

# Technological Opportunities to Decrease Vessels' GHG Emissions

18/08/2025 VTT – beyond the obvious

# Agenda

- Introduction
- Current Initiatives and Commitments
- Technological Measures and Opportunities
- Operational Measures
- Ship Design and Technological Development
- Alternative Fuels
- Case Studies: Practical Actions Taken
- Recommendations for the Future
- Conclusion

# Opening Remarks

- Technological Opportunities to Reduce GHG Emissions
  - Various technologies available to decrease emissions
  - Focus on practical actions taken by shipping companies
- Insights from Teemu Manderbacka and Ulla Tapaninen
  - Chapter on practical decarbonization actions
  - Analysis of current measures in the industry
- Presentation on Zero-Emission Marine Transportation
  - Digitalization in marine transportation
  - Steps towards achieving zero emissions

# Overview of Maritime Decarbonization



- Significant Transformation in Maritime Industry
  - Aiming to drastically reduce carbon emissions
  - Driven by increasing awareness of climate change
  - Urgent need for sustainable practices
- No Single Solution for Decarbonizing Vessels
  - Multiple enablers need to be activated simultaneously

# Getting to Zero Coalition

- Getting to Zero Coalition
  - Partnership between Global Maritime Forum and World Economic Forum
  - Aims to make zero emission vessels (ZEVs) commercially viable by 2030
- Goal of Full Decarbonization by 2050
  - Efforts to achieve complete decarbonization within the maritime industry

# Poseidon Principles

- Framework for Climate Alignment
  - Poseidon Principles assess and disclose climate alignment of ship finance portfolios
  - Provide benchmarks and actionable guidance for responsible banking in maritime sector
- Signatories and Global Impact
  - As of end of 2022, 30 financial institutions were signatories
  - Represent over 70% of global ship finance portfolio



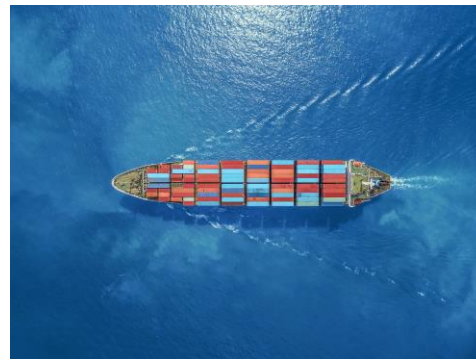
# Technological Measures and Opportunities



- Operational Measures
  - Strategies to optimize vessel operations
  - Improving fuel efficiency
- Ship Design and Technological Development
  - Innovations in ship design
  - Advanced technologies for emission reduction
- Alternative Fuels
  - Use of cleaner fuels
  - Exploring renewable energy sources

# Speed Reduction and Operational Changes

- Speed Reduction
  - Reduces fuel usage
  - Minimizes emissions
- Operational Changes
  - Concept of 'Virtual Arrival'
  - Adjusts vessel speed based on berth availability
  - Minimizes fuel usage
  - Reduces emissions





# Digital Tools and Technologies

- Role of Digital Tools in Operational Efficiency
  - Real-time data analytics for monitoring fuel consumption
  - Automated systems for route planning
  - Advanced software for managing maintenance schedules
- Benefits of Technologies in Shipping
  - Informed decision-making
  - Reduction in emissions

# Wind-Assisted Propulsion

- Wind-Assisted Propulsion
  - Bore Ltd uses Rotor Sail Solutions
  - Harnesses wind power to propel ships
- Fuel Savings
  - Up to 20% fuel savings achieved



# Hybrid Ro-Ro Vessels

- Introduction of Hybrid Ro-Ro Vessels
  - Finnlines has introduced new hybrid ro-ro vessels
  - These vessels incorporate energy-saving technologies
- Energy-Saving Technologies
  - Use of batteries to partially power the vessels
  - Air lubrication systems to reduce fuel consumption
- Environmental Benefits
  - Reduced fuel consumption
  - Zero emissions at berth



# Digital Twins



- Digital Twins in Ship Design
  - Creation of virtual replicas of physical vessels
  - Allows for real-time monitoring and optimization
- Benefits of Digital Twins
  - Identifying potential issues
  - Improving maintenance practices
  - Enhancing overall efficiency

# Biofuels

- Significance of Alternative Fuels
  - Crucial for reducing maritime carbon emissions
- Meriaura's Initiative
  - Baltic coastal shipping company
  - Testing 100% biofuel
- Biofuel Composition
  - Made from recycled raw materials
  - Waste-based bio-oil
- Environmental Impact
  - Reduces CO<sub>2</sub> emissions by up to 96%
  - Compared to traditional fossil fuels



# Electric Power

- Yara Birkeland Vessel
  - Electrically powered and autonomous
  - Designed to replace diesel-powered trucks
- Environmental Impact
  - Reduction of 40,000 truck journeys annually
  - Significant decrease in CO2 emissions
  - Lower NOx emissions

# Hydrogen and Ammonia

- Alternative Fuels Being Explored
  - Hydrogen as a potential fuel
  - Ammonia as a potential fuel
- Potential Benefits
  - Significant reduction in GHG emissions
  - Possibility of eliminating GHG emissions
- Challenges for Widespread Adoption
  - Need for appropriate infrastructure
  - Development of supply chains
  - Creation of regulatory frameworks

# Case Studies: Practical Actions Taken

- Bore Ltd
  - Implemented wind-assisted propulsion using Rotor Sail Solutions
  - Achieved up to 20% fuel savings
- Finnlines
  - Introduced hybrid ro-ro vessels with batteries and air lubrication systems
  - Reduced fuel consumption and enabled zero emissions at berth
- Tallink
  - Utilized an auto-mooring system
  - Reduced fuel consumption and emissions by speeding up the mooring process
- ESL Shipping
- Meriaura
- Yara



# Recommendations for the Future

- Improving Energy Efficiency in Newbuild Ships
  - Designing new ships to be energy-efficient
  - Considering the long service life of vessels
- Piloting Various Technical Solutions
  - Testing technologies like rotor sails and air lubrication systems
  - Implementing IT solutions for maintenance
  - Using batteries for energy efficiency
- Optimizing Passage Speed
  - Reducing vessel speed to decrease emissions
- Preparing for New Fuels
- Re-evaluating Transport Chains
- Introducing Regulatory Support

# Conclusion

- Collective Efforts Required
  - Shipping companies, shippers, and regulators must work together
- Technological Advancements
  - Embrace new technologies to reduce emissions
- Optimizing Operations
  - Improve efficiency in maritime operations
- Adopting Alternative Fuels
  - Use sustainable fuels to lower GHG emissions
- Contributing to a Sustainable Future
  - Maritime sector's role in reducing GHG emissions

