



UNITED NATIONS  
INDUSTRIAL DEVELOPMENT ORGANIZATION



GLOBAL PROGRAMME  
HYDROGEN IN INDUSTRY

# Advancing Global Standards & Certification Schemes





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## Hydrogen: Opportunities for developing countries



Clean hydrogen creates unique opportunities for a **net zero industrial development in the Global South.**

It is key to **decarbonisation of the hard to abate sectors** including steel production, cement, chemical industries and heavy transport, altogether responsible for approx. 20% of global CO2 emissions.



Jobs creation



Skills upgrading



Investment mobilisation



Wealth generation



Energy security



Opportunities:



Resilience



Diversified economy





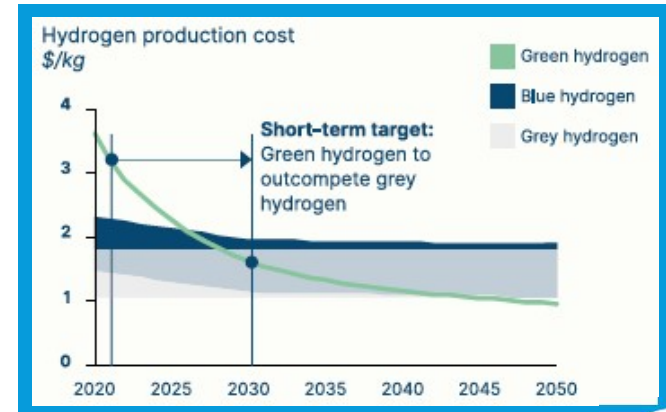
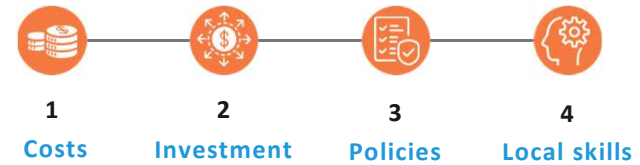
## What hinders the development of clean hydrogen?

### Bottlenecks of the GH2 economy

- Insufficient and expensive renewable energy
- Stagnating global electrolyser capacity
- Clean hydrogen projects are deemed risky investments
- High production costs of GH2 lead to price gap hampering demand
- Lack of domestic GH2 market in producer countries
- Uncompetitive prices of green products
- Non-existent trade infrastructure
- Lack of global coordination
- **Lack of global standards and certification**



### Challenges to overcome





# Towards a net-zero future: building a global clean hydrogen market

## Spur up demand and supply

- **Accelerate Local Production and Application** (in-situ) in industries in developing countries and transition economies, e.g. Green Hydrogen Industrial Clusters (UNIDO).
- **Enable Transparent Global Trade** considering the regional/national differences in demand as well as production potential and costs.

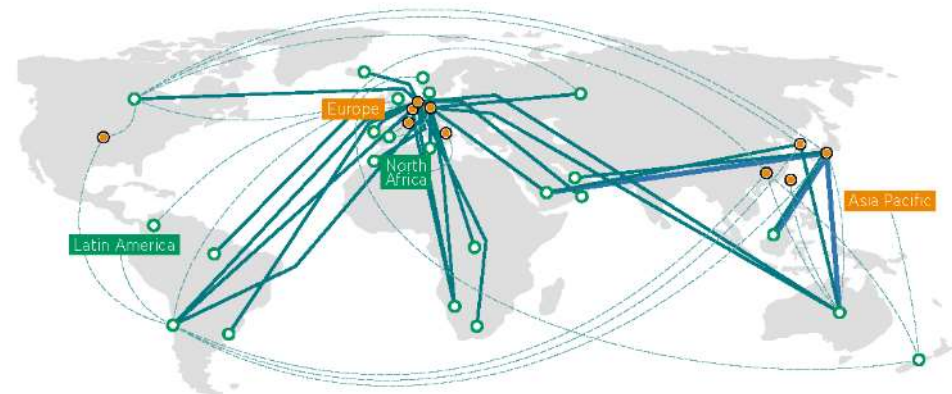
**Consequence:** We need reliable global standards and certification schemes.



50 countries have set up/working on national hydrogen strategies to date



New trade routes established or under development



Source: IRENA, Natural Earth 2021





## Inconsistency of voluntary and mandatory market mechanisms

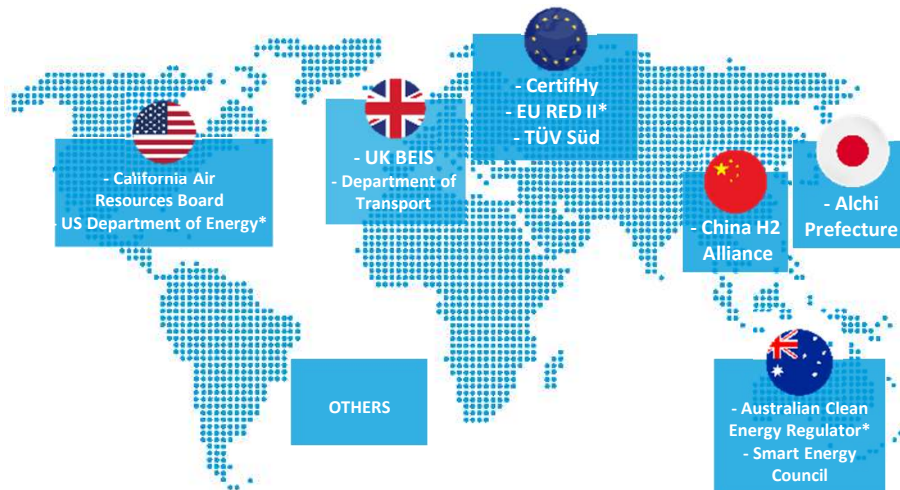
### Mandatory schemes:

set by governments under specific regulation

### Voluntary schemes:

set by private entities or standardization organizations

- These schemes comprehend different system boundaries, different products (H<sub>2</sub>, NH<sub>3</sub>) and production pathways...
- And the CO<sub>2</sub>-eq/KgH<sub>2</sub> varies from 0 to 18



VOLUNTARY MARKET		MANDATORY MARKET
<b>Aichi Prefecture</b> Low Carbon H2 Certification	<b>China Hydrogen Alliance</b> Standard and Assessment for Low Carbon H2, Clean H2 and Renewable H2 Energy	<b>California Air Resources Board</b> Low Carbon Fuel Standard
<b>Australian Clean Energy Regulator*</b> H2 Guarantee of Origin	<b>TÜV SÜD</b> CMS 70	<b>European Commission*</b> Renewable Energy Directive (RED II)
<b>CertifHy</b> Green and Low-Carbon H2 Certification	<b>Smart Energy Council</b> Zero Carbon Certification Scheme	<b>UK Department for Business, Energy &amp; Industrial Strategy</b> Low Carbon H2 Standard
		<b>UK Department for Transport</b> Renewable Transport Fuel Obligation
		<b>UK Department of Energy**</b> Clean H2 Production Standard

BEIS = Department for Business, Energy and Industrial Strategy  
Red = Renewable Energy Directive

\*in development  
\*\*in development for specific program eligibility

Source: IRENA, edited





## Colors/Energy Source & CO<sub>2</sub> -eq/kg for production of H<sub>2</sub>

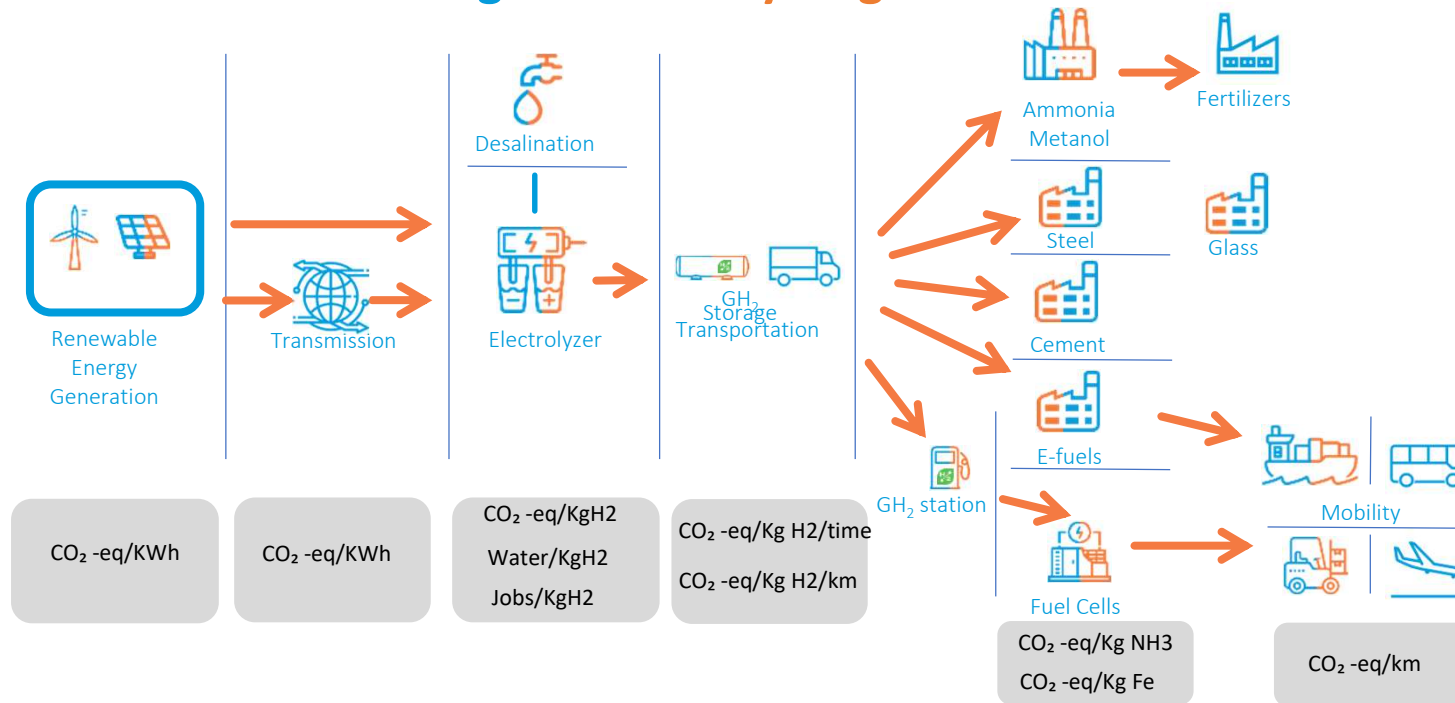
	GREEN	FOSSIL FUEL HYDROGEN		OTHERS	
Type					
Energy source					
CO <sub>2</sub> -eq /KG	0	9-12 18-20	0,8-5	Low	Solid carbon

- It is extremely important to **objectively measure** the CO<sub>2</sub> -eq of hydrogen.
- And there is a need to be transparent on **how this H<sub>2</sub> was produced** (like in other sectors/commodities).  
e.g. *organic, etc.*





## CO2 emissions along the clean hydrogen value chain








$$\Sigma (CO_{2a} + CO_{2b} + \dots CO_{2n})/\text{unit}$$



## To reach net-zero by 2050

- We need to decarbonize the hydrogen production and reach less than 1 CO<sub>2</sub> -eq/Kg

Status of today. Requirements for selected hydrogen labels:

Jurisdiction 	Label 		Requirements 	Purpose 
European Union	Renewable fuel of non-biological origin (RFNBO)	Feb. 2023	<p>Only <b>electrolysis from renewables is eligible and must prove additionality</b></p> <ul style="list-style-type: none"> <li>Hydrogen must be produced by means of additional renewable electricity, produced at the same time and in the same area as the hydrogen)</li> <li>Full life cycle of fuels should be considered when calculating emissions.</li> <li>Liquid fuels such as ammonia, methanol or e-fuels – are considered RFNBO if produced using renewable hydrogen</li> <li>Greenhouse gas emissions savings of more than 70% compared with fossil fuels.</li> </ul>	Eligible fuels to contribute to national renewables targets
European Union	EU taxonomy – aligned hydrogen	2022	<b>3 kg CO<sub>2</sub> –eq/kg H<sub>2</sub></b> life cycle emissions at the point of production	Guide investments
United States	Clean Hydrogen	2022	<b>4 kg CO<sub>2</sub> –eq/kg H<sub>2</sub></b> life cycle emissions up to the point of production	Eligibility for funding instruments
Victoria, Australia in partnership with Germany	Zero-carbon hydrogen	2020	Hydrogen comes <b>solely from renewable sources</b>	Receive guarantess of origin
Independent	Carbon-neutral hydrogen	2020	<b>Zero emissions, including upstream, net of offsets.</b> For hydrogen produced from fossil fuels, 50% or more of the CO <sub>2</sub> must be stored. Any solid carbon permanently secured.	Accreditation under voluntary TUV Rheinland Standard H2.21
Independent	Low carbon hydrogen	2017	<b>4.4 kg CO<sub>2</sub> –eq/kg H<sub>2</sub></b>	Accreditation under voluntary CertifHy system

Source: IEA, edited







## Paving the way for global technical ISO standards

➤ Working on standards for electrolysis, fueling protocols for compressing H<sub>2</sub>, fuel system components, safety.

Jan.

Circulation of a working draft (based on IPHE draft)

Mar.

Kick-off meeting of Working Group (CEA, France) to discuss comments

Jun.

Second Working Group meeting (AFNOR, France) to discuss comments

Sep.

Circulation of Draft Technical methodology for approval and comments

Nov.

Third Working Group meeting ISO/TC 197 to discuss final comments (**UNIDO**, Austria)

Dec.

Publication of methodology for determining the GHG emissions of hydrogen at COP 28

2024

Development of international standard for production, conversion, conditioning and transport

➤ Developing the methodology for accounting GHG emission in hydrogen production, conditioning and transport.





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## UNIDO - Collaboration

- **Accelerating the capacity and knowledge** of developing countries on hydrogen standards:
  - *capacity building activities,*
  - *development of a guidance document,*
  - *knowledge dissemination, etc.*
- **Enhancing participation** of developing countries in international standard setting negotiations and initiatives.
- **Advising countries on the benefits and advantages** of making reference to standards in their regulations and H2 policies.





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