ICES Working Group on Greening the Research Fleet (WGGRF)

ERVO 12th June 2024

First Results and Update

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CIEM

Science for sustainable seas

Working Group on Greening the Research Fleet

WGGRF

Working Group on Greening the Research Fleet

- **Start 05/2023**
- **3 years terms**
- **17 members**
- **9 nationalities**

Science for sustainable seas

ICES Science Plan

Seven interrelated scientific priorities

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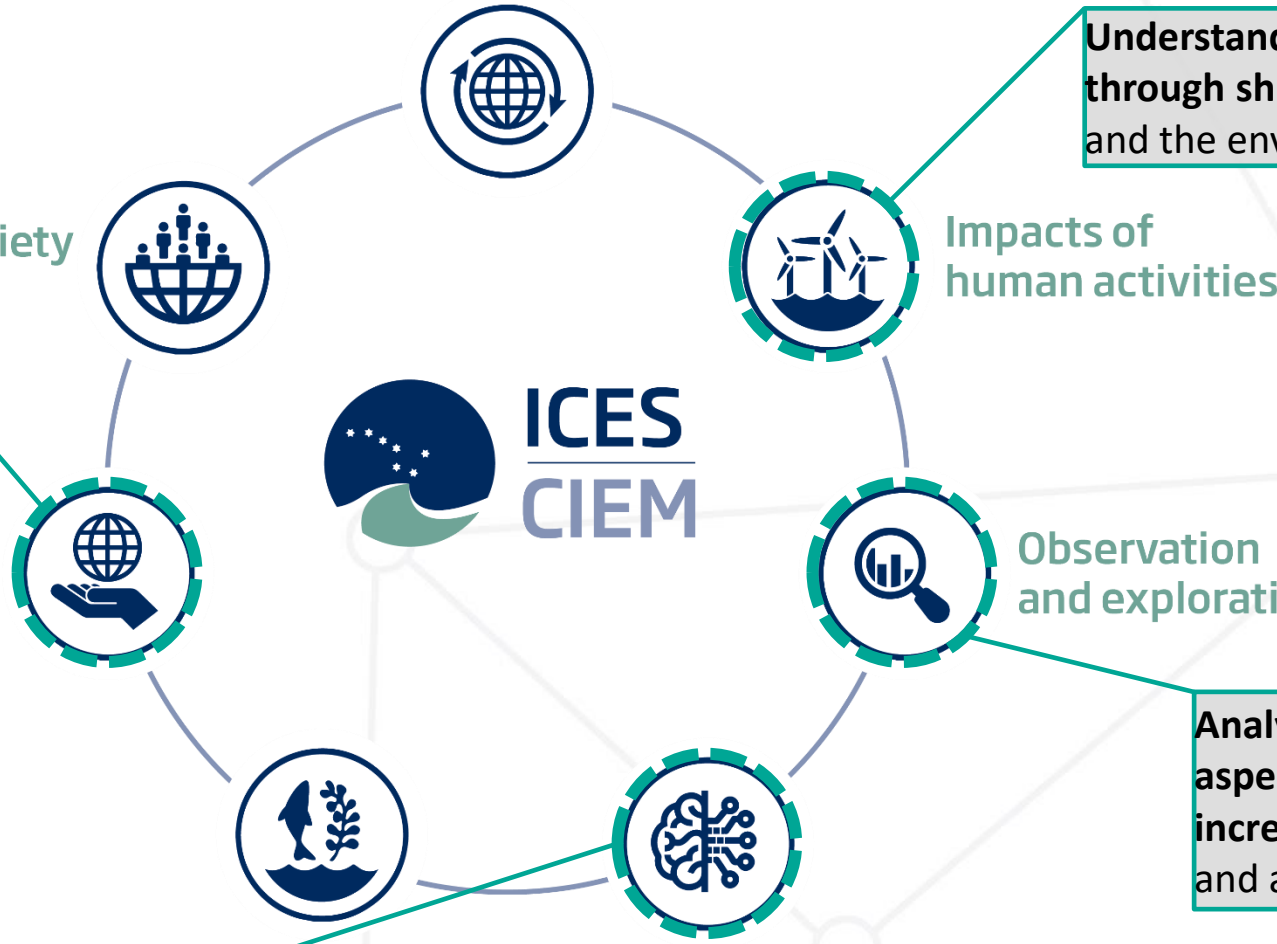
Provide evidence to **inform policy developers** as they seek to set objectives and to address and reconcile use and conservation of the sea.

Understanding pressures through shipping on ecosystems and the environment.



Horizon scan of new and emerging techniques and technologies potentially progressing the ICES vision and mission.

Develop and apply a wide range of analytical and statistical tools (…) to **describe (…) the distribution and dynamics of human activities** and assess their strengths and weaknesses.

Analyze and test (…) logistical aspects of survey design to **increase the efficiency**, scope and accuracy of monitoring.

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ICES WGGRF: Our Terms of Reference

ToR a

Task: collect fleet **baseline** emission and consumption data.

Deliverable: ICES Report on how to assess emissions of a vessel

ToR b

Task: review of IMO and other **regulation** with relevance for RVs.

Deliverable: Report or technical paper

ToR c

Task: draft **voluntary agreement** for RV operators

Deliverable: Draft to ICES

ToR d

Task: identify and publish **best practise** for NBs and retrofits

Deliverable: Technical paper, poster, manuscript

ToR e

Task: identify **best practise** for low-emission ops incl. autonomus systems

Deliverable: Technical paper, poster, manuscript

https://www.ices.dk/community/groups/Pages/WGGRF.aspx

First Results:
Fleet Baseline Data Evaluation, Stakeholder Survey and Trends in the Maritime Industry

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Fleet Baseline Dataset

Collected from 68 vessels from 13 countries (status 10/23):

(1) Vessel particulars

(2) Vessel operational data

(3) Consumption data

(4) Emission data: globally calculated using wtw emission factors

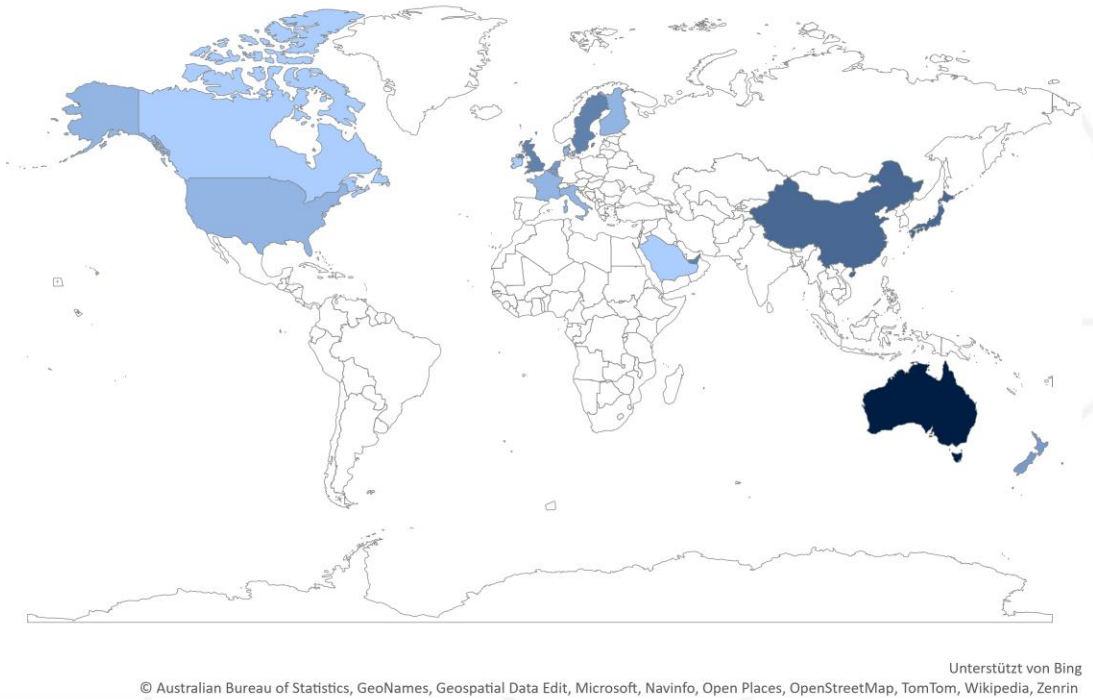
(5) Exhaust treatment

(6) Environmental measures taken

(7) Technical data: IHS

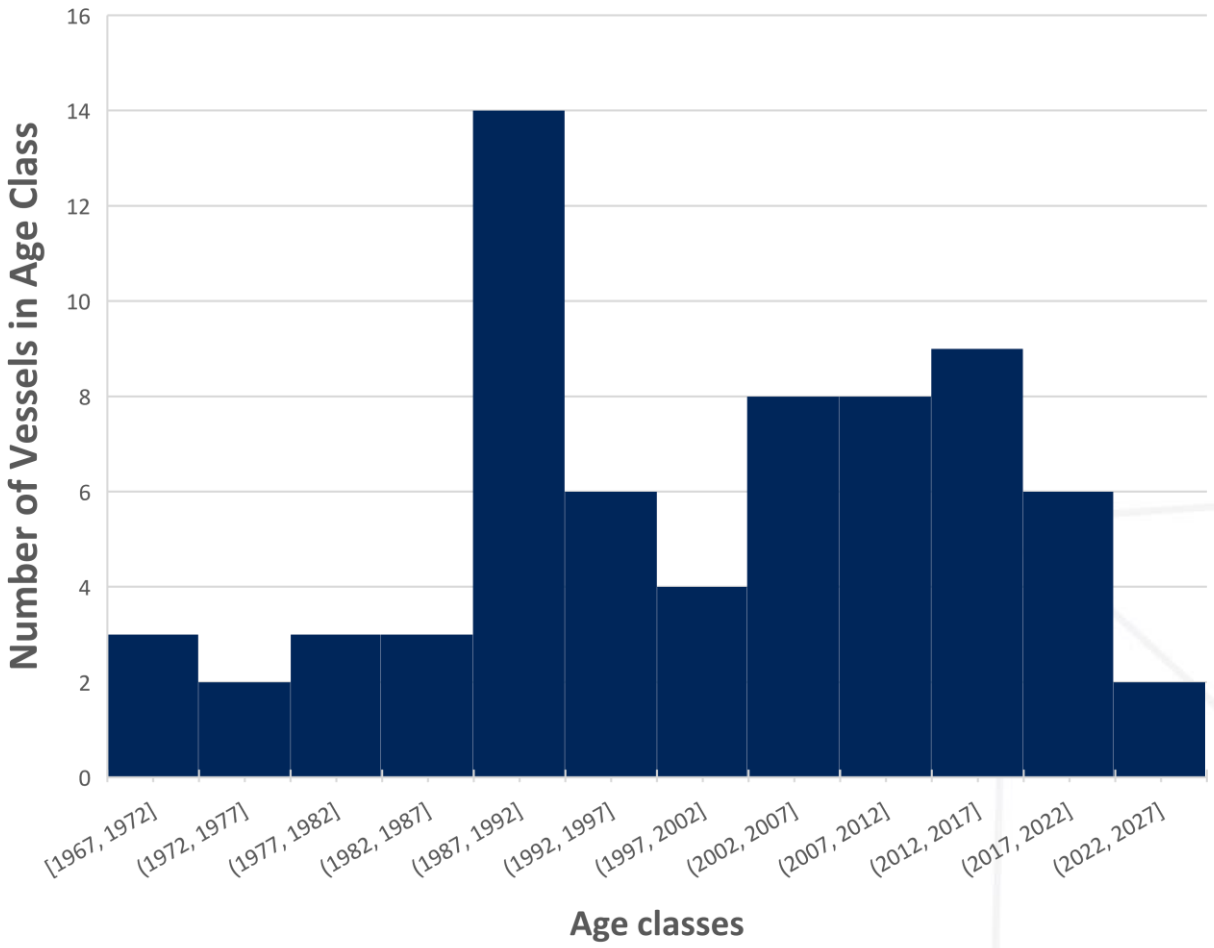
IRSO-Workshop: Stakeholder Survey

(16th Oct. 2023, Slido Polls)



Country	Number of Participants
Sweden	4
China	5
United Arab Emirates	4
France	2
Australia	8
United Kingdom	4
Belgium	3
Japan	5
Italy	2
Saudi Arabia	1
Denmark	2
Netherlands	3
Canada	1
Finland	2
USA	2
New Zealand	3
Ireland	1
Global	1
Total	**53**

RV-Fleet: Age distribution

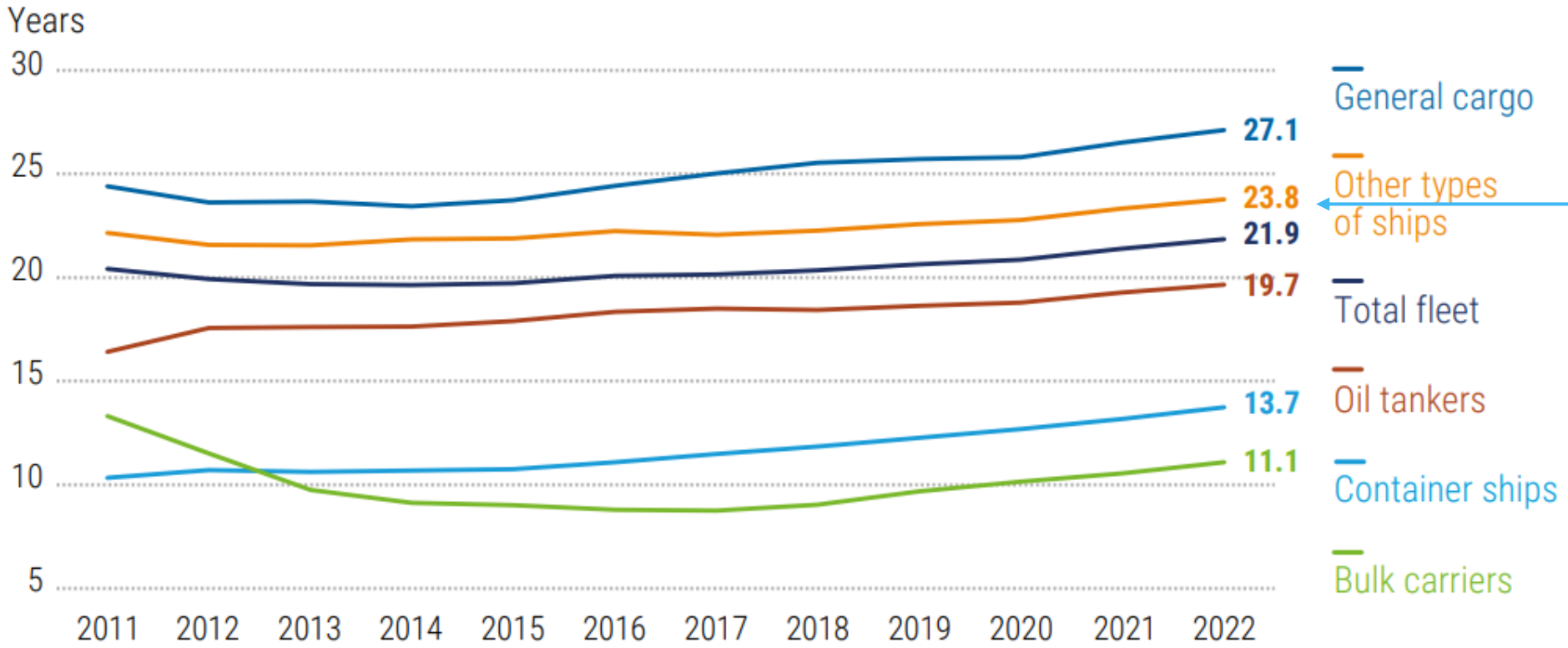


	Age [years]
Research Vessel age (average)	**22,7**
Expected age on replacement (av.)	**36,5**
Vessel Class **Large (> 80 m)**	**19,8**
Vessel Class **Medium (40 - 80 m)**	**23,5**
Vessel Class **Small (< 40 m)**	**21,5**

→ **Fleet renewal rate:**
Approximation using a 1:1 replacement assumption:
av. **3,8 % renewal rate** anticipated during 2021 - 2030

RV-Fleet: Comparison to Merchant Fleet

Figure 2.2 Average age of merchant fleet, 2011–2022



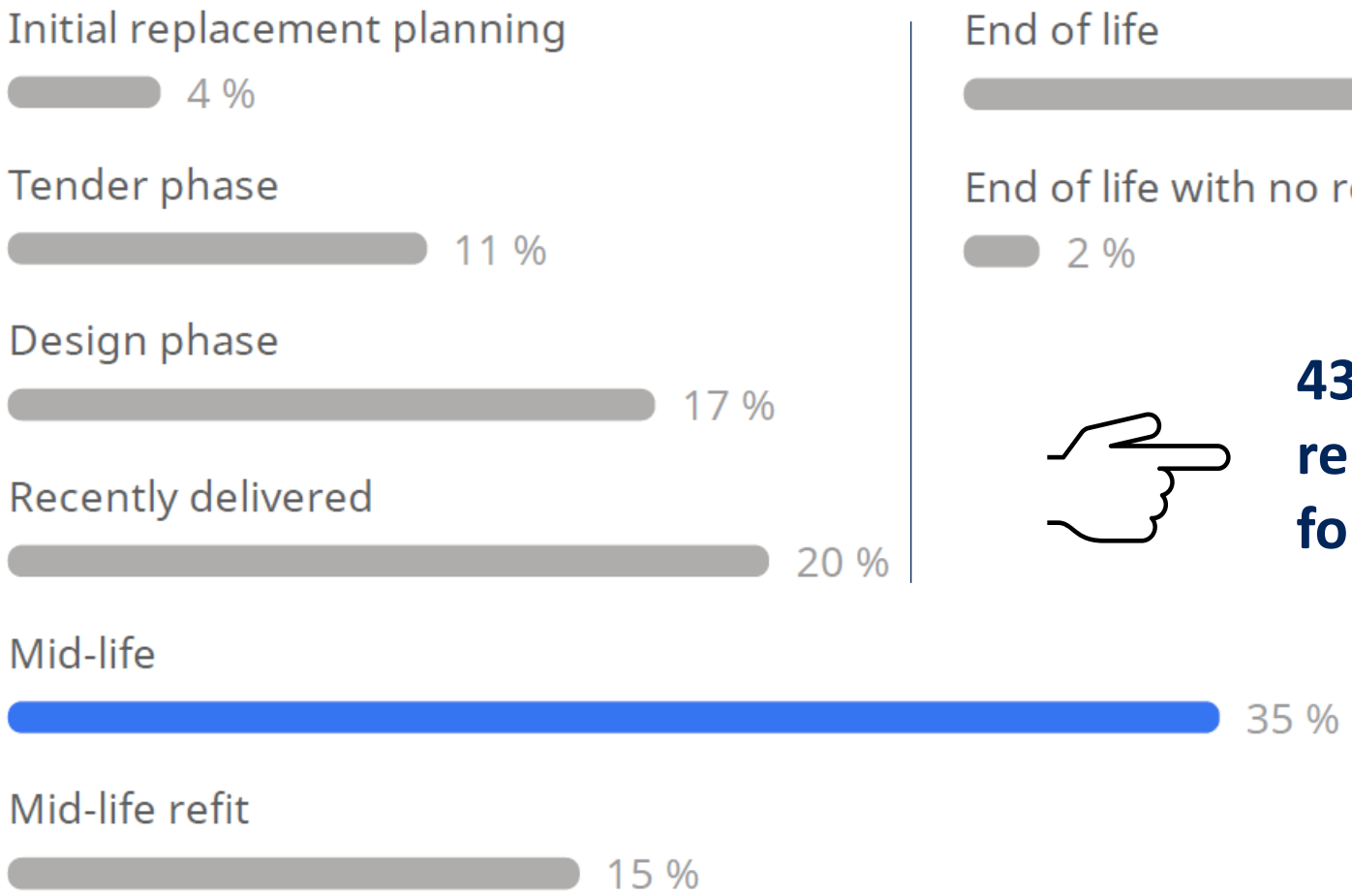
av. RV fleet age: 22.7

Source: UNCTAD calculations, based on data from Clarksons Research.

Note: Propelled seagoing vessels of 100 gross tons and above, as of 1 January 2022.

RV Fleet Status and Operational Information

What Life Cycle Stage is your RV currently in? [Multiple Choice (*multiple answers*)]



43 % of stakeholders are facing replacement or mid-life refits for at least one of their vessels.

Answers received: 046

RV Fleet Status and Operational Information

In your opinion, what is the most pressing topic in RV shipping today? [Word Cloud]

Answers received: 053

Sustainability Aspect:
Greenhouse Gas (GHG) Emissions

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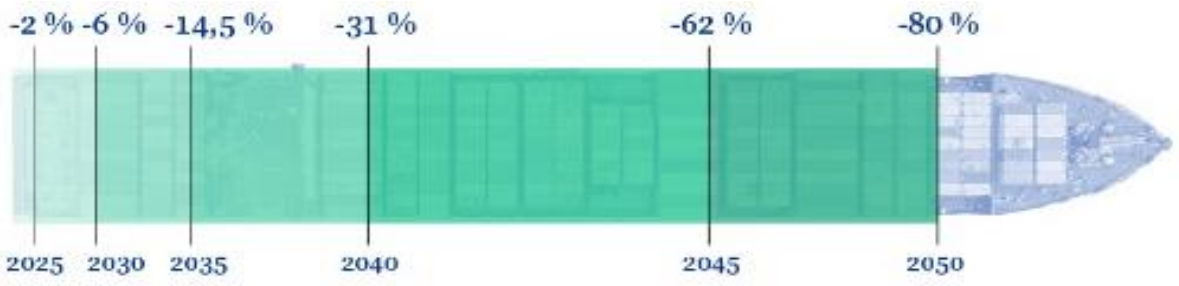
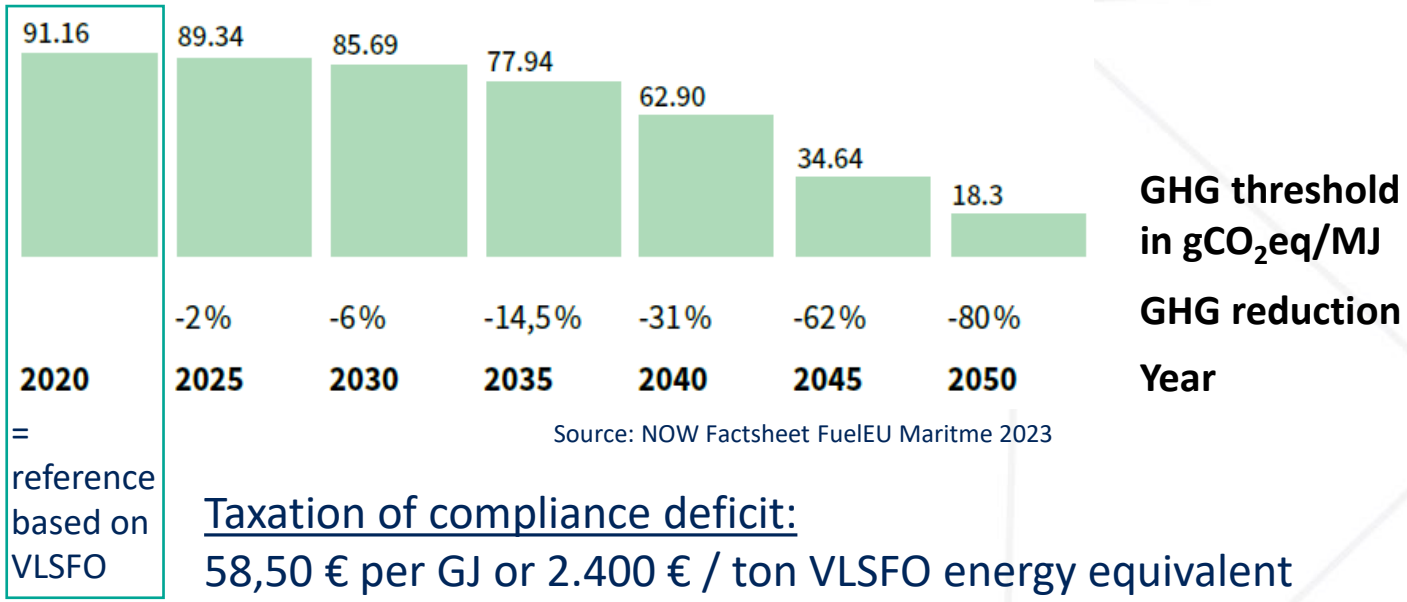
Regulatory developments:
EU: Taxation through FuelEU and ETS

Fuel GHG Intensity (Feedstock > Processing > Delivery)

Fuel EU (starts 1.1.25)





Source: NOW Factsheet FuelEU Maritme 2023

Taxation of compliance deficit:
58,50 € per GJ or 2.400 € / ton VLSFO energy equivalent

Emission costs (tailpipe CO_2e)

EU ETS (running since 1.1.24)

Anticipated EUA (= 1 ton CO_2e) price development:

Year	€ / EUA	Year	€ / EUA
30.5.2024	72	**2035**	173 - 194
2025	80 - 104	**2040 – 2050**	366 – 400+
2030	136 - 160		

Sources: BloombergNEF - EU ETS Market Outlook 1H 2024; London Stock Exchange Group, 2023; Pietzcker et al., 2021

[cf $(MDO)_{wtw}$ = 3,876 mt $_{CO2}$ / mt $_{MDO}$]

→ From 2026: more GHG covered, i.e. CH_4, N_2O
→ From 2027: several vessel types ≥ 400 GT to be included

IMO: near net zero ambitions 2050

2023 IMO Strategy on Reduction of GHG from Ships (MEPC.377(80))

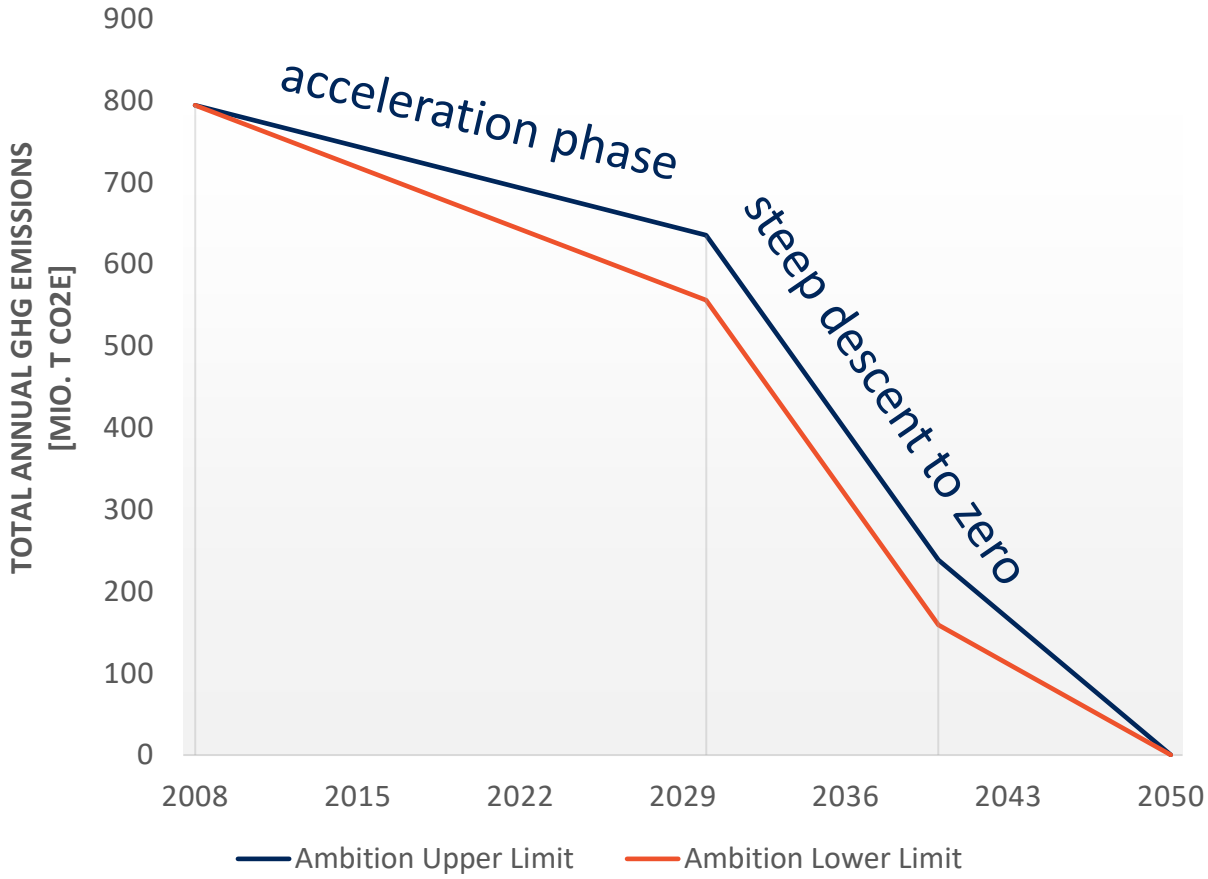
Ambitions

(1) Total annual GHG emission reduction envisaged:

20-30 % vs. 2008 by 2030
70-80 % vs. 2008 by 2040
near 100% by 2050

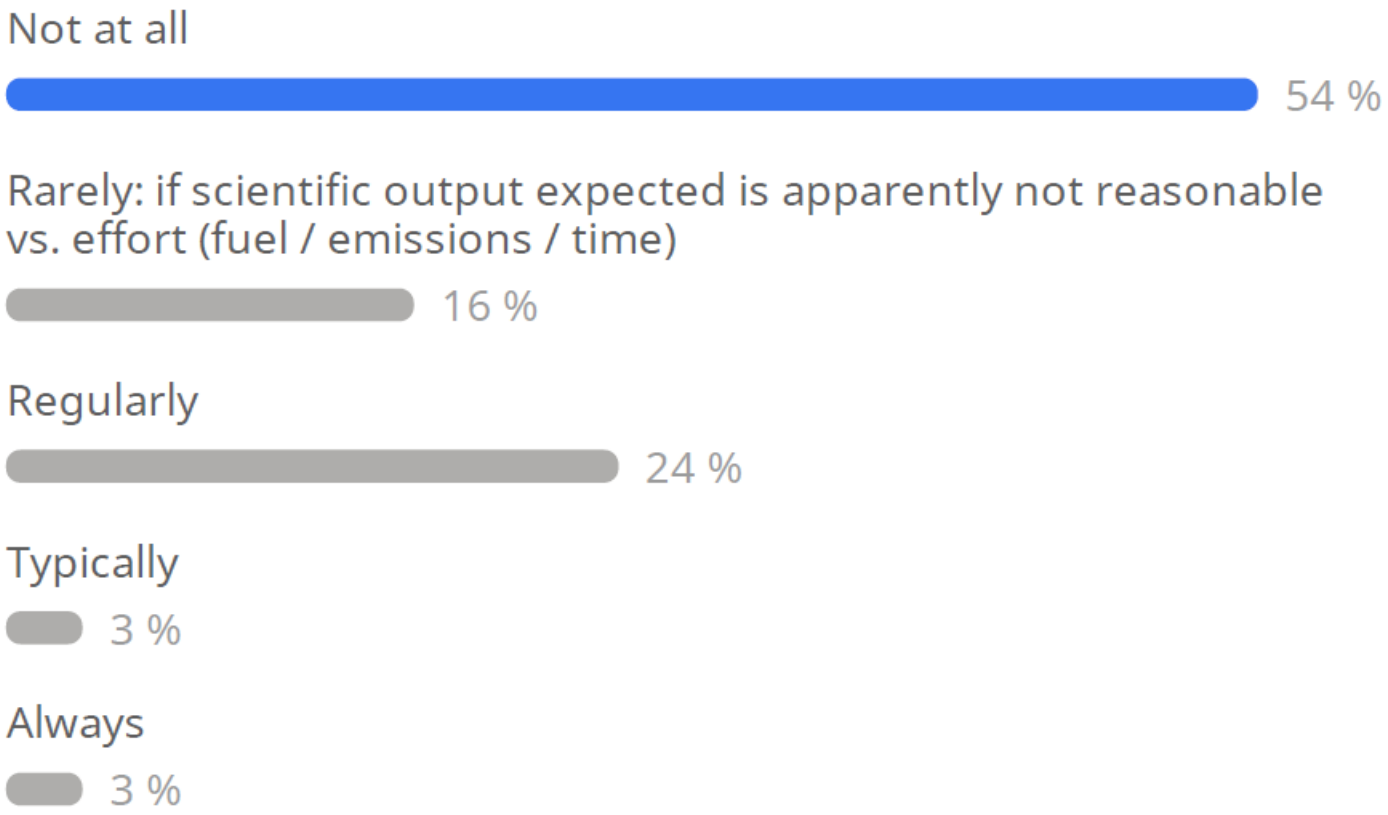
(2) Uptake of at least 5%, striving for 10 % of zero or near zero GHG energy sources by 2030.

(3) GHG emissions per transport work: - 40% by 2030 vs. 2008



RV Fleet Status and Operational Information

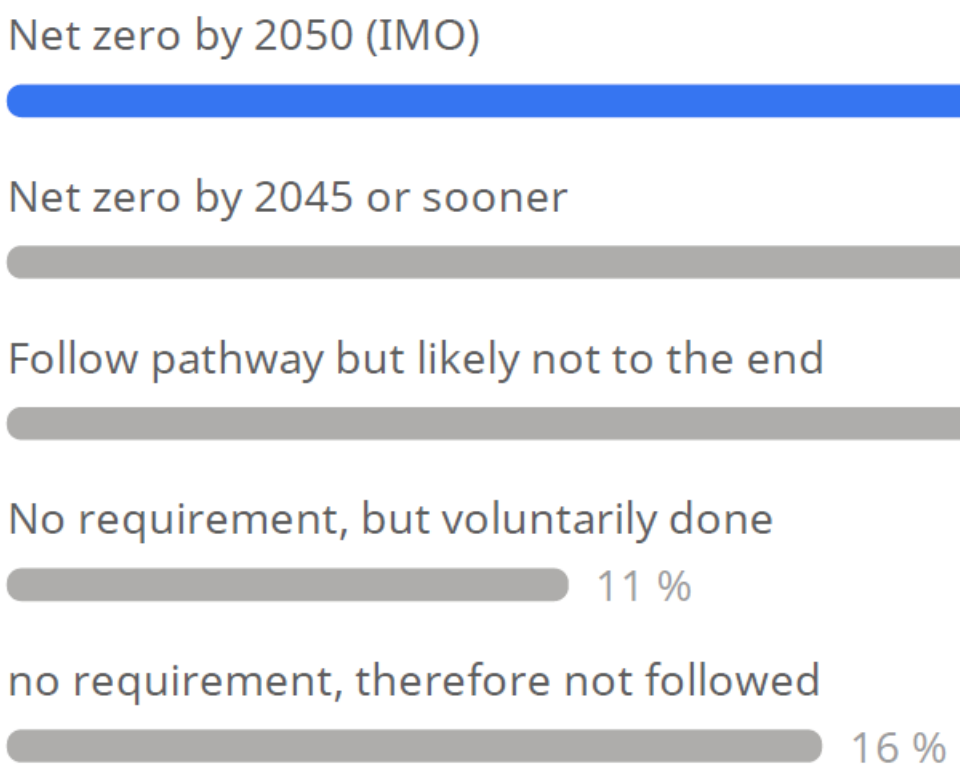
Do you consider GHG emissions for the planning of scientific activities?
[Multiple Choice (*single answer*)]



Answers received: 037

Greening the Research Fleet: Plans and Ambitions

Are you planning to follow IMOs trajectory to near net zero by 2050 (or a more ambitious target) with your RV? [Multiple Choice (*single answer*)]



50 % with IMO or even higher ambition!

Answers received: 044

Refit and newbuilding activity in merchant shipping – Energy Carriers

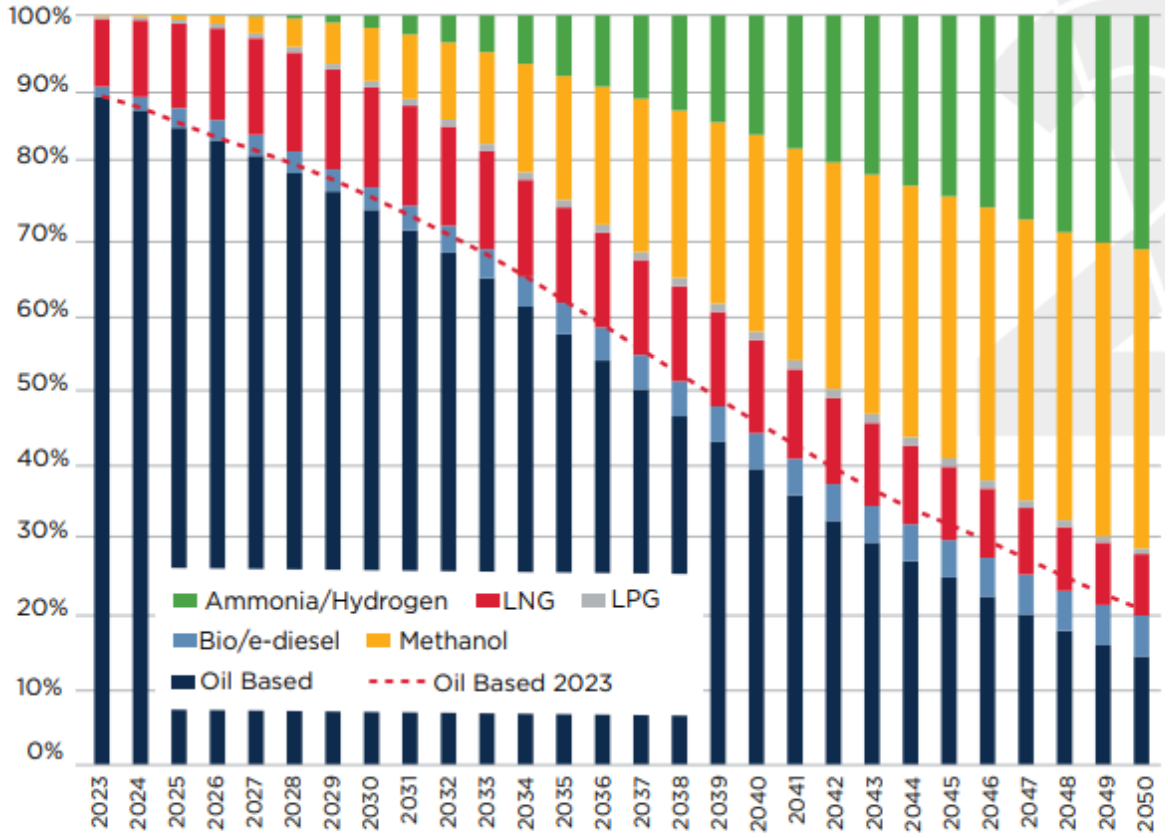


Figure 2.34: Fuel mix (HFO equivalent).

Ship types included: oil and chemical tankers, dry bulk carriers, containerships, LPG, LNG, car carriers, general cargo, ro/ro, ro/pax and cruise.

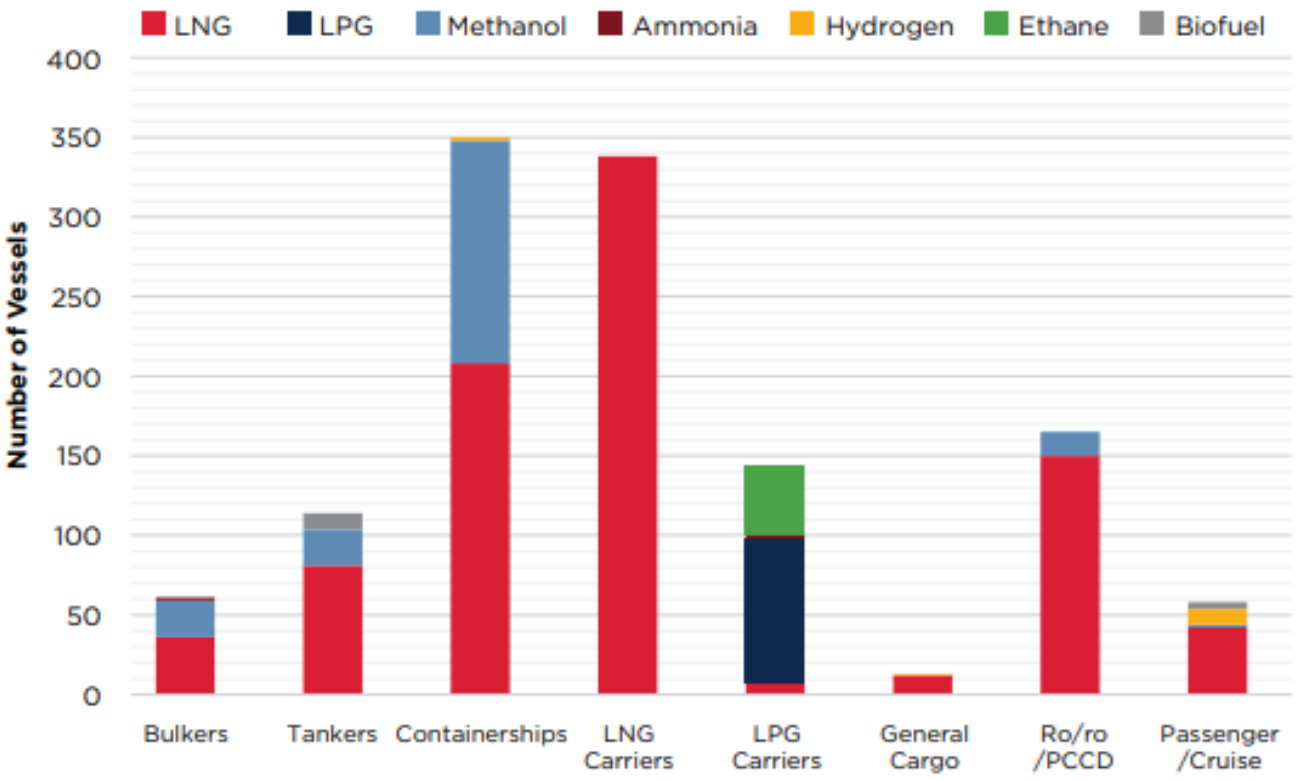


Figure 3.11: Orderbook by fuel type.

(Source: Clarksons Research, World Fleet Register, April 2024)

Source: ABS (2024) Beyond the Horizon. Orderbook tables based on Clarksons, April 2024

Refit and newbuilding activity in merchant shipping – Uptake of Energy Efficiency Technology

Existing Fleet		
Rank	**Energy Efficiency Technology**	**% All ship types**
1	Rudder Bulb	4,0
2	Propeller Duct	3,7
3	Stator Fin / Pre Swirl	3,1
4	Bow Enhancement	2,4
5	Propeller Boss Cap Fin	2,4
6	Hull Fin	1,1
7	Wake Equalizing Duct	0,5
8	Rudder Fin	0,4
9	Air Lubrication	0,3
10	**Solar Panel**	0,1
	(…)	
	Total	**11,7**

Orderbook (04/2024)		
Rank	**Energy Efficiency Technology**	**% All ship types**
1	Rudder Bulb	16,3
2	Bow Enhancement	15,9
3	Stator Fin / Pre-Swirl	11,8
4	Air Lubrication System	6,4
5	Propeller Boss Cap Fin	5,6
6	Propeller Duct	4,6
7	Hull Fin	3,0
8	**Solar Panel**	1,4
9	Rudder Fin	1,3
10	**Waste Heat Recovery System**	1,1
11	**Wind: Suction Wing**	0,6
	(…)	
	Total	**37,4**

Source: ABS (2024) Beyond the Horizon.

Greening the merchant shipping: Refit, Retrofits and Newbuilding drivers

Efficiency Gains

- Reduction of Energy Demand
- Increase of transport work by energy used [gram CO2 / t mile] (economies of scale)
- broader lender base for green assets (i.e. exceeding EEOI, EEXI, EU Taxonomy)

Regulatory Compliance

- Possibility to avoid GHG taxation / penalization over vessel lifetime
- Anticipation of upcoming IMO or local requirements
- Enable pooling / banking of compliance surplus

Other Benefits

- Underperforming fleet (compliance deficit) may be compensated (at least in the acceleration phase)
- Freight increase through proactive cargo owners (i.e. COZEV, ZEMBA)
- Resilience towards fuel price hikes
- Meeting requirements from ESG (i.e. CSRD, ESRS) reporting
- Company reputation

Challenges

- Fuel availability, especially e-fuels (RFNBO)
- Small players have substantial disadvantage to access and contract limited fuel resources.
- Technical requirements for uptake of new technologies often not mature.
- Use of ETS funds not controllable.
- Uncertainty on when CO2 costs from smaller ships (< 5000 gt) are being internalized (EU)
- Fuel EU and EU ETS are not compatible but complementary instruments

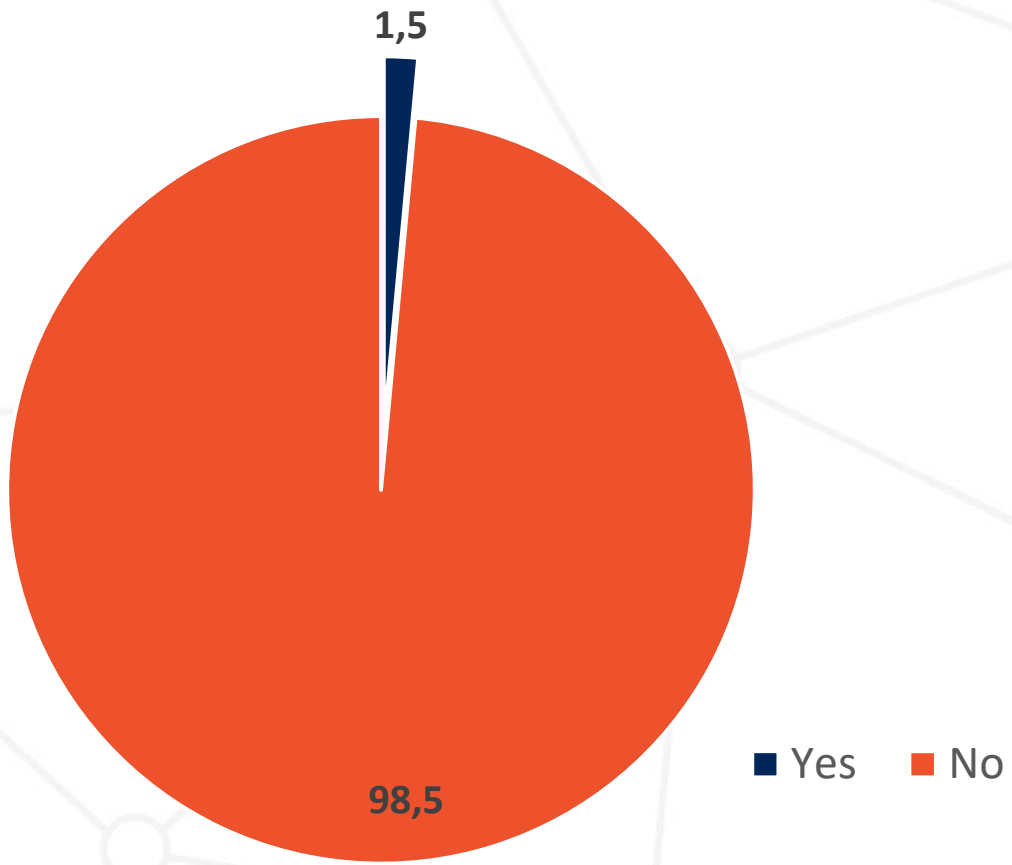
Source: https://deal.town/gcaptain/gcaptain-daily-your-daily-maritime-news-F3VAYMFZE

Energy Carriers used in the RV-Fleet

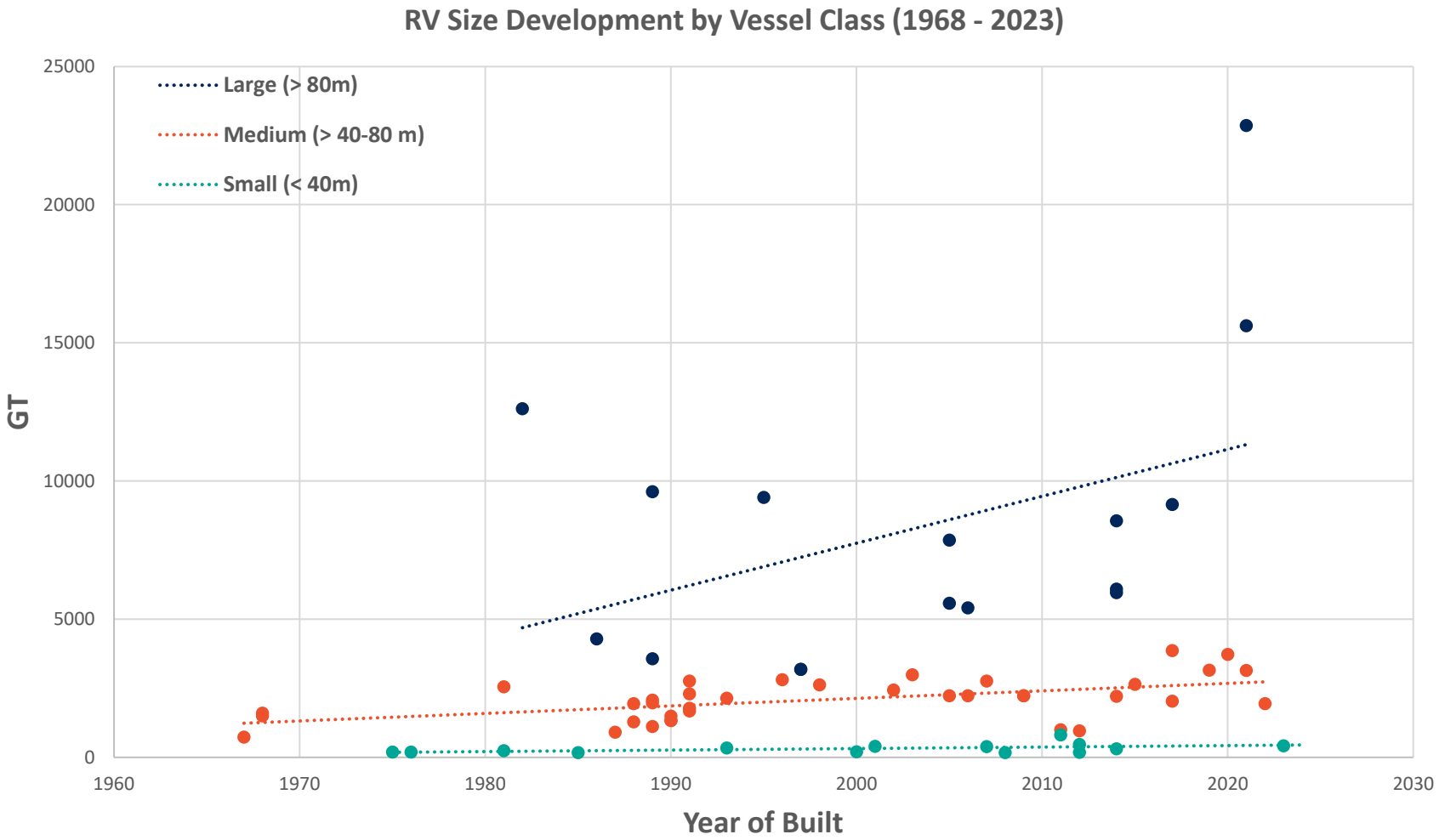
Energy Carriers in use

Dual fuel ready? [%]

(use of HVO not considered)



RV-Fleet: Vessel Size (GT) trends

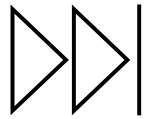


Where has GT increment been going to?

(1) Higher relative volume of enclosed spaces?
(2) Safety / Stability?
(3) Research capabilities?
(4) …

Greening the Research Fleet: Plans and Ambitions

Greening the research fleet: what measures are you **currently taking or considering to take in the nearby future to reduce GHG emissions** / carbon intensity of your operation? [Multiple Choice (*multiple answers*)]



Please see following page

Answers received: 043

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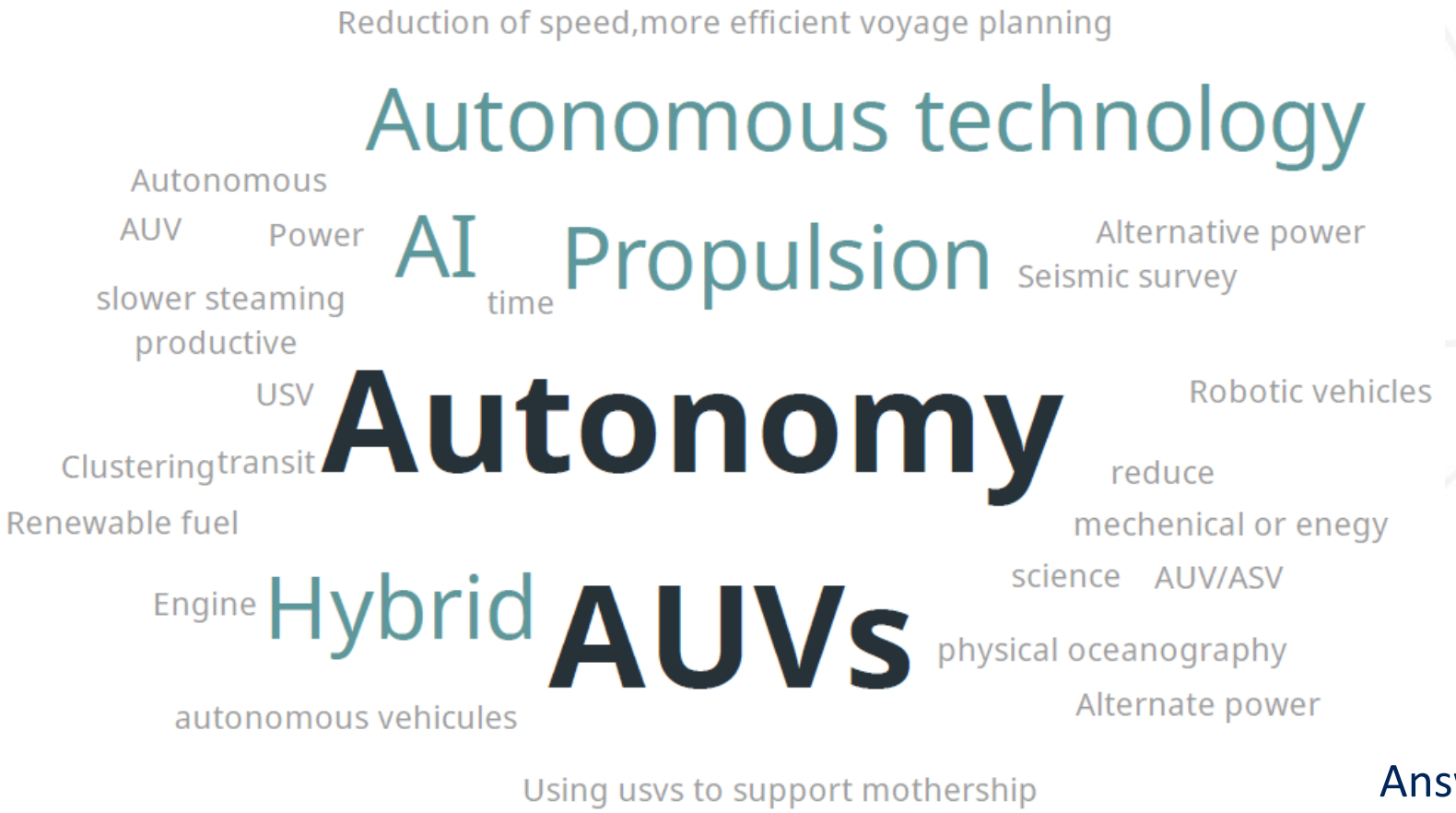
- WASP - Wind Assisted Propulsion
- Shaft Power Limitation
- Change to fuels with lower TtW / WtW GHG emissions (drop in fuels)
- More efficient hull coating / regular hull cleaning
- Improve/replace propeller or appendages
- Slow steaming
- Bubble Curtain
- Operational improvements (improved passage planning, improved vsl utilization)
- Install Battery (peak shaving etc.)
- Trainig of personnell
- Reduction of personnel carried on board
- Replace / improve efficiency of energy production
- Use alternative means for energy production (fuel cells etc.)
- Install energy efficiency software
- Reasonably reduce comfort / safety margins (i.e. use anchor vs. DP anchor mode)
- Install efficient machinery such as VFDs
- Heat recovery systems
- Shore power connection
- Hull form optimization
- Optimizing hydrodynamics for certain sailing conditions (trim etc.)

Note: Numbers indicate percentage of participants which chose this option

Greening the Research Fleet: Plans and Ambitions

In your opinion: **What scientific disciplines / devices / means on a RV do you associate with a GHG reduction potential**? [Word Cloud]



Answers received: 041

Greening the research fleet

Regulatory Requirements

- Part of RVs are **excluded from regulatory framework** (i.e. state owned vessels) or do not fall under requirements yet due to size (gt).
- Applicability depending on ownership / ISM Manager / nature of work (chartered out etc.) / decarbonization targets
- National **ESG / CSRD reporting may apply for the institute**. RVs are a major contributor to an institutes' Scope 1 emissions (estimate 70 – 80 %)

Compliance Benefits

- Anticipation of upcoming IMO or local requirements
- Resilience towards fuel price hikes
- Meeting requirements from ESG (i.e. CSRD, ESRS) reporting
- Institute reputation / public perception

Challenges

- Added compliance cost (mandatory or voluntary) cannot be transferred to multiple stakeholders.
- Justification of added fuel costs as a large contributor to operating costs
- Fuel availability: matching (remote) operating area and green fuel availability.
- Multirole capabilities hampers possible efficiency gains (bubble sweepdown vs. energy efficient ice breaking)
- Whats an appropriate efficiency indicator for research vessel work?
- Technical requirements for uptake of new technologies often not mature.
- Uncertainty on when CO2 costs from smaller ships (< 5000 gt) are being internalized (EU)

ICES WGGRF Outlook

1.) ICES-Report on “**How to assess emissions of a vessel**“ covering fleet status overview

2.) ICES Report or technical paper on **relevant regulations, gaps and compliance difficulties**

3.) First draft of a **voluntary agreement** between RV operators

Expected for 2025:

4.) Best practise and general recommendations for **new builds and refits.**

5.) Best practise and general recommendations for **low emission operation.**

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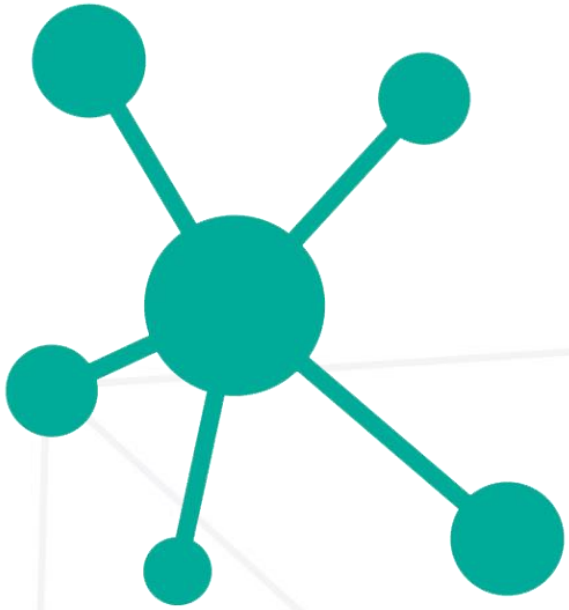

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