

# Alternative fuels, Retrofit and Newbuilding's

## New tool to support development of your Fuel strategy, keeping your fleet compliant



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- **Short introduction of KNUD E HANSEN A/S**
- **Overview Complexities in shipping**
- **Typical process when implementing new fuel(s)**
- **Important items to consider when defining your new fuel strategy**
- **Reflect your fuel strategy in your newbuilding design.**
- **Summery of recent project references**

# KNUD E HANSEN INTRODUCTION



- More than 850 vessels have been built to our design
- More than 450 hull lines developed, and model tested
- More than 300 conversions have been carried out to our design
- Thousands of surveys, onsite supervision and other services
- 100+ employees in seven offices – 3 continents

## SHIP DESIGN SINCE 1937



# OVERVIEW COMPLEXITIES IN SHIPPING

The shipping industry is highly cyclical and sensitive to global economic fluctuations. Demand for shipping services can be unpredictable, affecting freight rates and profitability. THIS REQUIRES A FLEXIBLE FLEET EG. Design and prepared to future fuel conversion



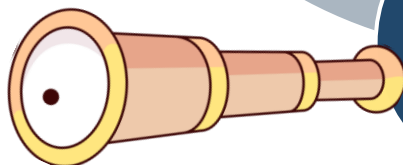
**Market Volatility**

Protecting vessels from cyber-attacks  
Monitor high-risk areas  
Focus on the security of ships, crew, and cargo requires additional resources and measures

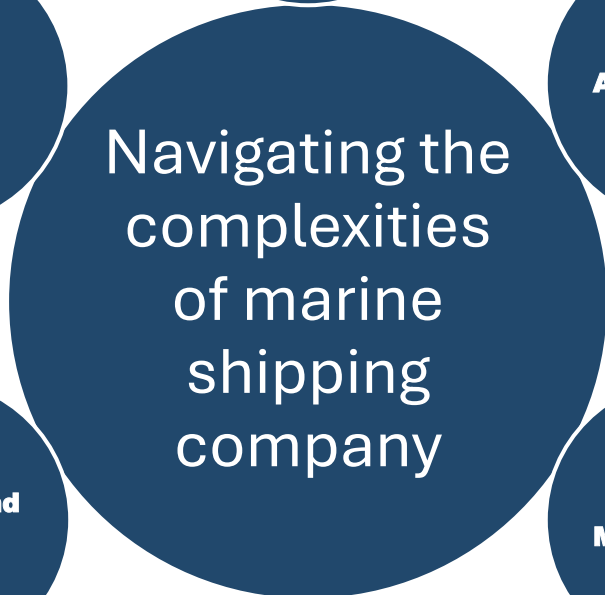


**Cyber security and Piracy Threats**

High operational costs, insurance, including fuel, crew wages, maintenance, and port fees, financial resources. Fuel costs are volatile and can significantly impact profit. Liability risks are crucial for ship owners. Incidents such as accidents, cargo damage, and environmental. GLOBAL WARMING GIVING MORE CHALLENGES AT SEA



**Operational Costs**



**Regulatory Compliance**



Ship owners to continually update and modify their fleets to remain compliant. This includes regulations on emissions, ballast water management, and safety standards

**Tech Advancements**



Keeping up with rapid technological advancements to stay competitive in the market

**Crew Management**

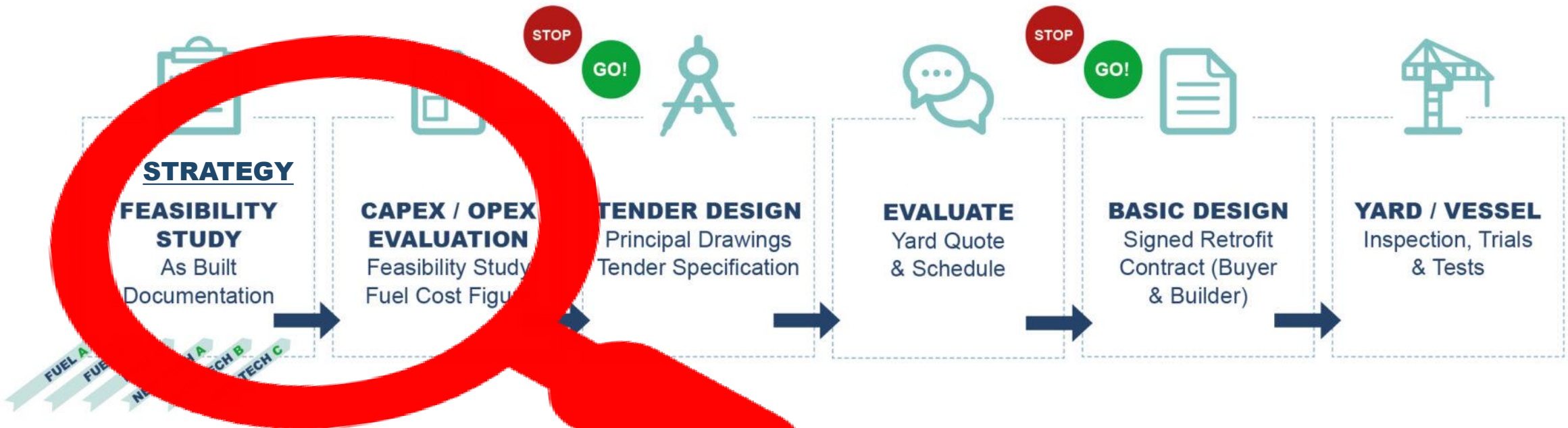


New complex ship systems also require additional training of crew and still focusing seafarers' welfare, health, and safety

## PROJECT STAGES & ACTIONS

### KNUD E. HANSEN DELIVERS THE WHOLE PACKAGE

KNUD E. HANSEN has conducted several H<sub>2</sub>, NH<sub>3</sub>, LNG and Methanol studies and designs.



# IMPORTANT ITEMS TO CONSIDER FOR THE STRATEGY



Scrapping/newbuild strategy

Identify more space on board

Dual fuel capability

Allocate space for new equipment

Effect on cargo capacity

Be ready when your client is demanding

HAZID & Rules

**It is too late to start the design work when your client is demanding green transportation**

Well-to-wake to be considered

Energy density of Fuel

FuelEU, CII, ETS, EEXI

Hazardous zone requirements

**Carry out initial conversion at sea to reduce time in dock**

Shipyards capacity

Is engine on market ?

More than one maker ?

Who can deliver the solutions and not only advice?

Major conversion, class?

Engineering capacity

More than one maker?

What possibilities gives energy saving/efficiency

**Develop a strategy for the whole fleet?**

H2, NH3, CH3OH, CH4

Engine modification

Crew training-audit

**Plug and play design to reduce time in dock**

What will converting involve and what shall be prepared

Modify structure for carry e.g. heavy tanks or modify tank arrangement

Class approvals

Predictable voyage patterns ? Operation profile

Operate constant with dual fuel

Key vendor capacity

Can you get fuel delivered in your operation area?

CAPEX/OPEX predictions

New cofferdams and vents

What is short/long term emission strategy

Fuel cost

**Prepare the design so you can push the green button when conversion shall be startet**

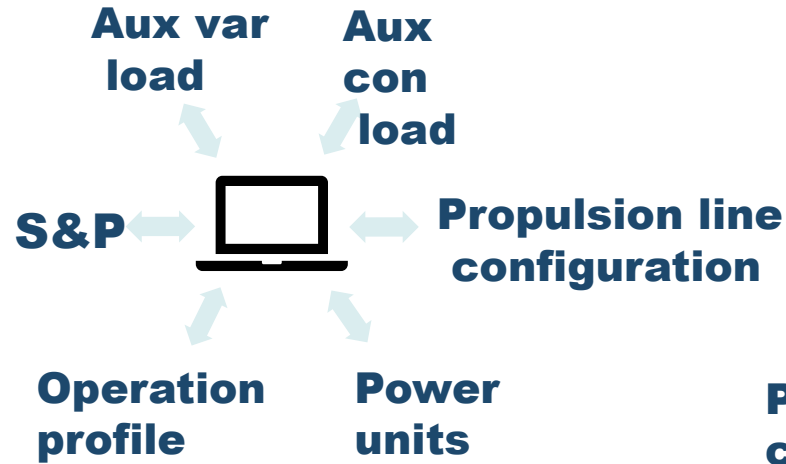


**MANY variables, constrains and consideration requires a  
NEW tool**

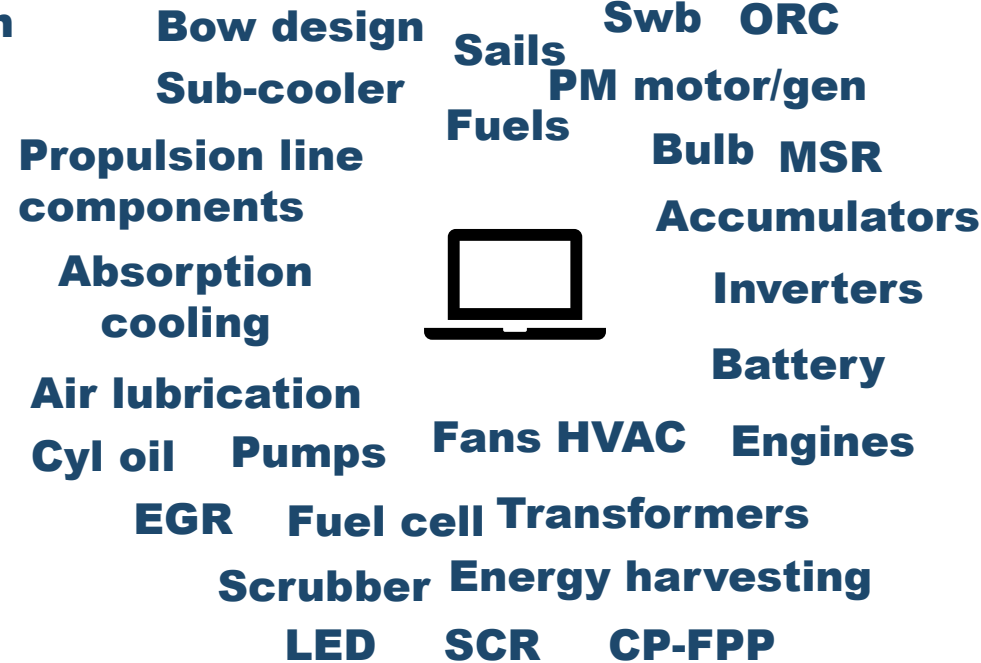


# KEH HAS DEVELOPED CALCULATION TOOL WHICH CAN GIVE YOU ANSWERS TO YOUR FUEL STRATEGY

## INPUT DATA COLLECTING SHIP/FLEET



## PROCESSING DATA



## OUTPUT SOLUTIONS AND BENCHMARKING SOLUTIONS





# SAMPLE OF OUTPUT FILES TO SUPPORT YOUR DESSIONS...



Project: xxxx ROPAX  
Project no: x1054



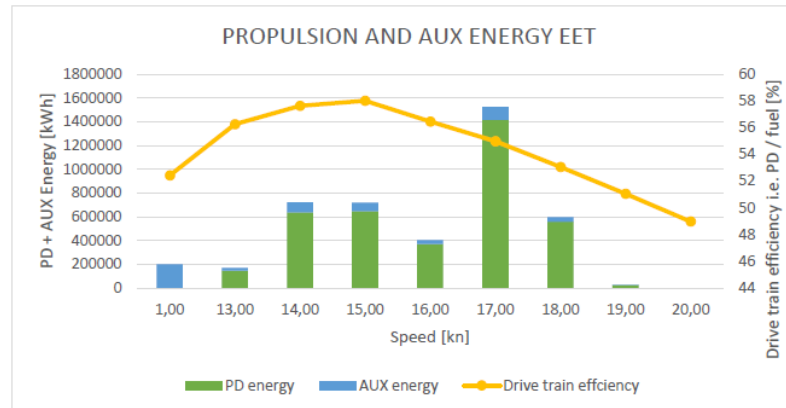
## Overview

GENERAL INFORMATION:	
Route:	Europa autumn 2021 Month 9
Power prediction:	x2068 - pd
Setup:	BBM installed
Fuel:	HFO (RMG 380)
Investment:	0,23 M€
Annual fuel cost savings:	0,26 M€
ESTIMATED ELAPSED TIME:	
Primary fuel consumed:	803,44 tons
Pilot fuel consumed:	0,00 tons
Primary fuel energy:	32.459,15 GJ
Pilot fuel energy:	0,00 GJ
Energy consumed:	32.459,15 GJ
Fuel cost:	457.963,23 €
CO <sub>2</sub> tax:	252.694,47 €
Total cost:	710.657,70 €
Peak aux power estimation:	1.015,73 kWe
WTW Carbon Footprint:	467,41 tons CO <sub>2</sub>
TTW Carbon Footprint:	2.526,94 tons CO <sub>2</sub>
WTW Carbon Footprint:	2.994,36 tons CO <sub>2</sub>

Project: xxxx ROPAX  
Project no: x1054



All graphs show the energy consumption and drive train efficiency with energy savings devices applied.

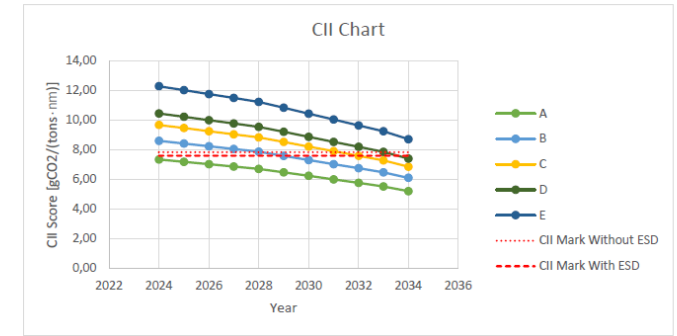


Project: xxxx ROPAX  
Project no: x1054

## CII projections - Current status & reduction in CO2 emission

The attained CII with and without energy saving devices (ESD).

	Without ESD	With ESD
Attained CII	7,84	7,60
CII rank 2024	B	B
CII rank 2034	E	E

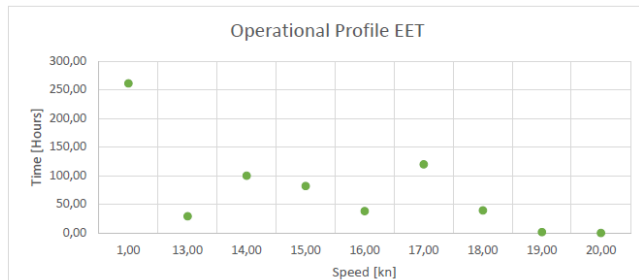


Project: xxxx ROPAX  
Project no: x1054



## Operational Profile

All calculations and result provided in this report is based on data submitted by shipowner and suppliers. The following graph show the operational profile submitted by shipowner.



Project: xxxx ROPAX  
Project no: x1054

## LCA

### LCA overview

Years in operation	30 -
Annual CO <sub>2</sub> e emmissions, without ESD	31.262,16 tons
Annual CO <sub>2</sub> e emmissions, with ESD	30.323,34 tons
Life Time CO <sub>2</sub> e emmissions, without ESD	0,94 Mtons
Life Time CO <sub>2</sub> e emmissions, with ESD	0,91 Mtons
Construction	0,20 Mtons
LCA, with ESD	1,13 Mtons
LCA, without ESD	1,11 Mtons

Project: xxxx ROPAX  
Project no: x1054

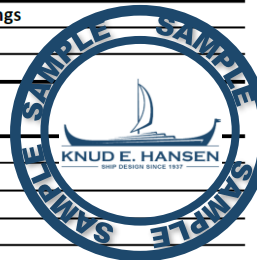
## Summary

Based on the data submitted by shipowner and provided by suppliers, the following improvements has been archived:

- Attractive NPV, payback time and OPEX savings
- Reduction of fuel cost
- Improved CII rating

The following is based on a 10 year period.

Investment	0,23 M€
Discount Rate	3,00 %
Annual Fuel Savings	0,26 M€
NPV	2,03 M€
Accumulated Savings	2,64 M€
Payback period	0,85 year(s)





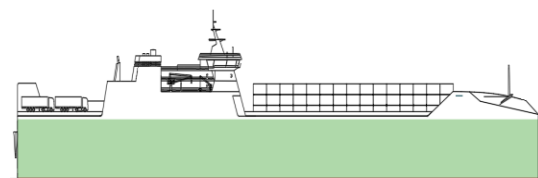
**KNUD E HANSEN fuel strategy support is based on strong references**



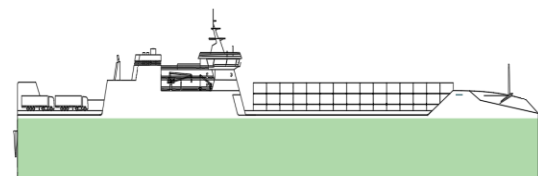
# RECENT PROJECT REFERENCES WITH NEW FUELS



**METHANOL**



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**AMMONIA**



**METHANOL© int**



**AMMONIA®**



**METHANOL©**



**LNG**



**METHANOL**



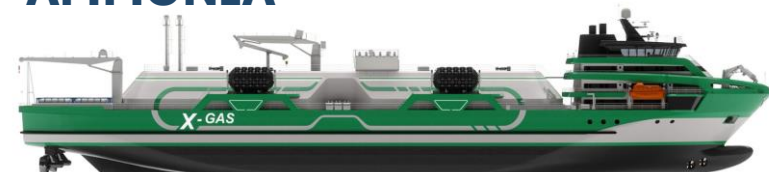
**LNG**



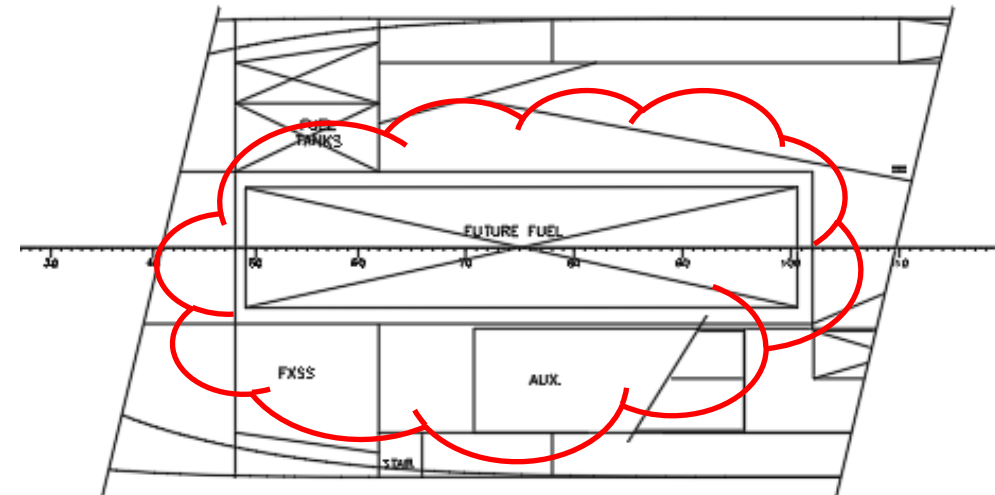
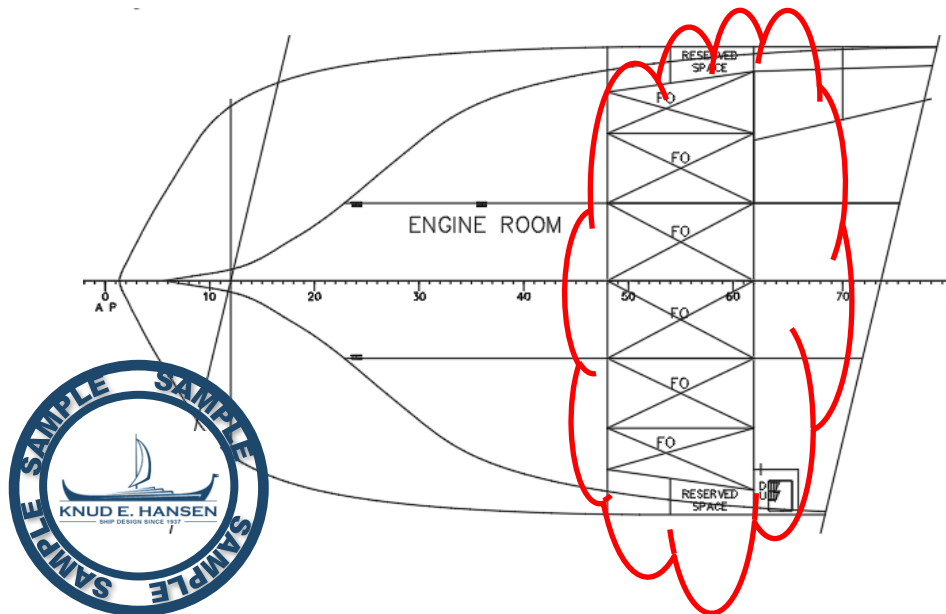
**METHANOL®**



**AMMONIA**



- Develop multiple designs considering different selected fuels
- Design "A" which will be the newbuild design and when doing design "A" we develop the fuel conversion designs B, C, D ... in parallel



# KEY TAKE AWAY - SUMMARY



**ACKNOWLEDGE THAT THE  
STRATEGY PROCESS IS  
COMPELEX AND REQUIRED  
MULTI DECIPLINE EXPERTICE**

**COMBINE YOUR FLEET DATA AND  
A EXPERINCED SHIP DESIGNER TO  
CREATE A STRONG STRATEGY FOR  
YOUR FLEET**

**KEH PROVIDE DETAILED  
ANALYSIS OF FLEET**

**LARGE RETURN ON  
INVESTMENTS WHEN  
PROBER ANALYSIS IS  
CARRIED OUT**

**AFTER IDENTIFYING THE OPTIMAL PATH FOR CLIENT  
KEH OFFER TO CARRY OUT THE DESIGN WORK  
NECESSARY FOR IMPLEMENTING THE  
SUSTAINABILITY UPGRADE OF VESSEL**

# RORO/ROPAX PROJECTS PAST 10 YEARS IN CHINA



The collage features several ship images and a map of China. Red lines connect the ships to specific locations on the map:

- Bohai**: A white and blue RORO ship.
- SMYRIL LINE**: A blue RORO ship.
- WALLENIUS MARINE**: A white and green RORO ship with the slogan "TOWARDS FULLY SUSTAINABLE SHIPPING".
- WALLENIUS SOL**: A blue RORO ship.
- 3100LM**: A red and white RORO ship.
- Huanghai**: A white and red RORO ship.
- GRIMALDI LINES**: A white and orange RORO ship with the slogan "TOWARDS DECARBONIZATION".
- Haimen**: A white and orange RORO ship.
- Jinling**: A white and green RORO ship.
- Hudong**: A white and blue RORO ship.
- ATLANTIC STAR**: A white and blue RORO ship.
- GRIMALDI HYBRID RoRo**: A white and green RORO ship with the slogan "TOWARDS DECARBONIZATION".

The map of China shows major cities like Harbin, Shenyang, Nanjing, Shanghai, Wuhan, and Ningbo. Other labels include KAZAKHKS, KYRG, BURMA, VIETNAM, LAOS, THAILAND, and Bay of Bengal. The word **QUESTIONS?** is written in large blue letters across the center of the collage.