

*OECD COUNCIL WORKING PARTY ON SHIPBUILDING  
(WP6) – WORKSHOP ON GREEN GROWTH OF MARITIME  
INDUSTRIES*

# **Green Technology Innovation in Shipping from a Danish Maritime Authority point of view**

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# Outline

## Focus on Innovation

### Innovation in general

- A Danish perspective

### Green Ship of the Future

### Blue INNOship II

### Learnings

# DMA 1/2

**An authority within the Ministry of Industry, Business and Financial Affairs**

## **Mission**

- To promote health and safety on clean seas and to effectively strengthen the competitiveness of and employment in the maritime industries

## **Vision**

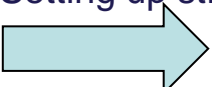
- Denmark is to be a leading maritime nation, setting the direction for future quality shipping

# DMA 2/2

## Tasks

- Flag, port and costal State authority
  - Compliance
  - Enforcement
- Seafarers' certification, social and health issues
- Shipping policy
- Competitiveness of the Danish Maritime Cluster
  - Framework conditions – international, level playing field
  - Research and innovation

## Where DMA seeks to make a difference on research and innovation

- Cross-cutting problems/possibilities
- Bringing stakeholders together
- Setting up structures
-  **aiming at systemic thinking**

**Business decides on and implements strategies**

# Danish innovation in general

## The company spheres

## Supporting Danish public/private measures

- Grants
- Loans

## Public private partnerships

## Five-year Danish research agendas

- Research2015, Research2020, Research2025
- The pipeline from research to innovation
- Tool for political prioritization

## European Community

- Horizon 2020
- +++

# Pipelines for maritime innovation

## Education and training

### Research

- Maritime and generic

### Employees

### New value propositions from vendors

- Maritime value chains

### Operational experience

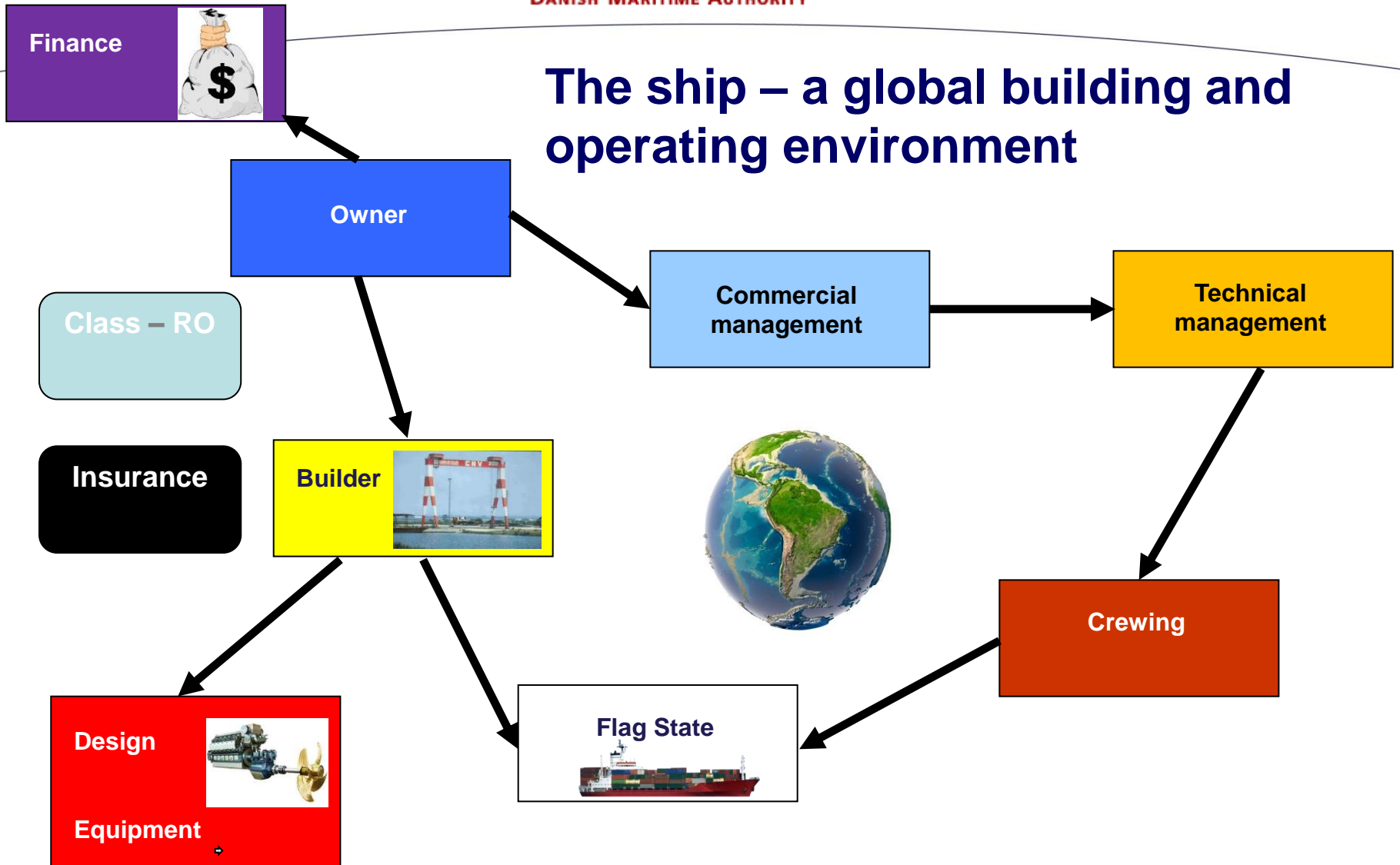
- Documentation
- Make it operational and share
  - Within companies
  - Within the industry!

### External demands and compliance

- New trading platforms

### The defining environment for green technology innovation

# The ship – a global building and operating environment



# Green Ship of the Future

**Formed in 2008**

## **Vision**

- Working towards emission free maritime transport
- Ambitious in the exploration and use of new technologies
- Enabling innovation across maritime value chains

## **Technical focus areas**

- Machinery – production and consumption of energy
- Propulsion
- Operation and maintenance
- Logistics
- General design

## **Participants**

- Industry
- Universities and maritime colleges
- DMA and industrial organizations



# GSF - Concept studies for ships, e.g. 1/2



## Low-emission RO/PAX study

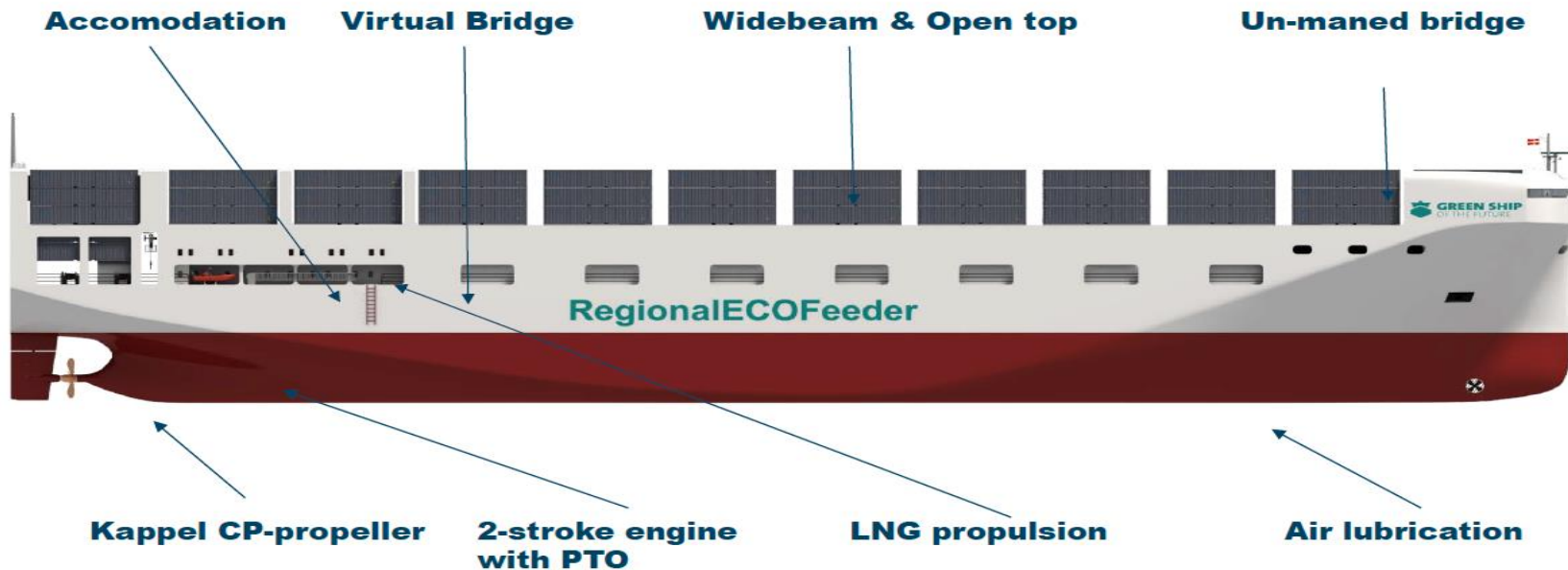
- A Swedish Ro/PAX being phased out
- What can we do better?
- New-building from Guangzhou Shipyard International (GSI)

## Tangible value

- Good makers list representation for the participants

# GSF - Concept studies for ships, e.g. 2/2 Regional ECO Feeder

Around 10 different technologies has been integrated in order to achieve highest energy efficiency performance



OMT →

# GSF - 3D print in the maritime industry

## Initial awareness track

### 4 subprojects

- On-board 3D print
- Large-scale 3D print
- 4D print
- Repair & reconditioning using additive manufacturing technology

# Blue INNOship – background

## A government initiative on innovation

- Grand challenges
- Investments in research and education must be transformed into innovation
- Societal partnerships on innovation, i.e. business, education and research

## Two-step process

- 21 proposals were drafted and 5 were chosen by the government, including the “Blue INNOship” proposal
- Funding according to a call from Innovation Fund Denmark
  - “Blue INNOship” succeeded
- Project start-up April 2015
- Budget of DKK 120 million (USD 19 million)

## Purpose

- Short term: Innovation activities aiming at emission reductions
  - Regulatory
  - Business driven
- Long term: Innovation model for the Danish Maritime Cluster

# Blue INNOship overview

## WP1 Ship design & propeller solutions

- Control pre-swirl fins
- Dynamic propeller speed control
- Trailer cat
- LightShip

## WP2 Performance and monitoring

- Vessel performance decision support
- Monitoring and performance

## WP3 Alternative fuel solution

- Gas valve train
- Multi-fuel burner
- Reduction of methane slip from LNG engine combustion
- Small-scale LNG/LBG liquefaction

## WP4 Emission reduction technologies

- Scrubber size reduction
- Slow-steaming antifouling paint
- Selective catalytic reduction of NO<sub>x</sub>
- Encapsulated biocides


## Servitization & retrofit

- Servitization project
- Retrofit project

- **36 participants**

# Blue INNOship – results up to now, e.g. 1/2

## Vessel performance decision system

- Two shipowners, a technological institute, a university and a vessel performance company
- Exploitation of existing systems and sensors on board ships
- Data from different sources
- Development of a data format
- Big data analytics  decision support

## Initial focus on hull and propeller conditions

- Savings of 3.5% and 5%, respectively

**Next step main engine, auxiliary engines and boilers**

## **Blue INNOship - results up to now, e.g. 2/2**

### **Shore based small scale LNG/LBG (Liquified Bio Gas) liquefaction unit**

- Two companies and a university
- A simulation model for small-scale liquefaction
- A mix of refrigerants depending of the gas composition

### **Verification process ongoing**

- Small-scale liquefaction industry benchmark
  - Up to 40% energy cost savings
  - Not larger CAPEX because of standard components

### **Scale up via modules**

**LNG/LBG storage capacity and transport can be reduced**

# ShippingLab

## Driving Future Maritime Innovation

### Background

- A recommendation from the “Growth Team for the Danish Maritime Cluster” (April 2017)
  - Blue INNOship success
- A government growth plan under preparation

### Driving themes

- Digitalization and business models
- Under preparation



# Learnings

**A challenging maritime value proposition on green innovation must be set up**

**It is hard work to create projects**

**Projects must be collaborative**

**The maritime value chain must be represented**

- Companies
- Research
- Education
- Business organizations
- Authorities

**Green innovation drivers**

- Regulation has a large impact
- Commercial drivers have lesser impact
  - The fuel prize
  - Incentives do not always work for green innovation

**Thank you for your attention**