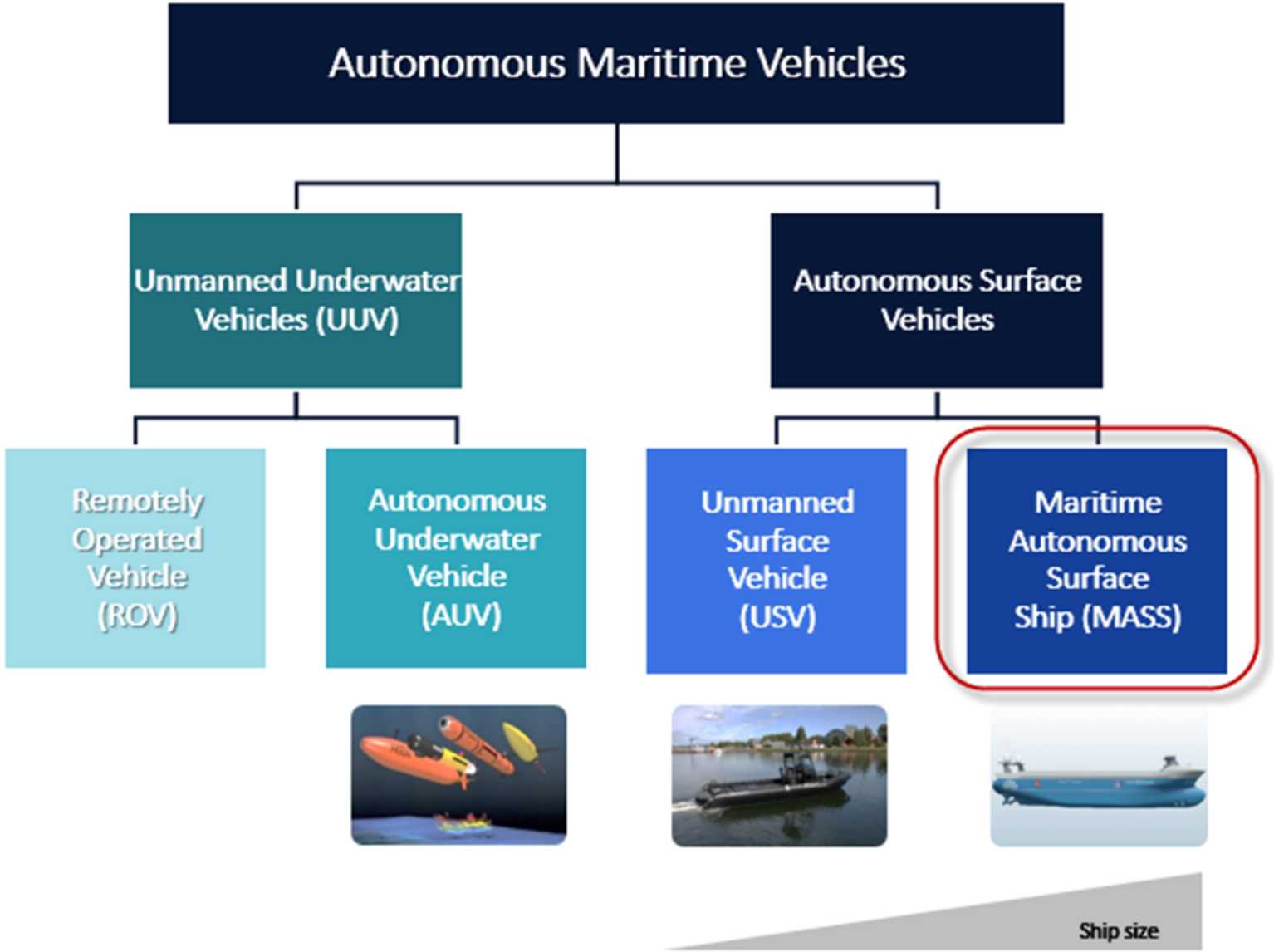
massterly
a Kongsberg Wilhelmsen joint venture

Commercial and Operational aspects of Autonomous Ships

ICMASS 2019 – Trondheim, November 2019


Autonomous Maritime Vehicles
Unmanned Underwater Vehicles (UUV)
Autonomous Surface Vehicles
Remotely Operated Vehicle (ROV)
Autonomous Underwater Vehicle (AUV)
Unmanned Surface Vehicle (USV)
Maritime Autonomous Surface Ship (MASS)
Ship size

Massterly – a Kongsberg and Wilhelmsen 50/50 joint venture to develop the maritime autonomous market

- Leading in development of autonomy
- Frontrunner in digital development
- In front on cyber security

- In front on vessel operation
- Major logistics operator at sea and on land
- One of the largest maritime network globally

Commercial aspect to autonomous shipping

MAJOR ENABLERS

- **Political will:**
  - To enable national industry and innovation
  - To reduce heavy traffic on roads
  - To reduce local pollution
- **Mature technology:**
  - Dynamic positioning technology is mature
  - Sensors and instruments are getting more mainstream
- **Increasing truck costs:**
  - Increasing truck driver shortage
  - Risk of taxation of trucks and roads
- **Public acceptance:**
  - Confidence in technology is increasing
  - Acceptance increases due to media attention autonomous cars – people get used to the idea around

MAJOR BARRIERS

- **Regulation**:
  - Even with the political will changes in regulation takes time, especially in international waters
- **Maintenance:**
  - Maintenance is still needed, making the transition for deep sea autonomy more challenging
- **Acceptance:**
  - Seafarers will fight for their jobs
  - Trust in technology is still an issue
- **Technology cost:**
  - High cost of technology and sensors makes direct competition with low cost vessels hard
- **Operator cost:**
  - Competence requirements of control centre crew drives operation costs

Autonomous does not mean unmanned

Degree of unmanned

Unmanned vessel

Reduced crew

Full crew

Cost-effective logistics,
moving goods by sea rather than truck

"Next Generation Shipping"
OPEX reduction
(fuel, crew, maintenance)

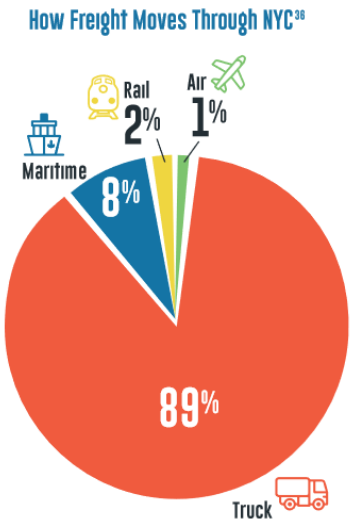
Conventional vessel

Autonomous functionality / remote control

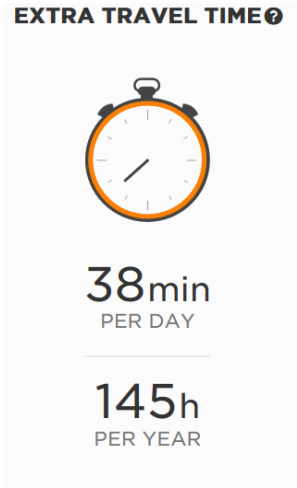
Fully autonomous

Degree of autonomy

Political ambitions and willingness to invest in the shift



Source: NYCEDC



Source: TOMTOM TRAFFIC INDEX 2016

<u>New York</u>

- Trucks move 90% of NYC fast growing freight tonnage
- Truck congestion cost NYC $862 million in lost economic activity (2017)
- “Freight NYC” initiative: Create a hub-and-spoke marine highway barging operation
- $100 million plan for more sustainable and resilient supply chain network by 2027

<u>EU</u>

- 30% of all goods transported by trucks >300 km. to be transferred to sea/rail by 2030 (50% by 2050)
- «Horizon 2020» funding earmarked to solve the Transport Challenge is €6,3 billion (2014-2020)

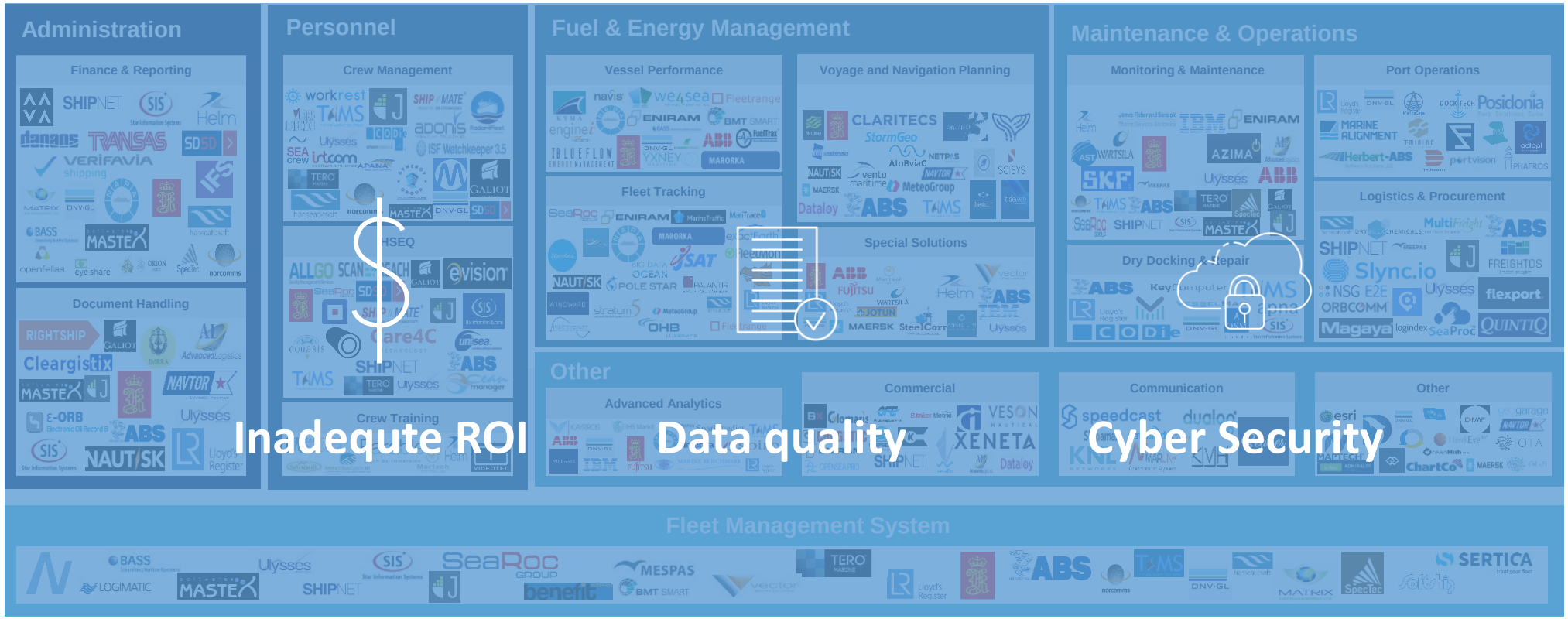
<u>Norway</u>

- Oslo drivers spend 145 hours per year in traffic jams
- Oslo: Emission-free high-speed ferries by 2024 and zero emissions in/out of port
- World heritage fjords: zero emissions tourist ships and ferries by 2026
- The state (ENOVA) has paid out support of NOK 1,3 billion to battery driven vessels since 2015

Challenging technical environment

- Customers and vendors require a common data infrastructure in order to scale

Maritime Software Landscape 2019



It’s not only about replacing onboard crew, but integration to create real value in the logistics chain

Onshore Systems

Ship Systems

Remote Control

Shipping plan

Mission plan (SCC)

Transport to vessel

Loading and Stability

Sailing plan

Manning (SCC)

Maintenance & Reenergize

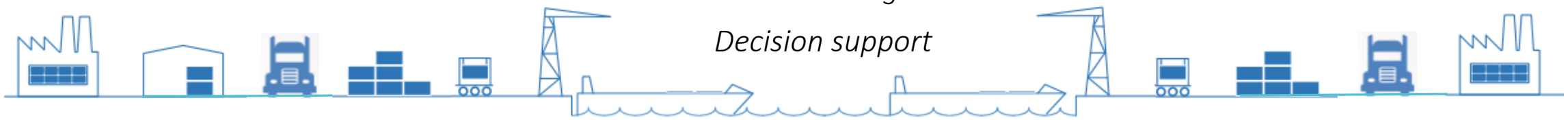
Transport to customer

Unloading and Ballast

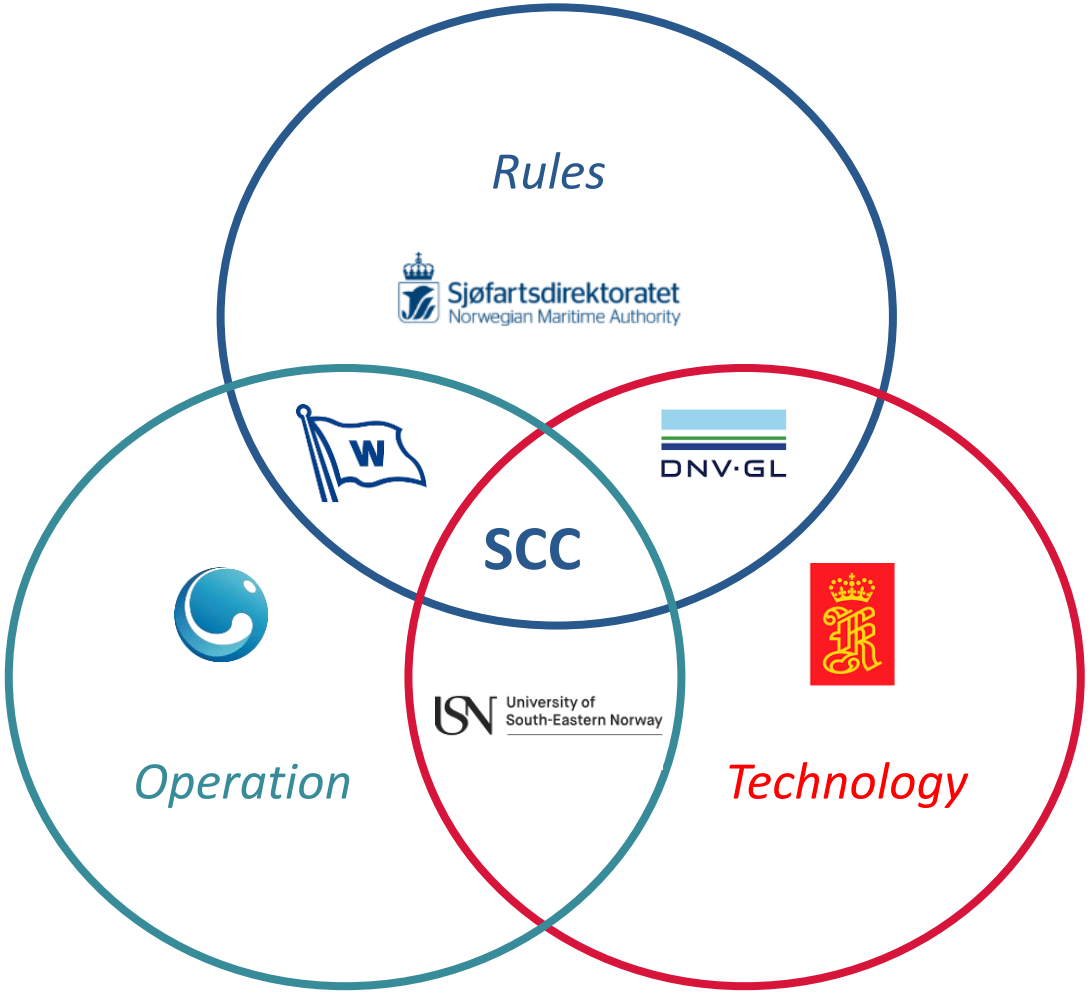
Reporting

Remote Monitoring & Control

Decision support



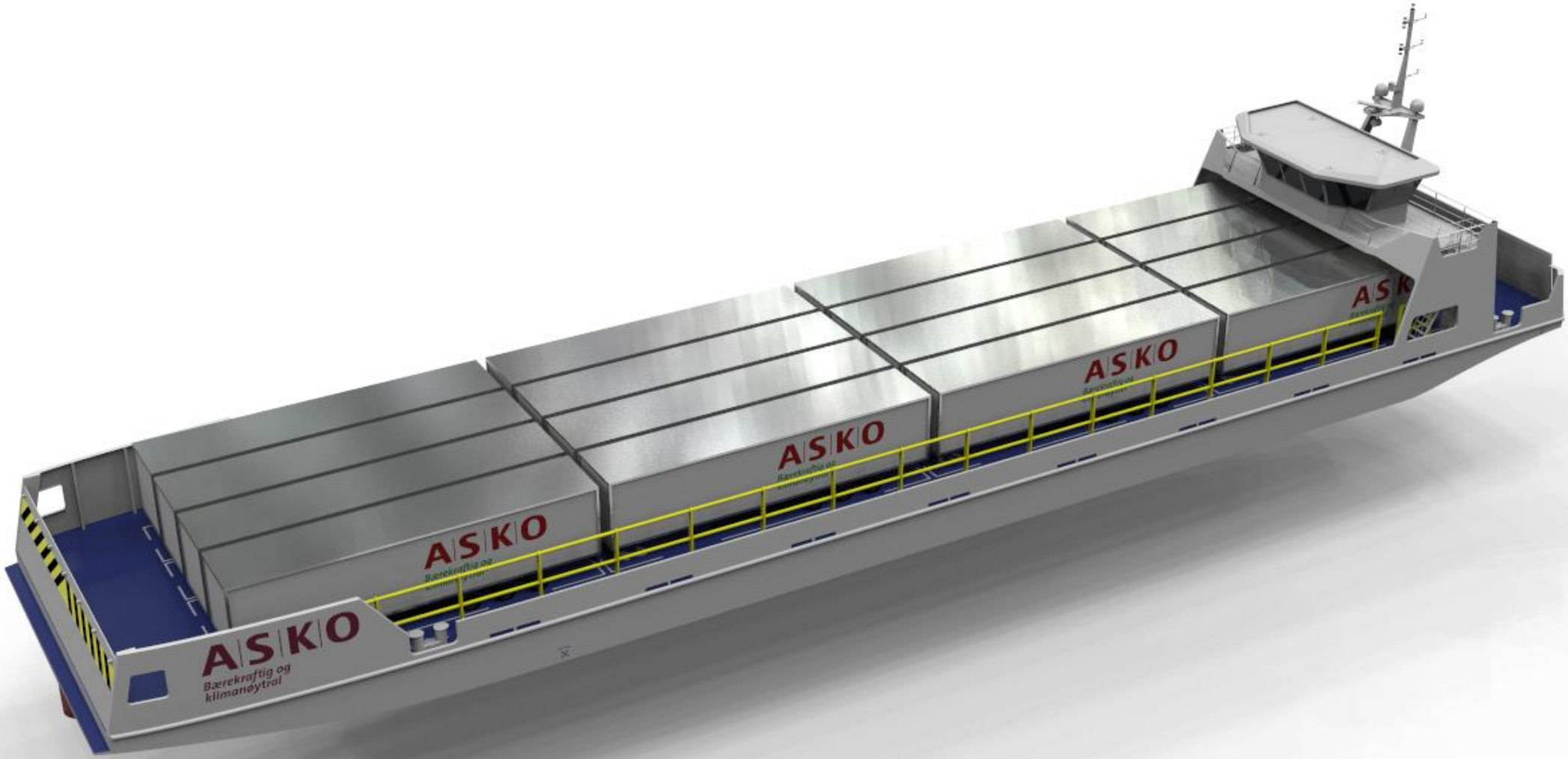
Interplay between technology and operation is crucial to succeed

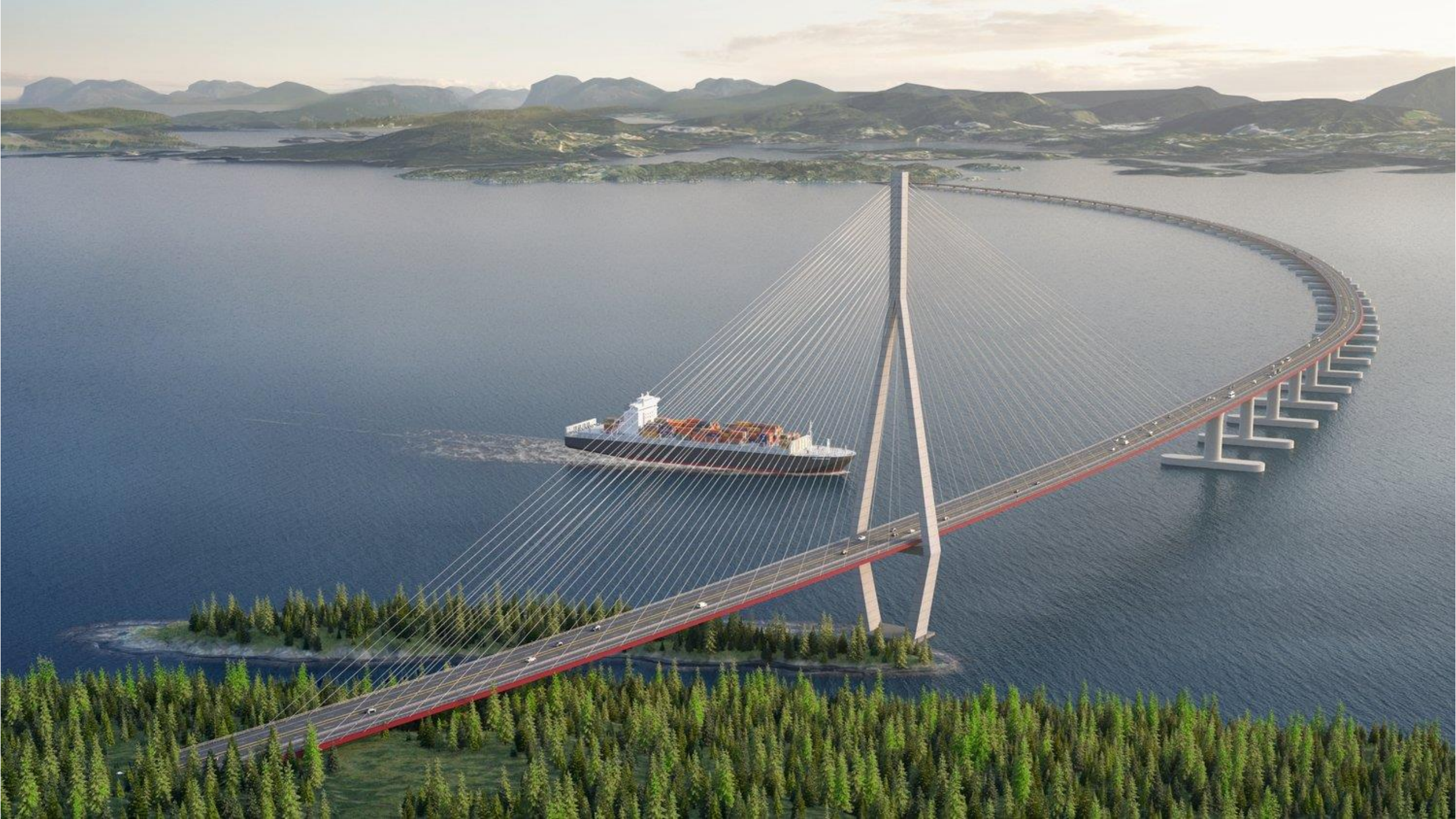


Items under discussion

- Captain's role
- Manning & competence in SCC
- Compliance with SOLAS, ISM and ISPS code
- Flag state regulations, local rules and permits
- Legal aspects and division of responsibilities
- Insurance


Zero Emission
YARA
Yara Birkeland


ASKO
Bærekraftig og klimanøytral



Why is Norway leading in environmentally friendly technology for the maritime industry?

Access to Finance

ENOVA · Innovation Norway · The Research Council of Norway · nysnø

Strong Clusters and maritime know-how

Norwegian Centres of Expertise NCE Maritime CleanTech · SAMS autonomous mobility · KONGSBERG · DNV·GL

Ambitious Cargo Owners

YARA · ASKO · HEIDELBERG CEMENT

Close cooperation with Authorities

Sjøfartsdirektoratet Norwegian Maritime Authority

massterly

a Kongsberg Wilhelmsen joint venture