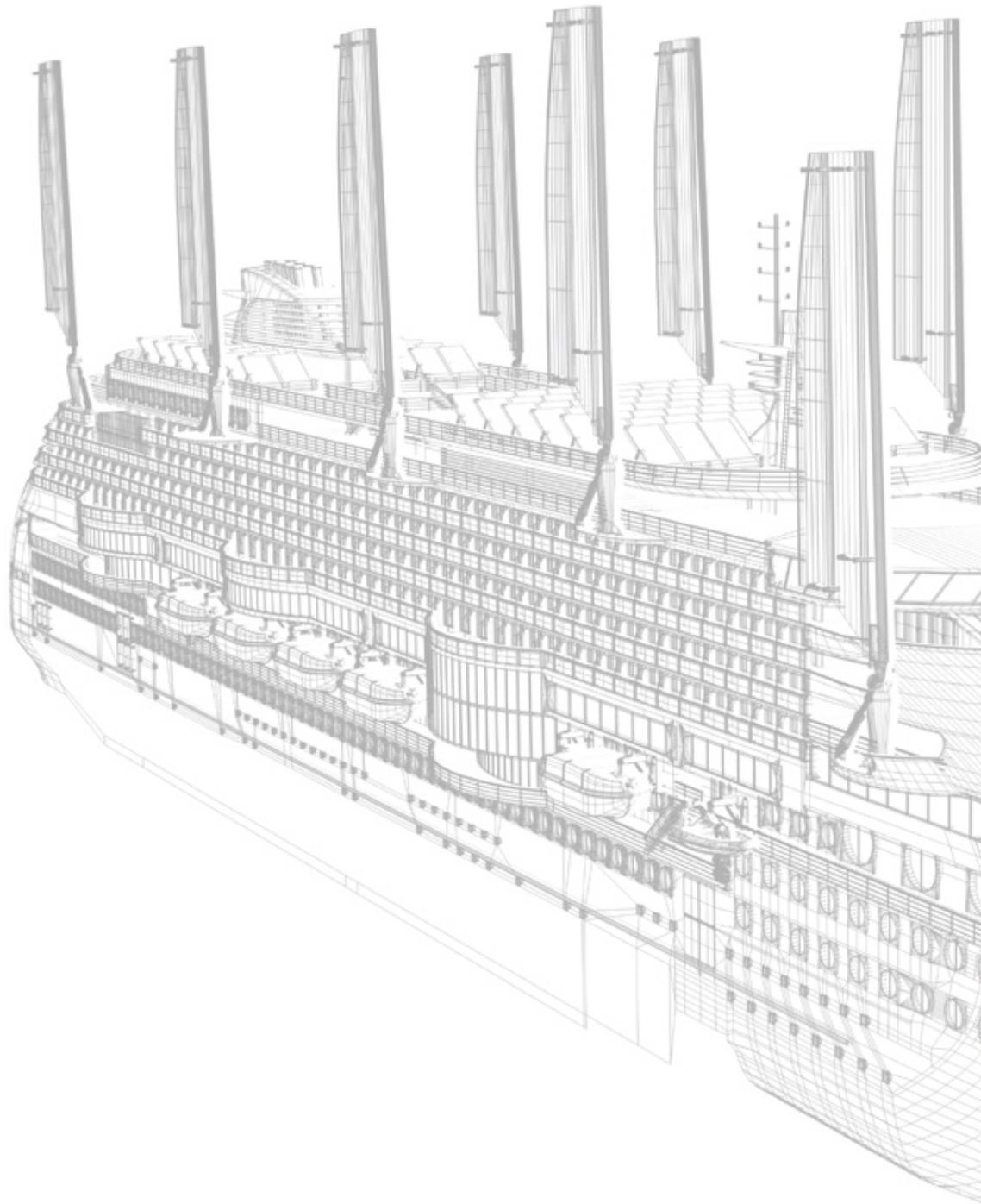


PEACE BOAT EcoShip

The world's greenest cruise ship sailing in 2020





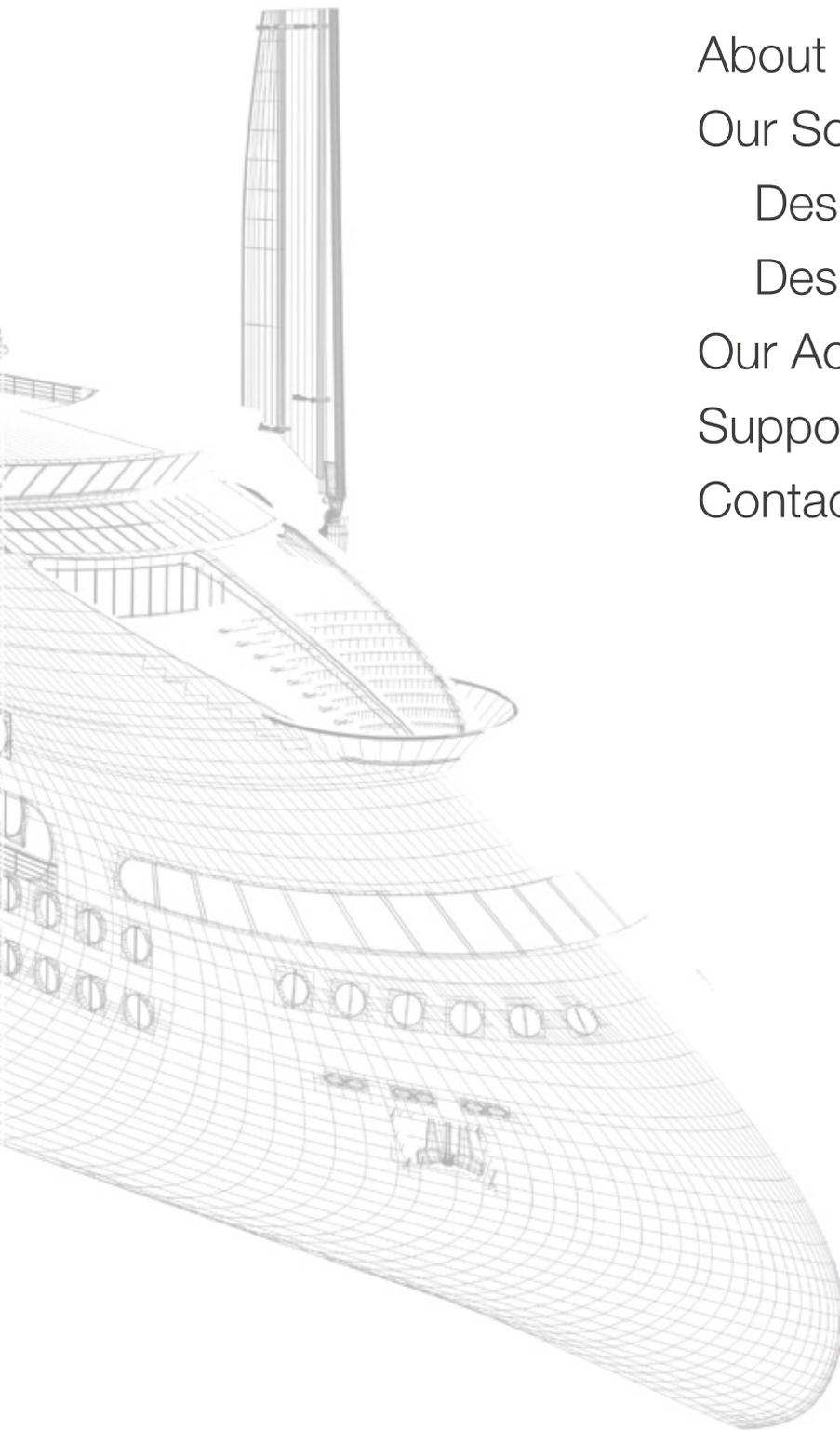
Architectural design by



Copyright: Peace Boat. Ship images and design copyright Peace Boat and Oliver Design.
Note: All the information is presented in good faith and based on the best available data at the time of publication. Concept images for reference only.
Version: 7. 01.2017

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Our Challenge: How can a passenger ship contribute to global sustainability?

Peace Boat's EcoShip Project is a transformational programme to construct the planet's most environmentally sustainable cruise ship. The EcoShip will be the platform for Peace Boat's around the world educational voyages carrying 6,000 people per year; host exhibitions on green technology in up to 100 ports per year; and serve as a floating sustainability laboratory contributing to research on the ocean, climate and green marine technology.

Over the last 30 years, Peace Boat has been making this vision a reality through chartered vessels which serve as a floating village, neutral meeting space and mobile classroom. The EcoShip project will take this to the next level by building a ship that will minimise environmental impact to an extent that surpasses the current best-in-practice.

The ship also will create awareness and encourage active engagement with the challenges embodied in the Sustainable Development Goals (SDGs). Peace Boat is a committed campaigner for the SDGs, also known as the Global Goals. The EcoShip will be a flagship for the Global Goals, a universal call to action towards ending poverty, protecting the planet and ensuring that all people enjoy peace and prosperity.

SUSTAINABLE DEVELOPMENT GOALS



Why now? A flagship for climate action around the world

After 30 years organising world educational and advocacy cruises on conventional passenger ship, Peace Boat is ready to take its commitment to the next level: create a ship that will embody our message, become a low-carbon cruising model for the industry and be the flagship for climate action around the world.

Ecoship will address climate action via the responsibilities of maritime transport in carbon reduction and in preventing oceans and coastal areas degradation. By integrating a set of innovative technological and managerial solutions, Ecoship will be a showcase for what the industry can do. With cruising booming particularly in Asia, it is all the more urgent that it is done on sustainable basis.

As a committed campaigner for the SDGs, Ecoship will be instrumental in creating awareness and trigger action.



Peace Boat Sailing since 1983



Over 30 years as an NGO and social business



2008 Nobel Peace Prize nominee



More than 60 around-the-world cruises



More than 30 regional voyages



More than 60,000 participants



Visits to over 100 ports in more than 80 countries



Multi-generational onboard community of 1,000 per cruise



Peace Boat organizes 3 round-the-world voyages per year

Global Voyage 93

December 9, 2016 - March 27, 2017



Global Voyage 94

April 12 - July 25, 2017



Global Voyage 95

August 13 - November 24, 2017



Study Programmes



Cultural Exchange



Encounters with locals



Life at Sea

Peace Boat: Timeline of Activities

- 1983** — Peace Boat is established. First Asian Voyage.
- 1990** — Peace Boat launches first round the world cruise.
- 1995** — Peace Boat carries out disaster relief activities in Kobe, Japan following Great Hanshin Earthquake.
- 1998** — Peace Boat Landmine Abolition Campaign (P-MAC) is established, raising funds for de-mining in Cambodia.
- 1999** — First Peace Boat southern hemisphere round the world cruise sails.
- 2000** — Peace Boat establishes the 'Global University' our onboard peace education programme.
— Cooperation with UNESCO on global "Manifesto 2000" campaign.
- 2002** — Peace Boat gains Special Consultative Status with the Economic and Social Council of the United Nations (ECOSOC).
- 2004** — Peace Boat becomes the Northeast Asia Regional secretariat for the 'Global Partnership for the Prevention of Armed Conflict' (GPPAC).
- 2005** — First 'Peace & Green Boat' voyage sails in cooperation with South Korea's Green Foundation.
- 2006** — Peace Boat US established in New York in collaboration with the Hague Appeal for Peace.
- 2008** — Nobel Peace Prize Nomination
— Peace Boat launches a campaign to bring survivors of Hiroshima and Nagasaki atomic bombings around the world.
- 2009** — Peace Boat works with UN's Millennium Campaign to raise awareness on MDGs.
- 2011** — Peace Boat Disaster Relief Volunteer Center (PBV) established: dispatches over 14,000 volunteers for relief efforts after Northeast Japan Earthquake & Tsunami
- 2013** — EcoShip Project launched at PB's 30th Anniversary Celebrations.
— Nobel Peace Laureate Rigoberta Menchú visits Peace Boat
- 2014** — Partnership with UNISDR's Making Cities Resilient Campaign.
- 2016** — Peace Boat sails as a committed campaigner for the UN SDGs. The logo is painted on the hull of the ship.
— Peace Boat and the UN DPI hold a "Floating Festival for Sustainability" in New York City



1998

2002



2005

2008



2009



2011



2013



2016

Our Solution: Building the greenest cruise ship



A whole-system integrated design process

1. Harnessing expertise

Building the planet's most environmentally sustainable ocean-going cruise ship implied a radically different approach, and a particular emphasis on the development of the concept and the choice of the technologies. The design of the ship was finalized in 2015, after a 3 year process involving an international team using an integrative design procedure that has harnessed the expertise of many specialties and both marine and land-based industrial sectors.

We took a whole-system integrated design approach to the project; A concept derived from the belief that elements of a system work best when they are specifically designed to complement, rather than to compensate for each other.

From the marine sector:

- Shipyard and shipbuilding
- Classification Society
- Cruise Operational Services
- Ship HVAC systems developers
- Internal ship designs
- Ship designer
- Naval architecture
- Ship engine developers

From the non-marine sector:

- Bio-mimicry
- Biophilic design in land (green buildings and green architecture)
- Low-carbon technical solutions
- Renewable energy and industrial energy research
- Solar energy research and design
- Sails and wind power research and design
- Research in energy efficiency
- Industrial water efficiency and close loop systems
- Alternative HVAC, natural ventilation systems
- Plant biology

2. The Charrette process

In April 2014, we gathered world experts on naval architecture, marine engineering, renewable energy, energy efficiency, maritime law, biomimicry, and biophilia, for an EcoShip design charrette in Hamburg, Germany. This multi-disciplinary charrette approach had never before been applied to the cruise industry and the innovative outcomes formed the basis of our EcoShip specifications.

Participants



Amory B Lovins
Rocky Mountain Institute
Co-founder / Chief scientist



Dayna Baumeister
Biomimicry 3.8
Co-founder / Keystone



Tomas Kåberger
Japan Renewable Energy
Foundation. Chair of the Board
Professor of Industrial Energy
Policy at Chalmers University of
Technology

and
MEYERWERFT
STX TURKU
PAX SCIENTIFIC
GOTHENBURG UNIVERSITY
DNV-GL
OLIVER DESIGN
MAK
DAIKIN
DETLEV SAILS
KOPF SOLAR DESIGN
FORESHIP
MARITIME HOLDINGS



3. Feasibility Studies 2015

As a result of the Charrette, a focused consultation process was launched to investigate the feasibility of the subsequent technological aspects:

From the marine sector:

- Hull shape and hull design
- Natural ventilation
- Best fuel options
- LNG bunkering alternatives
- Sails, sails retractability and sails resistance

From the non-marine sector:

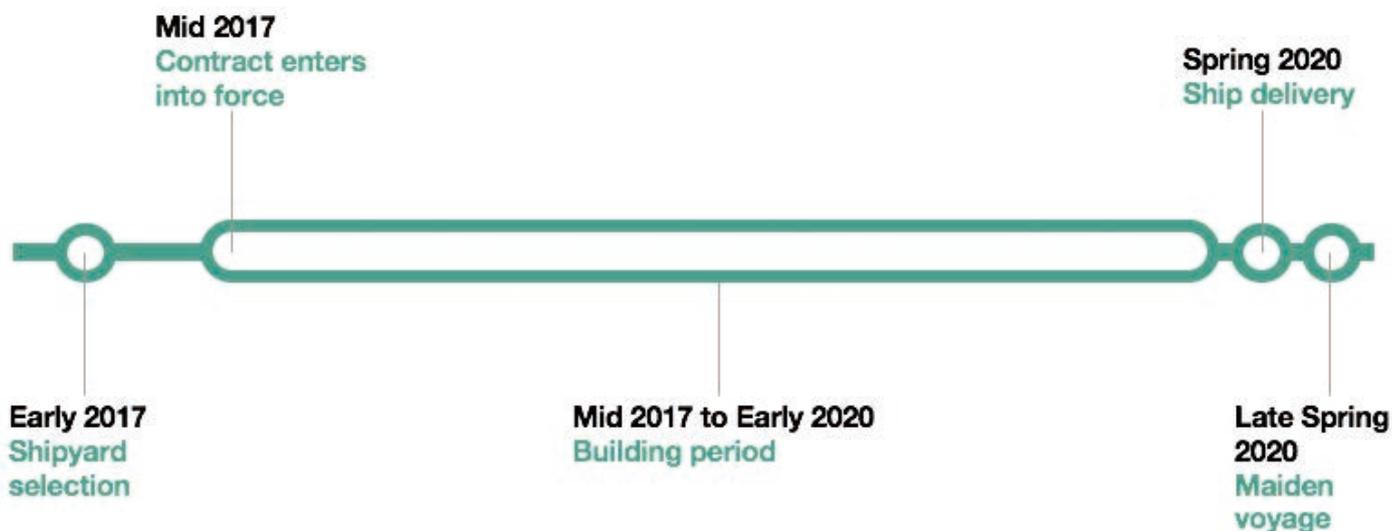
- Wind energy generation when alongside (retractable wind poles)
- Heat Recovery on board
- Solar energy efficiency
- Garden and available botanical choices

Today we have a General Arrangement Drawing; Technical Specifications for the vessel and a hull forms optimization program.

4. Consolidation of Green Advisory Board 2015-2016

A wide pool of partners and supporters of our project is in the process of consolidation through meetings in Germany, Japan, France, Spain and China. Some of them are now members of our Green Advisory Board that includes internationally renowned experts, mandated to ensure that the vessel continues to benefit from the latest technologies.

5. Timeline to launch

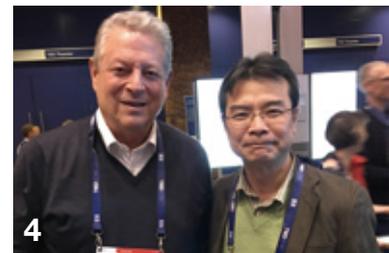


Building momentum for change

With the world eager to find positive and innovative solutions for a sustainable post-carbon future, Peace Boat's EcoShip project has been making waves at global events. Some highlights included the presentation of the project at both the COP 21 United Nations Climate Change Conference in Paris in 2015, and COP 22 in Marrakech in 2016.

United Nations Secretary-General Ban Ki-moon Ban Ki-moon discussed the EcoShip with our delegation at the 66th United Nations Department of Public Information (DPI)/Non-Governmental Organization (NGO) Conference, in May 2016. Other notable UN cooperation included hosting a "Floating Festival for Sustainability" to promote the SDGs in partnership with the UN Department of Public Information (DPI) in New York City in October.

On the maritime front, Peace Boat was honoured to sign an MOU for collaborative work on the EcoShip with the classification society DNV GL in September 2016. A signing ceremony was held in Hamburg at SMM, the world's most important meeting point for the maritime industry.



1. COP21. 2. Press conference at COP21. 3. TED Conference in Vancouver. 4. Al Gore with Peace Boat Director Yoshioka Tatsuya. 5. Seatrade Miami.



1



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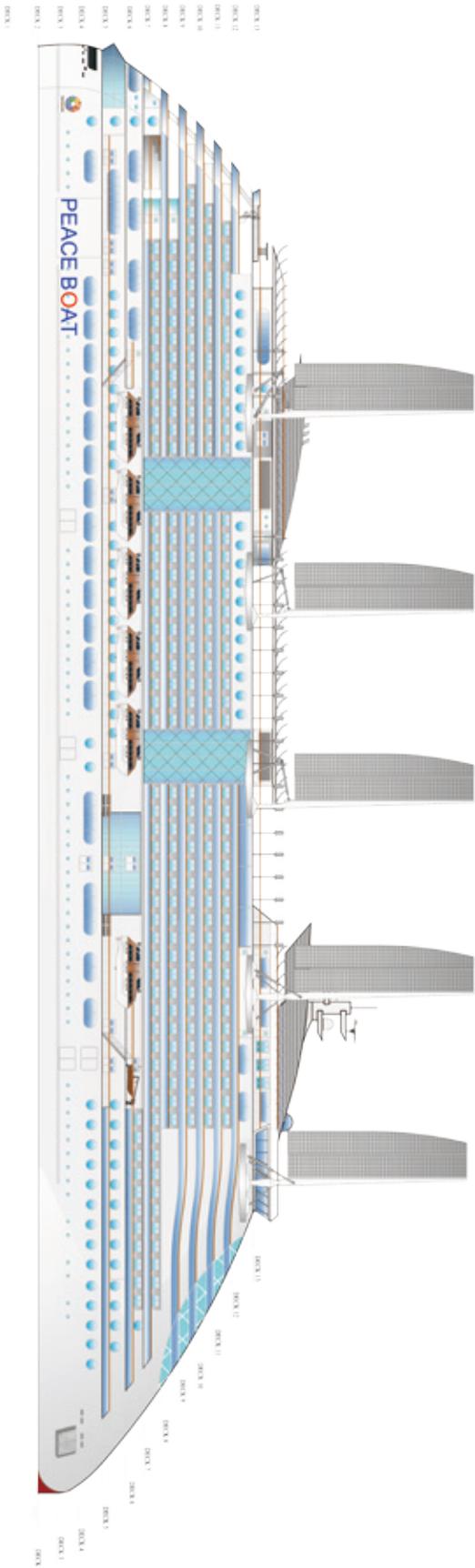
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1. Deputy Secretary-General of the UN, Jan Eliasson, onboard Peace Boat. 2. Erik Solheim, UNEP Executive Director. 3. With H.E. Dr. Sultan Ahmed Al Jaber in Abu Dhabi Sustainability Week. 4. DNV GL signing ceremony. 5. INK Asia. 6. Generating media impact. 7. With the UN Secretary-General Ban Ki-moon in the 66th UN DPI/NGO Conference. 8. Floating Festival Floating Festival for Sustainability in NYC. 9. Former President of Iceland, Ólafur Ragnar Grímsson. 10. Press conference at COP22.

Design and technology



PROJECT: PEACE BOAT — IMAGINE PROJECT | DRAWING: PROFILE AND TOP VIEW | SCALE: 1:300 | DATE: 09-06-2015

Main data

- GT: 55,000
- Length overall: 224m
- Beam: 31m
- Draught: 8m
- Top speed: 21knots
- Optimised cruising speed: 17 knots
- Passenger capacity: 2000
- Number of cabins: 750

Architectural design by



Technology overview

Together with the synergistic effects of the world voyages and educational programs onboard, the Ecoship's technology will result in a model that will minimise the threat to the oceans and planet from the booming cruise sector.

Radical energy efficiency

- 20% cut of propulsion energy
- 50% cuts on electricity load
- Integrated heat recovery and reuse system
- Fuel adaptability and future readiness

Boundary defying use of renewable technology

- 10 retractable wind generators
- 10 retractable photovoltaic sails
- 6,000 m² / 750 Kw of solar power generation
- Kinetic floors

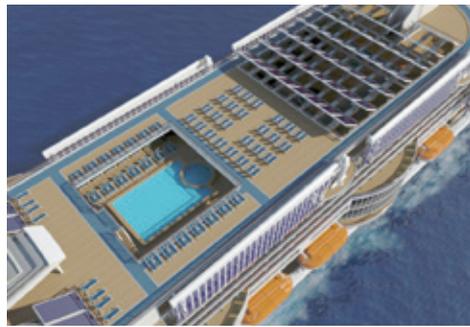
Nature-inspired technology and design

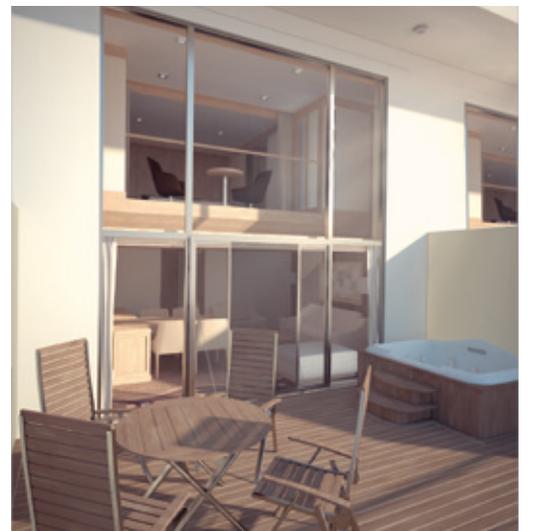
- Aerodynamic shape and hydrodynamic hull inspired by the whale (Biomimicry)
- Air bubble hull lubrication system
- Natural ventilation
- Biophilic design for comfort and inspiration

Real ecosystems onboard

- Onboard plant kingdom and vertical farming
- Closed loop water system
- Zero discharge / zero waste operation

**Resulting in a 40% cut
in CO2 emissions**





Waste energy reuse

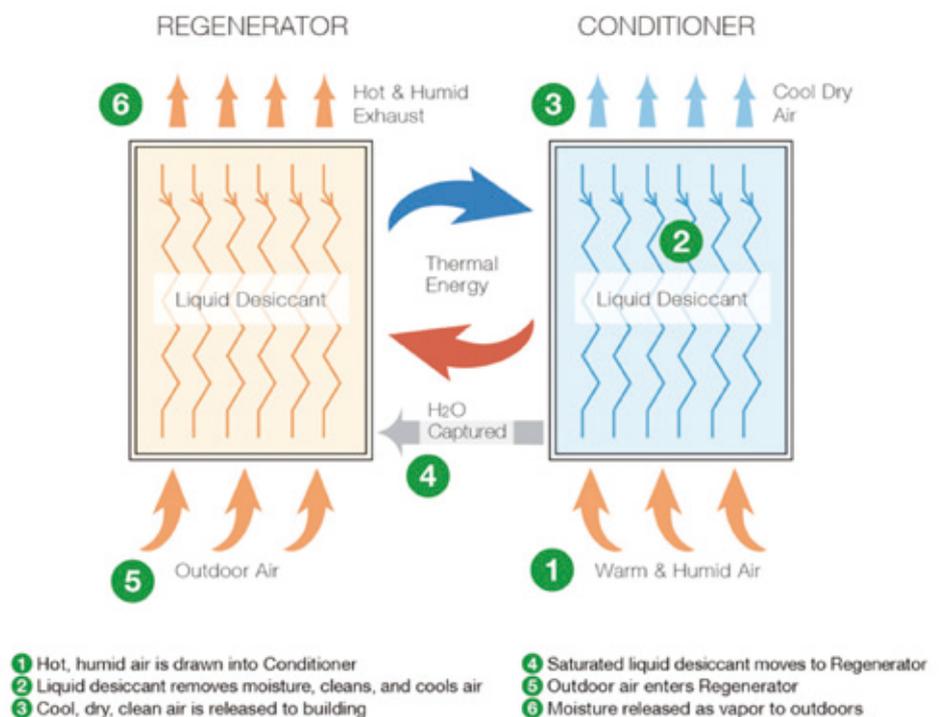
The reuse of waste energy relates, in particular, to engine cooling water and smoke gas heat. A massive amount of heat is produced on board, mainly through the LNG (Liquid Natural Gas) fuel combustion process. Further, since LNG is kept chilled during storage at -160°C , it provides an additional source of heat exchange when heated to the engine combustion temperature.

The Ecoship's radical waste energy reuse system takes advantage of these energy sources through smoke gas turbo generators, adsorption chiller plants, fresh water generators, domestic water heating and LNG cooled HVAC chiller water circuits.

The energy produced will be mainly used by the Hotel, especially the HVAC system, which represents about 50% of the hotel load making it one of the most energy-consuming systems on any cruise ship.

In addition to this, energy waste prevention measures will also be implemented including highly insulating 4-layer glass windows that will keep out most thermal radiation. Remote control and central monitoring systems will be programmed to use HVAC according to occupancy. Also, "sensitive furniture" such as cooling mattresses, will help reduce the energy consumed at night by avoiding the wasteful cooling of whole spaces.

Thermal energy used for air-conditioning (adsorption chiller)



Reference: thermalhydraulics.wordpress.com

Boundary-defying use of renewable energy

As of 2016, it is expected that the EcoShip will run on 4 different fuels, namely, LNG, Bio-gas (methane), MDO and bio-diesel from non-edible crop by-products. These fuels will cover 95% of the propulsion needs and 60% of the hotel load needs, the rest being covered by renewables or waste energy re-use. However, as research progresses and as existing technologies are adapted for maritime use, the ship has been designed to allow cost effective retrofitting for these new technologies.

Retractable sails and wind generators

The EcoShip will be fitted with 10 retractable sails expected to produce an average of 4% of the necessary propulsion power. The maximum efficiency of the sails under optimal sailing conditions will be of 10%.

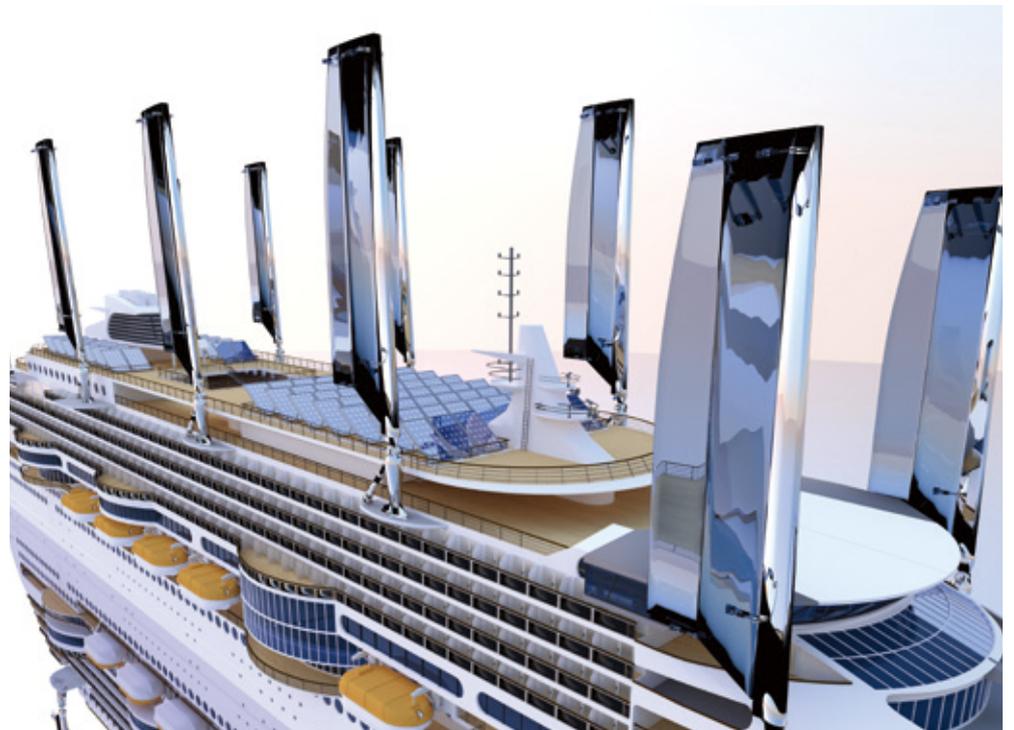
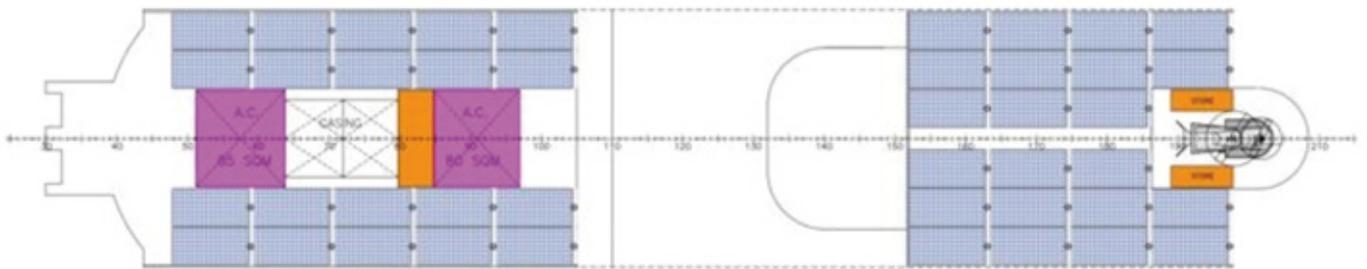
In addition the ship is equipped with 10 retractable wind turbines delivering about 300 KW with wind speed of about 12 m/s. Wind energy can be generated and used when in port or when sailing under the right wind conditions. It can power the galleys via frequency converters. Under good wind conditions, 30% of the in-port energy needs of the hotel could be covered by wind power.



Solar energy

6,000 m² of solar panels effective at any one time (top deck and one ship's side) provide 750 kw capacity for lighting. The total installed solar panel area is much larger, at about 12,000 m².

Large areas of the ship in direct sunlight will be covered with solar panels. These include windows in public spaces; passenger balcony railings; the upper top deck as well as the vessel's sails. The sails will be covered with transparent photovoltaic panels and all external lighting will be fed by the photovoltaic solar energy production systems. The Ecoship's target for solar energy is 100% of the lighting electricity needs of the passenger cabins and exterior public areas.



Nature-inspired technology and design

Hull Configuration

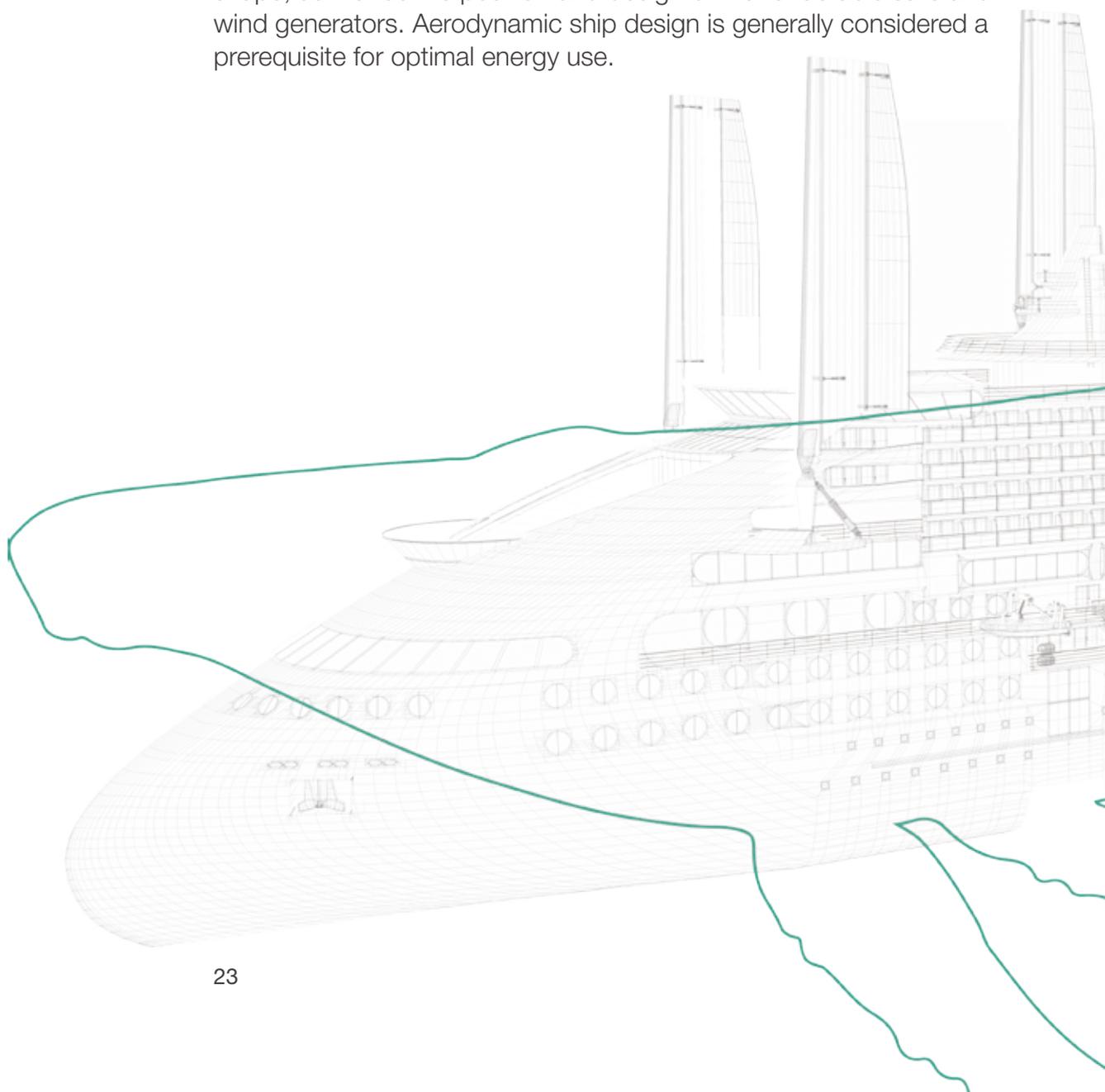
Hull design is an important factor in fuel efficiency. Originally inspired by the shape of the whale (inverted bow or equivalent), the hull has undergone parametric modelling using the most advanced techniques with special emphasis on savings and hydrodynamics. Experts believe that an appropriate hull shape could result in up to a 5% reduction in fuel consumption.

Anti water-drag technology

The hull will be fitted with anti-drag underwater technology, which will contribute to the improvement of hull performance. “Air lubrication” systems, which use a bed of air bubbles at the base of the hull, are already readily available.

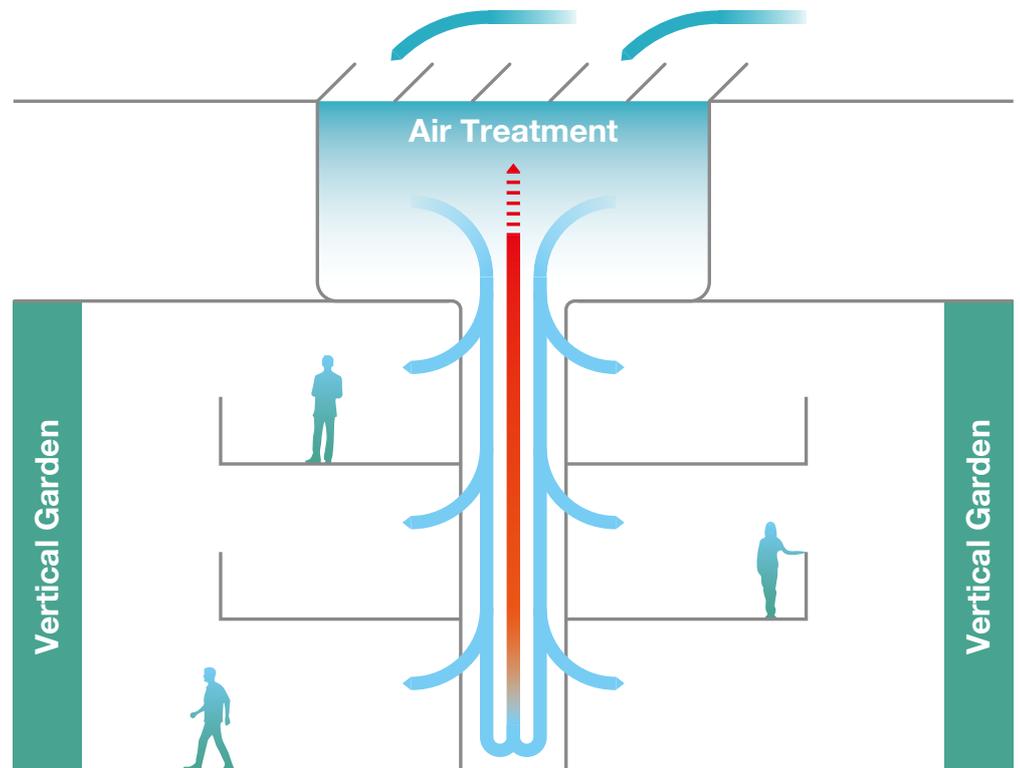
Aerodynamic design

The external design will minimise air-drag. Elements that contribute to this minimisation are the total exterior volume of the ship and its shape, as well as the position and design of the retractable sails and wind generators. Aerodynamic ship design is generally considered a prerequisite for optimal energy use.



Natural ventilation

The forward and lateral gardens will work as chillers for the HVAC (Heating, Ventilation and Air Conditioning) system. Outside air will be forced into the gardens where water spray will evaporate, providing the cooling effect. Additionally, air circulating from the ship's accommodation will cool down the incoming air after having been treated in the gardens. This chiller water circuit method is designed to save about 20% in A/C electric power when compared to a conventional compression system. In order not to mix up air sources, heat exchange will be carried out by means of wheel enthalpy recoverers.



What is biophilic design?

Biophilia is humankind's innate biological connection with nature. It helps explain why crackling fires and crashing waves captivate us; why a garden view can enhance our creativity; why shadows and heights instill fascination and fear; and why animal companionship and strolling through a park have restorative, healing effects.

Biophilic design reconnects us with nature and is essential for providing people opportunities to live and work in healthy places and spaces with less stress and greater overall health and well-being.

In reality this involves incorporating nature within the space design, be it visual or sensual. The Ecoship's cabins and public spaces will be designed along biophilic principles to create a space of wonder and inspiration that is a comfortable home for a three-month voyage.

14 Patterns of Biophilic Design for health and well-being in the environment



PHOTOS COURTESY OF MICHAEL MORAN STUDIO, PLAN B ARCHITECTS, WOHA ARCHITECTS, 70 MAGAZINE, AND TERRAPIN BRIGHT GREEN

NATURE IN THE SPACE

1. Visual Connection with Nature
2. Non-Visual Connection with Nature
3. Non-Rhythmic Sensory Stimuli
4. Access to Thermal & Airflow Variability
5. Presence of Water
6. Dynamic & Diffuse Light
7. Connection with Natural Systems

NATURAL ANALOGUES

8. Biomorphic Forms & Patterns
9. Material Connection with Nature
10. Complexity & Order

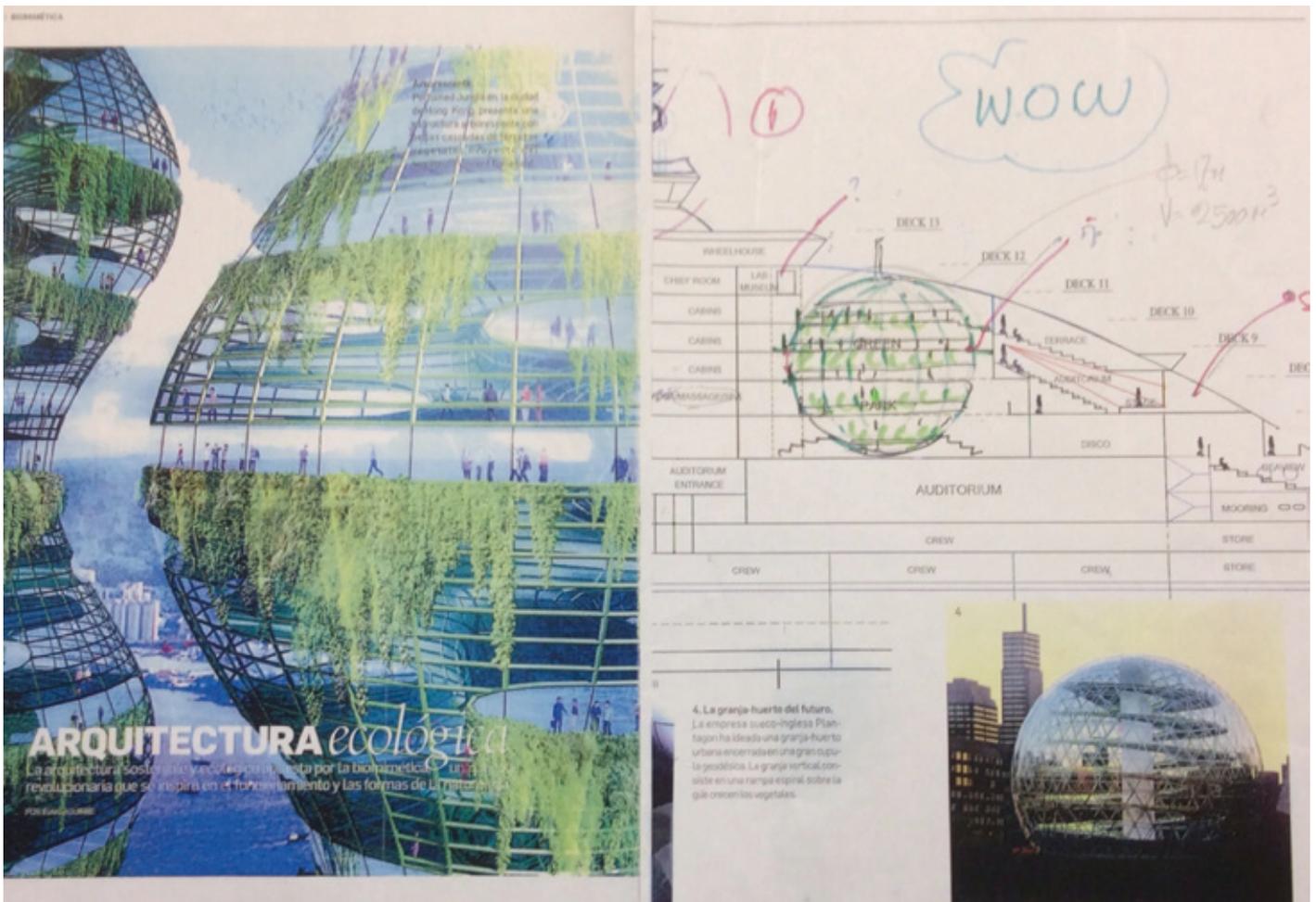
NATURE OF THE SPACE

11. Prospect
12. Refuge
13. Mystery
14. Risk/Peril



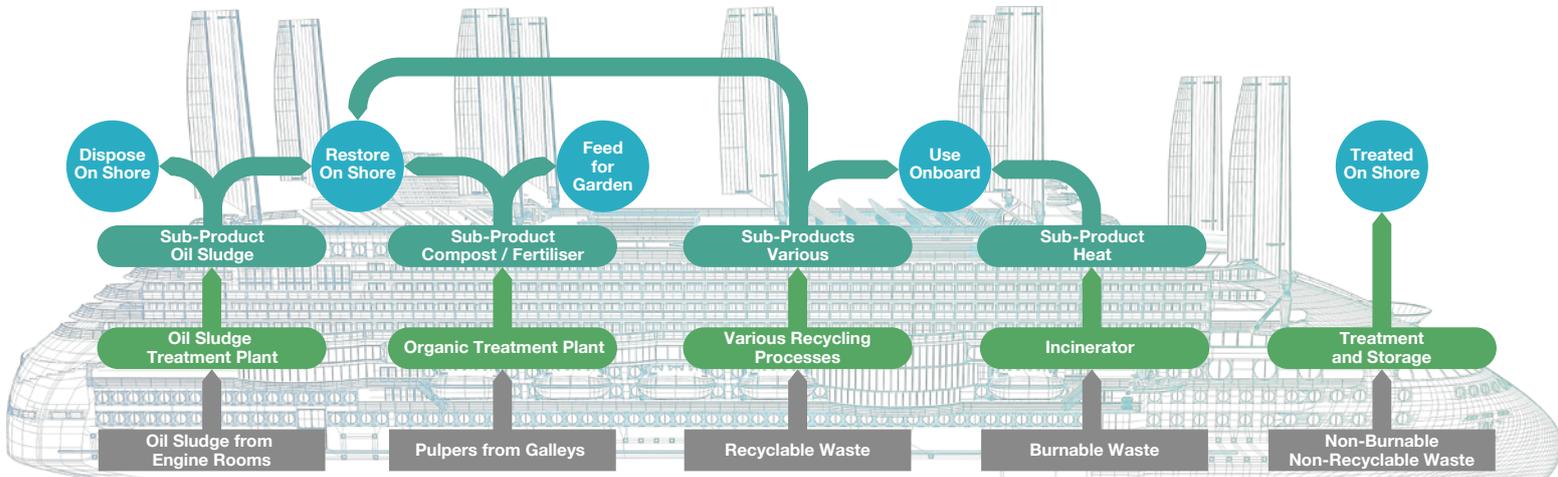
Real ecosystem onboard - Plant Kingdom

The green heart and lungs of the Ecoship will be the plant kingdom, a garden spanning five decks with a volume of over 900m³. Together with the vessel's 4 green towers, it will absorb surplus technical water; utilise compost from organic onboard waste; and revitalise the vessel's air through CO₂ capture and O₂ release as well as being a key element of the HVAC system. The species in the plant kingdom and towers will be chosen for their adaptability to the ship's conditions, and will also produce vegetables for consumption onboard. The plant kingdom, designed according to biophilic principles, will be the backdrop for the ship's sustainability learning programs and research as well as a source of inspiration and comfort for the ship's passengers and visitors.



Zero discharge, minimum waste operation

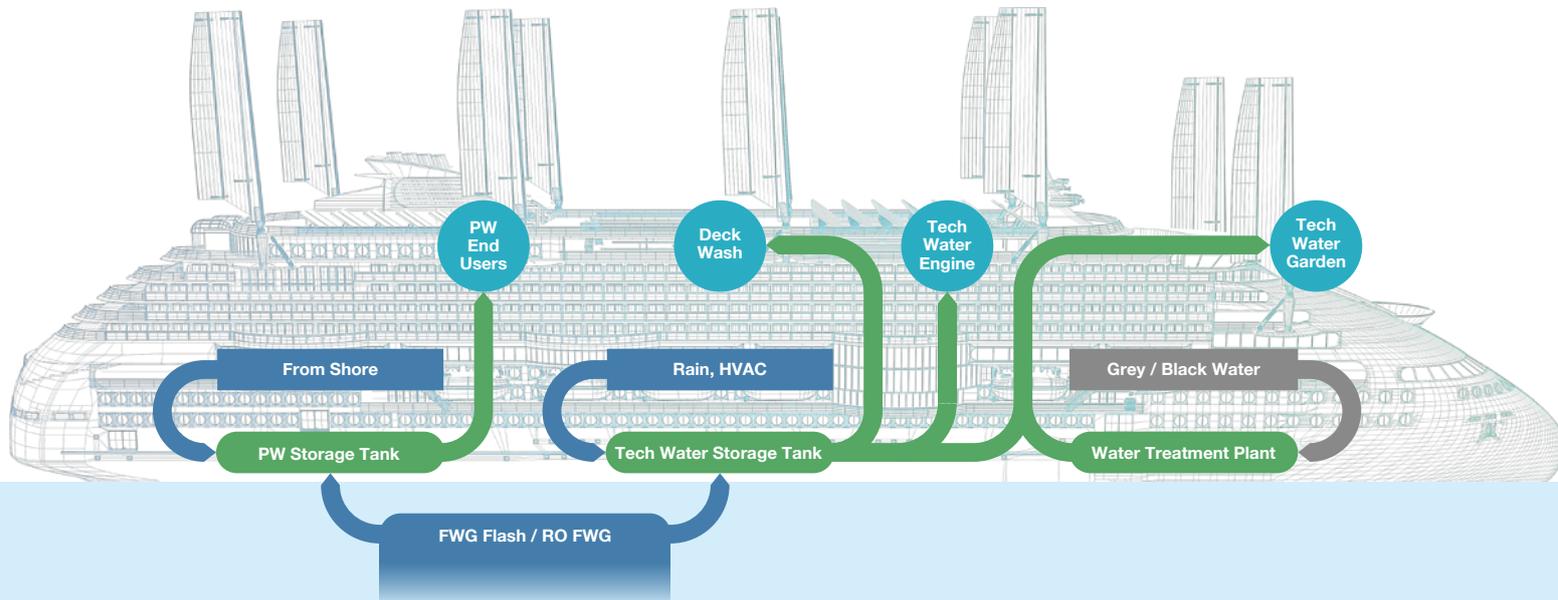
The Ecoship Project is committed to a target of zero discharge and close to zero waste operations and will incorporate closed-loop waste and water management systems.



Closed waste loop

The Ecoship project's aim is to minimise waste both in and out. This involves a policy of minimising all types of packaging. Where waste is produced, a key component of the closed loop system is the production of usable sub-products.

While much of these will be recycled onboard, excess products could be 'restored' to the local communities visited. Specifically from galley pulpers and recycled waste, sub-products include water, compost and fertilisers, cartons, wood, plastic and paper.



Closed water loop

The Ecoship closed water loop technology is just part of a broader focus to minimise water usage onboard:

- Cabins will incorporate water counters to show the amount of water used
- Sprinklers, irrigation and other cleaning devices will incorporate high pressure, low consumption technology

- Toilets will use less than 1 litre of water per flush
- The use of technical water (non-drinking) wherever possible, for toilets, hull/deck washing etc.
- Education and management of the crew to improve water saving practices.

Key

- PW: Potable Water
- FWG Flash: Fresh Water Generator using sea water evaporation at low pressure
- RO FWG: Fresh Water Generator using Reverse Osmosis

*Design and technology subject to change

40% CO2 reduction

A key Ecoship deliverable is an estimated 40% CO2 reduction in comparison with a cruise ship with conventional propulsion built before 2000; and an estimated 30% reduction compared to a good current design.

This calculation has been done according to the International Maritime Organization's 2004 guidelines on the method of calculation of the attained energy efficiency design index for new ships (EEDI). It is intended to define the CO2 produced per transported unit or, in the case of passenger vessels, by gross tonnage. The result may vary slightly depending on operational conditions.

These results will be achieved through the combination of the propulsion efficiency, hull forms, accommodation efficiency, hull air bubbles and renewable technologies, as well as by route, speed and management measures.



Peace Boat Founder and Director Yoshioka Tatsuya on the significance of CO2 reductions in shipping at the COP 21 Climate Change meeting in Paris, December 2015

Our Actions



Overview

The Ecoship builds on Peace Boat's 30-year history to amplify our message and become a catalyst for inspiration and change for our participants, our partners in port and for all those around the world who engage with the vessel.

Besides the Ecoship's technology and design, it will embody sustainability efforts through its activities, carrying out a diverse range of programmes around the world in cooperation with a wide variety of partners, including NGOs, civil society groups, students groups and volunteer organisations.

As an NGO with Special Consultative Status with the Economic and Social Council of the United Nations, Peace Boat is a committed campaigner for the SDGs. The Ecoship will take a holistic approach to put the SDGs into practice.

1. Educational voyages for peace and sustainability

- 3-4 round-the-world voyages per year
- 6,000 voyage participants per year
- 100 ports visited annually, inspiring over 100,000 people
- Hundreds of educational programs on board and in the ports visited

2. Venue, vehicle and messenger for advocacy campaigns

- Committed messenger for the SDGs, climate action and other global campaigns
- Potential venue for worldwide meetings
- Safe mobile space beyond borders
- Vehicle for unique training programs

3. Leadership for a green cruising model

- Green technology exhibitions in 100 ports annually
- Best technology directly available for future ship developments
- Floating sustainability laboratory
- New cruising regions will develop on a sustainable basis

1. Educational Voyages for Peace and Sustainability

Sailing 3-4 times a year around the world, the Ecoship's educational voyages will induce changes in mindset and behaviour among its 6,000 annual participants. Our innovative experiential education programs combine learning onboard with study and advocacy programs in ports, and will focus on the UN SDGs.



2. Venue, vehicle and messenger for advocacy campaigns

The Ecoship will be much more than a boat for travelling. Its voyages will create alliances and amplify local efforts on key global issues. The ship will also engage with international civil society by leading or participating in numerous international campaigns and advocacy efforts to help build a more peaceful and sustainable world. The ship will be also a potential venue for worldwide meetings, training sessions and safe space for dialogue beyond borders.



3. Leadership for a green cruising model

The EcoShip, with its stunning hull form and spectacular solar panelled sails, will be an inspirational sight as it sails into port: a true flagship for green innovation. The EcoShip will be an exhibition hall in ports, allowing innovators, companies and educators to display their green solutions to a worldwide audience, and welcoming people from every corner of the globe to cooperate. We expect to work with stakeholders in ports (governmental, academic, community and commercial) to realise the ship's potential to lead sustainable change.



Supporters

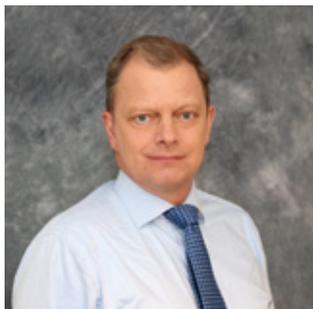


“Peace Boat’s Ecoship sailing the oceans and cooperating with communities in port will be a wonderful symbol of the interconnectedness of peace and sustainability.”

Wanjira Mathai
The Green Belt Movement

“An exciting vision of a ship that fits the needs, and inspires the people, of the planet it travels. Projects with this ambition seem impossible until they are done, but doing them transforms the industry”

Amory B Lovins
Rocky Mountain Institute



“Peace Boat’s Ecoship Project – with its perfect combination of improved energy efficiency and renewable sources of energy – is an attempt to break through boundaries and bring in new sustainable technologies in to the shipping industry. It will move the whole industry, setting examples of what can be achieved.”

Tomas Kåberger
Japan Renewable Energy Foundation

“We live in a carbon-constrained world today where we know that we have to reduce, radically, the carbon emissions that are going into the atmosphere if we’re going to avoid the catastrophe of climate change...and Ecoship is obviously a way we have to go.”

David Suzuki
Environmental activist



“Delighted to see the progress of the Ecoship, a visionary project for the advancement of maritime transportation. Such pioneering efforts create the path toward a new reality, one that is urgently needed.”

Christiana Figueres
Mission2020 Convenor and Vice-Chair of the Global Compact of Mayors for Climate and Energy.

Contact us

Contact us and get involved:

info@ecoship-pb.com

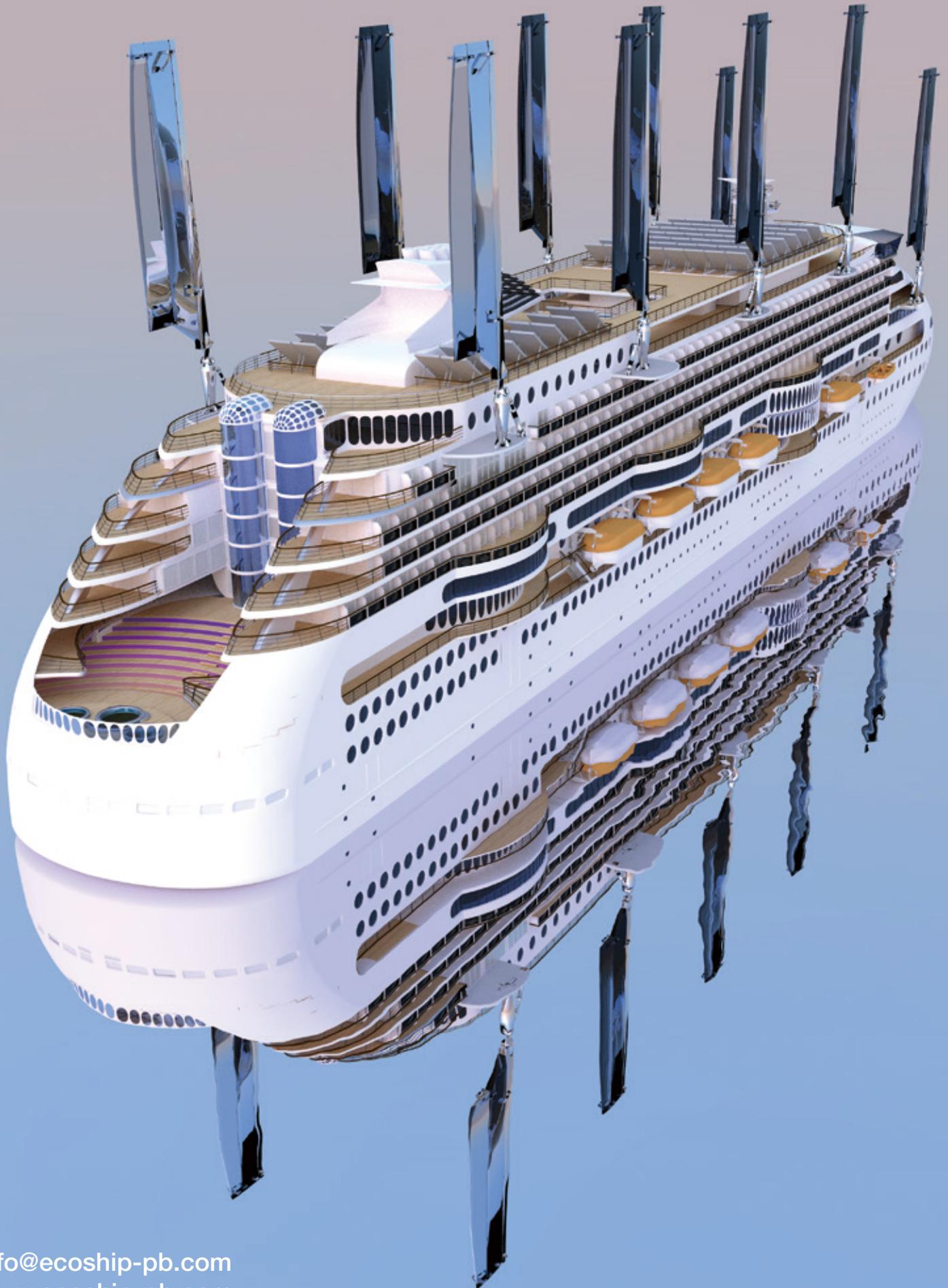
www.ecoship-pb.com

Industry partners



Ecoship is a Peace Boat project. Founded in 1983, Peace Boat group is Japan's largest cruise organization. Combining education, advocacy and travel in a unique social business model, our global voyages and on-land activities promote peace, human rights and sustainability. Peace Boat is an NGO in Special Consultative Status with the Economic and Social Council of the United Nations.

Peace Boat, Nokk Bldg.
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Tokyo, 169-0075, Japan



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PEACE
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