2019 ESPO
EUROPEAN SEA PORTS ORGANISATION
LIVORNO | 23 – 24 MAY

UMAS

The different Technological Pathways towards the Greening of the Shipping Sector

Dr Carlo Raucci

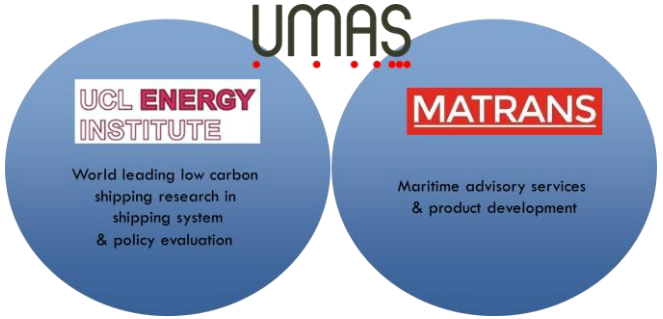
SESSION 2: NEW TECHNOLOGIES

Thursday 23 May 2019

Maritime consultancy delivering applied solutions for a carbon constrained future

About UMAS

UMAS is a group that combines the shipping research from the UCL Energy Institute and the advisory expertise of MATRANS to bring decarbonisation solutions to shipping

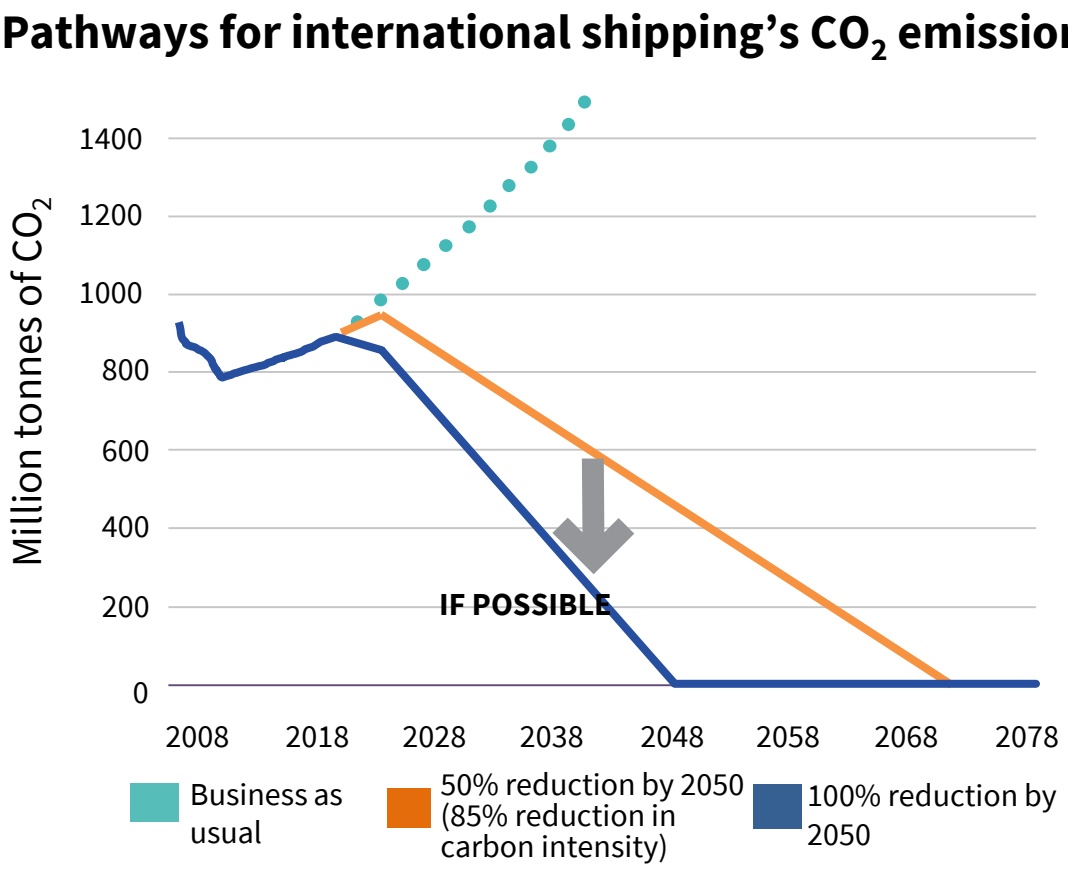


Fuel use statistics & emissions (AIS-data)

Shipping system simulation (Scenarios analysis Computational models)

Policy evaluation (Impact analysis)

Reducing greenhouse gas (GHG) emissions from international shipping



IMO Action Plan

Streams of activity	2018	2019	2020		2021	2022		2023
	MEPC 73	MEPC 74	MEPC 75	MEPC 76	MEPC 77	MEPC 78	MEPC 79	MEPC 80
Candidate short-term measures (Group A) that can be considered and addressed under existing IMO instruments[2]	Invite concrete proposals	Consideration of proposals	Consideration and decisions on candidate short-term measures that can be considered and addressed under existing IMO instruments e.g. further improvement of the existing energy efficiency framework with a focus on EEDI and SEEMP, ITCP[3]					
Candidate short-term measures (Group B) that are not work in progress and are subject to data analysis	Invite concrete proposals	Consideration of proposals	Consideration and decisions on candidate short-term measures that are not work in progress and are subject to data analysis, consistent with the Roadmap[3]					
			Data analysis, in particular from IMO Fuel Oil Consumption DCS					
Candidate short-term measures (Group C) that are not work in progress and are not subject to data analysis	Invite concrete proposals	Consideration of proposals	Consideration and decisions on candidate short-term measures that are not work in progress and are not subject to data analysis e.g. National Action Plans guidelines, lifecycle GHG/carbon intensity guidelines for fuels, research and development[3]					
Candidate mid-/long-term measures and action to address the identified barriers	Invite concrete proposals	Consideration of proposals including identification of barriers and action to address	Progress made and timelines agreed on the development of mid- and long-term measures					
Impacts on States[4]	Invite concrete proposals	Finalization of procedure	Measure-specific impact assessment, as appropriate, consistent with the Initial Strategy, in particular paragraphs 4.10 to 4.13					
Fourth IMO GHG Study	Scope	Initiation of the Study	Progress report	Final report				
Capacity-building, technical cooperation, research and development	Development and implementation of actions including support for assessment of impacts and support for implementation of measures							
Follow-up actions towards the development of the revised Strategy		Ship fuel oil consumption data collection pursuant to regulation 22A of MARPOL Annex VI (DCS)			Initiation of revision of the Initial Strategy taking into account IMO DCS data and other relevant information			Adoption of revised Strategy

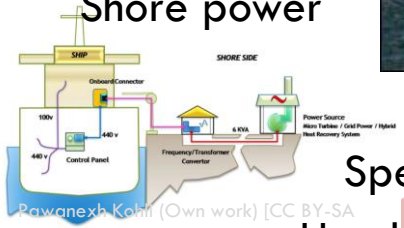
Source: MEPC 73/19/Add.1 Annex 9

Technological pathway

Compliance with Sulphur limit (LSHFO, MDO, LNG, scrubbers)

Kites

Shore power



Speed reduction

Hotel systems

Solar power

Turbo-compounding in Series

Hull Coating management

Rudder Bulb

Trim optimisation

Port turnaround optimisation

Energy saving light

2020 2030 2040 2050

Switching fuel

- A wide take up of zero carbon fuels will have to occur over the next 20 years
- Ports play a crucial role in helping the shipping sector manage the transition to clean shipping

Net-Zero Carbon Fuels

Energy sources

1. Renewable Electricity
2. Biomass
3. Natural gas +CCS

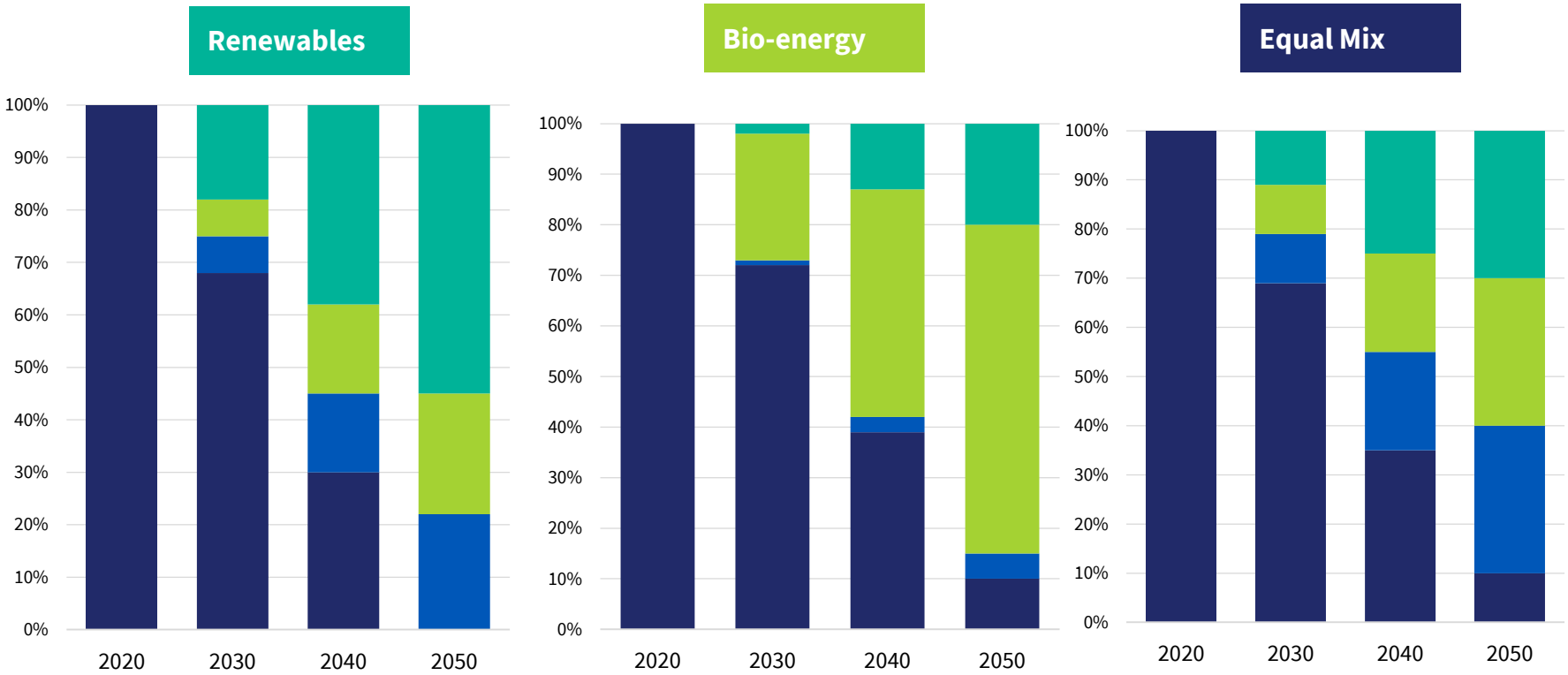
Net-zero carbon fuels options

1. Hydrogen,
2. Ammonia,
3. Methanol,
4. Any other biofuels,
5. Batteries

Fuel options

Energy sources	Hydrogen	Ammonia	Methanol	Biofuels	Batteries
Renewable electricity	**x**	**x**	**x**		**x**
Biomass			**x**	**x**	
Natural gas with CCS	**x**	**x**			

Energy source and marine fuels mix



Energy source: Renewable electricity
Fuels: e-H_2, e-NH_3, e-gas oil, e-methanol, batteries

Energy source: Natural gas with CCS
Fuels: NG-H_2, NG-NH_3

Energy source: Bio-energy
Fuels: Bio-gas oil, Bio-methanol, Bio-LNG

Energy source: Fossil fuels without CCS
Fuels: HFO, MDO, LSHFO, LNG

https://www.lr.org/en-gb/latest-news/lr-and-umas-release-new-zero-emission-vessels-transition-pathways-study/

The need of actions now

1. Policy levers to be clarified and adopted (e.g. $/tCO$_2$)
2. Establishing zero-carbon fuel bunkering infrastructure
3. Establishing trade routes on which zero GHGs are emitted
4. Secure supply
5. Analysis and learning from first adopters' demonstration projects and feasibility studies
6. Unlock climate funds
7. Development of niche markets

2020

Autonomous ship

Fuel cells

Hydrogen with Fuel cells

Image Credit: norled.no

Methanol
Ammonia
Biofuels with ICE

Image Credits: corporate.man-es.com

Batteries

2030 2040 2050

Port leadership

- Ports could use data and information to improve the way decarbonisation risk is managed
- Port could initiate schemes in establishing trade routes on which zero GHGs are emitted
- Port could promote technological development, innovation and offering a solution to the chicken-and-egg problem faced by alternative fuel
- Analysing local current and potential future availability of zero-carbon fuels based on:
  - existing low-/zero-carbon fuel options
  - natural resources availability
  - port partner, policies and pilot projects

https://www.shipmap.org/

Key conclusions

- The shipping sector is expected to decarbonise and new policies entering in force
- Short-term new technologies
- Managing decarbonisation risks and spotting opportunities
- Opportunities can be exploit by taking action now
- There is no a right answer now, but we can prepare for these future pathways
- Ports can play a crucial role promoting technological development and offering a solution to the chicken and egg problem

Thank you

Dr Carlo Raucci
carlo.raucci@u-mas.co.uk

Maritime consultancy delivering applied solutions for a carbon constrained future