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H2MA

The evolution of **CLEAN HYDROGEN**



Perspectives from
production to use
in mobility and
industry

29th of October 2025
Venezia Heritage Tower
(Marghera, Venice)



The role of hydrogen in the decarbonization process: strategic and technological elements

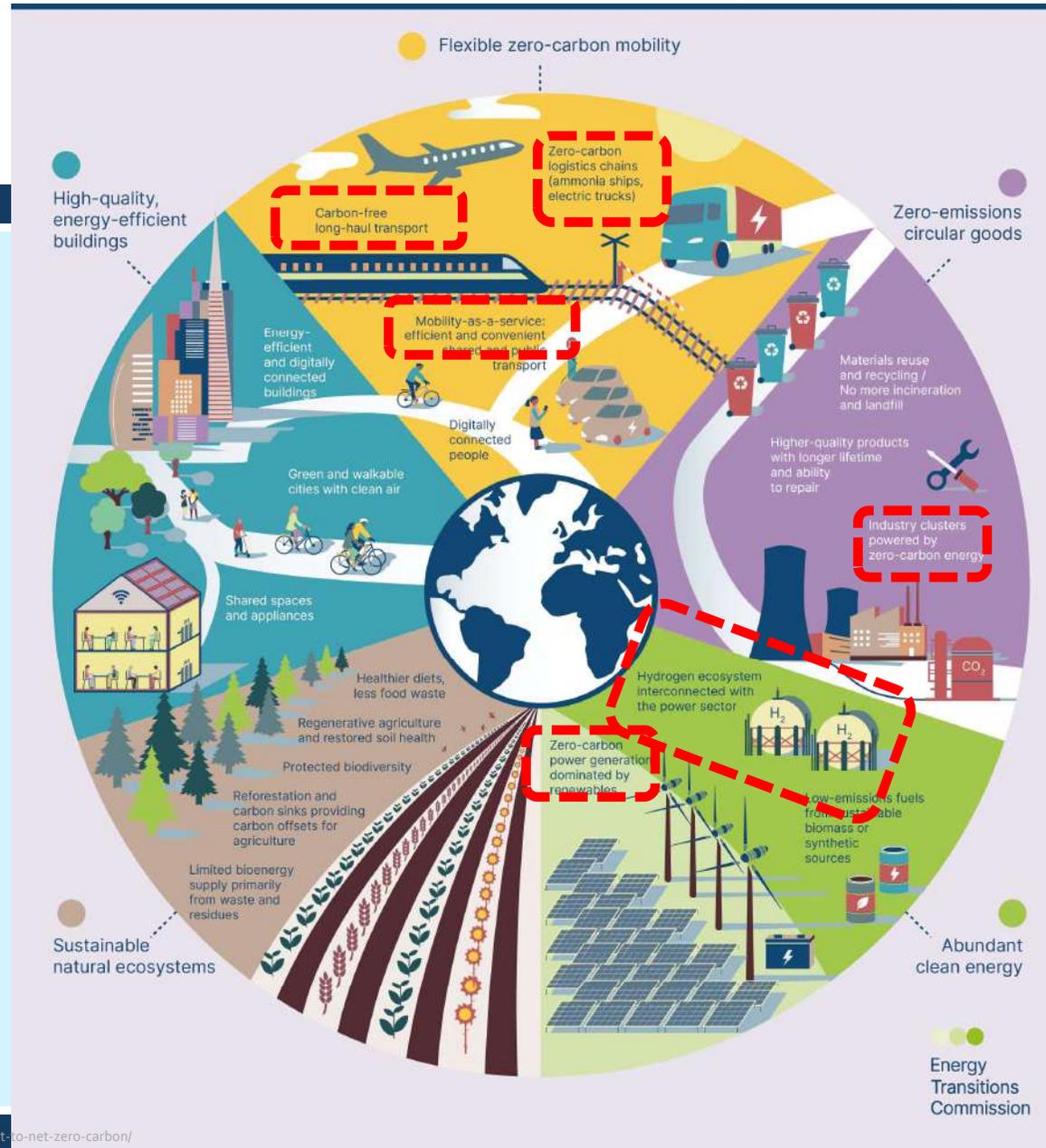
Cristina Cavicchioli - Ricerca sul Sistema Energetico - RSE S.p.A



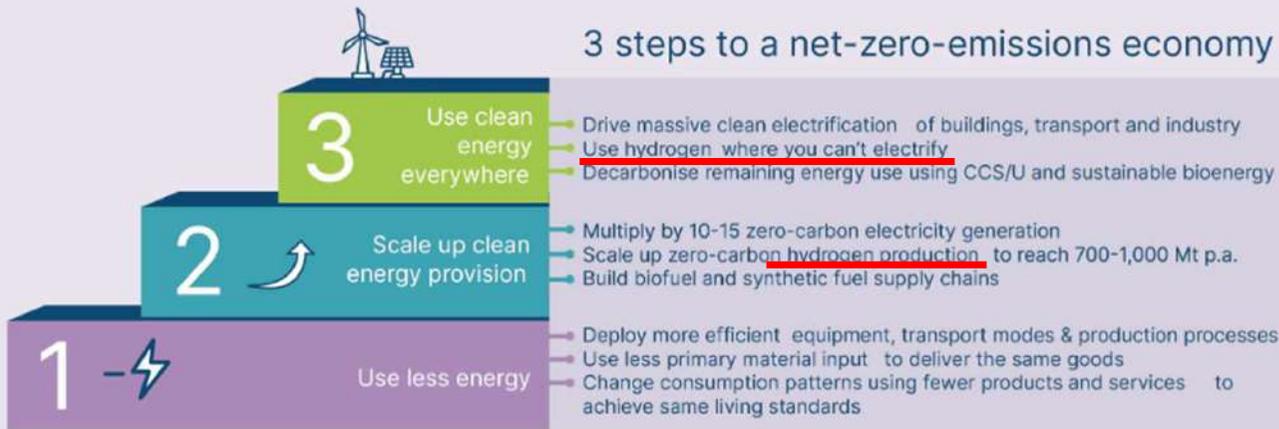
A Possible Mission



A Possible Mission



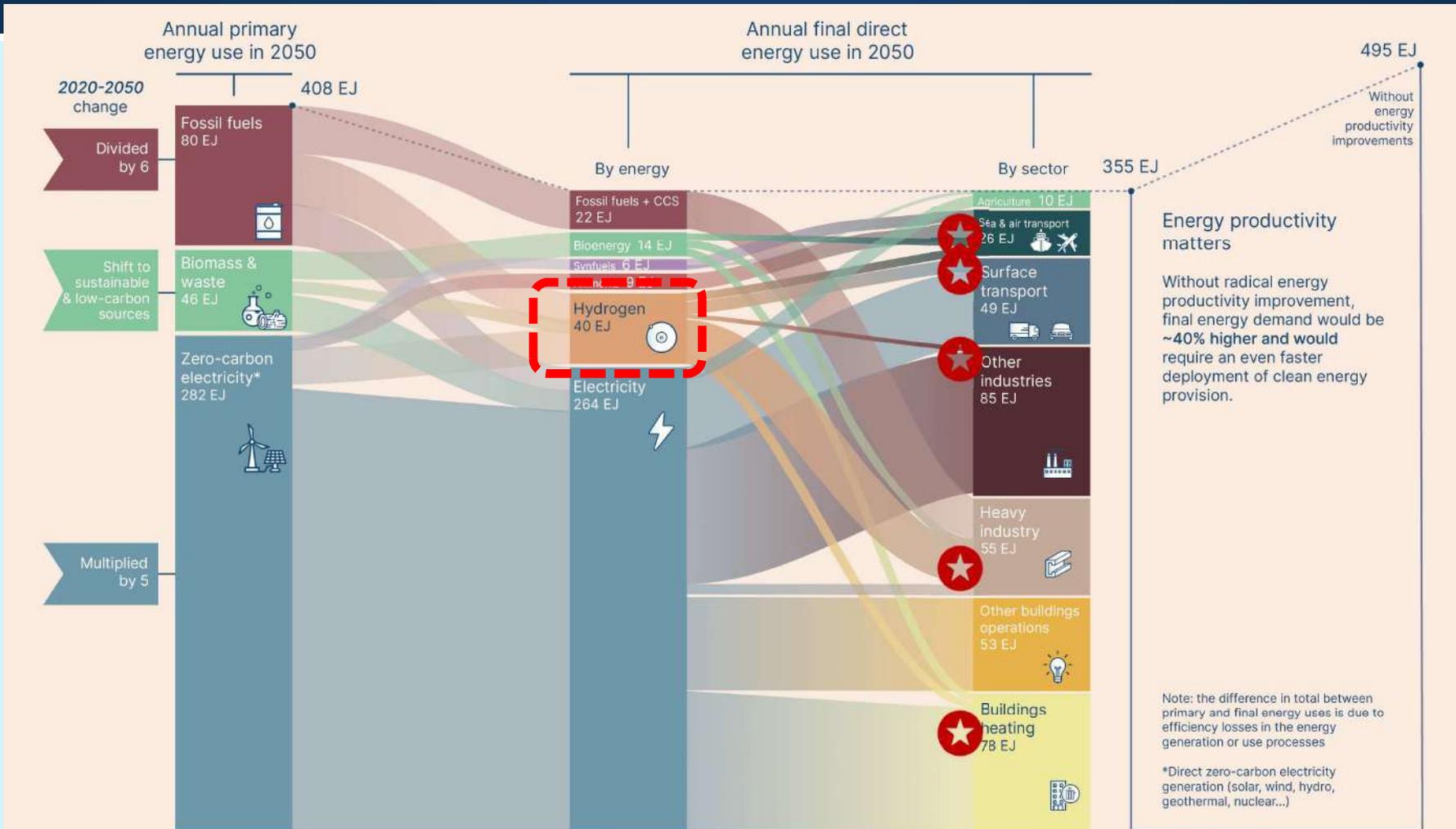
Reaching net zero emission to 2050



The journey of zero-emissions solutions



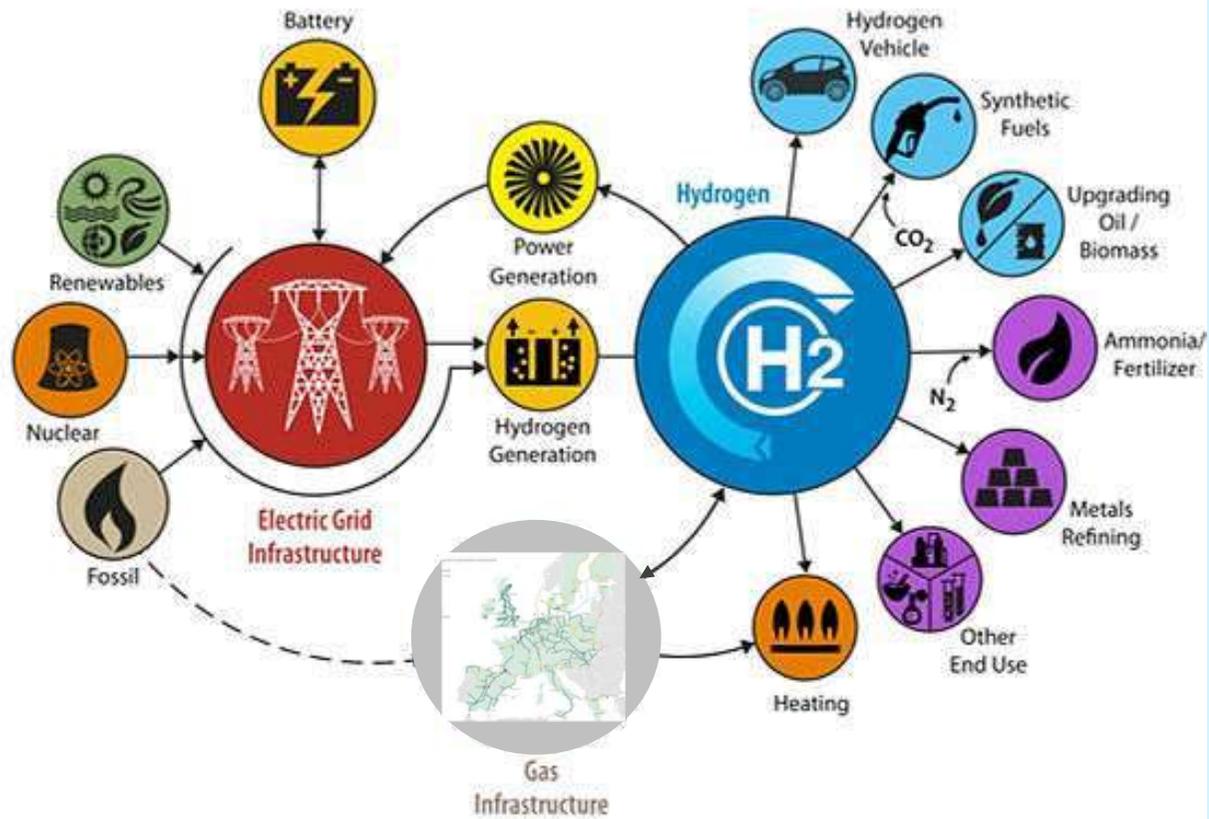
Reaching net zero emission



One of the main actors



Hydrogen role in the energy system

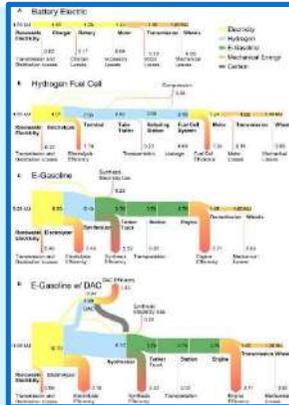


Hydrogen weakness: comparison of different efficiencies in vehicles

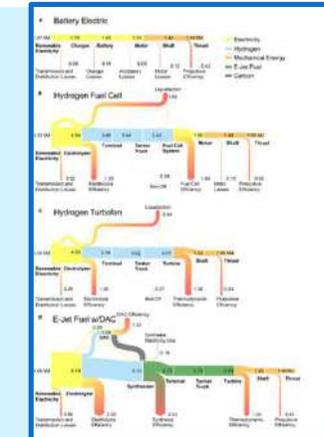
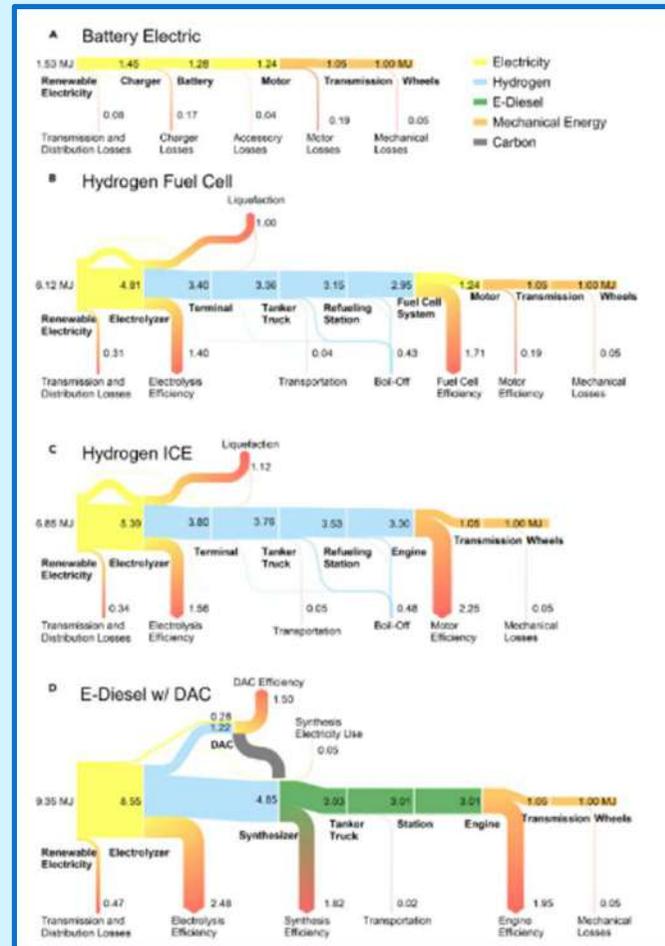
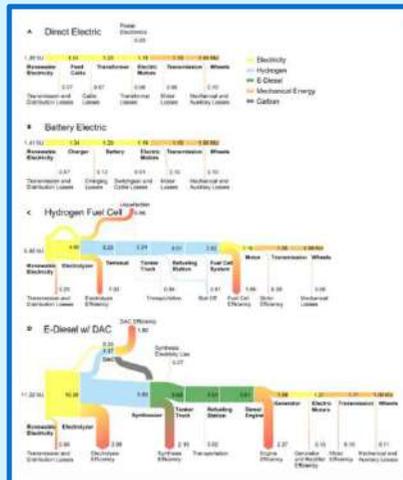
Light-duty vehicle

Heavy-duty vehicle

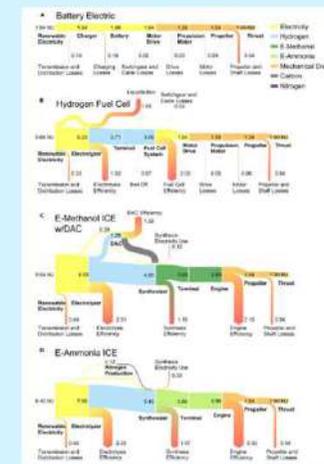
Aircraft



Rail



Marine



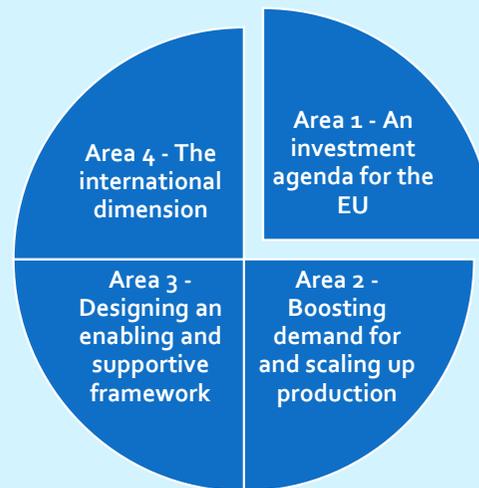
EU hydrogen policy framework

The **European hydrogen policy framework** was first proposed by the Commission in July 2021, as part of the 'Fit for 55 package'. It includes:

- binding targets for the uptake of renewable hydrogen in industry and transport by 2030* as part of the revised **Renewable Energy Directive** which entered into force in 2023.
- **Hydrogen and decarbonized gas market package**, in force since 2024, to support the creation of optimum and dedicated infrastructure for hydrogen, as well as an efficient hydrogen market.
- The policy framework builds on the Commission's **EU hydrogen strategy** (COM/2020/301) which outlined **20 key hydrogen actions** across 4 areas.



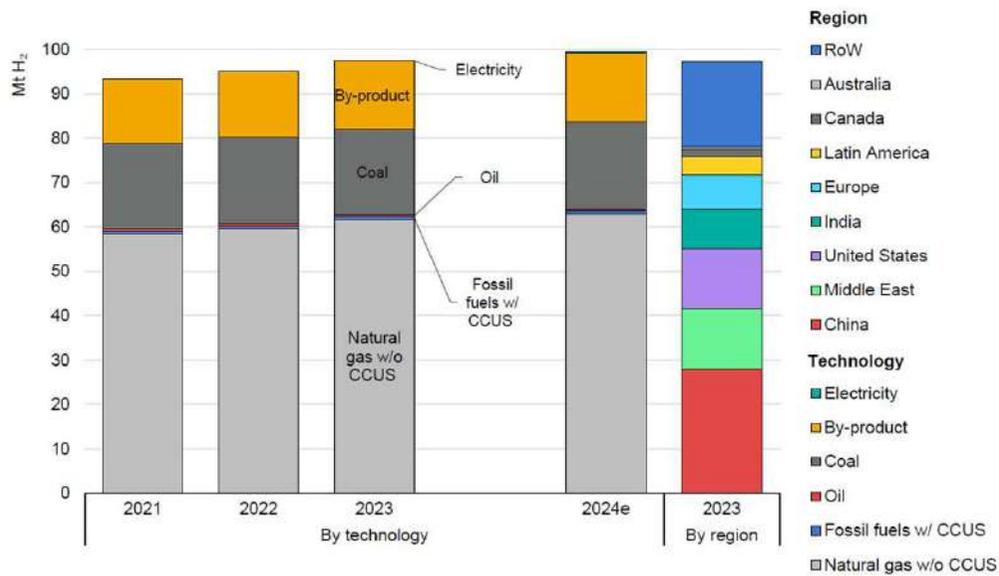
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*: In September 2024, the Commission published **guidance** to support EU countries and stakeholders in implementing these targets by 21 May 2025.

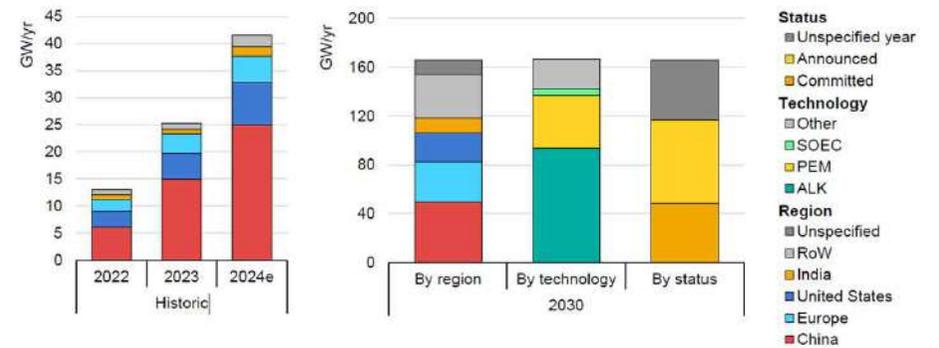
Global H₂ production

Hydrogen production by technology and by region, 2021-2024



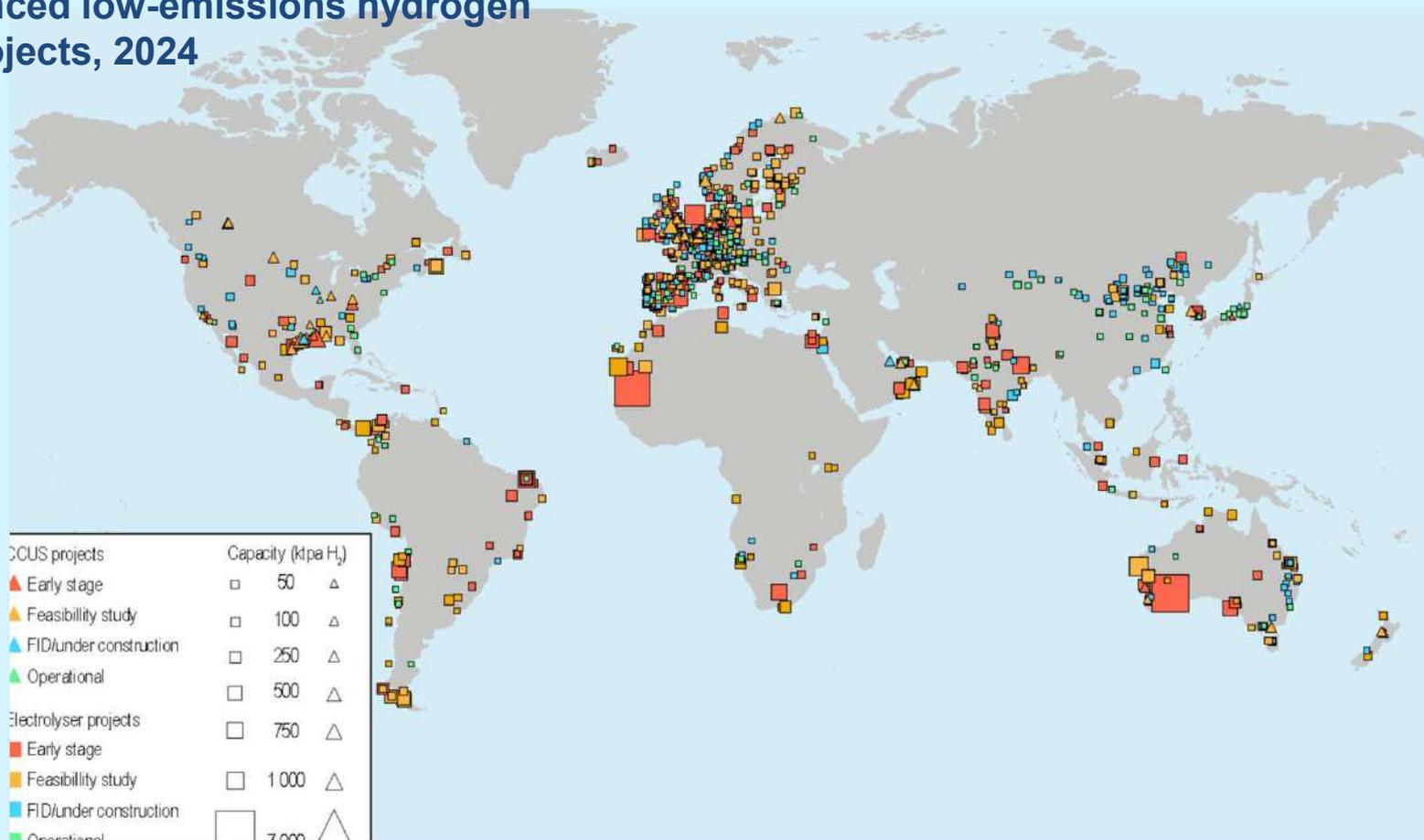
IEA, CC BY 4.

Electrolyser manufacturing capacity by region, 2022-2024e, and announced capacity additions by region, technology and status, 2030



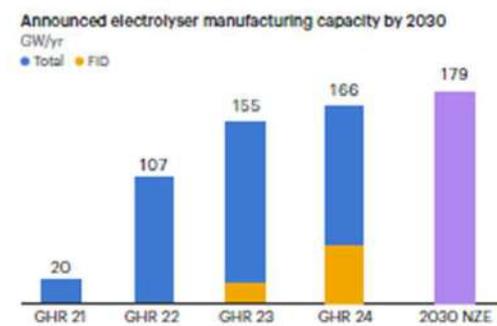
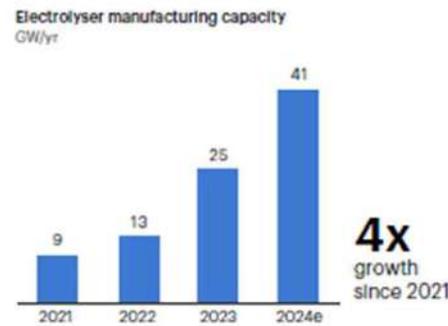
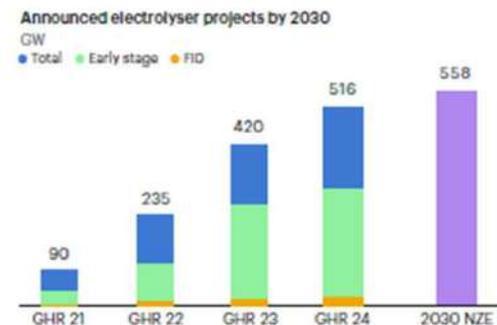
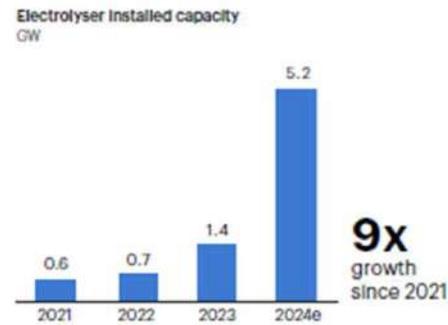
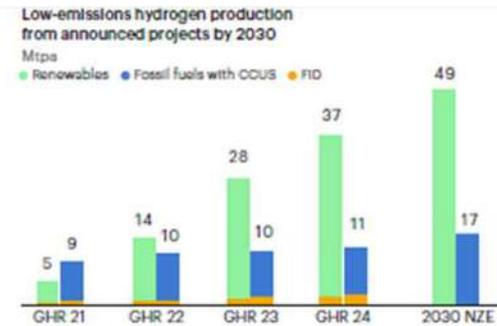
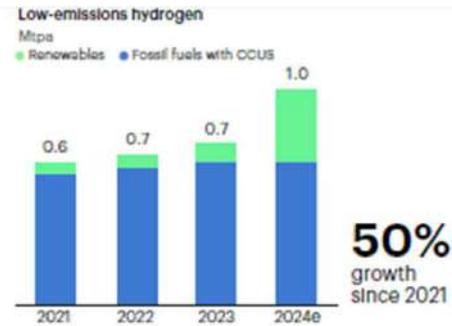
Low emission H2 production Projects

Map of announced low-emissions hydrogen production projects, 2024



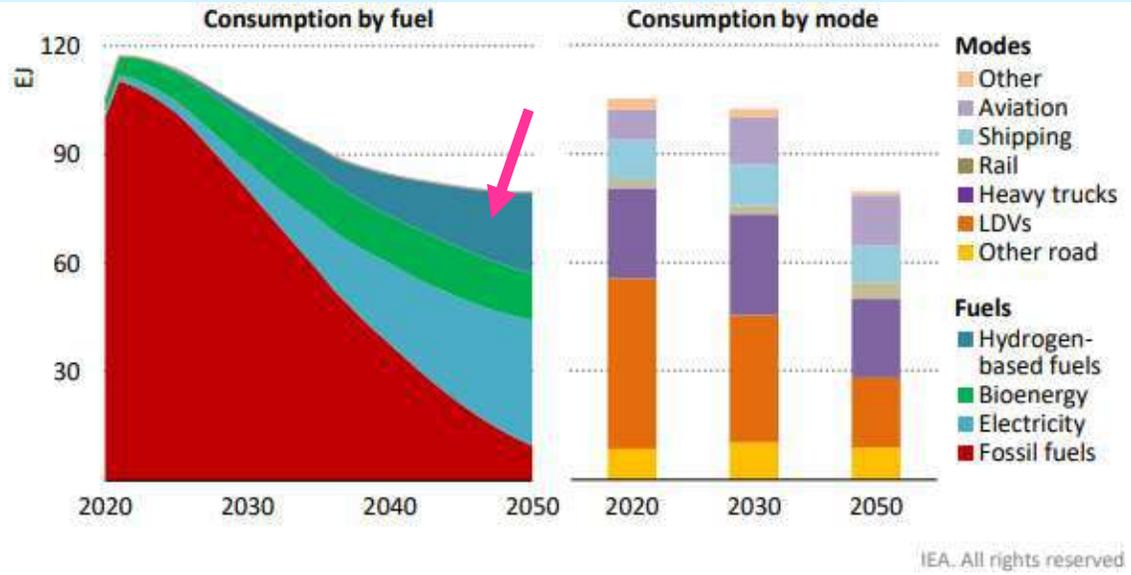
Low emission H2 production: the growth

Low-emissions hydrogen production growth



Note:
 2024e = Estimated based on announced projects.
 FID = Final Investment Decision

Hydrogen global scenario to 2050



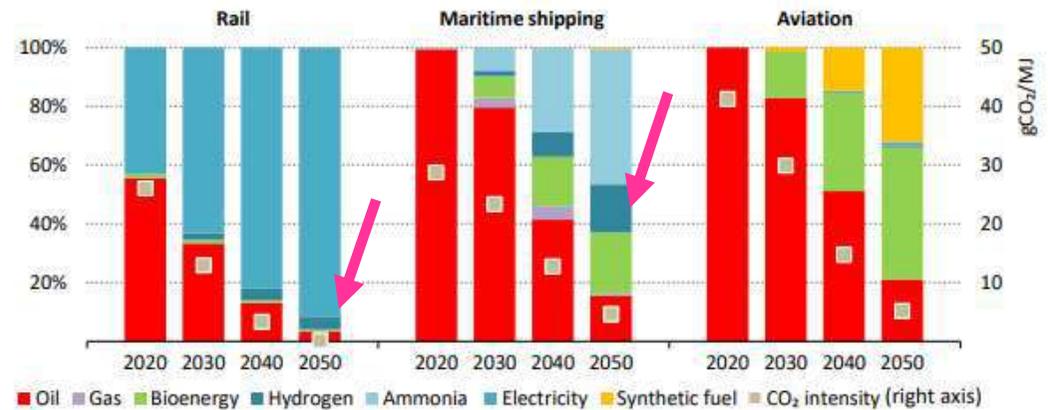
Electricity and hydrogen-based fuels account for more than 70% of transport energy demand by 2050

Note: LDVs = Light-duty vehicles; Other road = two/three wheelers and buses.

Global Transport final consumption by fuel type and mode in the NZE

Source: IEA « Global Hydrogen Review 2024 »

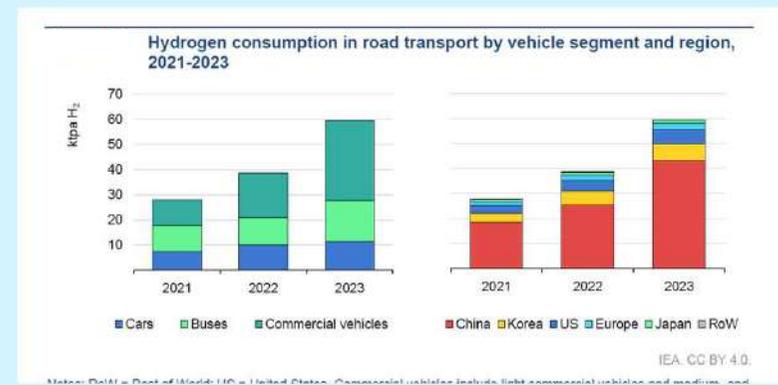
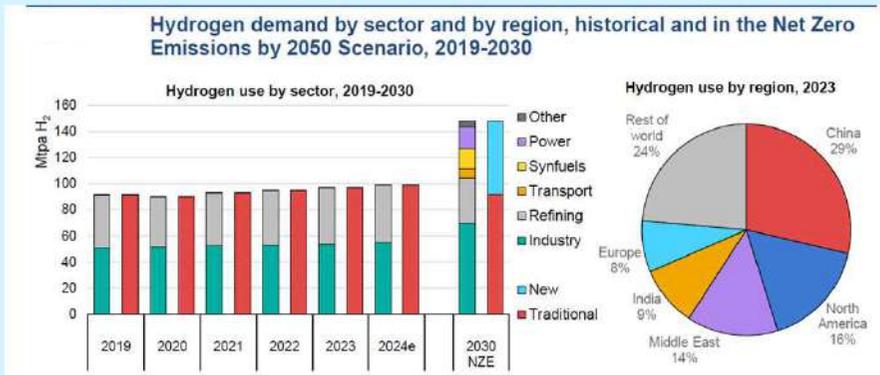
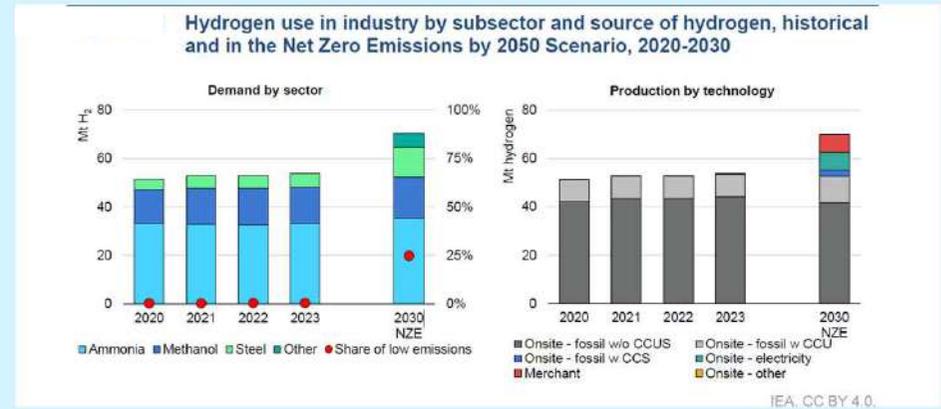
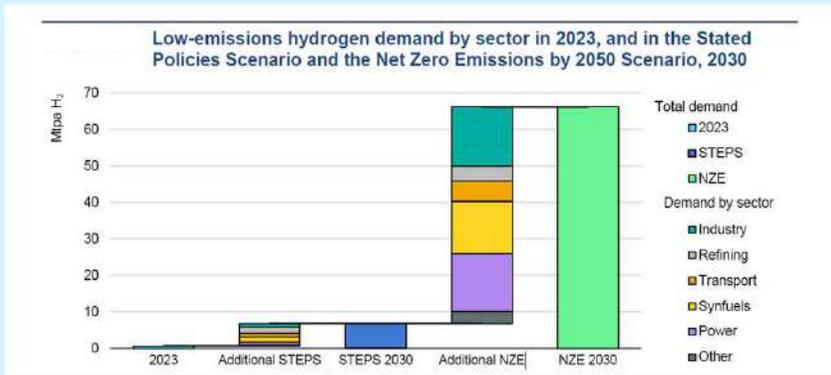
Global energy consumption by fuel and CO₂ intensity in non-road sectors in the NZE



Railways rely heavily on electricity to decarbonise, while shipping and aviation curb emissions mainly by switching to low-emissions fuels

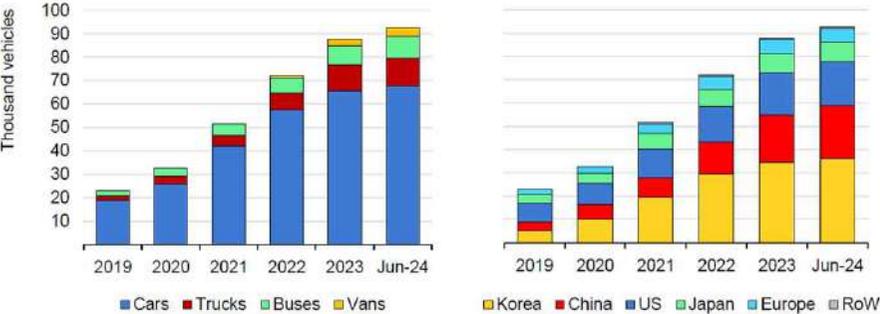
Note: Synthetic fuel = low-emissions synthetic hydrogen-based fuels.

Low emission Hydrogen demand

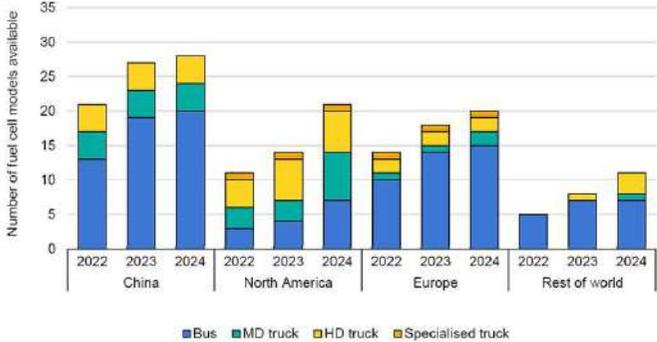


Low emission Hydrogen demand: road transport

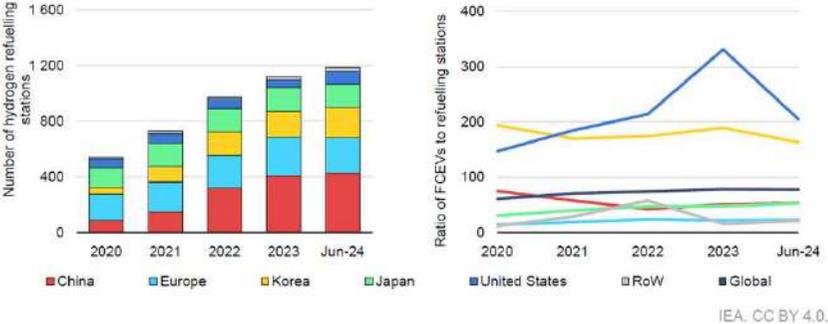
Fuel cell electric vehicle stock by segment and region, 2019-2024



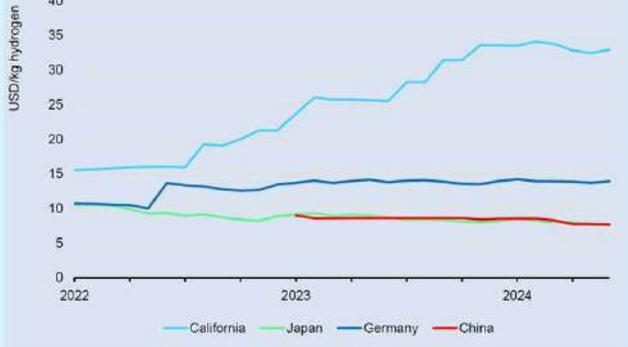
Fuel cell electric vehicle models by original equipment manufacturer headquarters, type of vehicle, and release date, 2022-2024



Hydrogen refuelling stations by region and ratio of fuel cell electric vehicles to refuelling stations, 2020-2024

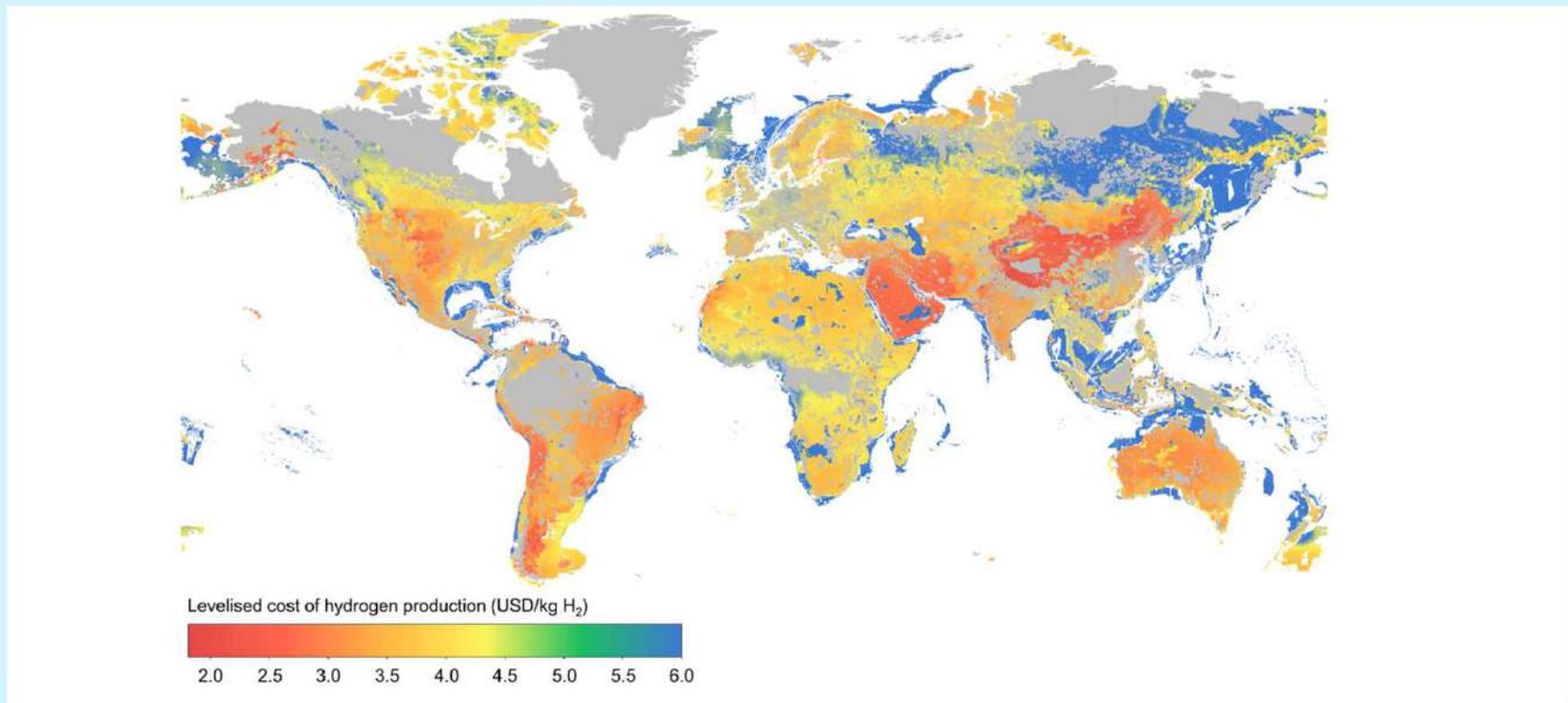


Monthly hydrogen pump prices



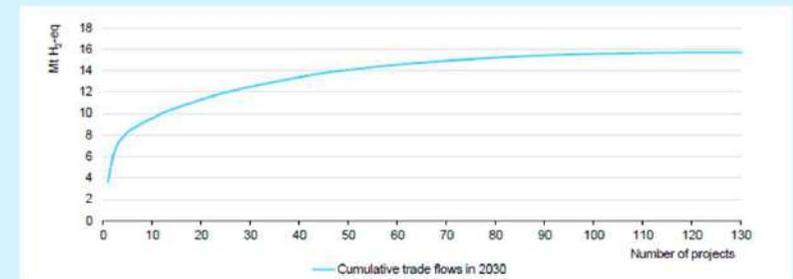
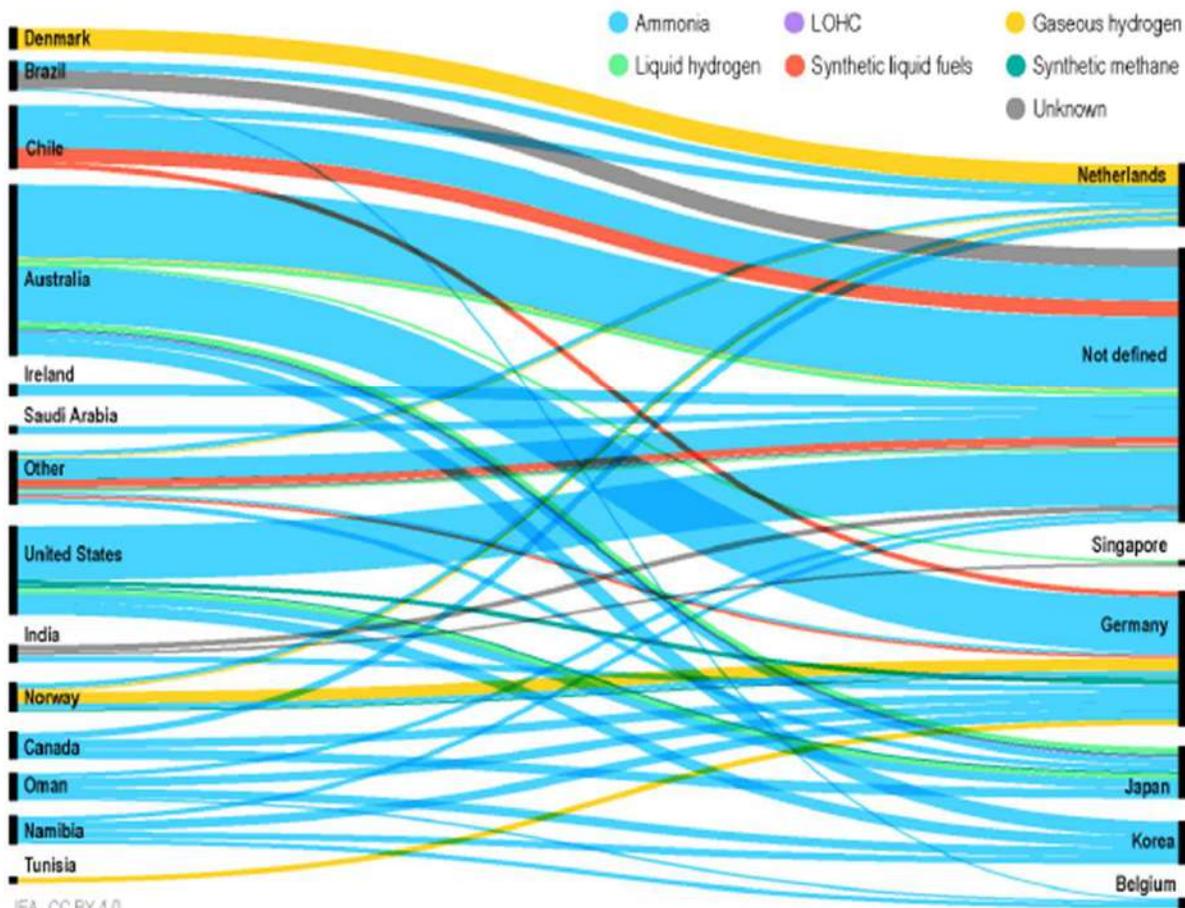
Source: IEA « Global Hydrogen Review 2024 »

Hydrogen production costs 2030 from hybrid PV and onshore wind (Net Zero Emission scenario by 2050)



Hydrogen trade and infrastructure

Potential low-emissions hydrogen bilateral trade flows by carrier based on announcements and cumulative hydrogen trade volume over number of projects, 2030



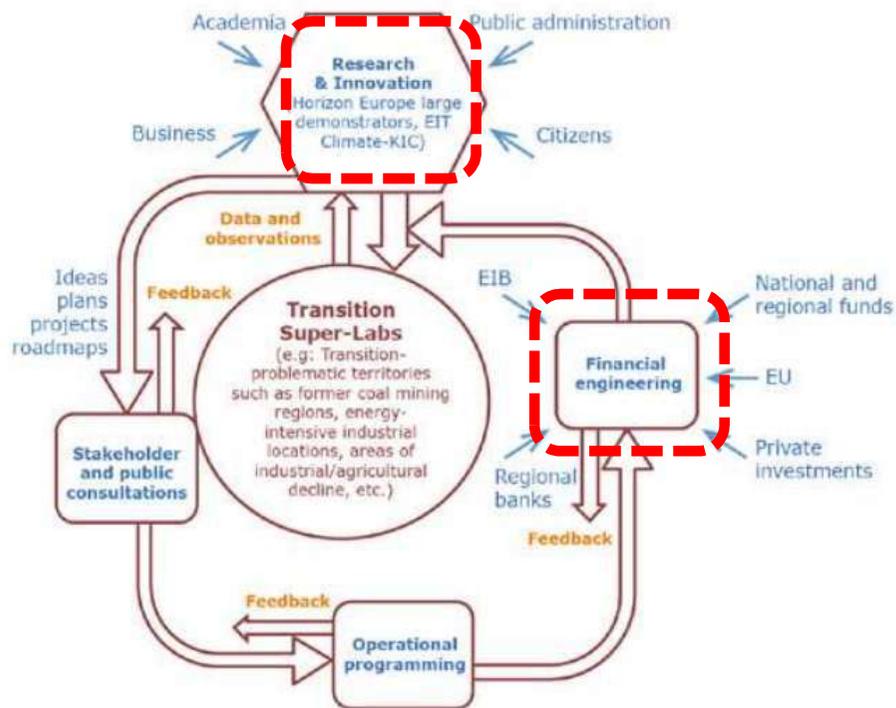
Hydrogen trade and infrastructure

Mature European Hydrogen Backbone can be created by 2040

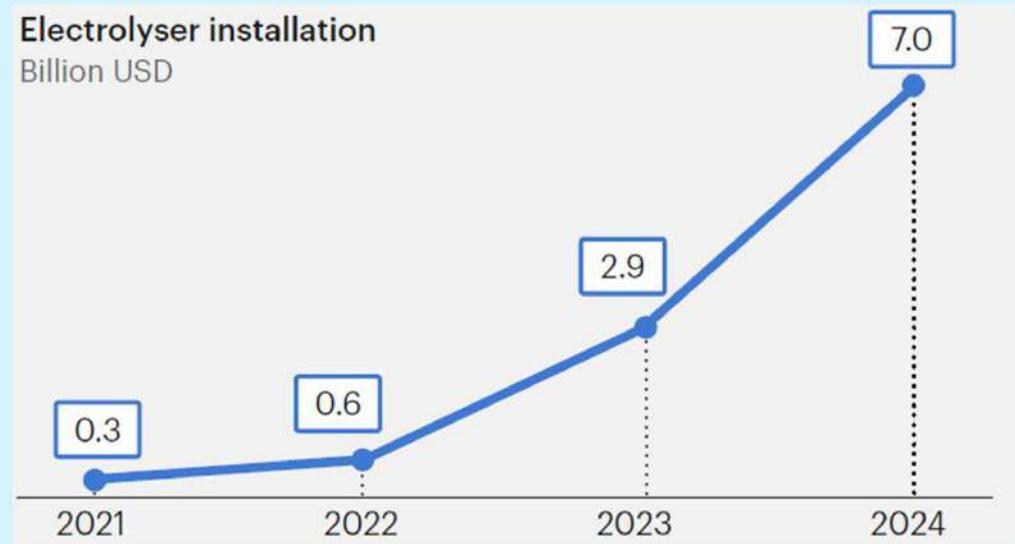
- H₂ pipelines by conversion of existing natural gas pipelines (repurposed)
- Newly constructed H₂ pipelines
- - - Export/Import H₂ pipelines (repurposed)
- - - Subsea H₂ pipelines (repurposed or new)
- Countries within scope of study
- Countries beyond scope of study
- ▲ Potential H₂ storage: Salt cavern
- Potential H₂ storage: Aquifer
- ◆ Potential H₂ storage: Depleted field
- Energy island for offshore H₂ production
- City, for orientation purposes



Investment and Innovation on Hydrogen

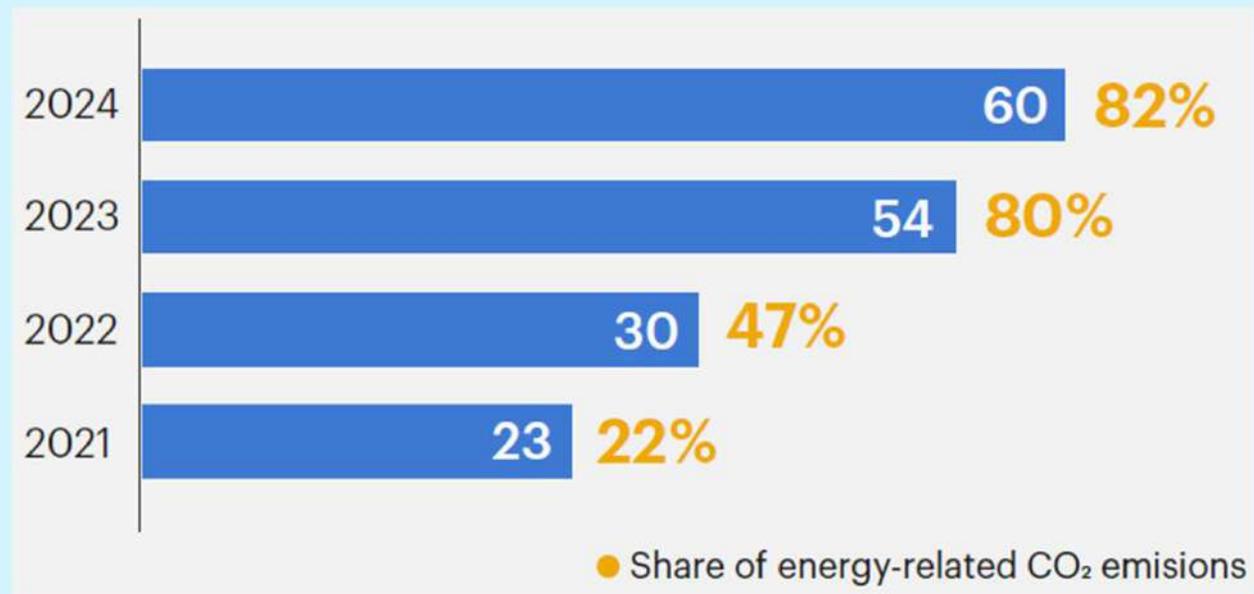


Electrolyser installation
Billion USD

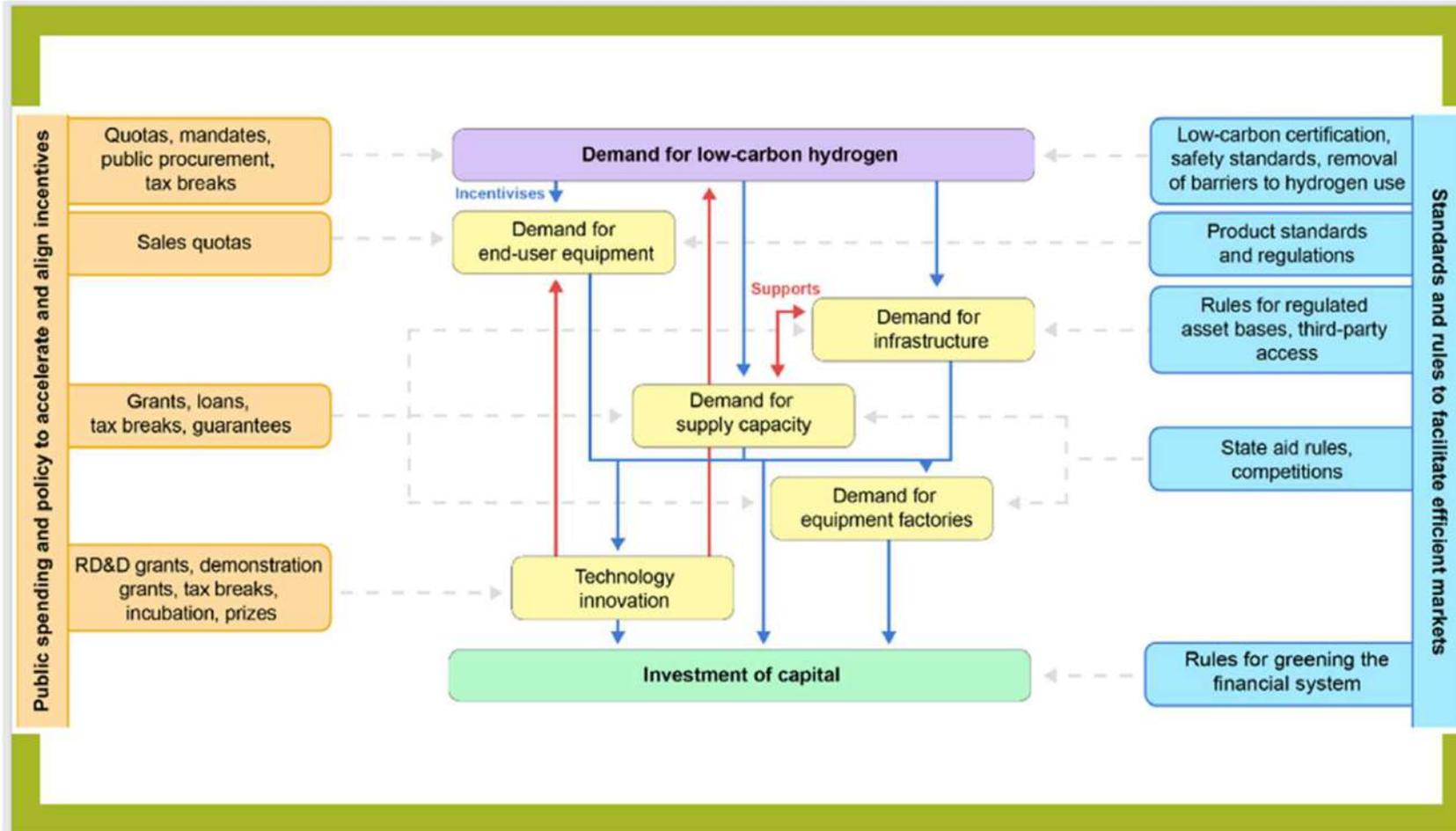


Policies on Hydrogen

Number of Hydrogen strategies



Policies on Hydrogen



Source:

S. G. Nnabuife, E. Oko, B. Kuang, A. Bello, A. P. Onwualu, S. Oyagha, J. Whidborne - The prospects of hydrogen in achieving net zero emissions by 2050: A critical review - Sustainable Chemistry for Climate Action 2 (2023) 100024



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