DEME | Emission reduction challenges and the role of methanol

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DEME

Emission reduction challenges and the role of methanol

CONTENT

1

Key Activities
OVERVIEW

DREDGING

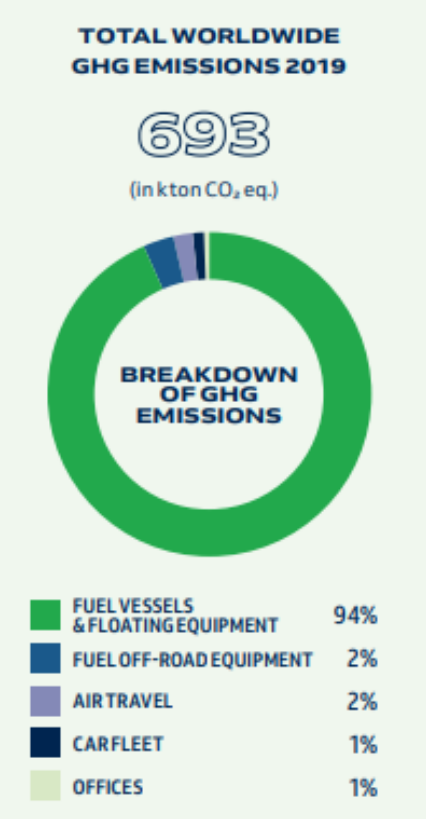
OFFSHORE

ENVIRONMENTAL

INFRA

2 Key Challenges

2. Key Challenges

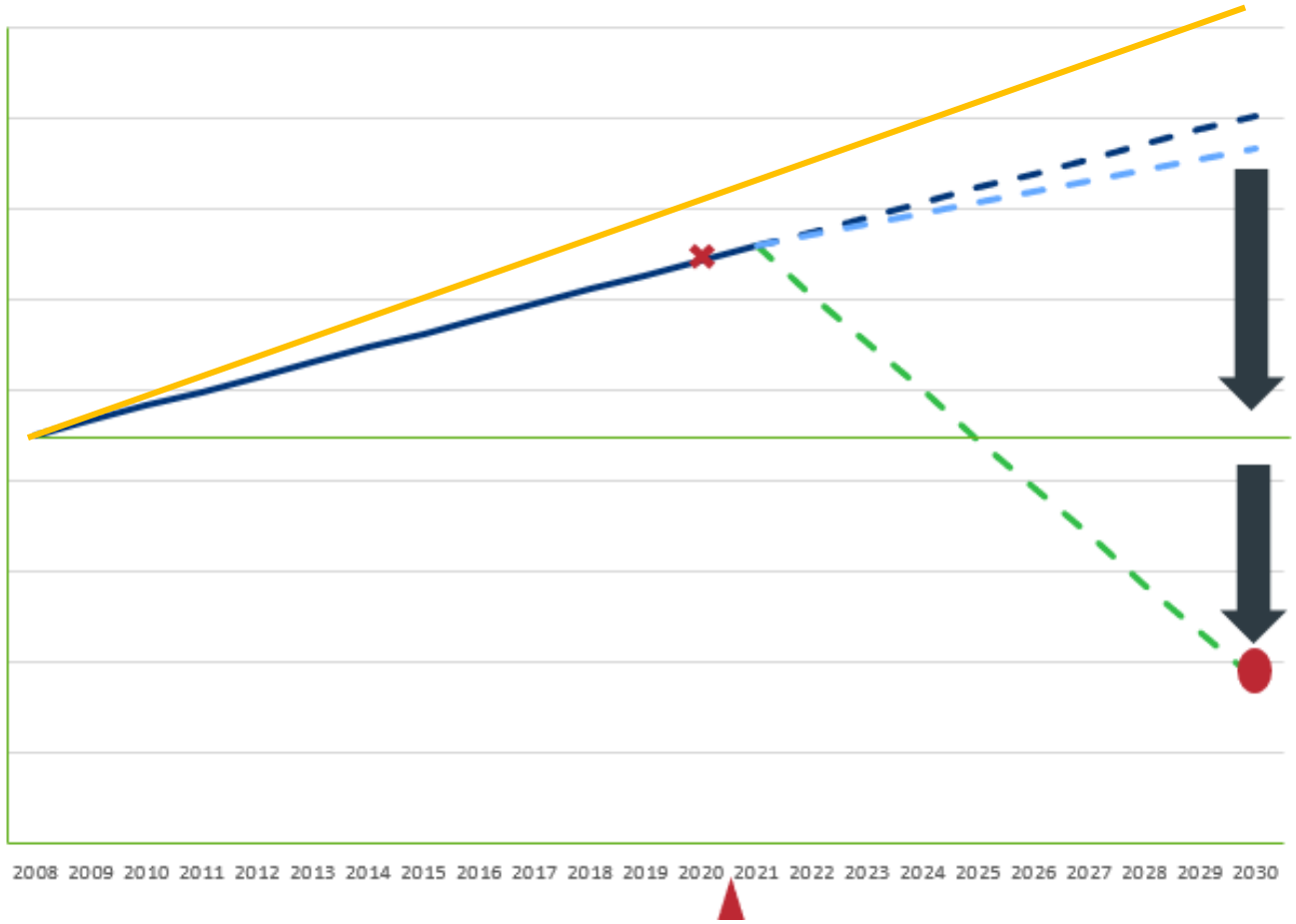


- DEME sustainability goals
  - 2030 target: 40% reduction relative to 2008
  - 2050 target: Climate-neutral organisation
- Fleet most significant part of GHG emissions

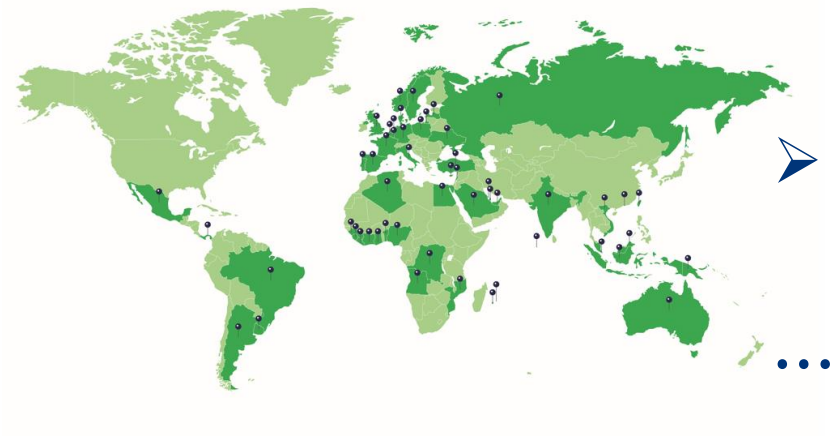
2. Key Challenges

GHG: Efficiency and fuel trends

Business-As-Usual
Efficiency
Alternative fuel
Target



2. Key Challenges



- Worldwide coastal operations with ocean going vessels
- Sustainability: UN SDGs

- IMO: NOx and SOx (ECAs) and T.CO_2/T.NM (?)
- Regional: EU Green Deal, China, …
- Further localisation: EU Stage V for inland waterways, ports, …
- Carbon tax regimes

… more to come, more are needed … synergies?

2. Key Challenges

Fleet specific

- Purpose-built vessels
- Combustion engines range kW to MW
- Large vessel lifespan: Newbuilt & retrofit

- Emissions
- Technical
- Commercial

Fuel options

3

FUEL OPTIONS
METHANOL

3. Fuel options

FOSSIL-

- Diesel
- LNG
- Methanol
- Ammonia
- Hydrogen

BIO-BASED

- Biodiesel
- Bio-LNG
- Bio-Methanol

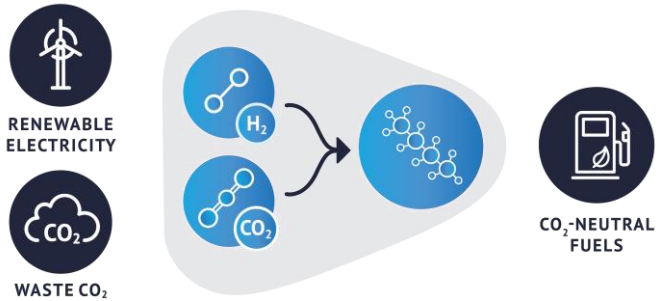
PtL-BASED

- PtL-Diesel
- PtL-LNG
- PtL-Methanol
- PtL-Ammonia
- PtL-Hydrogen

3. Methanol - EMISSIONS

Why methanol?

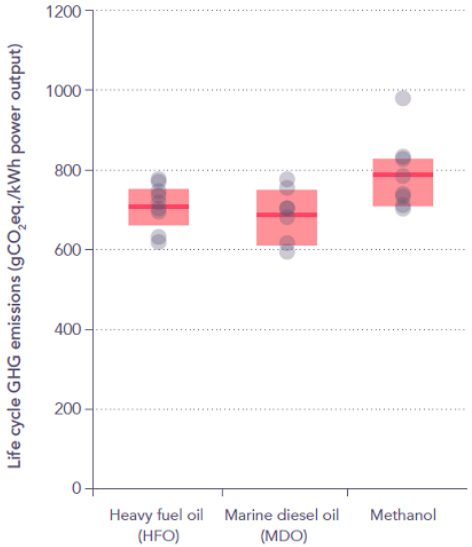
- **GHG emissions:**
  - Biomethanol from biogas and/or glycerol: large variety of feedstocks
  - PtL-methanol using renewable electricity and carbon capture



- **Local pollutants:**
  - Reduction local pollutants (NO_X, PM, PN, SO_X) without aftertreatment

Why not methanol?

- **GHG emissions:**
  - No CO_2 reduction on a well-to-wake basis when operating on fossil methanol
  - PtL-methanol production in pilot phase, with maturation of Direct Air Capture of CO_2 required to close the cycle by 2050



- **Local pollutants:**
  - Formaldehyde and methanol slip emissions are a point of attention

3. Methanol - TECHNICAL

Why methanol?

- Most convenient way to transport and store renewable energy (compared to LNG, ammonia and hydrogen)
- Vessel technology (almost) mature
- Engine technology can quickly mature, with real-life demonstrator cases and continuous R&D effort
- Dual-fuel technology enabler to future-proof ships
- Feasible for retrofit

Why not methanol?

- Considerable deadweight impact
- Impact on vessel layout and operational procedures, but manageable
- Limited commercial availability of methanol engines
- Competition from LNG, biofuels, ammonia and hydrogen as alternative dual-fuel technology

3. Methanol - COMMERCIAL

Why methanol?

- PtL-methanol promising contender to de-carbonize shipping
- Manageable impact on CAPEX

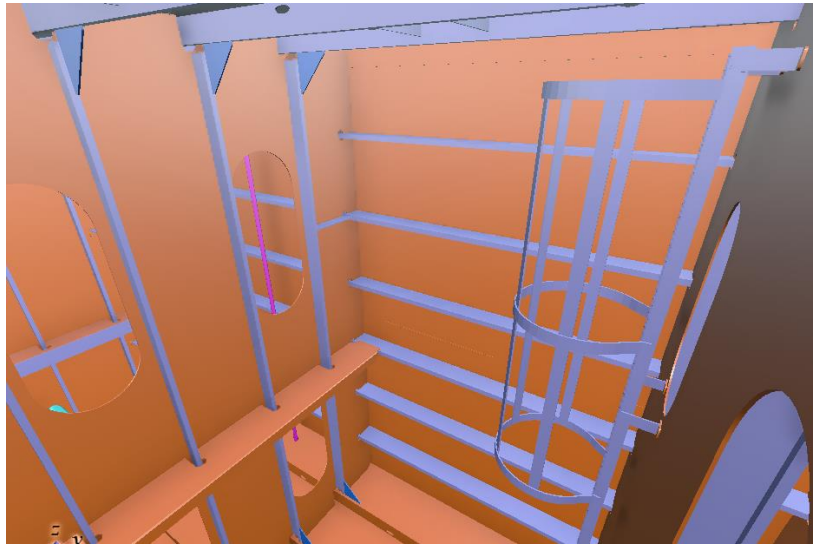
Why not methanol?

- Current limited availability of climate-neutral methanol at considerable additional cost
- Uncertain evolution of climate-neutral fuel availability and cost
- Additional investment with uncertain benefits

4

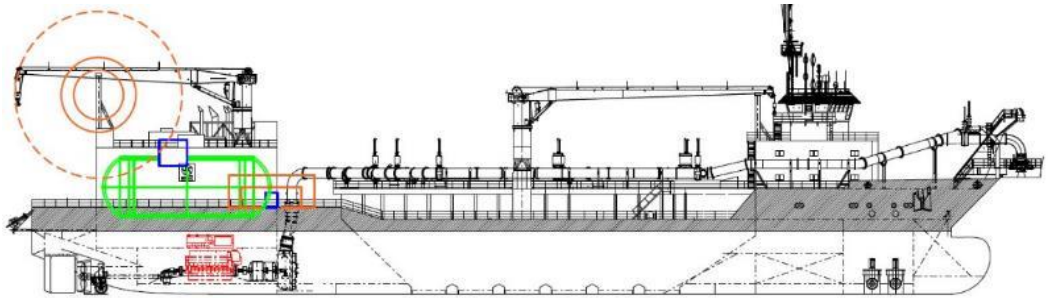
METHANOL
ON BOARD

4. Methanol on board



- **Storage of methanol**
  - At atmospheric pressure and ambient temperature
  - In structural tanks with zinc coating
  - Cofferdams required but adjacent to sideshell allowed below the waterline

- **Low-flashpoint fuel**
  - DEME has proven that implementation of low-flashpoint fuels is feasible, even in our purpose-built vessels full of equipment
  - Hazardous zones (“ATEX”) on deck with (manageable) impact on vessel operational procedures



Dual-fuel (LNG) TSHD “Scheldt River”

4. Methanol on board

- **Dual-fuel engine technology**
  - DEME (4-stroke) engines vary from <100 kW to >10 MW, whereas the market is focusing on lower range
  - No loss of propulsion in case of methanol leak, omitting the requirement for redundant methanol supply
  - Operational flexibility and future-proofing of vessels

- **Legislation**
  - Draft IGF code ready for approval by IMO
  - Hazardous zones do not scale with vessel size, requiring a case-by-case approach

5 CLOSING

Closing

Climate neutral fuels will be the main contributor in decarbonization

Specific challenges for methanol:

- Emissions (PtL and/or with Bio - CO_2 source)
- Policy: Synergies and fuel specific (LCA)
- Technical: Engine technology
- Availability

Partnerships are needed to contribute in bridging the gaps!

6 QUESTIONS & ANSWERS