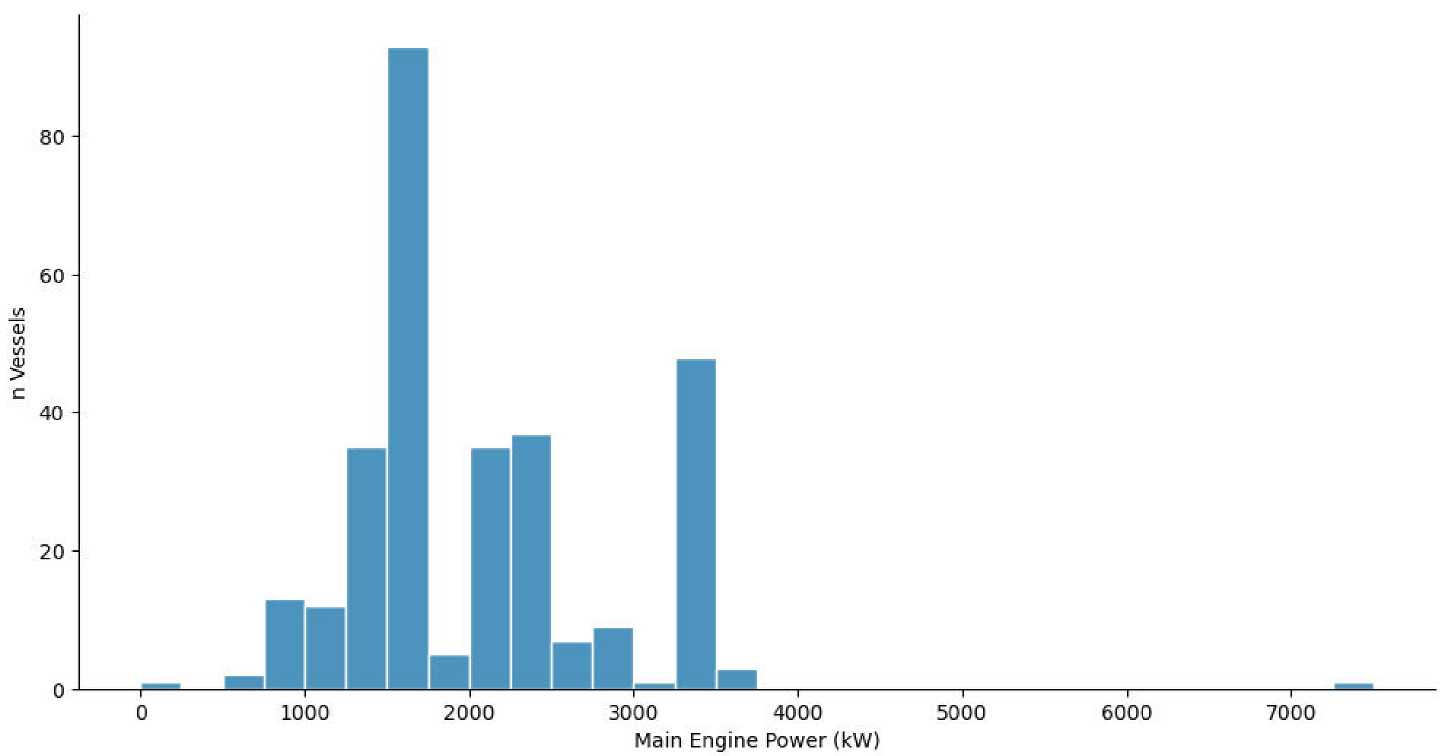


Figure 4

Distribution of main engine power (kW) for Inland Cruise vessels

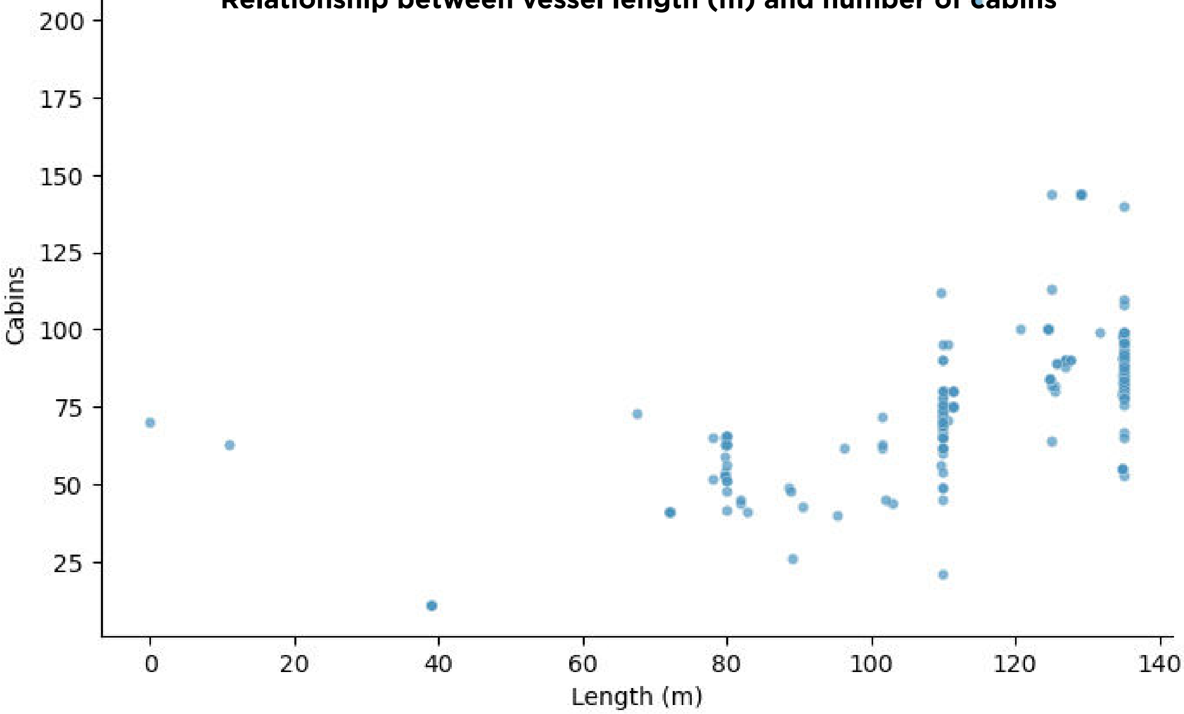


Length, Breadth, and Passenger Cabins

The majority of the fleet falls between 70-140 meters (m) in length, with passenger cabin counts ranging between 40-125 rooms. There are four vessels with larger capacities, three have <150 cabins and a single vessel has a capacity of 200 cabins.[7] As expected, there is a positive relationship between vessel length and number of cabins, with each additional meter of length corresponding to an additional 0.54 cabins for vessels greater than 60 m in length ($p < 0.001$). The relationship between length and breadth is also positive, though the constraints of the operating environment are clearly reflected in the data, with a cluster of vessels with a beam of 10 - 12 meters, and lengths clustered around 80 m (18 of 23 vessels flagged in Portugal), 110 m (55 of 79 flagged in Germany or Switzerland), and 135 m (161 of 190 flagged in Germany, Switzerland, or the Netherlands), likely corresponding to limitations on size for the waterways those vessels operate on. The Douro River in Portugal has a length limit of 79.8 m due to lock restrictions. The 110 m and 135 m class ships, so called Large Rhine Vessels (CEMT Class Va and Vb, respectively), are also limited by locks on the Rhine and Danube waterways.[8]

Figure 5

Relationship between vessel length (m) and number of cabins

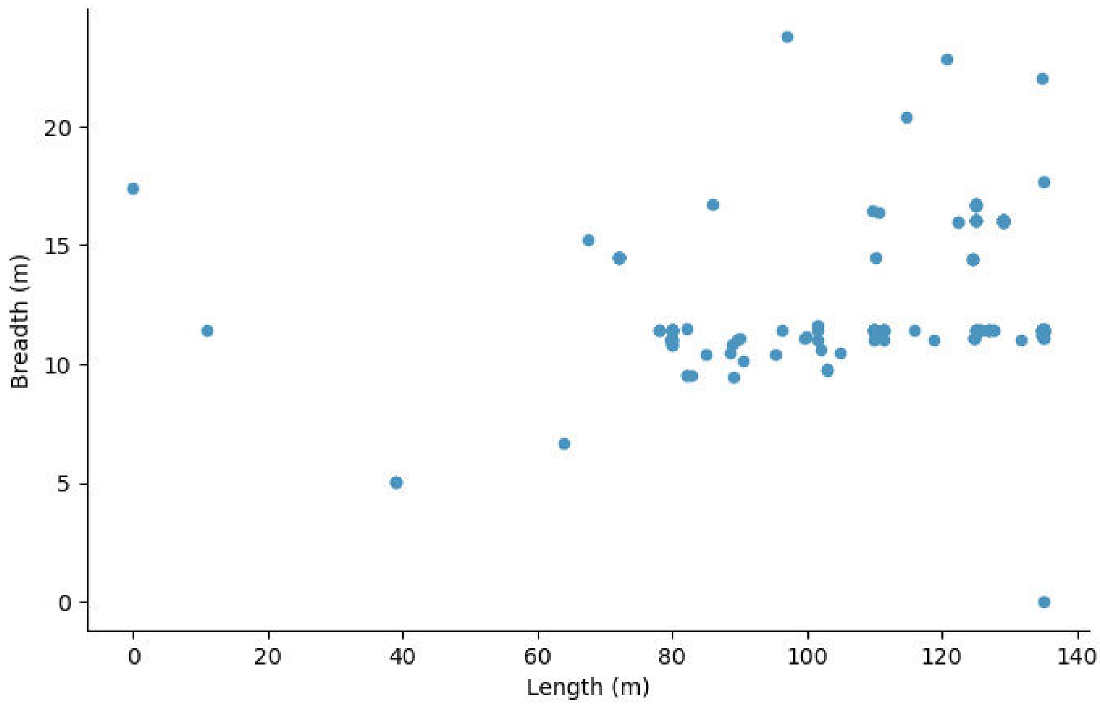


7 The vessel with a length of 0 m reporting 75 cabins is the Primadonna, flagged in Austria with undisclosed ownershi; additional vessel particulars could not be found. The S. S. La Venezia, flagged in Switzerland and operated by River Countess GmbH, has a data error; she is 110 m, not 11.0 m, long.

8 https://unece.org/DAM/trans/main/sc3/AGN_map_2018.pdf

Figure 6

Relationship between vessel length (m) and breadth (m)



Vessels by Flag and Operator

Engine power distributions vary significantly across flags. Switzerland accounts for the largest share of inland cruise vessels, with 195 vessels, but those vessels reporting have less than half the mean power of the U.S. fleet. There are three U.S. flagged vessels (two reporting main engine power), with the American Empress an outlier in power demand (7,500 kW). All other nations had mean values below 3,000 kW and max values ≤3,600 kW. There are 11 vessels with an "Unknown" flag.

Table 1

Number of vessels flagged by country

Flag	Flagged Vessels
Austria	1
Bulgaria	1
Egypt	8
France	10
Germany	41
Luxembourg	2
Malta	36
Moldova	1
Myanmar	1
Netherlands	28
Portugal	17
Portugal (Mar)	3
Russia	39
Switzerland	195
Ukraine	1
United States of America	3
Unknown	11

Figure 7

Distribution of reported main engine power (kW) by flag for inland cruise vessels

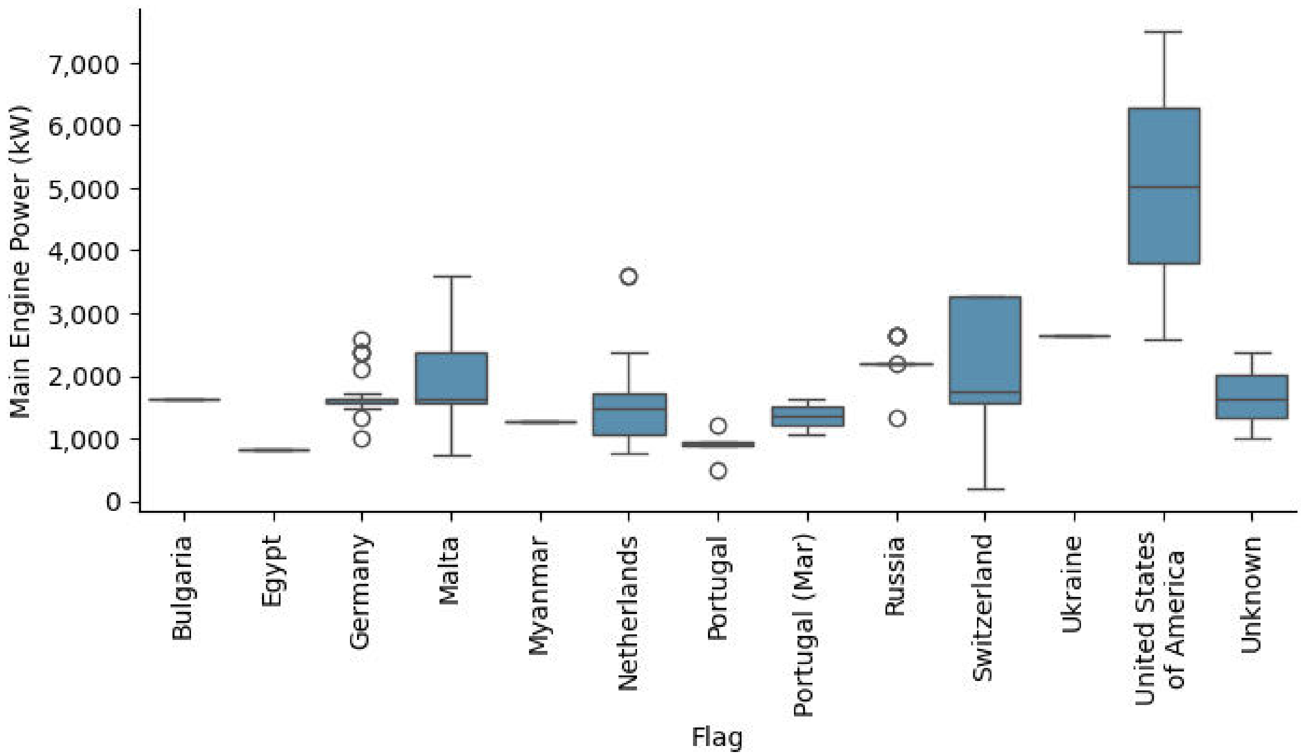


Table 2

Vessels reporting main engine power (kW) by flag of registry for inland cruise vessels

Flag	count	mean	std	min	25%	50%	75%	max	Sum
Bulgaria	1	1,640	-	1,640	1,640	1,640	1,640	1,640	1,640
Egypt	2	810	0	810	810	810	810	810	1,620
Germany	35	1,679	316	1,000	1,566	1,620	1,640	2,592	58,760
Malta	29	1,850	570	744	1,566	1,640	2,386	3,600	53,644
Myanmar	1	1,280	-	1,280	1,280	1,280	1,280	1,280	1,280
Netherlands	13	1,724	925	760	1,066	1,492	1,716	3,600	22,416
Portugal	7	897	211	500	882	920	938	1,220	6,280
Portugal (Mar)	2	1,353	406	1,066	1,210	1,353	1,496	1,640	2,706
Russia	39	2,230	201	1,324	2,208	2,208	2,208	2,646	86,977
Switzerland	167	2,216	819	198	1,566	1,760	3,280	3,280	370,130
Ukraine	1	2,646	-	2,646	2,646	2,646	2,646	2,646	2,646
United States of America	2	5,037	3,483	2,574	3,806	5,037	6,268	7,500	10,074
Unknown	3	1,675	694	1,000	1,320	1,640	2,013	2,386	5,026

Table 3

Reported data for total main engine power, total deadweight, and total cabins for Inland Cruise ship operators with more than 10 vessels

Operator	Vessels	Main Engine kW		Deadweight		Cabins	
		Sum	n Null	Sum	n Null	Sum	n Null
A-Rosa Flussschiff GmbH	13	18,324	1	2,792	2	1,260	0
AMA Waterways GmbH	22	40,284	1	410	20	1,550	2
Luftner Cruises	10	10,720	3	200	9	415	5
Owner Unknown	14	0	14	0	14	0	14
Rptd Sold Undisclosed	33	55,421	4	9,877	12	2,706	9
Scenic Tours Europe AG	13	19,236	3	1,827	9	694	4
Scylla AG	40	46,280	10	0	40	2,172	12
Viking River Cruises AG	76	216,558	0	19,430	63	6,122	10
Vodohod LLC	13	27,820	0	5,570	2	800	7
All others combined	164	188,556	49	16,051	134	9,931	26

In total we identified 105 unique operators in the SeaWeb data. There are nine operators that operate 10 or more vessels,[9] which together account for 234 vessels (59% of the fleet), 70% of the reported installed power, 71% of the reported deadweight, and 61% of the reported cabins.[10]

9 NOTE: This does not include Operators listed under different names but likely to have the same parent company, e.g. "Viking River Cruises AG" and "Viking Cruises Portugal SA", due to complexities in cross-referencing company names.
10 NOTE: Summary statistics are performed on the Seaweb data available, with the number of null or zero values identified in the adjacent column.

Inland Cruise Vessel Sustainability Reporting and Emissions

This section evaluates the current state of decarbonization, environmental stewardship, and sustainability reporting within the inland cruise ship sector. We identify progress in areas such as greenhouse gas (GHG) and pollutant emissions, fuel use and efficiency, strategies and technologies deployed, and other indicators of climate or environmental risk mitigation. This analysis explores the extent and depth of reporting within the inland cruise industry, assessing the state of industry transparency, and gauging progress to align with broader climate and sustainability targets.

Company Reporting Practices

As part of the Fleet Characterization, we identified seven operators, two groups of operators that are either unknown or undisclosed, and a group encompassing operators reported to have fleets of fewer than 10 vessels (Table 4). These companies were the basis for a public records search. The search was expanded to include unnamed river cruise operators with publicly accessible reporting to gain a more comprehensive understanding of the industry's sustainability practices.

Table 4

Inland cruise ship operators identified in fleet

Operator	Vessels
A-Rosa Flussschiff GmbH	13
AMA Waterways GmbH	22
Luftner Cruises	10
Owner Unknown	14
Rptd Sold Undisclosed Interest	33
Scenic Tours Europe AG	13
Scylla AG	40
Viking River Cruises AG	76
Vodohod LLC	13
All others combined	164
Total Vessels	**385**

Qualitative sustainability and impact narratives were identified for most cruise lines. However, only two provided formal reports that included standardized metrics, approved methodologies, calculated emissions, defined targets, and other quantitative data (Table 5). The majority relied on general statements or qualitative descriptions on their webpages, without transparency and formal sustainability reporting. We found that inland river cruise companies are generally not voluntarily reporting emissions or fuel information.

Of the two formal reports, one is published by a cruise line that also manages ocean-going cruises. The only report from a cruise line focused solely on river cruises, Uniworld, was included within a broader corporate sustainability report for The Travel Corporation, which also covers the organization's hotels, vehicles, and other business holdings. These suggest higher expectations for sustainability reporting due to larger corporate footprints and stricter regulatory requirements.

Table 5

Operators with sustainability reports

Operator	Public Reporting	Waterways
Uniworld (The Travel Corporation)	Yes	River
Scenic Group	Yes	Ocean/River
Viking River Cruises	No	Ocean/River
AMA Waterways	No	River
A-ROSA*	No	River
Lueftner / Amadeus Cruises	No	River
Scylla	No	River
Vodohod	No	River
American Cruise Lines	No	River

* A-ROSA launched a sustainability department in 2022 that has been undergoing data collection to establish a baseline and carbon footprint. They intend to publish a roadmap of goals and measures in 2025, indicating a start of formal reporting.

Of the cruise lines with no formal reporting, four had pages outlining the operator's sustainability efforts. These pages emphasized a commitment to sustainable tourism, highlighting ongoing initiatives and technologies related to environmental responsibility, along with any public recognition, such as receipt of The Green Award,[11] where applicable. Three cruise lines, Viking, Vodohod, and Scylla, had no dedicated page for sustainability or impact narratives on their websites.

These sustainability pages suggest that the cruise lines are leveraging green marketing, likely driven by passengers increasingly valuing sustainable practices and corporate stewardship. Positive marketing language was frequently used to emphasize leadership in sustainability, including when the actions taken aim to meet minimum regulatory requirements. For example, the use of low-sulfur MGO is highlighted, even though MGO is an industry standard fossil fuel meeting minimum requirements by regulations such as EU Directive 2016/802.[12]

These pages did not include numerical data such as GHG emissions or tonnes of waste, making it difficult to assess their actual environmental impact. Without this quantitative information, it's challenging to measure how these organizations are progressing toward broader decarbonization or environmental goals, as there are no clear metrics to track their performance or compare their efforts against industry standards.

Given the limited availability of inland cruise company reports, we explored the EU Monitoring, Reporting, and Verification[13] (MRV) database as a potential source of emissions data. However, the MRV reporting requirements apply only to ships over 5,000 gross tonnage (GT), and none of the vessels we identified were found in the EU MRV reporting. SEC filings were also reviewed for information about environmental investments, but the disclosures were generally high-level and again lacked specific numerical data or measurable climate targets. Filings focused on regulatory compliance and incremental improvements, with broad statements about future projects.[14]

In the absence of comprehensive company-reported emissions data, we turned to vessel specifications and IMO methodologies to calculate typical GHG emission rates for inland river cruises. The Emission Estimates section

11 https://www.greenaward.org/

12 https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32016L0802

13 https://mrv.emsa.europa.eu/#public/eumrv

14 E.g., https://ir.viking.com/sec-filings/all-sec-filings/content/0001193125-24-215885/0001193125-24-215885.pdf

Table 6

Reported technologies for efficiency, sustainability, and emissions reduction

Operator	Waterways	Shore Power (Y/N)	Water Treatment (Y/N)	Other Technologies
Uniworld (The Travel Corporation)	River	N	N	—
Scenic Group	Ocean/River	Y	Y	Efficient Hull Design; SCR; Dynamic Positioning; Advanced Propulsion and Navigation Systems; Waste Heat Recovery
Viking River Cruises	Ocean/River	N	N	Solar Panels; Hybrid Engines; Energy-Efficient Hull, Propeller and Rudder Arrangements; Engines with Heat Recovery Systems
AMA Waterways	River	Y	Y	'River Track Pilot' Navigation; Stateroom Solar Panels; Solar Heating; Water Jet Propulsion
A-ROSA	River	Y	Y	SCR; Exhaust Heat Utilization; E-Hybrid Propulsion; Hull Optimization
Lueftner / Amadeus Cruises	River	Y	Y	'Fleet Controlling System'; Solar Panels
Scylla	River	N	N	—
Vodohod	River	N	N	—
American Cruise Lines	River	Y	Y	Efficient Hull Design

explores these methodologies and results in detail, showcasing emission profiles derived from available vessel data.

Inland Cruise Onboard Technologies

This section examines the technologies for efficiency, sustainability, and emissions reduction reported by cruise lines, with a closer look at the details provided for shore power and wastewater treatment systems.

IHS-Seaweb data did not list shore power equipment or green award certifications for the identified river cruise vessels, although some sustainability reports and webpages from cruise companies indicate that there are vessels in the river fleet with shore power. The available reporting is unclear regarding the rate of shore-side infrastructure connections. When reported, companies included disclaimers stating that shore power is used, such as "where available and feasible." In cases where shore power is reported in detail, operators report systems typically used with low-voltage systems,[15] such as power locks, which is aligned with the auxiliary engine hotel demand requirements for inland river cruise vessels.

Table 6 provides an overview of the technologies highlighted by the companies in their sustainability efforts, showcasing the initiatives they've reported as part of their green marketing strategies and environmental commitments. The sustainability reports and webpages of three river-only cruise lines did not mention any technologies. In the order presented in Table 6, we outline the shore power and water treatment technologies identified by our team, including both company-wide initiatives and those specific to each operator's river fleet, where information was available.

15 E.g., ISO/IEEE/IEC 80005-3. https://standards.ieee.org/ieee/80005-3/5934/

- For Scenic Group[16,17] River Cruising, among all the sustainable technologies listed in Table 6, only advanced propulsion and navigation systems, shore power, onboard treatment of waste and drinking water, and efficient hull design were applicable to the river-only vessels. Reporting is unclear if these technologies were applicable to all thirteen of their river cruises or specific vessels. No details were provided on shore power usage, including equipped vessels, port connections, or hours utilized, and further review of their website and press releases offered no clarification. Membrane biological reactors were reported for wastewater and a combination of reverse osmosis, ultraviolet, or carbon filtration for drinking and showering water.
- AMA Waterways[18] reported that AmaKristina became the first river cruise ship to receive the Green Award in 2020. Following this, 19 other ships in their inland European fleet were also recognized. Their fleet was designed with 'power locks to plug into a port's power supply' and an external travel review page clarifies that all 19 ships are capable of connecting to shoreside power.[19] Onboard water treatment plants use 'microfiltation', but no further detail is available.
- A-ROSA[20] reported that all 17 ships have shore power connection and wastewater treatment plants, with sewage sludge disposed of shoreside. Their A-ROSA SENA vessel has received a Gold Tier Green Award. Company-wide sustainability information is limited to this level of detail, but they plan to begin formal reporting in 2025.
- Lueftner-Amadeus Cruises[21] broadly reported that they connect to shoreside infrastructure via powerlock whenever possible, for which we infer the fleet of 16 is all capable. Their fleet is equipped with membrane technology plants with microfiltration systems to recycle all water used onboard. Additionally, all ships have received the Green Award.
- American Cruise Lines[22] reported all new ships are built to be shore power capable, but did not specify when this standard was first implemented. Older ships are "retrofit ready" as shoreside infrastructure becomes available. This could mean pre-installed electrical wiring or designated space for equipment, but the terminology was not clearly defined. Details about which vessels are equipped with these technologies could not be found. All ships are equipped with advanced wastewater treatment systems that can be tailored to meet varying state requirements, as well as wastewater storage to comply with no-discharge zones.

FuelEU Maritime[23] requires all container and passenger vessels ≥5,000 gross tonnage to use shoreside power by 2030. River cruise vessels are typically well below this limit and thus would not be covered by the regulation. However, the Alternative Fuels Infrastructure Regulation[24] (AFIR) supports a network of shoreside power at both inland and marine ports. Under article 10 of AFIR, all Trans-European Transport Network (TEN-T) core inland waterway ports must have at least one installation providing shore-side electricity supply to inland waterway vessels by January 1, 2025. All TEN-T comprehensive inland waterway ports must have at least one installation providing shore-side electricity supply to inland waterway vessels by January 1, 2030.[25]

16 https://issuu.com/scenic10/docs/scenic_group_impact_report?fr=sZTliZTcyNzMwMTc

17 https://issuu.com/scenic10/docs/cherish_the_planet?fr=xKAE9_zU1NQ

18 https://www.amawaterways.com/Sustainability

19 https://rivercruiseadvisor.com/2024/05/amawaterways-green-initiatives/

20 https://newsroom.arosa-cruises.com/press-kits/press-kit-sustainability.htm

21 https://www.lueftner-cruises.com/en/why-amadeus/sustainable-travel.html

22 https://www.americancruiselines.com/why-american/about-us/environmental-responsibility

23 https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52021PC0562

24 https://transport.ec.europa.eu/transport-themes/clean-transport/alternative-fuels-sustainable-mobility-europe/alternative-fuels-infrastructure_en

25 https://maritimetechnology.nl/media/s3tfujj2/230925_ops-compatibility-inland-vessels-and-seagoing-vessels.pdf

In 2022, it was reported that existing grids at inland ports could not feasibly meet vessel electricity demands for shoreside power by 2030.[26] However, by 2024, nearly 60% of TEN-T core inland ports and nearly 40% of TEN-T comprehensive inland ports were equipped with at least one onshore power supply dock for river cruise ships.[27]

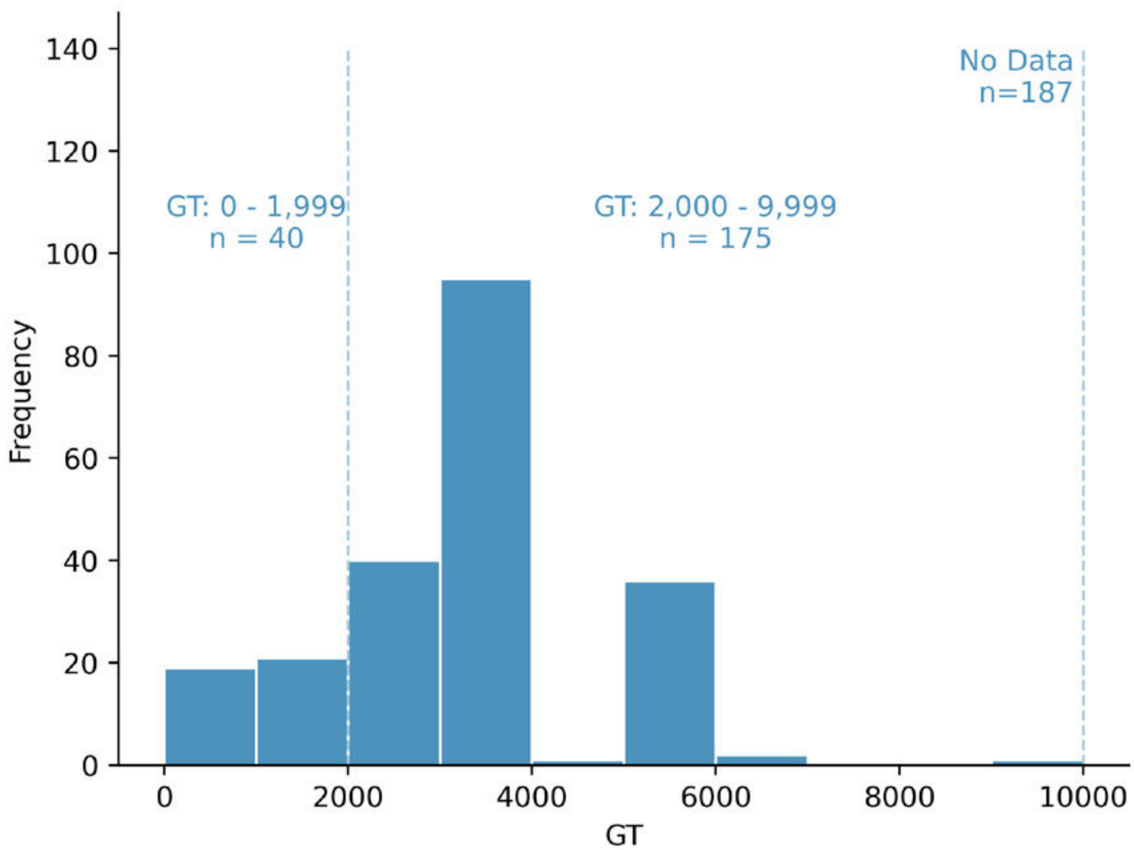
While there are no regulatory requirements for inland river cruises to use shore power, company reports indicate that many of these vessels have the capability to connect. As European ports expanded shoreside electricity infrastructure under AFIR, local river cruise operators simultaneously invested in equipping their fleets to utilize the technology. This suggests a business case for voluntary adoption, likely including fuel savings when docked, growing consumer demand for greener travel, and the potential for future regulatory mandates.

Emission Estimates

Company sustainability reporting is relatively sparse in the inland river cruise sector. Where companies do report, reporting is often aggregated at the company level, which can often include different types of cruises (e.g., ocean cruises), or other company activities. We therefore focus inland river cruise emission estimates on independent publicly reported data in the Fourth IMO Greenhouse Gas Study (GHG4),[28] and vessel characteristics available data in IHS SeaWeb.

Figure 8

Frequency of vessels by gross tonnage (GT) category in GHG4



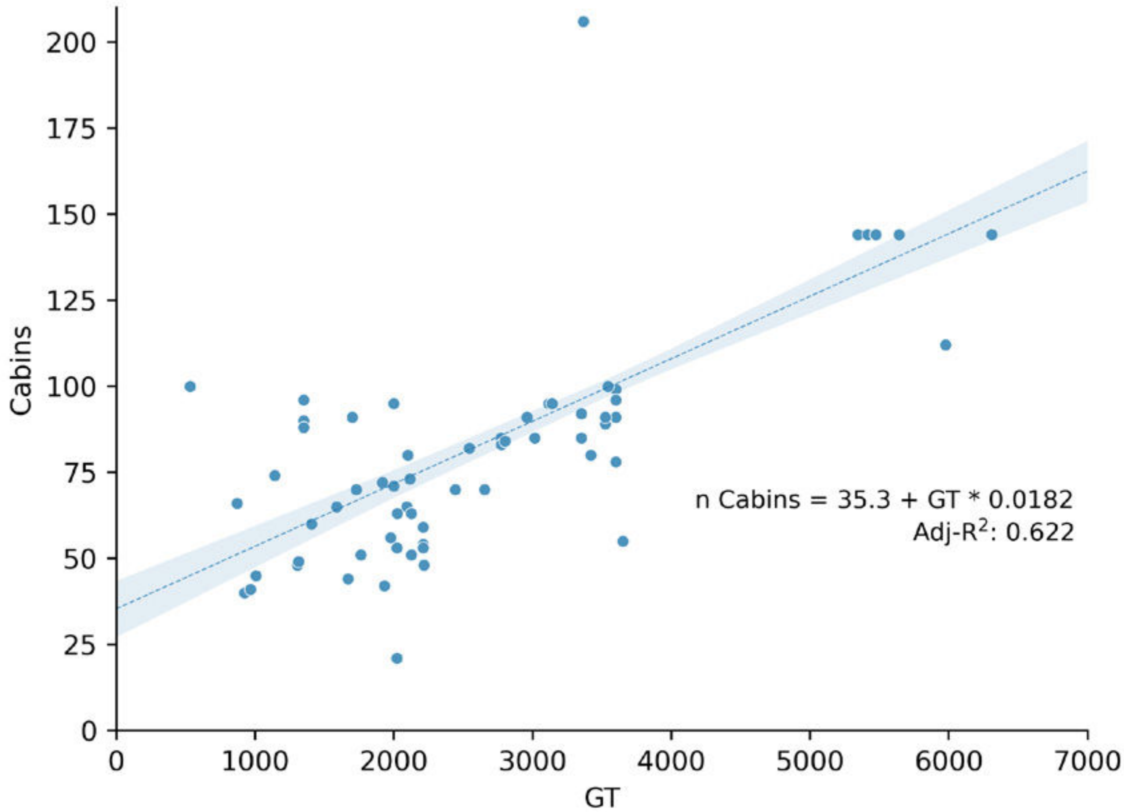
26 https://www.europarl.europa.eu/RegData/etudes/ATAG/2022/729395/EPRS_ATA(2022)729395_EN.pdf

27 https://cruiseindustrynews.com/cruise-news/2024/07/advancing-shore-power-in-europes-inland-ports-ig-rivercruise-study-2024/

28 https://www.imo.org/en/ourwork/Environment/Pages/Fourth-IMO-Greenhouse-Gas-Study-2020.aspx

Figure 9

Linear relationship between gross tonnage and number of cabins for inland cruise vessels



The Fourth IMO Greenhouse Gas Study provides insight into the average emissions of smaller cruise vessels.[29] Given the sizes of vessels observed for the inland sector, described in the Fleet Characterization, we gathered data for vessels in the 0 - 1,999 gross tonnage (GT) and 2,000 - 9,999 GT range (Figure 8), corresponding to the relevant cruise ship size ranges in GHG4.

The IHS SeaWeb data include 40 vessels in the 0 - 1,999 GT category, and 175 vessels in the 2,000 - 9,999 GT category (Figure 8). Gross tonnage data were not available for 46.5% of the vessels identified as Inland Waterway Cruise vessels. The mean gross tonnage for vessels in the IHS data that were between 0 and 1,999 GT is 1,345 GT, and the mean GT for vessels between 2,000 and 9,999 GT is 3,603 GT. The mean main engine power for these groups is 1,260 kW and 2,440 kW, respectively.

Estimating Cabins and Passengers

The relationship between gross tonnage and cabins is linear and well explained by the equation shown in Figure 9. This relationship suggests that for every 1,000 GT added, the number of cabins generally increases by 18, all else being equal. Assuming double occupancy, this relationship estimates that each additional 1,000 GT yields 36 additional passengers.

Estimating Emissions

Aggregating the IMO data and adjusting the fuel oil consumption (FOC) estimates by days at sea, and assuming ULSD fuel, indicates that a cruise ship less than 2,000 GT will emit around 22.5 metric tonnes (MT) of carbon dioxide (CO_2) per day, and a 2,000 - 9,999 GT vessel will emit around 67.6 MT CO_2/day.

29 Table 35, Fourth IMO Greenhouse Gas Study.

Table 7

Vessel operational parameters for small cruise ships from GHG4

Vessel Size (GT)	n Vessels	Days at Sea	MT		
			Total FOC	FOC/Vessel-Day	CO_2e/Vessel-Day
0 - 1,999	812	93	27,000	6.99	22.5
2,000 - 9,999	110	148	31,000	20.98	67.6

This analysis estimates emissions for two theoretical vessels, a 1,500 GT vessel and a 3,500 GT vessel, corresponding to roughly the observed mean in the IHS data for each of the IMO size categories. The prior analysis of the relationship between gross tonnage and cabins allows us to estimate that the smaller theoretical vessel has ~64 cabins, and the larger theoretical vessel has ~100 cabins, for a double occupancy (DO) rate of 128 and 200 passengers, respectively.

Table 8

Estimated cabins, passengers, and emissions for two representative vessels

Vessel Size (GT)	n Cabins (predicted)	n Cabins (rounded)	n Pax (DO)	MT		
				FOC / Vessel-Day	CO2e / Vessel-Day	CO2e / Pax-Day
1,500	62.57	64	128	6.99	22.5	0.176
3,500	98.90	100	200	20.98	67.6	0.338

This analysis finds that the estimated emissions per passenger day are 0.176 MT CO_2e for a 1,500 GT vessel, and 0.338 MT CO_2e for a 3,500 GT vessel. Assuming a baseline SFOC of 195 g fuel/kWh, and that the vessels are operating on ULSD, as is required in the inland rivers in the U.S. and Europe, these calculations yield 35,852 kWh of operation per day across the main and auxiliary engines, and boilers for the 1,500 GT vessel, and 107,608 kWh per day for the 3,500 GT vessel.

The Scenic Group, which operates luxury river cruises and tours, estimated their emissions at 0.102 MT CO_2 per person per night in 2023.[30] These are the only public data that were available to validate the estimated daily per passenger values. The data available in IHS SeaWeb[31] show that the Scenic Groups vessels average 2,546 GT and 954 kW main engine power. The installed power on these vessels is approximately 75% of the mean installed main engine power on the representative 1,500 GT vessel and 39% of the mean installed main engine power on the representative 3,500 GT vessel, meaning that the estimates derived from GHG4 reporting are in reasonable agreement with the values reported by Scenic Group.

- The ratio of the estimated emissions for the 1,500 GT (0.176 MT CO_2e) to the reported emissions (0.102 MT CO_2e) yields a percent ratio of 58%, which is lower than the ratio of main engine power (75%), but in reasonable agreement.
- The ratio of the estimated emissions for the 3,500 GT (0.338MT CO_2e) to the reported emissions (0.102 MT CO_2e) yields a percent ratio of 30%, which is lower than the ratio of main engine power (39%), but in reasonable agreement.

30 https://issuu.com/scenic10/docs/scenic_group_impact_report?fr=sZTliZTcyNzMwMTc ; https://issuu.com/scenic10/docs/cherish_the_planet?fr=xKAE9_zU1NQ

31 n = 5 vessels registered to Scenic Tours Europe AG

Reporting from Uniworld for 2023 shows total estimated emissions of 18,866 MT CO_2e over 11 vessels,[32] or 1,715.1 MT CO_2e per vessel. The IHS Seaweb Data contains information on main engine power for 8 of the vessels listed on the Uniworld site.[33] The mean main engine power for these vessels is 1,860 kW (median 2,026 kW) and the mean number of cabins is 62.75. Gross tonnage information was not available. Assuming that these vessels spent around 93 days at sea, aligned with the 0 - 1,999 GT IMO category based on the number of berths, this yields 18.44 MT CO_2e / vessel-day, or 0.147 MT CO_2e / pax-day, which is in good agreement with, and further validates, the 0.176 MT CO_2e / pax-day estimate based on the data from GHG4.

Estimates presented for the representative 1,500 GT and 3,500 GT vessels find emissions of 0.176 MT CO_2e / pax-day and 0.338 MT CO_2e / pax-day are lower than prior FOE estimates for emissions from ocean going cruises (0.421 MT CO_2 / pax-day).[34] These results indicate that river cruising yields around 20 - 58% lower emissions per passenger-day than prior estimates for ocean-going cruises. This is intuitive given that river cruise vessels generally travel at slower speeds, have shallower drafts, and encounter less hull resistance from currents and wave action. When traveling upriver, against the flow of water, operational engine loads would be higher, but when traveling with the flow of the river would yield much lower engine loads due to the cubic relationship between speed and power.

We have been careful to document all the underlying assumptions that have gone into generating these estimates. Each of these assumptions may introduce sources of error (e.g., source data rounded to the nearest thousand metric tonnes, use of fleetwide averages, etc.), and therefore these assumptions and data sources should be communicated when discussing these results.

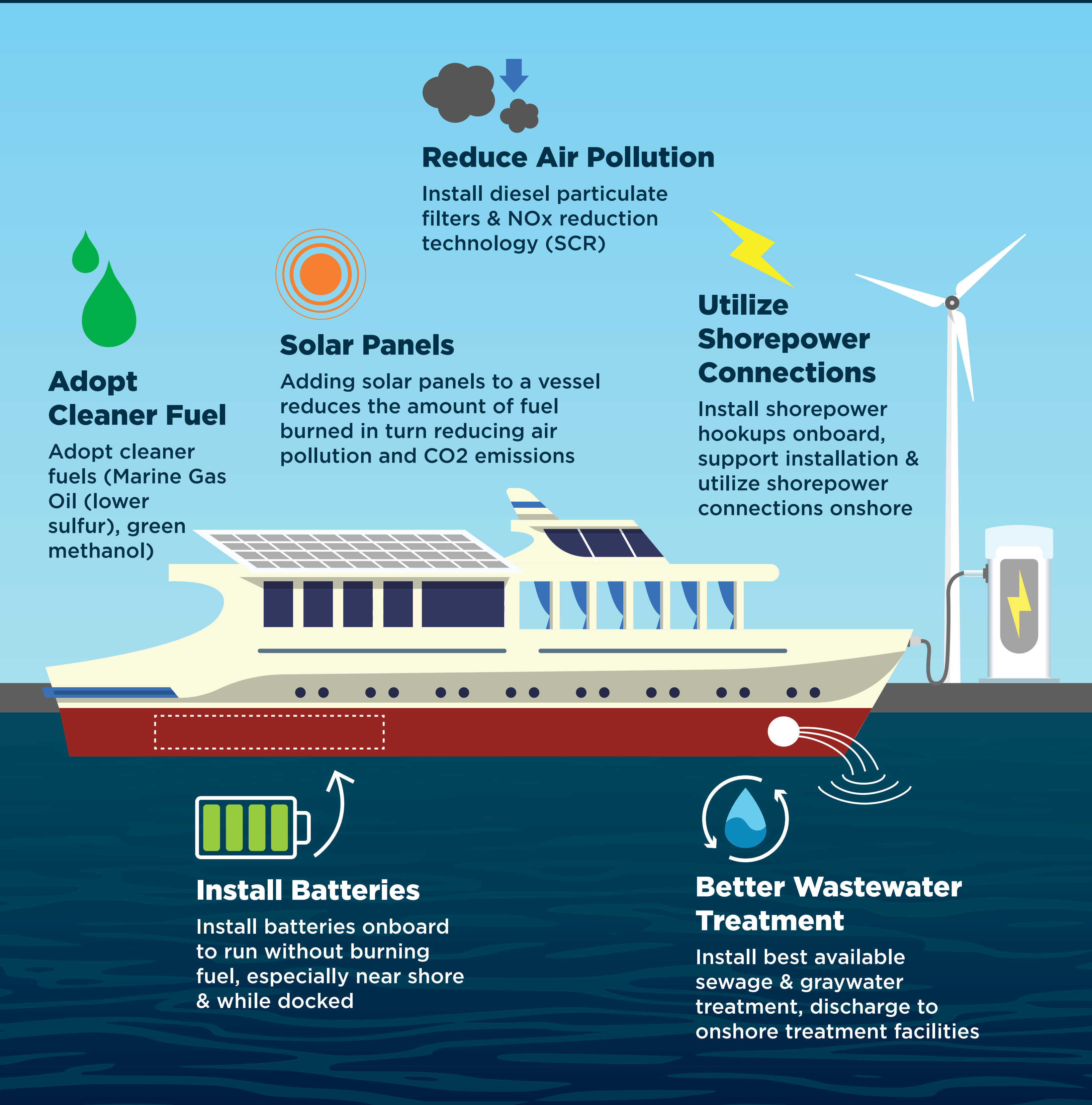
32 https://impact.ttc.com/progress/

33 https://luxury.rivercruise.com/riverboats.cfm

34 https://foe.org/news/cruise-passengers-carbon/

APPENDIX FIGURE 1

Sample Sustainability Measures On-Board a Modern River Cruise Ship



"Clean Cruising" for more info: https://foe.org/blog/what-would-a-clean-cruising-industry-look-like/