

Introduction to environmental stewardship

Hi I'm Jasmine and I'm going to talk about environmental stewardship in Venice focusing on reducing cruise-ship emissions, improving wastewater systems, and protecting the fragile lagoon ecosystem to ensure the city's long-term environmental and tourism sustainability.

Cruise ship emissions (air, water, noise) and strategies for reduction

In 2019 Venice had around 27,500 sulphur oxide emissions per year, which dropped in 2021 by 80% due to the ban on large ships or ships which used fuel with a sulphur content of over 0.1% from entering the centre specifically in Giudecca Canal and St. Mark's Basin and was instead redirected to the industrial port Marghera (Transport & Environment, 2023). Before this rule UNESCO threatened to put Venice on its World Heritage in Danger List due to its noise pollution and threatening Venice's lagoon and heritage (Transport & Environment, 2023).

From 2030, under the new EU rules, ships will be required to use shore power connections or alternative zero-emission technologies while anchored (European Commission, 2025). While docked cruise ships burn heavy oil and release carbon dioxide, nitrogen oxides, sulphur oxides and particulate matter. However, by using shore power, ships can turn off their engines, cutting these emissions almost entirely (ICCT 2023).

These measures protect Venice's ecosystem which ensures that Venice remains a reliable place for tourism long term and enhances its image as a sustainable tourism destination which draws tourists to the area (Ponte et al., 2022).

Venice could further reduce air pollution by enforcing mandatory shore-power use and limiting high-emission vessels entering the lagoon.

Waste and water management systems (grey water, plastics, sewage)

In Venice the buildings use septic tanks for its sewage as it has no conventional underground sewage system because it would require lifting the entire city. The untreated wastewater from houses relies on strong lagoons to flush it into the sea twice a day as it goes directly into the canals and makes the water salty whilst creating serious pollution issues (Best Venice Guides, 2020).

Many of Venice's older septic tanks are outdated and prone to leakage which allows wastewater to seep into the canals and groundwater. This is why Venice upgrading these with improved pumping networks and sealed watertight tanks. However, the high costs and the complexity of the city's infrastructure mean the process is taking a long time. (Rinaldi et al, 2018).

Venice relies on wastewater treatment plants for treating sewage and wastewater from Venice and the lagoon area. However, this gets overloaded during the peak tourism seasons and leads to untreated sewage water entering (Munaretto and Munaretto, 2012). To change this Venice could encourage hotels and tourism

businesses to adopt low-flow fixtures, greywater reuse, and linen-reuse programmes.

Alternative fuels (LNG, hybrid-electric, hydrogen)

Silversea the LNG hybrid-powered ship started its voyage from Venice in August 2023. It uses fuel cells and batteries for local emission-free operations in port and is designed for a 40% reduction in greenhouse gas emissions overall (Offshore Energy, 2023).

Venice is looking at full electrification of water taxis which is commonly used by tourists. Electrification is a viable low emission alternative for medium distance lagoon routes and reduces carbon dioxide, nitrogen oxides, sulphur oxides and particulate emissions which improves the air quality (Saldarini et al. 2023).

Hybrid-electric ships use batteries alongside other fuels to cut emissions, especially when they're in port or on short trips. However, these ships are expensive to build and need new infrastructure, which makes it harder for ports like Venice to use on a large scale (Saldarini et al., 2023).

Hydrogen is being considered as a long-term zero-emission solution for Venice's maritime sector especially for ships that are going on longer trips that battery electric systems can support. Fuel-cell technologies offer zero direct emissions and only produce water vapour, which means they are promising for future decarbonisation of lagoon transport (Saldarini et al., 2023).

The Sustainable Tourism Framework focuses on minimising environmental impacts while ensuring destinations remain viable for future generations (UNWTO, 2026).

Venice's adoption of LNG-hybrid ships, electric water taxis, and hydrogen technologies reflects this framework by reducing emissions and protecting the lagoon so Venice's tourism can continue sustainably.

Marine and coastal ecosystem protection in port destinations

The MOSE System is the mobile barriers that prevent high tides from flooding Venice (Giupponi et al., 2024). MOSE closures are handled in a way that tries to limit ecological disruption, because shutting the barriers too often can lead to nutrient build-up and a decline in lagoon water quality (Davies & Umgiesser 2023). This prevents flooding, which would damage Venice's cultural heritage and tourism infrastructure.

The North Adriatic Sea Port Authority are in charge of monitoring the water quality, controlling the ship waste and emissions, developing shore power and ensuring natural habitats are protected in Venice's ports (North Adriatic Sea Port Authority 2019).

Protecting marine ecosystems in busy ports like Venice is essential because cruise ship traffic can damage sensitive habitats and reduce water quality, it also helps Venice stay a cultural tourism hotspot because a lot of tourists visit for its lagoon ecosystem (Hall, 2019).

The Carrying Capacity Theory examines the limits of a destination's environment, infrastructure, and social systems before negative impacts occur (Saveriades, 2000). Venice's flood barriers and strict lagoon monitoring help prevent environmental pressures from exceeding what the fragile lagoon can sustain, ensuring the city remains a viable tourism destination without negatively affecting the destination's environment.

Preventing commodification or "Disneyfication" of culture

Some people in Venice feel as though they're living in a theme park because the huge number of tourists has led to authentic shops and cultural experiences being replaced by souvenir stores and generic attractions. (Tzatzadaki, 2020). Out of the destination's 20 million annual visitors 80% are day trippers. Venice is combatting this by charging tourists who only visit for the day an entry fee of up to €10 and banning tourist groups larger than 25 (Responsible Travel, n.d).

Due to this, locals have started to refer to Venice as 'Veniceland' because they feel that it is becoming like Disneyland (Travel Industry Today, 2024). Locals feel that the fee turns the city into a 'museum city' or 'theme park' instead of their home (Travel Tomorrow, 2024).

Tourists are abiding by these regulations and are starting to visit in off-peak seasons to regulate visitor numbers, explore less popular areas, stay overnight in Venice hotels instead of going on day trips to contribute to the local economy and shopping and dining in locally owned businesses (Bertocchi and Camatti, 2023).

Case Study (Norwegian Fjords)

Norway has zero-emission zones in its UNESCO-listed World Heritage fjords (Norwegian Government, 2024). From the 1st of January 2026 cruise ships with 10,000 gross tons must operate with zero direct emissions when passing through World Heritage fjords. Ships can meet this requirement by using biogas or electric propulsion, burning zero-carbon fuels or connecting to shore-power when available (Norwegian Maritime Authority, 2024). This is in place to protect fjord ecosystems and air quality while steering cruise traffic toward more sustainable technologies (UNESCO, 2018). Cruise ship traffic has grown rapidly in Norway, which is increasing local air pollution and affecting air quality and visitor experience.

This is similar to Venice's 2021 cruise ship ban because they both aim to protect UNESCO World Heritage sites by restricting high-emission vessels and pushing the cruise industry towards cleaner, more sustainable technologies (UNESCO, 2018) (Transport & Environment, 2023).

In destinations such as Flåm and Geirangerfjord, mass cruise tourism has led to overcrowding, infrastructure strain, and commercialisation of culture. The influx of tourists makes locals feel like they are living in a theme park (Viken and Müller, 2017). This is similar to problems occurring in Venice that have been previously mentioned.

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