Harmonising standards, removing barriers

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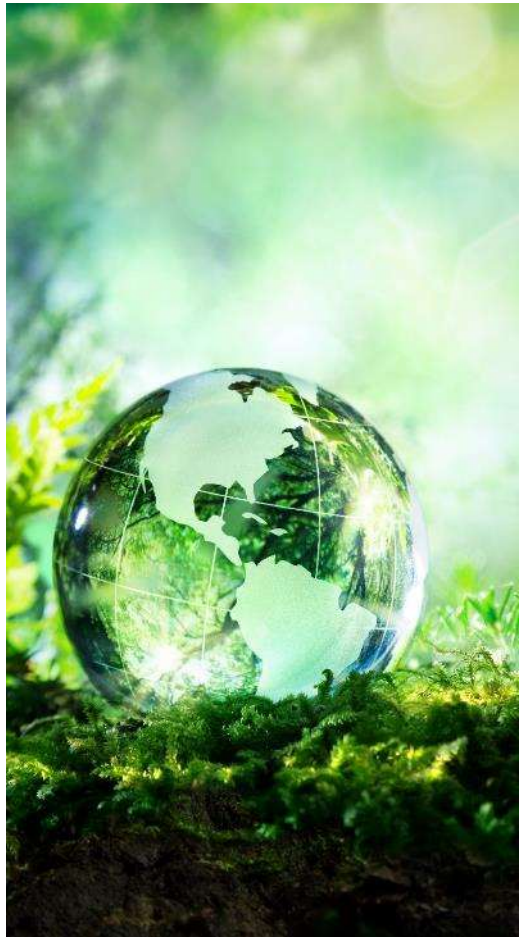
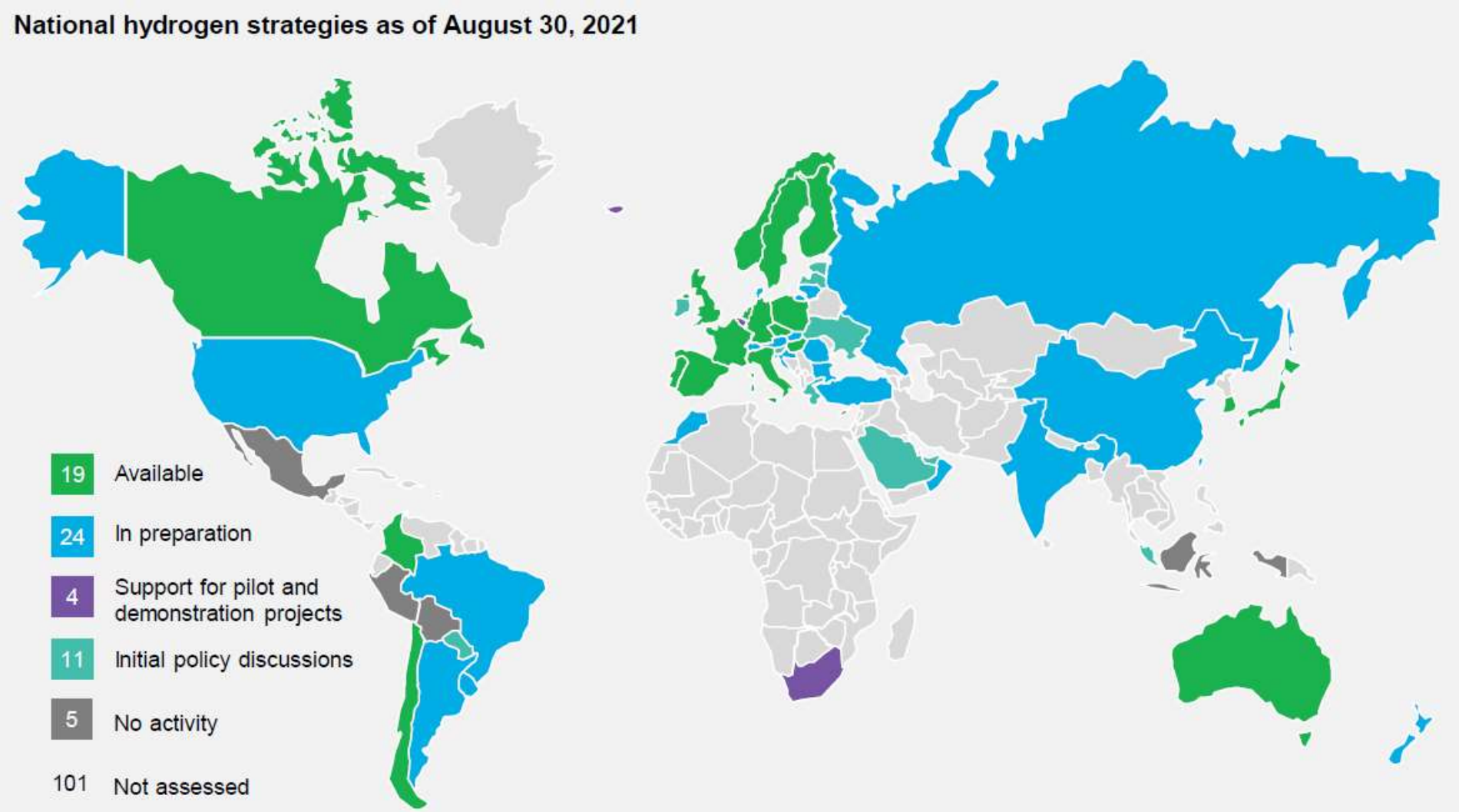
Outline

- A fast evolving global context
- Main barriers for the creation of an international market?
- The role of international multilateral collaborations
  - The case of the GHG footprint of hydrogen
- Conclusions



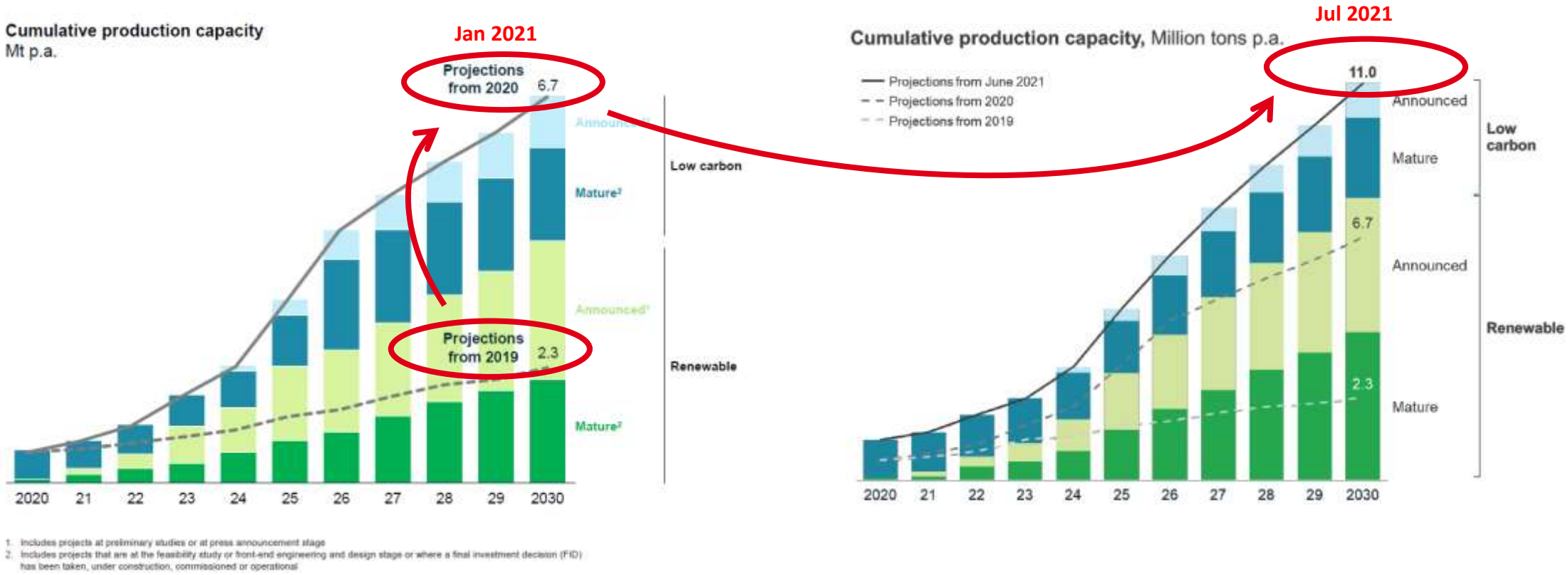
A fast evolving global context

More and more countries have or prepare their hydrogen strategy



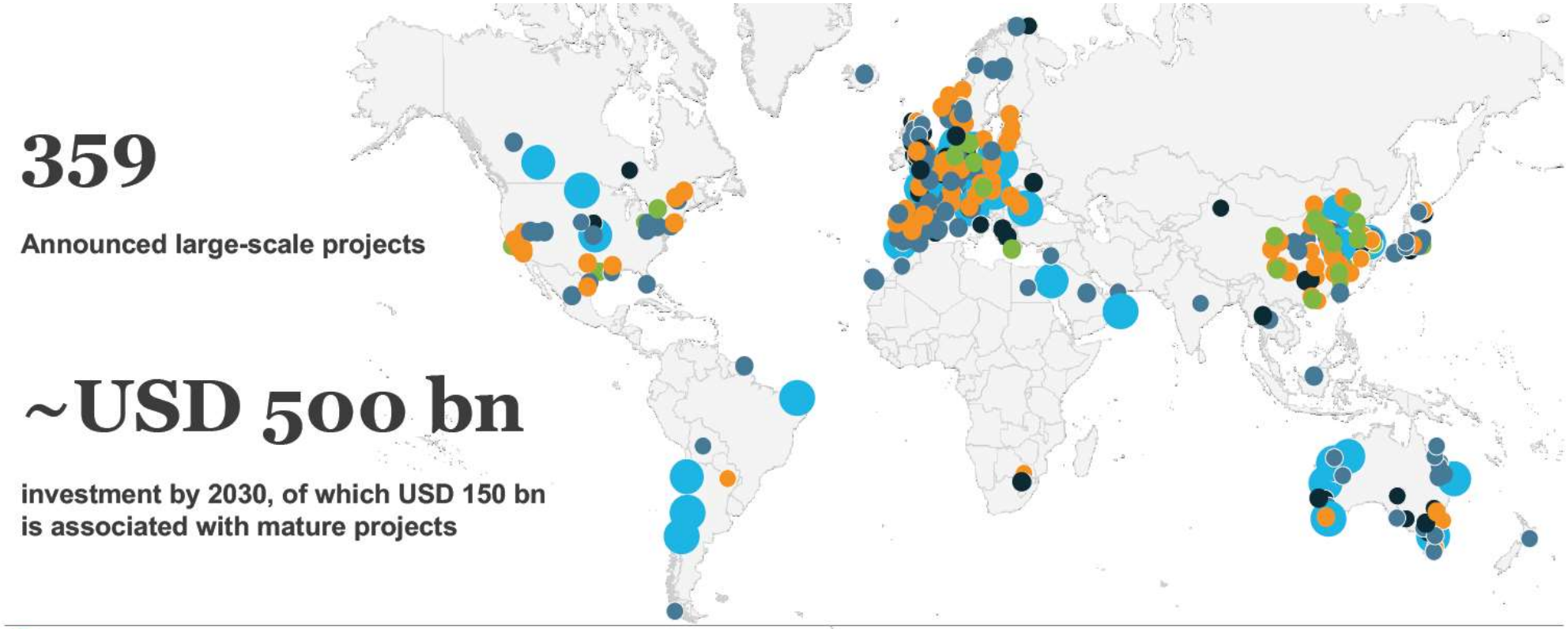
Source: BloombergNEF, Green hydrogen Compact Catalogue (2021)

The demand of renewable and low-carbon hydrogen has been significantly increasing …



Source: Hydrogen Council, Hydrogen Insights (2021)

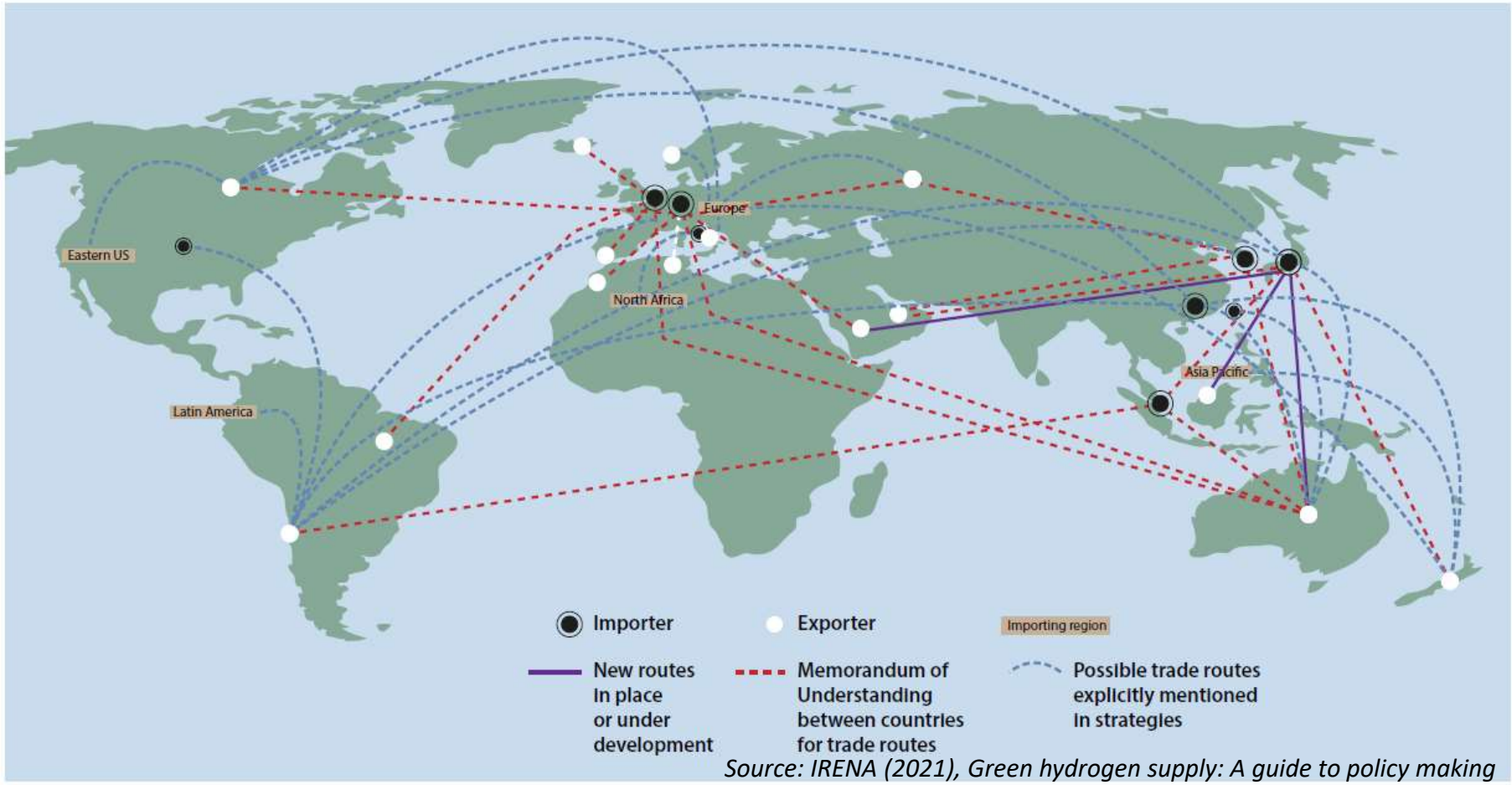
… as has the number of large scale demonstration projects …



Source: Hydrogen Council, Hydrogen Insights (2021)

A fast evolving global context - High momentum

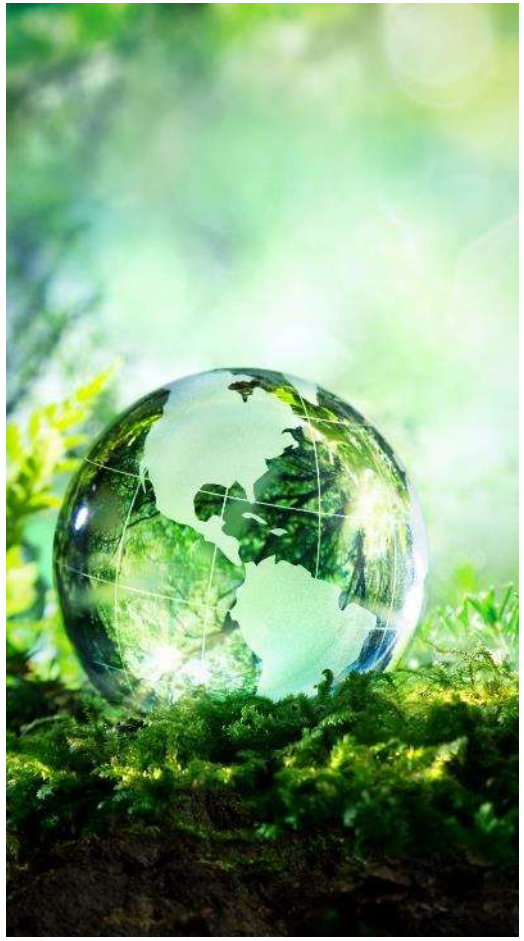
… with emerging international hydrogen trade routes.



Source: IRENA (2021), Green hydrogen supply: A guide to policy making

Notes: Hydrogen policies are evolving rapidly. Information on this figure has been kept as detailed and complete as possible at the time of writing, however more countries may have announced or planned new hydrogen routes.

Boundaries and names shown on this map do not imply any endorsement or acceptance by IRENA.



Main barriers for the creation of an international market?

Main barriers for the creation of an international market of renewable and low-C hydrogen?

- Cost
- Installation of the production capacities
- Mass transport of hydrogen over long distances

- Regulations currently tend to limit the development of a “clean” hydrogen industry
- **Market transparency** expected by society on how hydrogen contributes toward a carbon neutral economy. **Carbon content becomes therefore a pivotal parameter.**

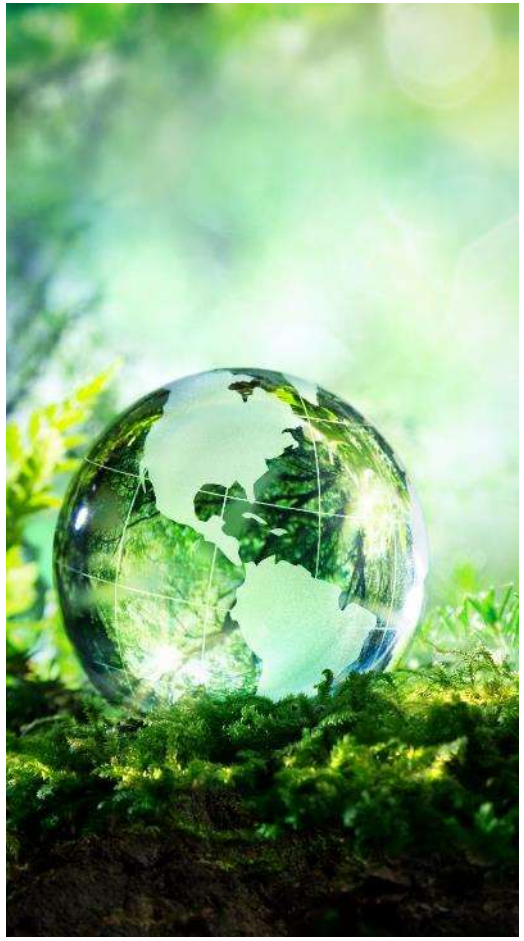
Main barriers for the creation of an international market of renewable and low-C hydrogen?

→ Trade will benefit from **common international standards** for the safe transport and storage of large volumes of hydrogen, and from **tracing the environmental impacts** of different hydrogen supplies

→ Among the noted barriers by e.g. IEA, IPHE and HEM documents, the issue of **lifecycle impacts** poses a particular challenge as identical hydrogen molecules can be produced and combined from sources with very different GHG intensities.

Accounting standards for different sources of hydrogen along the supply chain may be fundamental to creating a market for renewable and low-carbon hydrogen.

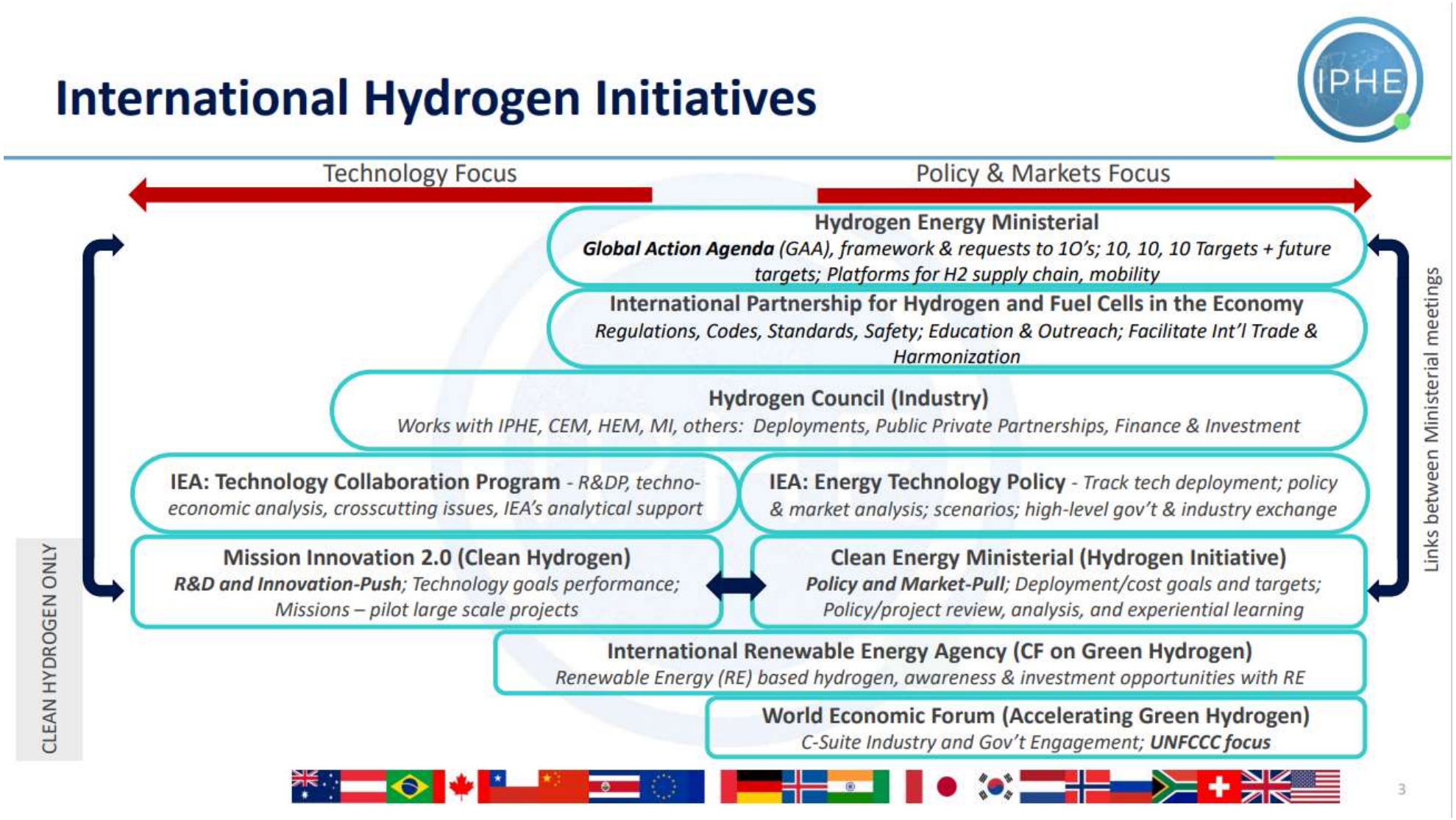
These need to be developed on an **internationally agreed basis**.



The role of international multilateral collaborations

→ The case of the GHG footprint of hydrogen

Several international hydrogen initiatives involving public & private stackeholders



International collaborations and coordination is key

Example of regulation, codes and standards to be adapted or developed

Hydrogen infrastructure

- Harmonise national and across borders regulations on injection of hydrogen in natural gas streams
- Harmonise HRS regulations and process including multi-fuel refueling stations, on-site production stations
- Maritime: rules for the landing and bunkering of hydrogen and on-shore and off-shore refueling of hydrogen and hydrogen-based fuels vessels

Hydrogen Mobility

- Harmonise regulations for usages of fuel cell mobility units in closed areas (tunnels, bridges, underground parking)
- Rules for the type of approval of hydrogen and hydrogen-based fuels vessels (ships, boats, utility vessels…)

→ Compendium of Regulatory Areas for Action in Hydrogen Infrastructure and Mobility/Transportation Technologies, IPHE (2021) - https://1fa05528-d4e5-4e84-97c1-ab5587d4aabf.filesusr.com/ugd/45185a_b8d5ee02e7444b2e8371bc9c1ed38be8.pdf

Production of "Clean" Hydrogen

- Choice of types of hydrogen to be supported
- Create and harmonise **guarantees of origin (GoO), certificates or PPAs for hydrogen**

Create and harmonise guarantees of origin (GoO) and certificates

- **Market transparency is** expected by society on how hydrogen contributes toward a carbon neutral economy. **Carbon content becomes therefore a pivotal parameter.**

  →Tracing and Tracking system for renewable and low carbon hydrogen
  As developed for electricity, certification allows buyers to be confident about the quality of hydrogen.

- Development of an EU wide Guarantees of Origin (GoO) Scheme for Hydrogen

  Two definitions: **one for Renewable and one for Low-Carbon Hydrogen** – more than 70,000 GOs issued already

CertifHy

Four production plants included in the pilot scheme which have been already audited

Air Liquide, Port Jerome (SMR +CCS)

Colruyt Group, Halle (Electrolysis +RE)

Air Products, Rotterdam (by product H2 from Chlor-alkali process)

Uniper, Flakenhagen (Electrolysis + RE and methanation

https://cmo.grexel.com/Lists/PublicPages/Statistics.aspx

→ Harmonisation of GoO and certificates needs harmonised definitions and methodology for the GHG emissions determination.

Example of hydrogen definitions or eligibility for policy support

- Chinese standard on evaluation of low-carbon hydrogen, clean hydrogen and renewable hydrogen (29 Dec 2020)

	Index		
	Low carbon H_2	Clean H_2	Renewable H_2
Carbon emission per unit of hydrogen ($kgCO_2e/kg_{H2}$) less than	14.51	4.9	4.9
The energy consumed for hydrogen production is renewable energy	No	No	Yes

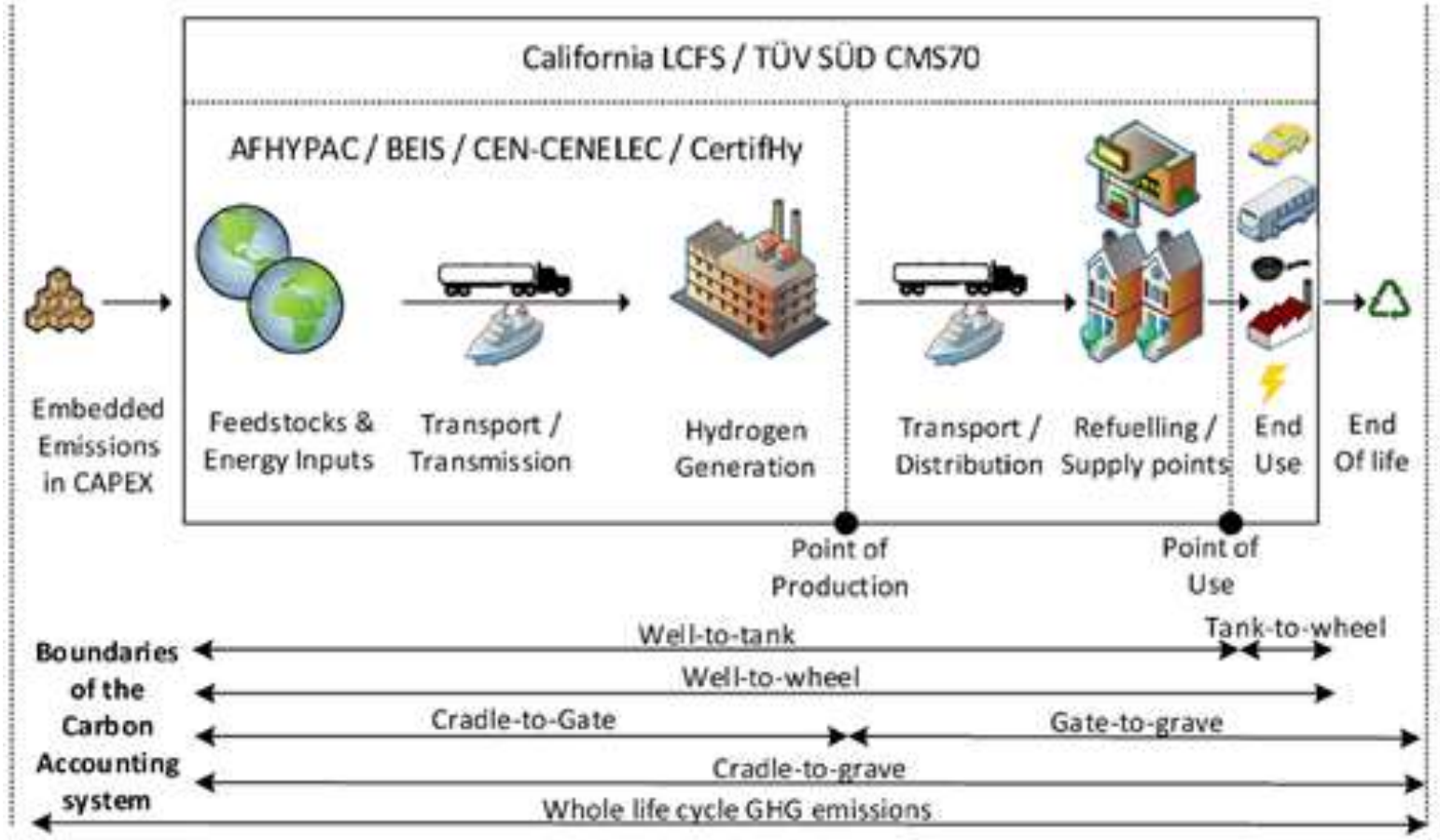
- European thresholds within the EU in terms of eligibility for policy support

	Eligibility for policy support
	Carbon emission per unit of hydrogen ($kgCO_2e/kg_{H2}$) less than
Renewable Energy Directive proposes a limit of	3.38
EU taxonomy for sustainable activities sets limit of	3.0

→ None of these are considering a full LCA approach making comparison difficult

→ **A methodology for determining the GHG emissions of a unit of hydrogen is needed.**

What product system boundary to select?



Source: A. Velazquez Abad, P.E. Dodds, Energy Policy 138 (2020) 111300

Guiding principles of a methodology

1. **Inclusive** –
   methodologies should not exclude any potential primary energy to produce hydrogen
2. **Flexible** –
   approaches must allow for unique circumstances (e.g. country specificities) and hence be flexible
3. **Transparent** –
   methodologies must be transparent in approach and assumptions to build confidence
4. **Comparable** –
   approach should be comparable to ensure a fair comparison on emissions
   - for each hydrogen production pathway considered
   - with the approach used by other energy vectors (e.g. electricity)

   → *"well-to-gate" is currently commonly adopted, even if whole life cycle GHG emissions should be preferred in the future*
5. **Practical** –
   methodologies must be practical, facilitating uptake by industry and use in the market.

   → *distinguish between hydrogen production, conditioning and transport to the usage gate and conversion*

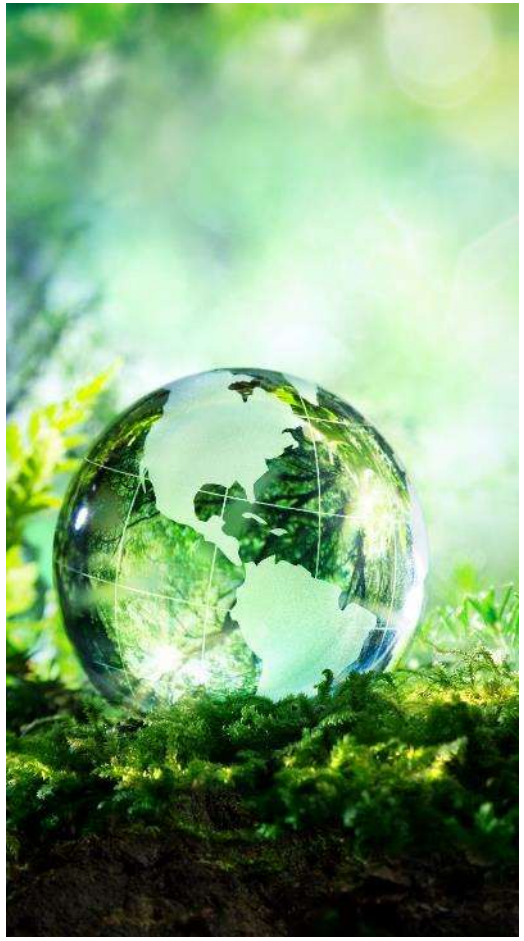
Guiding principles of a methodology

The proposed emissions accounting methodology to be applied for hydrogen has to be based on the different existing standards to study the GHG emissions as

- ISO 14067 (Greenhouse gases- Carbon footprint of products - Requirements and guidelines for quantification)
- ISO 14040 (Environmental management LCA— Principles and framework) /14044 (Requirements and guidelines), ISO 14064-2 (Quantify, monitor and report GHG emission reduction and removal enhancement) and 14064-1 (Design and develop GHG inventories for organizations)
- GHG protocols (Product Life Cycle Accounting and Reporting Standard)

But introducing the specificities of the hydrogen value chains, in particular the emissions allocation.

→ IPHE should publish shortly a working document describing a "Methodology for determining the greenhouse gas emissions associated with the production of hydrogen".



Conclusions

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- More and more countries have or prepare their hydrogen strategy and the demand for renewable and low-carbon hydrogen has been significantly increasing over the last year with emerging international hydrogen trade routes
- To overcome the main barriers for the creation of an international market of renewable and low-C hydrogen, **common international standards** for the safe transport and storage of large volumes of hydrogen, and tracing the environmental impacts of different hydrogen supplies is requested.
- Among the regulation, codes and standards to be adapted or developed, international trade will benefit from **harmonised guarantees of origin (GoO) and certificates** based on
  - definitions of renewable, low-carbon or “clean” hydrogen
  - technology-agnostic determination of the GHG emissions of the consumed hydrogen
- IPHE, a government-to-government partnership, should publish shortly a working document describing a “Methodology for determining the greenhouse gas emissions associated with the production of hydrogen”.

Thank you for your attention