The zero GHG future and how to get there

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UMAS

Maritime consultancy delivering applied solutions for a carbon constrained future

Underestimate pressure and politics at your peril…

Leading countries blocked from speaking at UN climate summit

Secretary-general takes tough line on select coal-supporting nations

António Guterres, UN secretary-general, has demanded that countries attending the summit commit to net zero emissions by 2050
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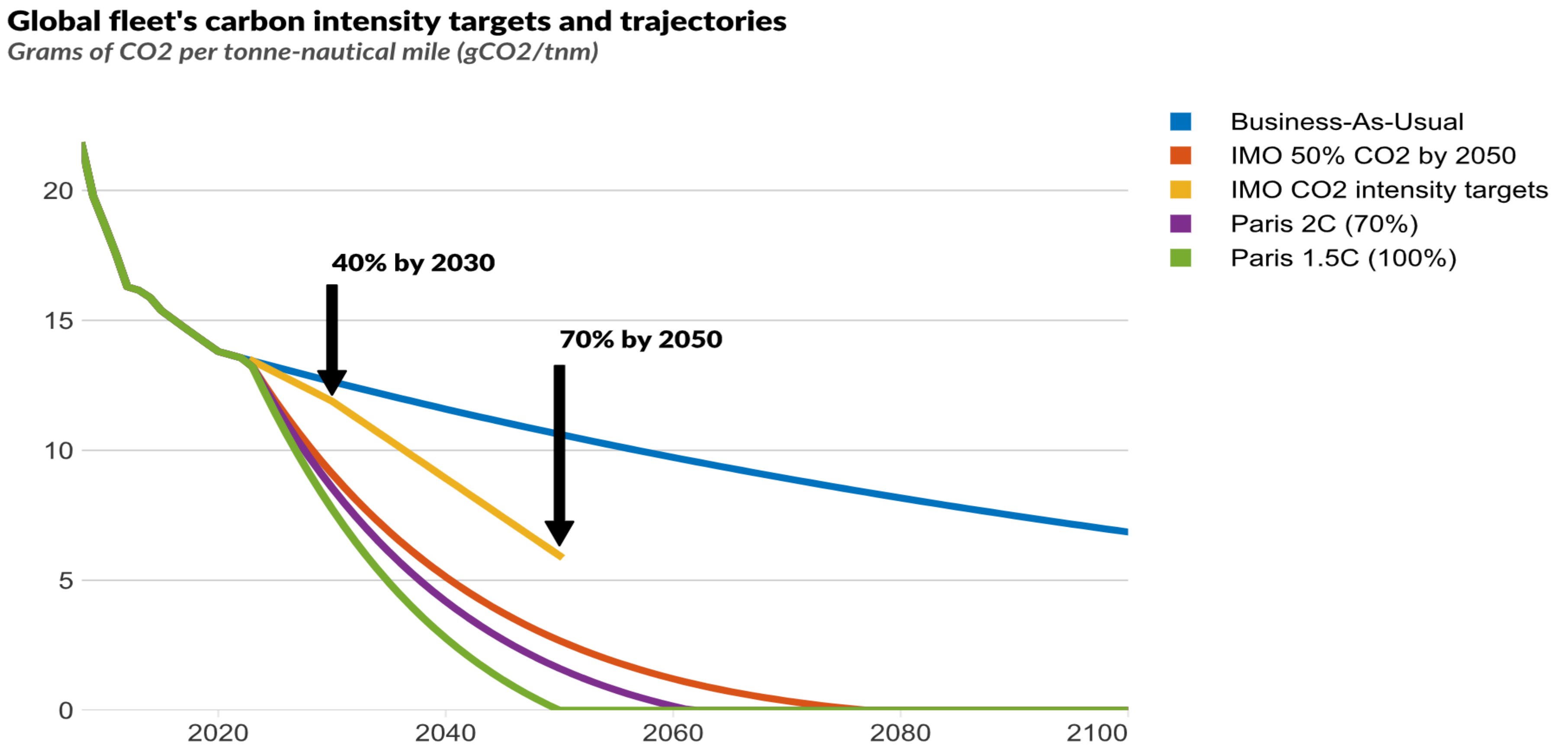
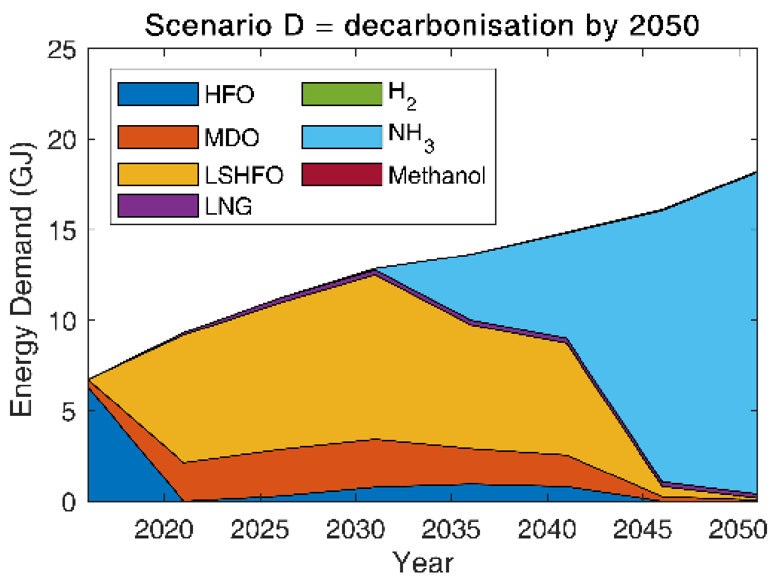
We will be moving very fast

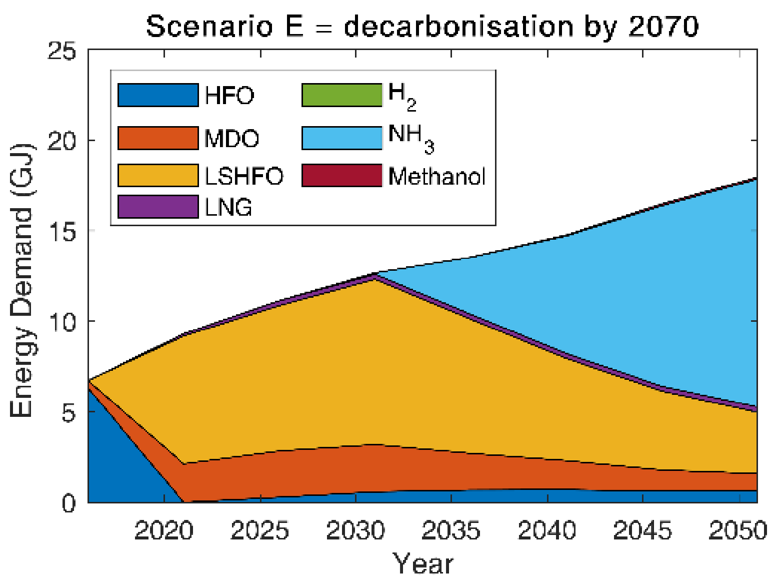


A hydrogen carrier (e.g. ammonia) will have a 75-99% market share by 2050

2050 decarbonization (1.5°C aligned)
GJ



2070 decarbonization (IMO aligned)
GJ



The scenarios suggest ammonia is likely to represent the least-cost pathway for international shipping

Source: UMAS GloTraM (2019)

Yara and Engine 50MW Green NH3 (2021)

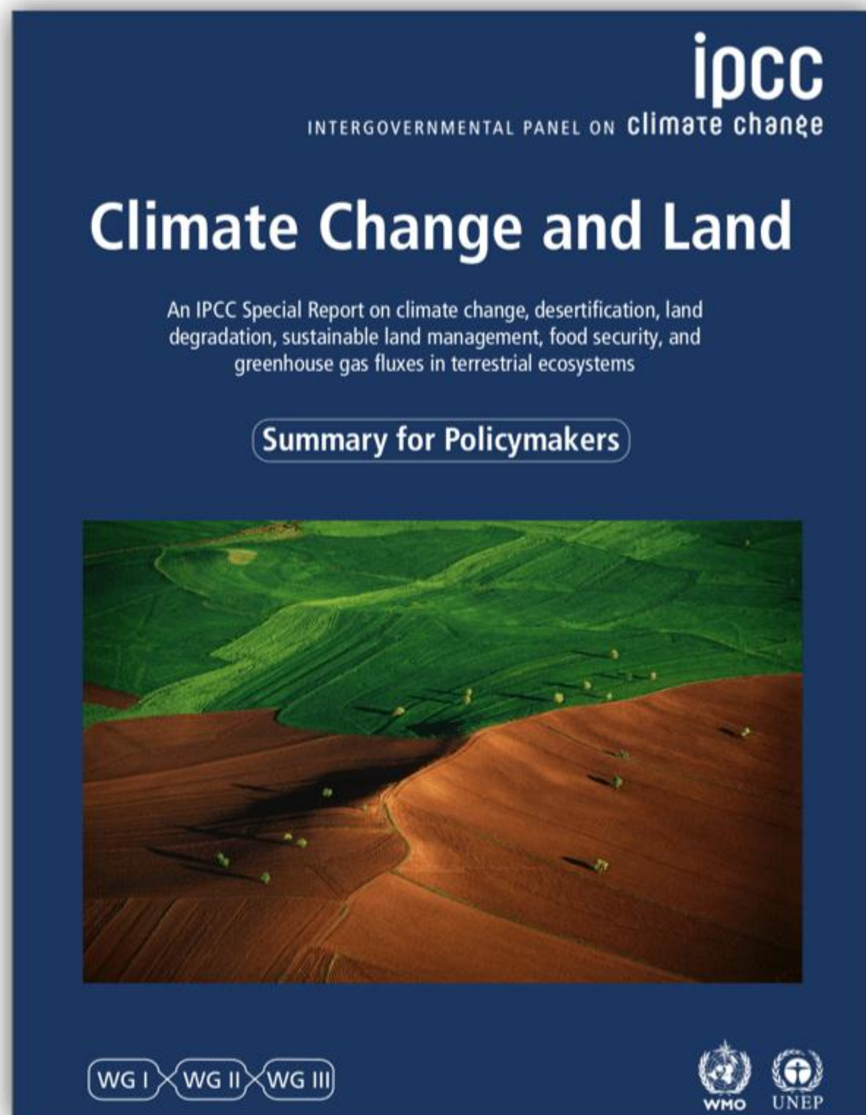
~100MW Solar array
50MW electrolyser
80tpd ammonia

What about synthetic hydrocarbons (e-LNG, e-methanol? etc.)?

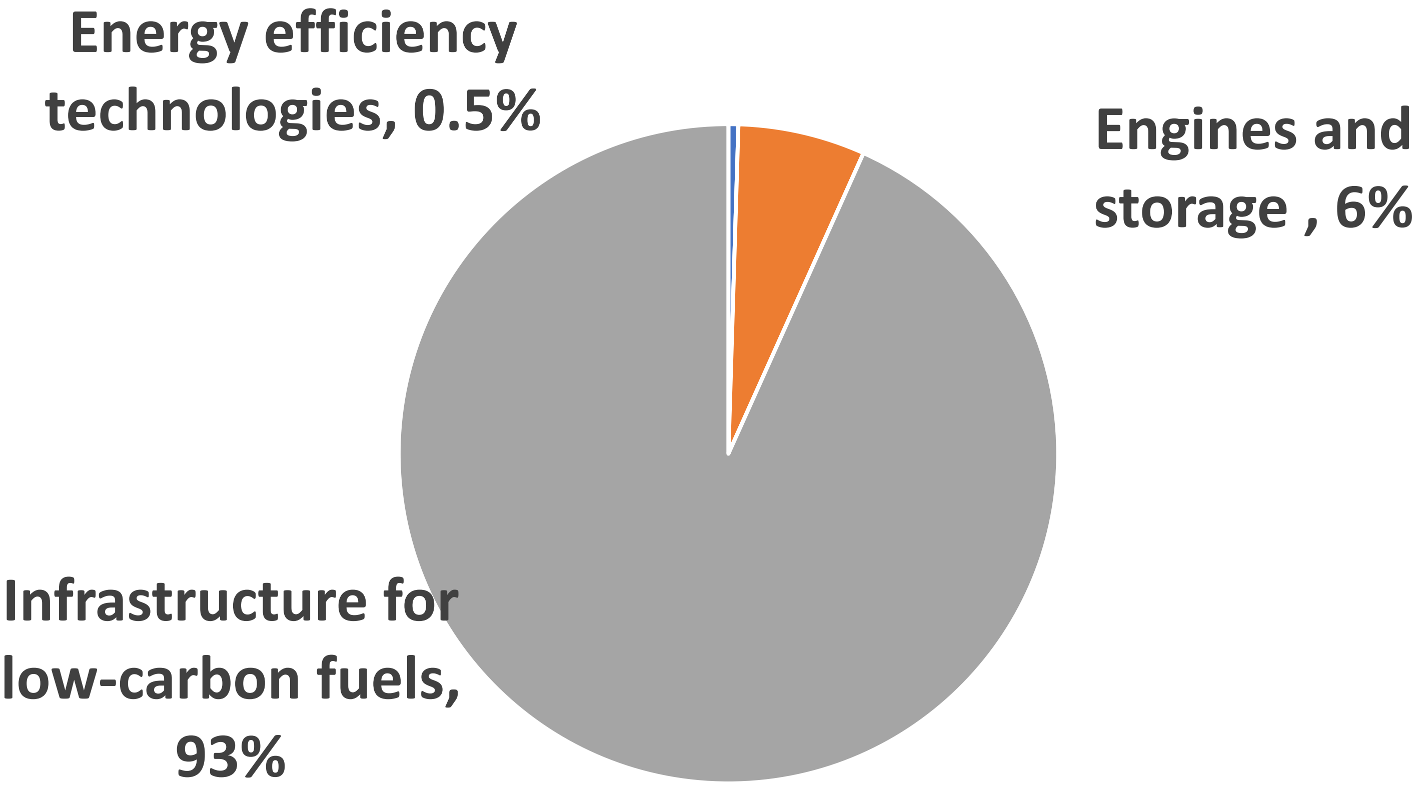
Direct air capture of CO_2

Bioenergy?

UMAS



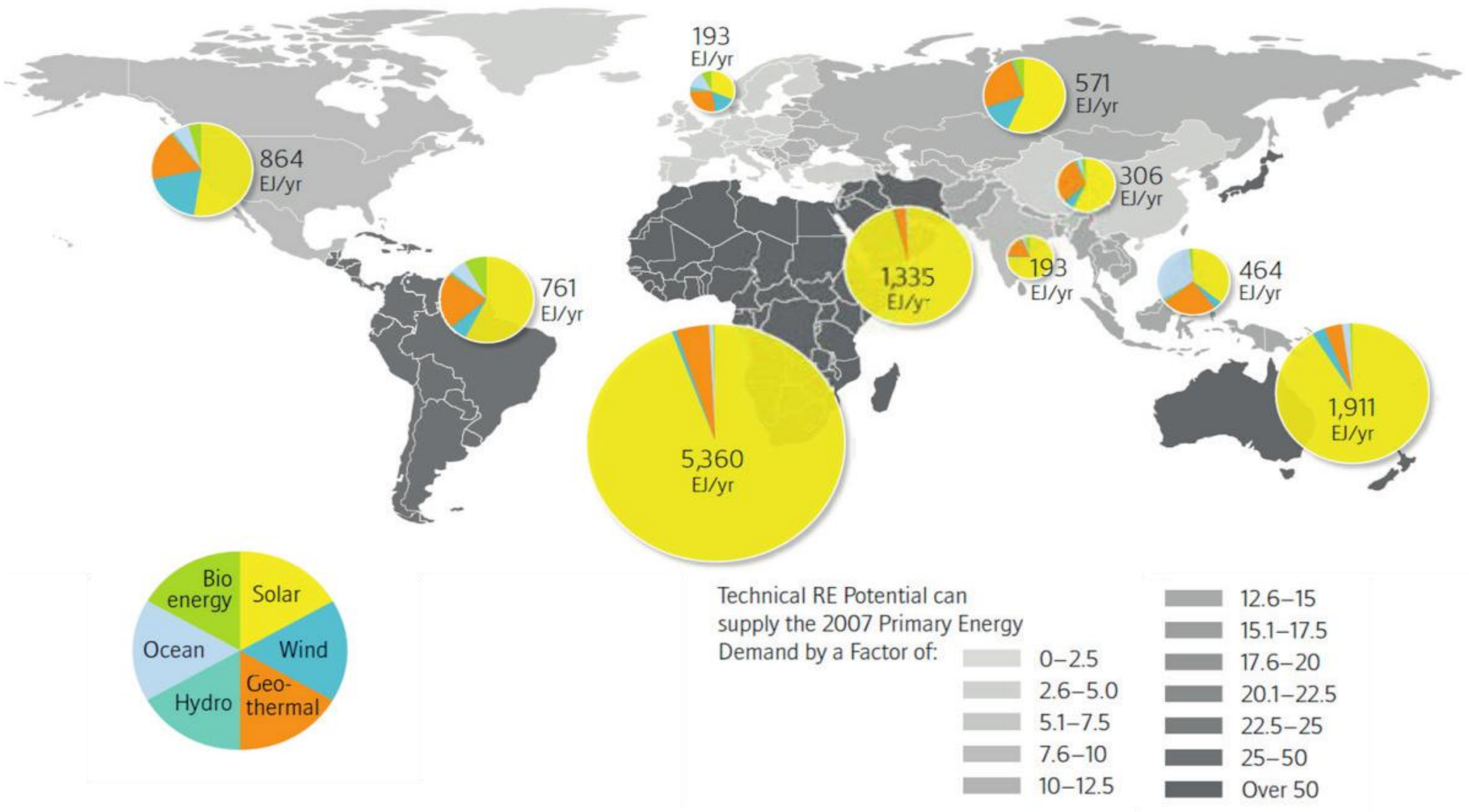
Investment needs are dominated by the supply-chain/infrastructure



Source: UMAS GloTraM (2019)
Note: Sum of the investment costs up to 2050. Decarbonisation by 2050 scenario assuming a mix of NH_3 production methods (SMR+CCS and electrolysis)
Investment costs up to 2050 capex only

Many countries have the potential for renewable fuel provision

- Shipping – 20-40EJ/yr



Where possible, go straight to long-run solutions

- Domestic
- Early adopter fleets
  - Container
  - Cruise
- Niche geographies

Belgium - hydrogen

Peru - wind

China - battery

Help

- Energy efficiency
- Drop-in fuels to existing fleet/infrastructure
- Wind assistance
- Shore power/port electrification

Hinder

- LNG
- Offsets

Public		Private
Govt. provide risk capital/guarantee	2020	R&D, trials and pilot projects
IMO sends very clear signal on projected quantities of non-fossil fuel	2023	Very shortlist of long-run solutions
Latest date for IMO adoption of clear policy driver for switch from fossil	2025	Solid investment cases formed on expected IMO policy
IMO and govts. clear on incentivization of upstream decarbonisation	2028	Fleet and infrastructure investment flowing
IMO clear on incentivization of upstream	2030	Zero roll-out

Concluding remarks

- Don’t panic, there are options and there is time but we have to use it well
- Decarbonisation = investment = business case
- This only works with public and private in symbiosis