



# INFRASTRUCTURE FOR FUTURE FUELS IN THE NORDICS

15 November 2022

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NORDIC ROADMAP FOR THE INTRODUCTION OF SUSTAINABLE ZERO-CARBON FUELS IN SHIPPING

## TASK 1A – SCREENING OF SUSTAINABLE ZERO-CARBON FUELS

The Norwegian Ministry of Climate and Environment on behalf of the Nordic Council of Ministers



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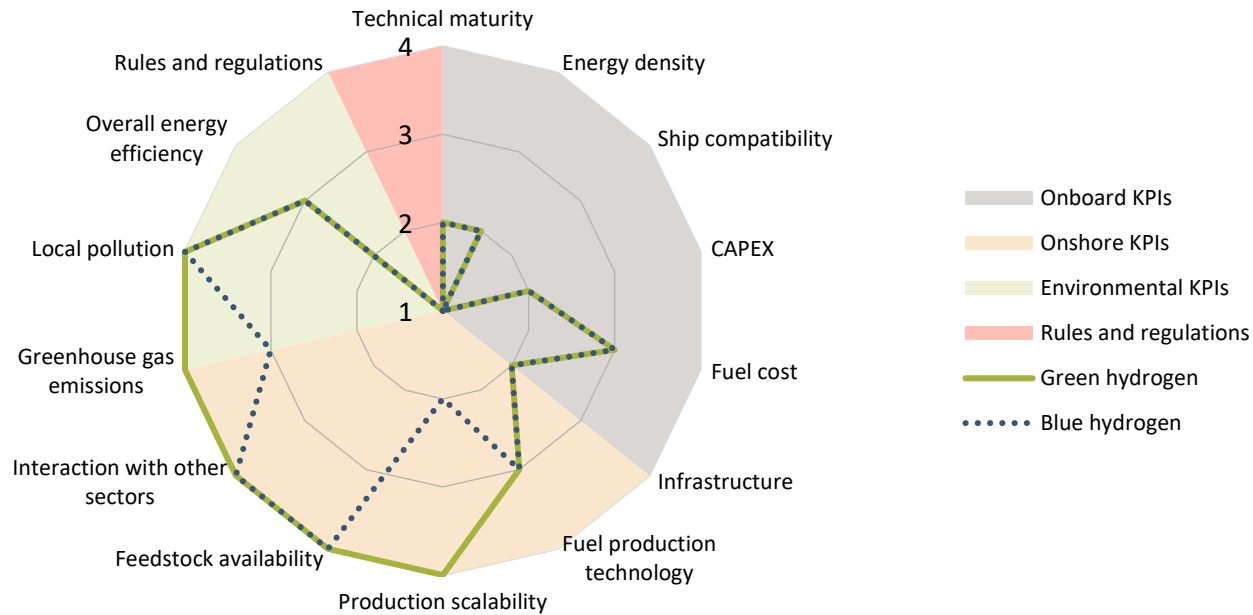
NORDIC ROADMAP FOR THE INTRODUCTION OF SUSTAINABLE ZERO-CARBON FUELS IN SHIPPING

## TASK 2B – INFRASTRUCTURE AND BUNKERING CHALLENGES FOR SELECTED FUELS

The Norwegian Ministry of Climate and Environment on behalf of the Nordic Council of Ministers

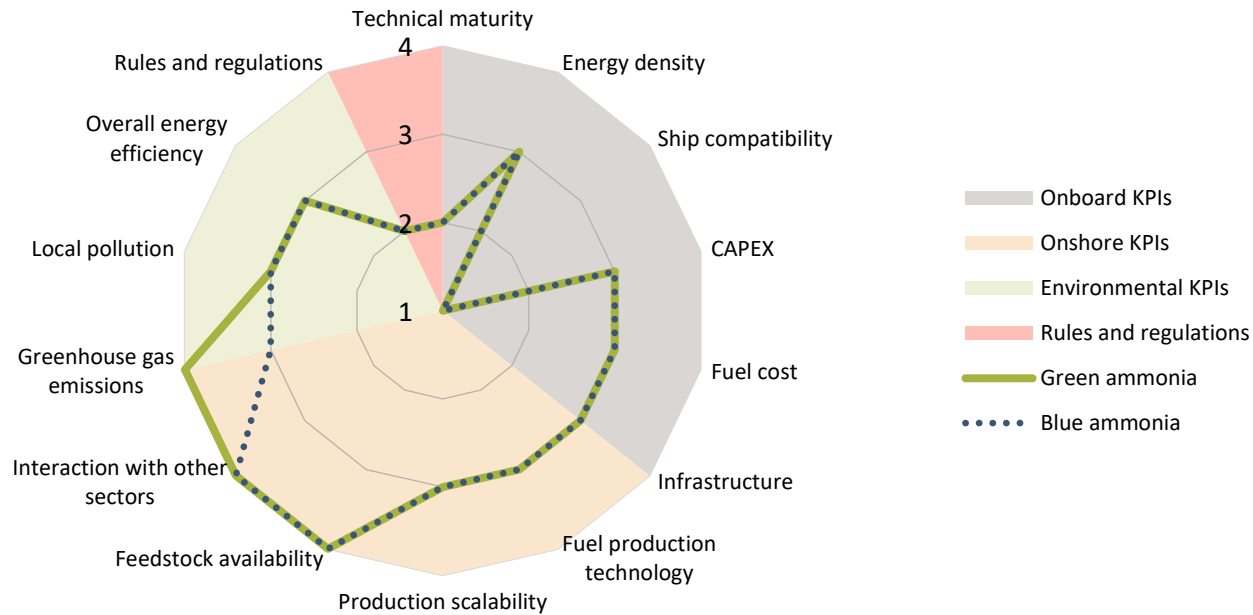


# KPIs for hydrogen as a marine fuel



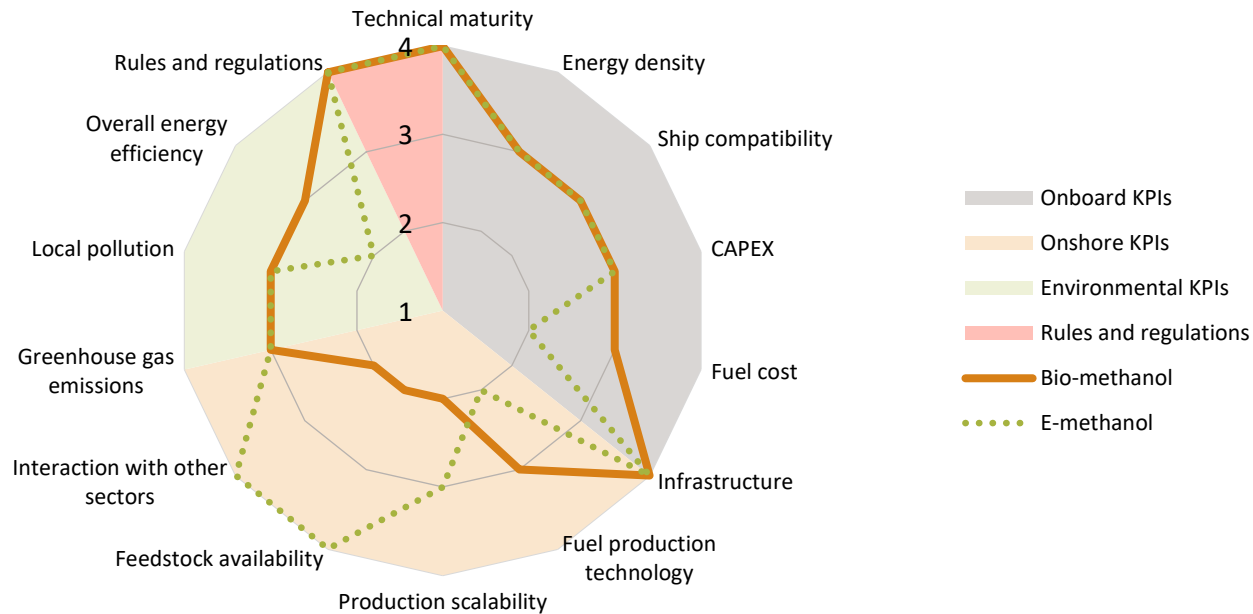
Scoring of onboard, onshore, environmental and rules and regulations related KPIs for both green and blue hydrogen. Source: Menon Economics

# KPIs for ammonia as a marine fuel



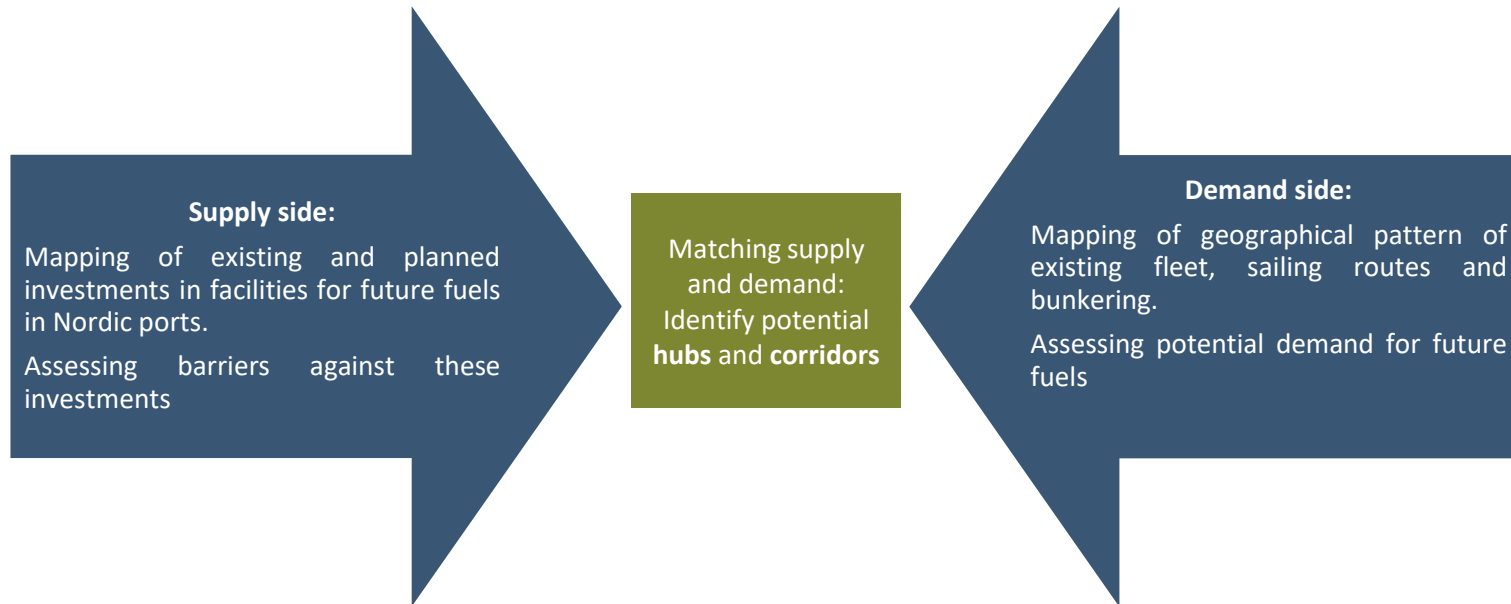
Scoring of onboard, onshore, environmental and rules and regulations related KPIs for both green and blue ammonia.  
Source: Menon Economics

# KPIs for **methanol** as a marine fuel

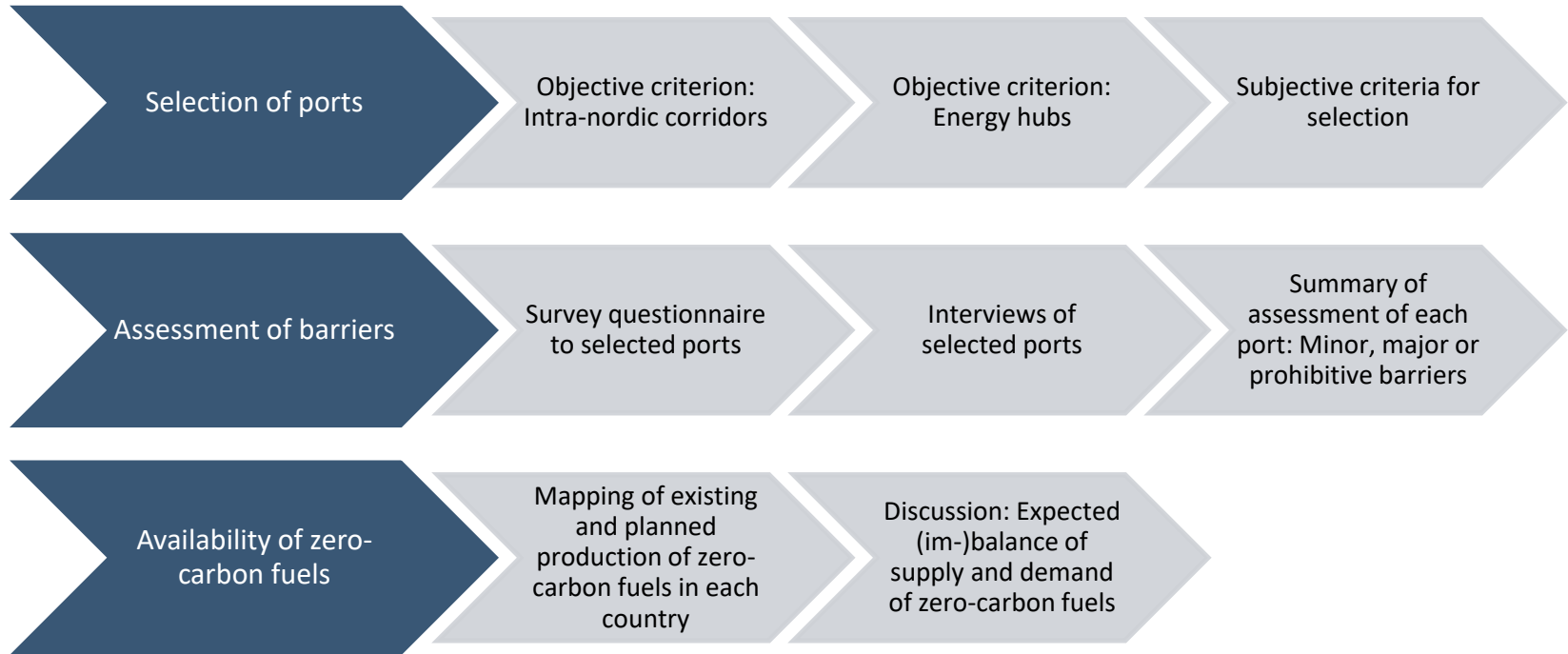


Scoring of onboard, onshore, environmental and rules and regulations related KPIs for both **bio- and e-methane**.  
Source: Menon Economics

## Purpose: Identify potential hubs and corridors – by matching supply and demand of selected fuels



# Three work streams



# SELECTION OF 30 PORTS FOR ASSESSMENT OF BUNKERING BARRIERS

Port	Country	Criterion for selection	Part of Intra-Nordic Corridors	Energy consumption	Subjective criteria
Stockholm	Sweden	1	Helsinki - Stockholm	150-200	
Reykjavik	Iceland	1	Reykjavik - Torshavn	50-100	
Oslo	Norway	1	København (Nordhavn) - Oslo	50-100	
Mongstad	Norway	1	Göteborg - Mongstad	150-200	
København (Nordhavn)	Denmark	1	København (Nordhavn) - Oslo	50-100	
Helsinki	Finland	1	Helsinki - Stockholm	200-250	
Göteborg	Sweden	1	Frederikshavn - Göteborg	200-250	
Vasklot	Finland	2	Holmsund - Vasklot	<50	
Torshavn	Faroe Islands	2	Mjóeyrarhöfn - Torshavn	<50	
Stromstad	Sweden	2	Sandefjord - Stromstad	<50	
Sandefjord	Norway	2	Sandefjord - Stromstad	<50	
Naantali	Finland	2	Kapellskar - Naantali (Nadendal)	<50	
Mjóeyrarhöfn	Iceland	2	Mjóeyrarhöfn - Torshavn	<50	
Larvik	Norway	2	Hirtshals - Larvik	<50	
Kristiansand	Norway	2	Hirtshals - Kristiansand	<50	
Kapellskar	Sweden	2	Kapellskar - Naantali (Nadendal)	<50	
Holmsund	Sweden	2	Holmsund - Vasklot	<50	
Hirtshals	Denmark	2	Hirtshals - Kristiansand	<50	
Tvärminne	Finland	3		50-100	
Tromsø	Norway	3		100-150	
Trelleborg	Sweden	3		50-100	
Tananger	Norway	3		50-100	
Nynashamn	Sweden	3		50-100	
Narvik	Norway	3		50-100	
Malmö	Sweden	3		50-100	
Kotka	Finland	3		50-100	
Kilpilahti (Skoldvik)	Finland	3		50-100	
Esbjerg	Denmark	3		100-150	
Bergen	Norway	3		100-150	
Ålesund	Norway	3		50-100	



## Demand side barriers

**Barriers connected to the shipowners' willingness to invest in retrofitting or newbuilding of "green vessels":**

- The shipowners' choice can be summarized in three questions:
  - i) What is feasible?
  - ii) what is allowed?
  - iii) what is cheapest?
- The "what is cheapest" question has two important aspects:
  - Risks connected to availability of each fuel
  - Expected cost of each fuel

## Supply side barriers

**Minor, major or prohibitively strong barriers in or around the ports connected to:**

1. Safety and regulation issues
2. Need of investments in infrastructure for transportation, storage and/or bunkering
3. Small demand – insufficient for minimum efficient scale (MES)
4. Proximity to production facilities
5. Access to renewable energy for production of selected fuels.
6. Organizational barriers – fragmented decision authority

## Preliminary results from survey and interviews

- 50% of the ports plan to supply at least one of the three fuels (hydrogen, ammonia and methanol)
- Norway seems to be more optimistic about hydrogen as a marine fuel than the other Nordic countries
- The fuels will (in most cases) be available between 2025 and 2030
- Most severe barriers:
  - Safety and regulatory issues – particularly for ammonia
  - Investments – particularly for hydrogen and ammonia. However, bunkering vessels may be a flexible and low-cost alternative
  - Uncertainty about demand – shipowners' choice of fuel



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