



Roadmap for Shipping Decarbonisation

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NEW CHALLENGES

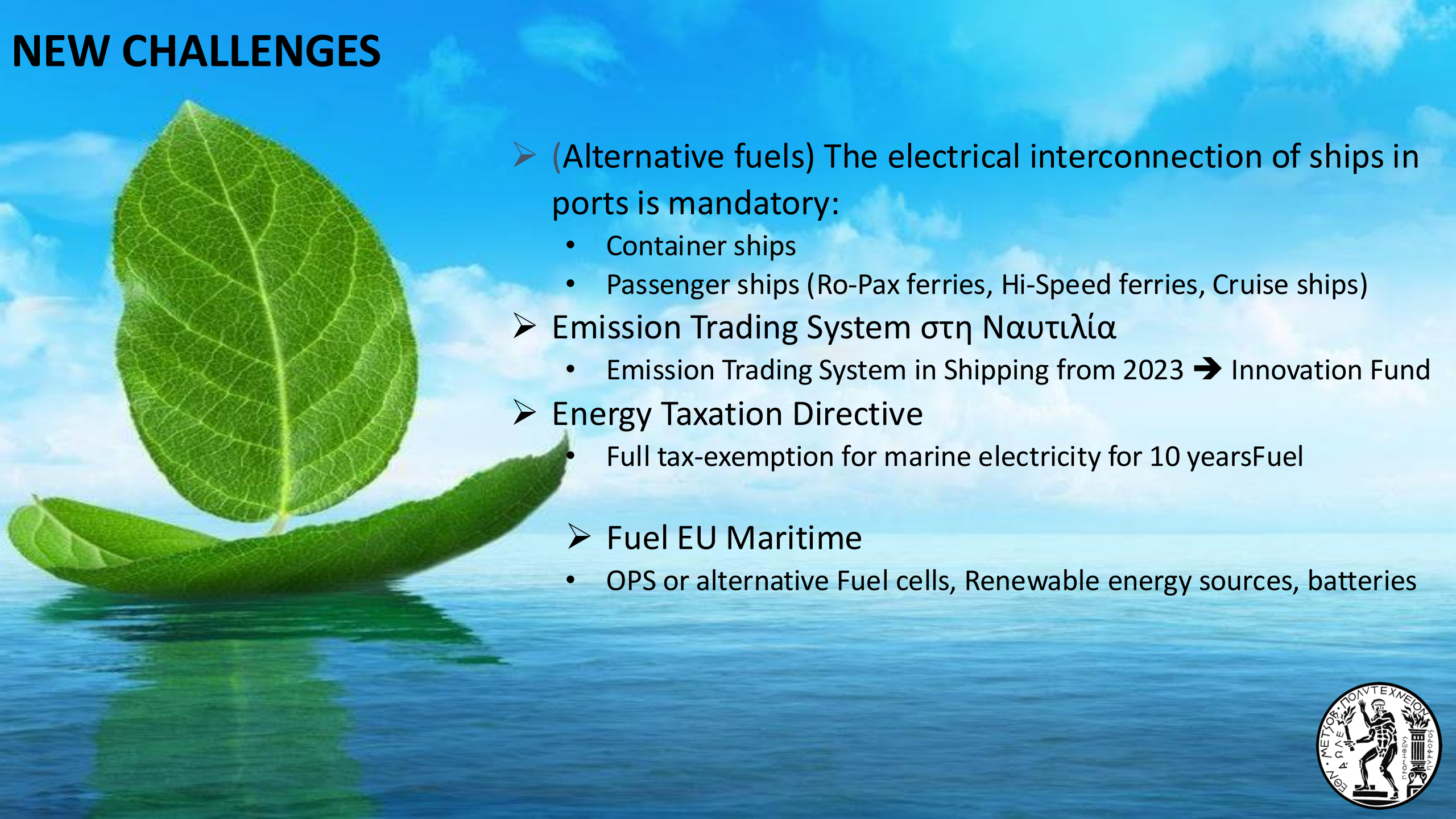


International Regulatory Pressure:

- Global frameworks such as the IMO's goals for a 20% reduction in emissions by 2030 and 70-80% by 2040 are guiding industry action.
- Companies are adjusting their strategies to meet these ambitious targets, balancing short-term operational changes with longer-term investments in low-emission technologies.



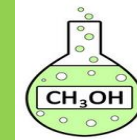
NEW CHALLENGES

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- (Alternative fuels) The electrical interconnection of ships in ports is mandatory:
 - Container ships
 - Passenger ships (Ro-Pax ferries, Hi-Speed ferries, Cruise ships)
 - Emission Trading System στη Ναυτιλία
 - Emission Trading System in Shipping from 2023 → Innovation Fund
 - Energy Taxation Directive
 - Full tax-exemption for marine electricity for 10 years
 - Fuel EU Maritime
 - OPS or alternative Fuel cells, Renewable energy sources, batteries



Roadmap towards green shipping

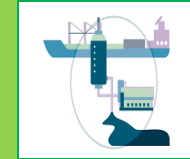
Alternative Fuels and Management



Energy Upgrade and Reduction of Footprint in Ships and Ports



Active Emissions and Technologies for Reducing the Environmental Footprint



Digitalization Technologies



Circular Economy Solutions



Best Combination of Solutions



FUEL OPTIONS

What is the best fuel option?

	Availability	Infrastructure & Storage	Maturity of technology	Energy density	Price	Green credentials
VLSFO/MGO	Green	Green	Green	Green	Green	Red
LNG	Green	Yellow	Green	Yellow	Green	Yellow
LPG	Green	Yellow	Yellow	Yellow	Green	Yellow
Methanol	Yellow	Yellow	Green	Yellow	Yellow	Yellow
Biofuels	Red	Green	Yellow	Green	Red	Light Green
Hydrogen	Red	Red	Red	Red	Red	Light Green
Ammonia	Red	Yellow	Red	Yellow	Yellow	Light Green

DNV, C_Chyrissakis_Future_marine_fuels-NTUA-22_April_2021



SHORT TERM: *METHANOL*
LONG TERM: *HYDROGEN*



TECHNOLOGIES AND MEASURES

Efficiency Technologies



Marine Digital

MODEL OF THE "GREEN" SHIP

Kite-Sail System

Can Reduce Fuel Consumption by 20-40% Annually



Rig-Sail System

This Hybrid System can save Fuel up to 30%



Solar-Sail System

This Hybrid System can save Fuel up to 20%



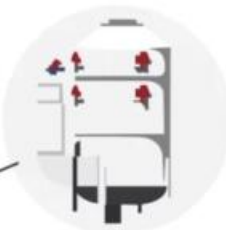
Optimized Cooling System

Can save 25% of electricity
Fuel saving 1.5%



Fuel Optimization System

up to 12% saving fuel and the reduction of emissions



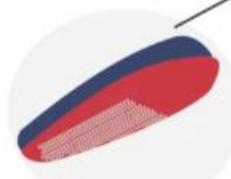
No Ballast Ship

Longitudinal Water Trunk does not carry Ballast Water



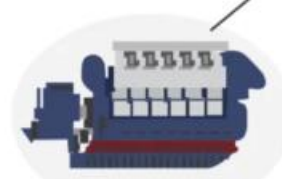
Improved Hull Paints

Reduces Friction,
Fuel Saving up to 8%



Air Bubbles Hull Lubrication

Reduces Friction,
Increases Speed,
Fuel Saving Up to 10%



Green Propulsion

«Dual Fuel Engines»
«Water in Fuel»
«Exhaust Gas Recirculation»
«Fuel Cell Technology»
Reduces SOx up to 100%
NOx up to 35%



Speed Nozzle

Increases efficiency at higher speed
Fuel Saving up to 5%



Advance Rudder & Propeller

New design can save fuel up to 4%

Exhaust Scrubber

SOx emission reduced by 98%



TECHNOLOGIES AND MEASURES

Operational Measures

- **Route Optimization:** Optimize routes to minimize fuel consumption.
- **Speed Reduction:** Implement speed reduction measures.
- **Just-in-Time Shipping:** Improve cargo management to reduce waiting times.
- **Digitalization:** Utilize digital technologies for efficient operations.



TECHNOLOGIES AND MEASURES

- **Technological Innovation and Digitalization:** Companies are increasingly investing in digital tools like AI for optimizing fleet operations and energy efficiency.
- These innovations support predictive maintenance or better decision-making, reducing environmental impacts and improving fuel consumption.



DECARBONIZATION BY SHIPPING MARKET



Bulk Shipping:

- **Iron Ore and Coal:** hybrid vessels, especially for shorter routes.
- **Grain:** Explore alternative fuels like biofuels or ammonia, and optimize cargo loading to reduce fuel consumption.



DECARBONIZATION BY SHIPPING MARKET



Tanker Shipping:

- **Oil Tankers:** Transition to alternative fuels like biofuels or ammonia.
- **Gas Carriers:** Explore hydrogen-powered vessels or alternative fuels like methanol.



DECARBONIZATION BY SHIPPING MARKET



Container Shipping:

- **Short Haul:** Invest in battery-electric or fuel cell-powered vessels.
- **Long Haul:** Explore hydrogen-powered vessels or alternative fuels like methanol or ammonia.
- **Hub-and-Spoke Model:** Develop regional hubs to reduce long-haul distances.
- **Cargo Optimization:** Optimize cargo loading and routing to reduce fuel consumption.



DECARBONIZATION BY SHIPPING MARKET



Coastal Shipping:

- **Short Haul:** Invest in battery-electric or fuel cell-powered vessels.
- **Longer Haul:** Hybrid vessels with biofuels or methanol
- **Hub-and-Spoke Model (???):** Develop regional hubs to reduce long-haul distances.



DECARBONIZATION BY SHIPPING MARKET



Cruise Shipping:

- **Shore Power:** Implement shore power connections in ports to reduce emissions while docked.
- **Hybrid or Electric Propulsion:** Explore hybrid or electric propulsion systems.
- **Energy-Efficient Design:** Focus on energy-efficient ship design and hull forms.



KEY QUESTIONS

Time Horizon:

- **Near-Term:** Implement efficiency measures, shore power, and explore biofuels.
- **Mid-Term:** Transition to hybrid or electric vessels in certain markets.
- **Long-Term:** Fully decarbonize the shipping industry through alternative fuels and advanced technologies.



KEY QUESTIONS

- **Cost of Transition:**

- **Shared Responsibility:** Should the cost of the transition be shared among stakeholders, including shipowners, charterers, governments, and financial institutions ???
- **Policy Incentives:** Governments can provide incentives, such as tax breaks or subsidies, to encourage decarbonization.
- **Green Finance:** Promote green finance initiatives to support investments in sustainable shipping technologies.



KEY QUESTIONS

Green Jobs and Workforce Upskilling:

- The decarbonization of shipping is expected to create millions of green jobs, especially in the renewable energy sector and e-fuel production.
- Greece has recognized the need to upskill its maritime workforce, declaring 2024-2025 as the "Years of Maritime Training" with a focus on digital and technical education.



KEY QUESTIONS

Collaboration and Industry Alliances:

- Greek shipping companies are increasingly forming alliances, such as the Maritime Emissions Reduction Centre (MERC), to pool resources and knowledge.
- This collaboration aims to accelerate innovation and align interests among different stakeholders in tackling decarbonization.



CONCLUSIONS

- Decarbonizing the shipping industry requires a comprehensive approach involving various stakeholders, technologies, and measures.
- By focusing on market-specific solutions and leveraging technological advancements, the industry can achieve a sustainable and greener future.
- Discussions from recent meetings on shipping decarbonization in Greece, emphasize that decarbonization is not just a regulatory requirement but a pivotal opportunity for economic and technological transformation within the maritime sector.



A large, vibrant green leaf is shown floating on a calm, blue body of water. The leaf is positioned on the left side of the frame, with its reflection visible in the water below. The background consists of a clear blue sky with scattered white clouds, extending to a horizon line that meets the water.

Thank you for your attention!

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