# The Energy Efficiency /Environmental Equation – Opportunities and Challenges

A. Poulovassilis

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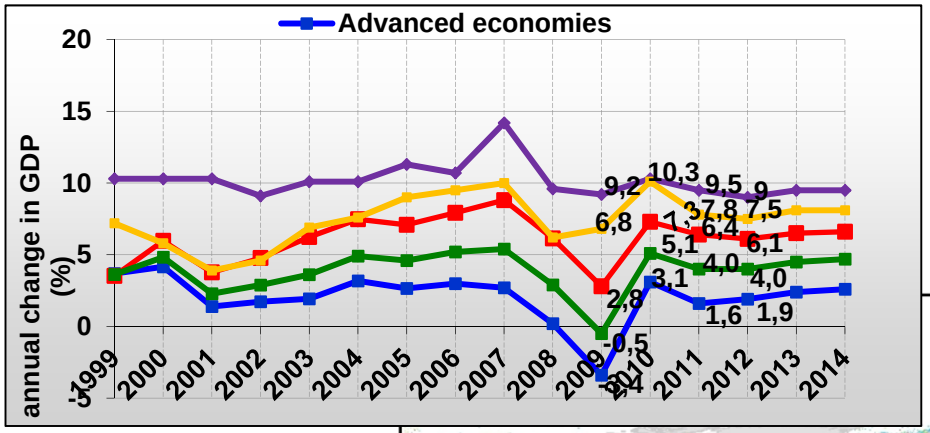
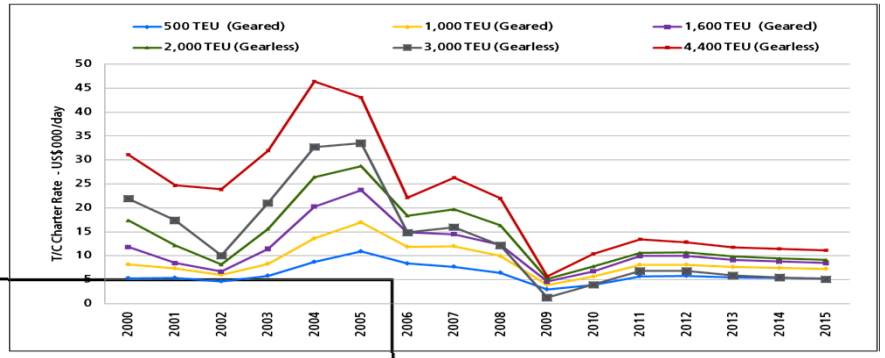
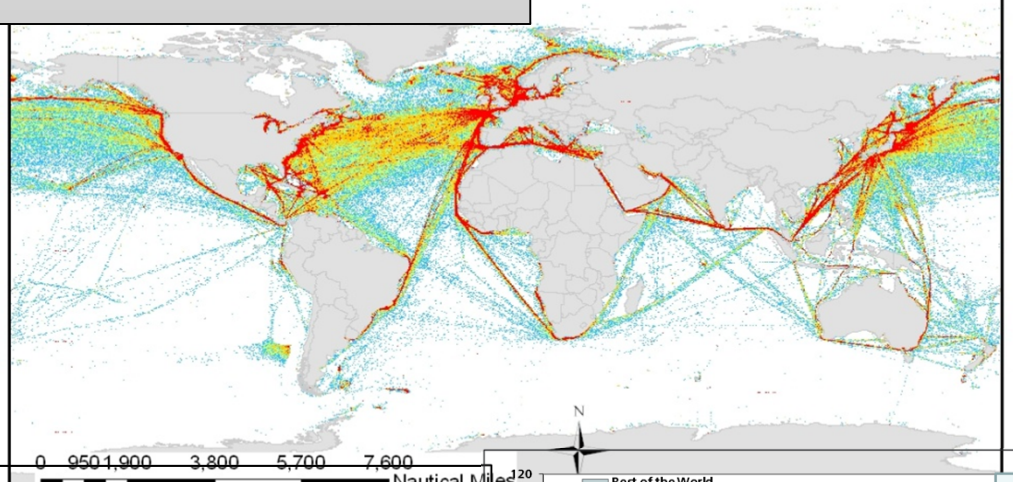
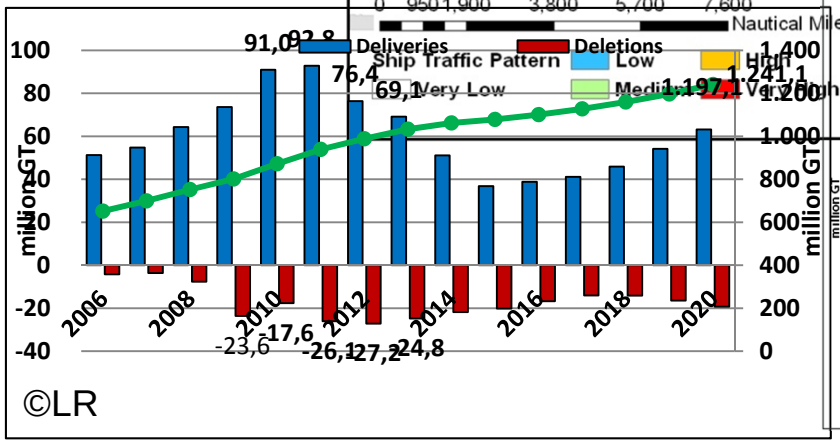


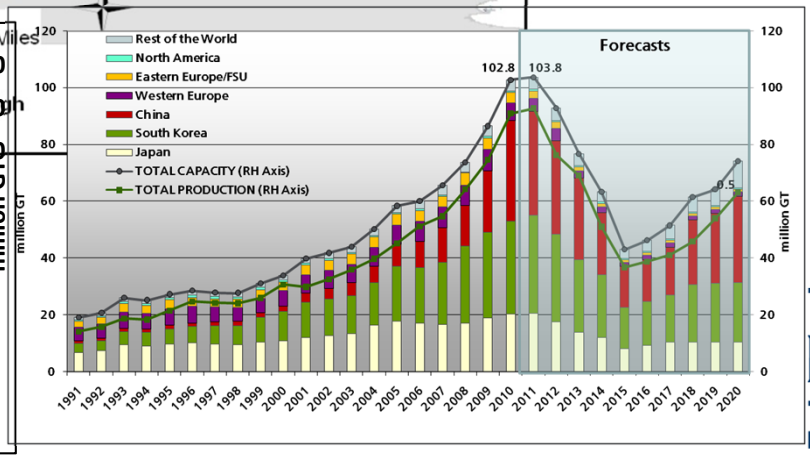




## Risk !?




## Opportunity !?

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# 7 Mega trends

1. The Global Economy: Emerging Giants?

2. Freedom vs.. level playing field: Ocean Governance

3. No secrets: demand for transparency

4. Moving on from oil – the future of energy

5. Demanding higher standards: sustainability regulation

6. Advancing technology – making it pay

7. Adapting to a changing climate





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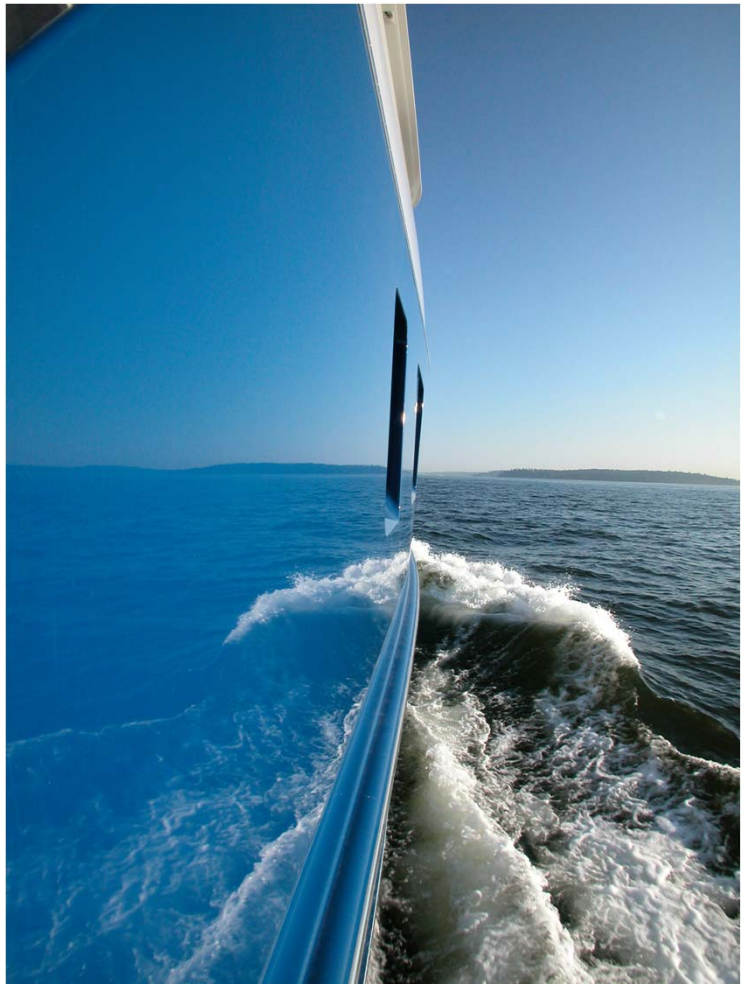
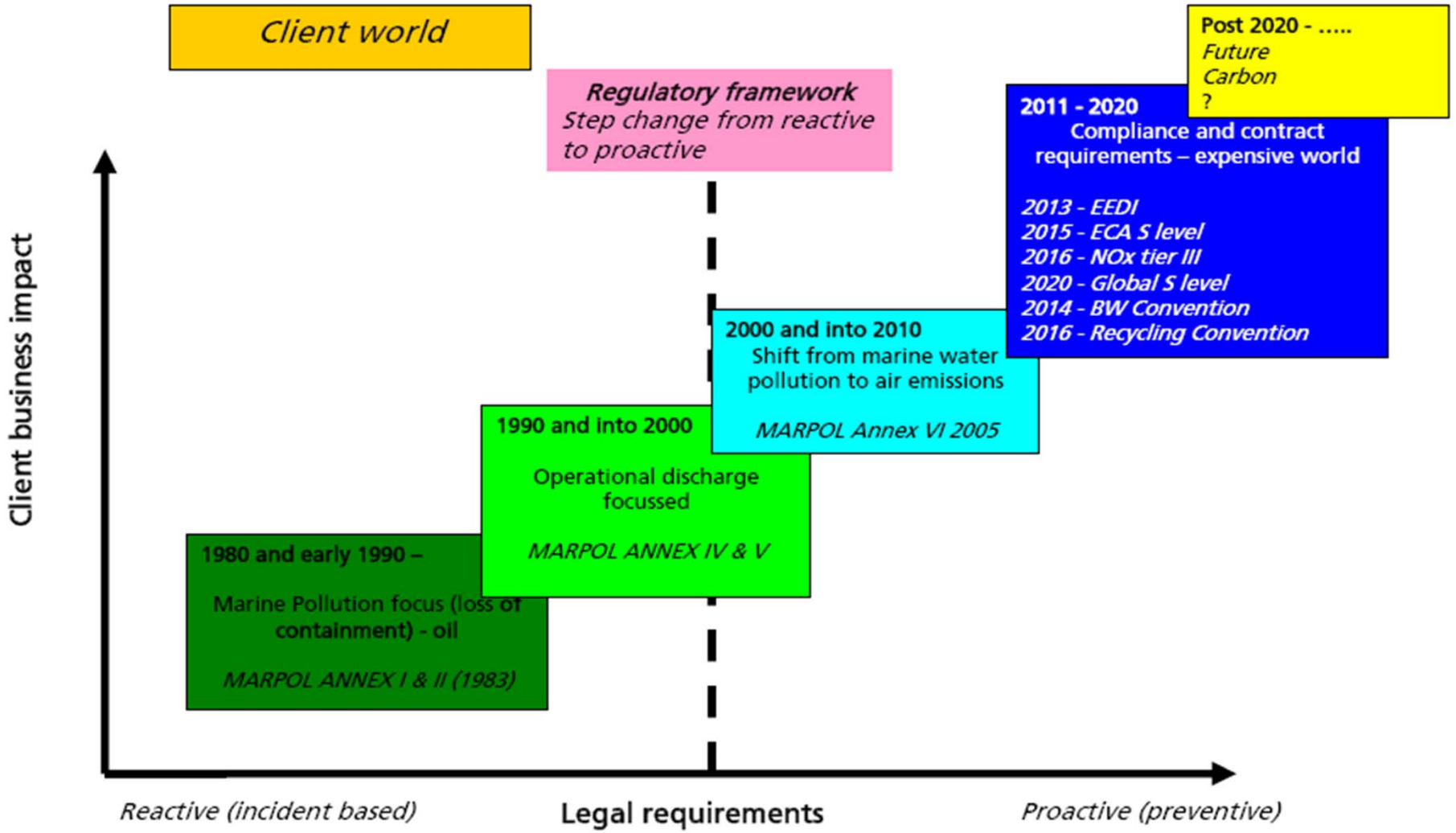
# Changing world



*Challenges -*

- increase demand for energy efficiency
- choice widening and technology changing
- changing design to reduce costs of ballast water treatment
- supplier demand for life cycle information on ship building and operation
- second hand values decreasing
- technology challenges to meet regulatory compliance



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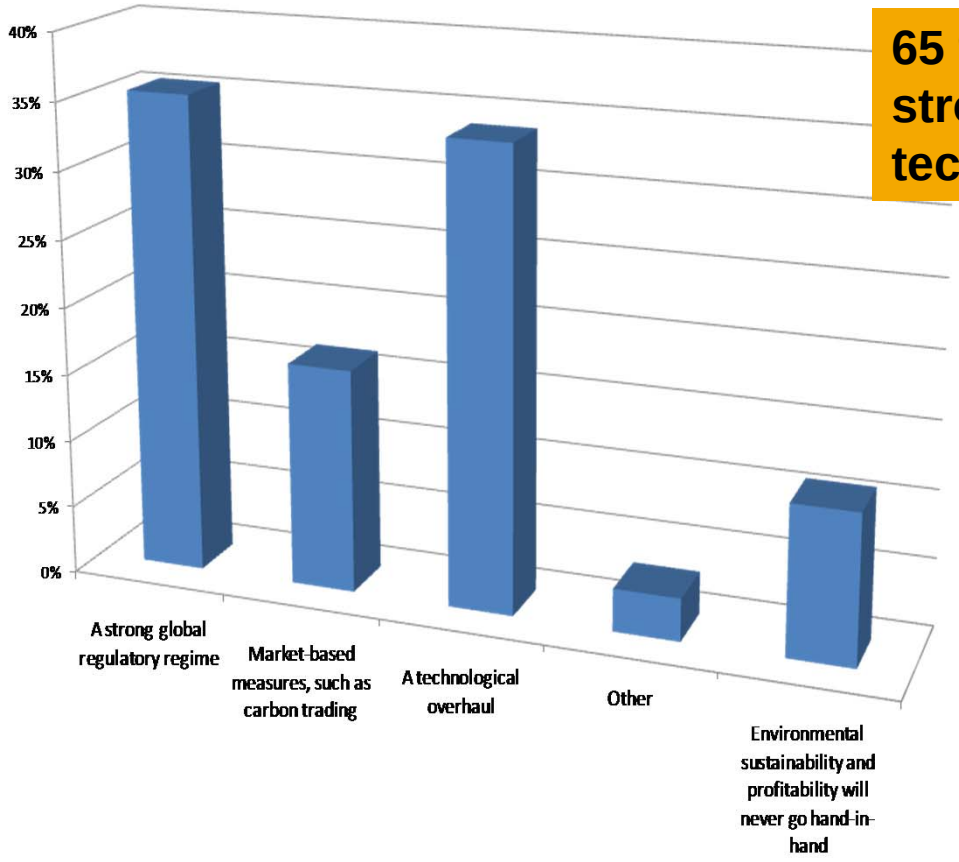
# "Demand / expectation" of more regulation

**How can environmental sustainability and profitability go hand-in-hand?**




**65 % of respondents = strong regulatory regime + technology overhaul**

Survey for SmartShipping 2011



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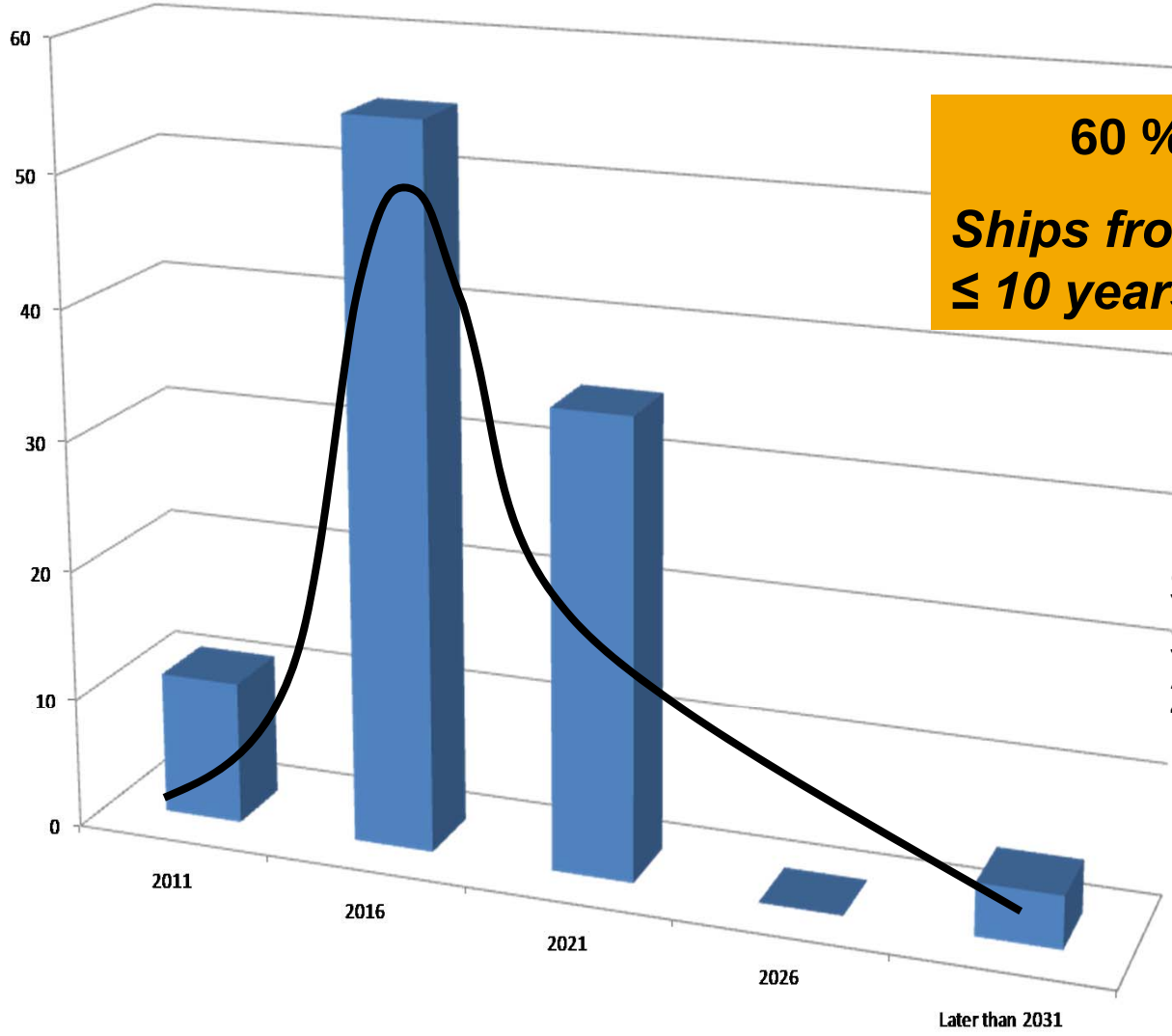
# How long will ships last?




**60 % believe**

***Ships from 2006/2007 ≤ 10 years life***

Survey for SmartShipping 2011



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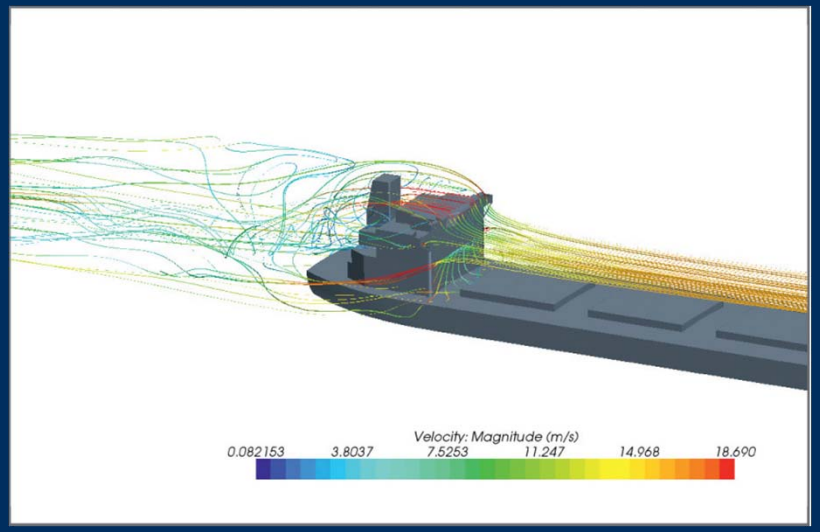
# Future proofing of ships

*Look at energy only at this point*

1. Efficiency
2. Fuel choice



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# Future proofing of ships
## - an example

***Who are you?***

- Owner with long term chartered fleet
- Mainly bulkers and tankers
- Meet the charterer demands……..*"To carry the right amount of cargo over a specified distance at a certain speed and fuel consumption"*

***What is your 'environment'***

- Cost containment critical when it comes to new build
- Access to finance difficult
- Over supply of vessels and consequences
- Charter rates dropping
- Increased regulatory burden that you have to pay for
- Public demand for 'green' not followed through to charter rates

*Energy Efficiency is an issue for now*

# Future proofing of ships

- technology linked to ship type (average reductions)

## *Capesize bulker*

| | % EEDI reduction | | | |
|---|---|---|---|---|
| **Technology** | **2010** | **2015** | **2020** | **2025** |
| Ship dimension | 0 | 2 | 5 | 7 |
| Propeller type et al | 0 | 0 | 2 | 2 |
| Propeller / rudder | 0 | 1 | 3 | 4 |
| Main engine type | 0 | 2 | 4 | 5 |
| Main engine actual SFC | 0 | 5 | 5 | 5 |
| Aux engine | 0 | 2 | 4 | 4 |
| Aux engine SFC | 0 | 5 | 5 | 5 |
| Design Speed Reduction | 0 | 0.12 | 1.4 | 3.72 |
| | | | | |
| Design speed | 14.6 | 14.59 | 14.5 | 14.33 |

***Question – "what is real and what works in a 'laboratory'?"***



Data taken from IMO study on EEDI Nov 2011

# Future proofing of ships

## - EEDI reduction technologies (options)

| EEDI reduction measure | Remark |
|---|---|
| Optimised hull dimensions and form | Ship design for efficiency via choice of main dimensions (port and canal restrictions) and hull forms. |
| Lightweight construction | New lightweight ship construction material. |
| Hull coating | Use of advanced hull coatings/paints. |
| Hull air lubrication system | Air cavity via injection of air under/around the hull to reduce wet surface and thereby ship resistance. |
| Optimisation of propeller-hull interface and flow devices | Propeller-hull-rudder design optimisation plus relevant changes to ship's aft body. |
| Contra-rotating propeller | Two propellers in series; rotating at different direction. |
| Engine efficiency improvement | De-rating, long-stroke, electronic injection, variable geometry turbocharging, etc. |
| Waste heat recovery | Main and auxiliary engines' exhaust gas waste heat recovery and conversion to electric power. |
| Gas fuelled (LNG) | Natural gas fuel and dual fuel engines. |
| Hybrid electric power and propulsion concepts | For some ships, the use of electric or hybrid would be more efficient. |
| Reducing on-board power demand (auxiliary system and hotel loads). | Maximum heat recovery and minimising required electrical loads flexible power solutions and power management. |
| Variable speed drive for pumps, fans, etc. | Use of variable speed electric motors for control of rotating flow machinery leads to significant reduction in their energy use. |
| Wind power (sail, wind engine, etc.) | Sails, fletnner rotor, kites, etc. These are considered as emerging technologies. |
| Solar power | Solar photovoltaic cells. |
| Design speed reduction (new builds) | Reducing design speed via choice of lower power or de-rated engines. |

Data taken from IMO study on EEDI Nov 2011

# Can I future proof my ship?

## - considerations

*Questions:*

- Who gets the benefit of the ROI?
- What market do you operate in?
- What will happen to charter terms after EEDI becomes compulsory?
- Your risk adverseness and available funds/ leverage ?
- Your fleet age and type ?
- Your charter contracts and who they are with ?
- Second hand value ?
- Build costs ?

# Can I future proof my ship?

## - options now

*Options:*

- EEDI now for new ships
- Waiver – no, would affect second hand value
- Attained EEDI at best value possible (at no or limited cost)
- Watch speed flexibility – look for engines that are efficient across wide range of speeds
- Open discussion with charter parties - rates versus EEDI in future (= fuel consumption)
- SEEMP – management of Energy on-board, operational
- Open discussion with charter parties - rates versus SEEMP benefit (= fuel consumption)

# Options for now

*Ship operator /owner:*

- Evaluate your ships using the various tools either in the IMO tool box or others
- Understand energy impact of other IMO requirements
- Review management options
- Monitoring and reporting system do they meet discussed accuracy

*Ship yard and ship designer:*

- Improvement in EEDI via better ship and machinery design

*Industry bodies:*

- Possible change to charter contracts
- Technical input to MBM discussion to ensure pragmatic decisions

*Supply chain community:*

- Better management of port infrastructure and logistics

# Options for next 3 years

*Ship operator / owner:*

- Consider cost / benefit of other forms of propulsion / ship enhancement / alternative fuels
- Plan for implementation of possible regional or IMO MBM

*Ship yard and ship designer:*

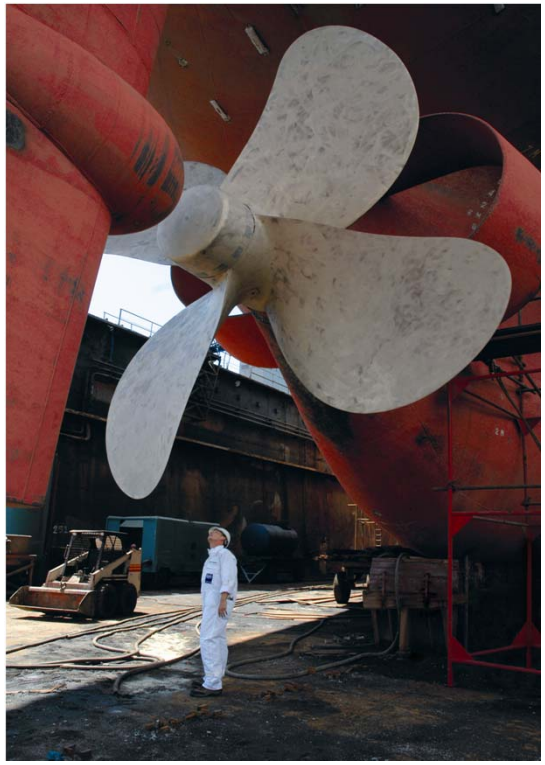
- Design options to include other propulsion approaches, hull coatings, material choices etc

*Industry bodies:*

- Build awareness and understanding of how a MBM would operate
- Bunker adjustment factors / Virtual arrival

*Supply chain community:*

- Linked thinking in port infrastructure and logistics chain



# Options for beyond 5 years

*Ship operator / owner:*

- Look at investing in green ship developments
- Be aware of interaction between other IMO requirements and holistic environmental thinking

*Ship yard and ship designer:*

- Design to include other propulsion approaches, hull coatings, material choices etc

*Supply chain community:*

- Operation of integrated port infrastructure and logistics

# Thank you

Our overall research work includes focus on the main sustainability principles of *planet, people and profit*, given our mission since 1760 has been – *'We aim to secure for the benefit of the community high technical standards of design, manufacture, construction, maintenance, operation and performance, for the purpose of enhancing the safety of life and property at sea, on land, and in the air'.*