

Accelerating Innovation in Clean Hydrogen

Market Assessment Webinar

27th November 2024, 2:00-3:00pm CET

Accelerate-to-Demonstrate (A2D) Facility

Our partners:





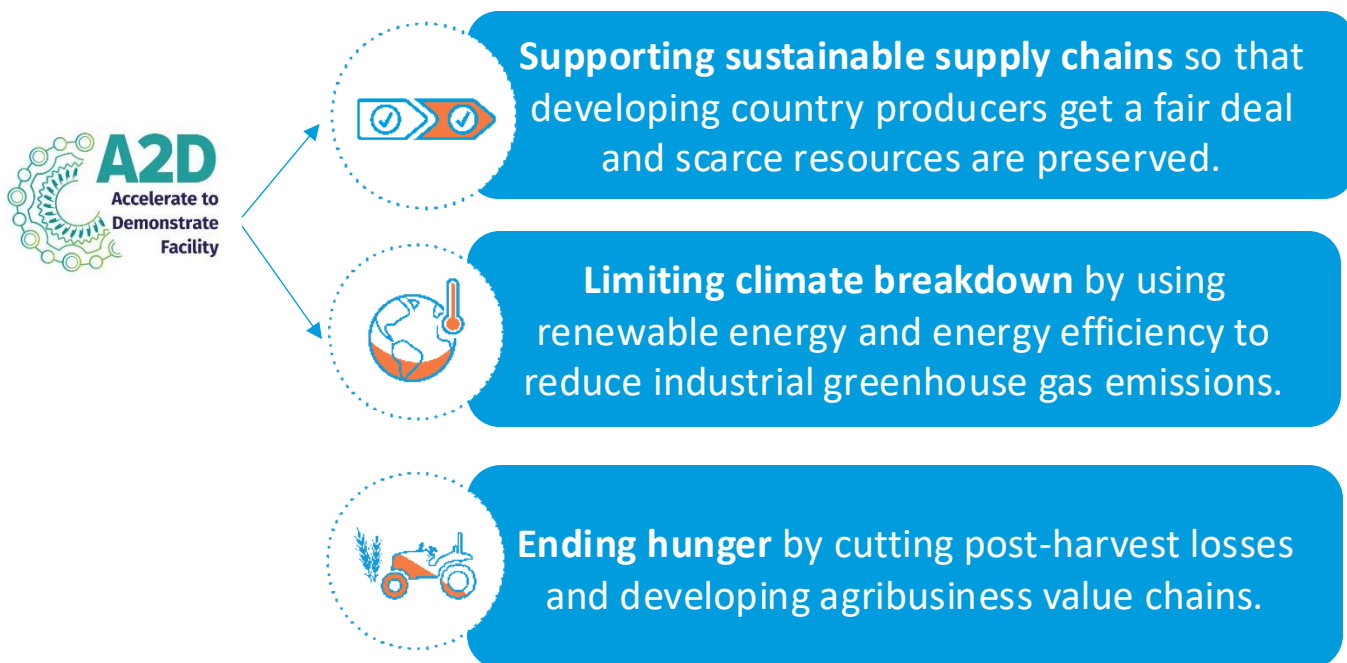
Agenda

Time	Agenda item	Speaker
2:00 – 2:05 p.m	Opening remarks	Mr. Peter Warren, A2D Facility Manager, UNIDO
2:05-2:10 p.m	Overview of the A2D facility	Ms. Pankhuri Poddar, Clean Hydrogen Project Coordinator, UNIDO
2:10 – 2:40 p.m	Market assessment presentation	Ms Maria Jose Riquelme Zambrano, Senior Consultant
2:40-2:55 p.m	Questions and answers	Moderated by: Ms. Pankhuri Poddar, Clean Hydrogen Project Coordinator, UNIDO
2:55 – 3:00 p.m	Closing Remarks	Mr. Peter Warren, A2D Facility Manager, UNIDO



UNIDO's role in advancing clean energy innovation

- ❖ UNIDO is the UN Agency for the promotion of inclusive and sustainable industrial development in developing countries.
- ❖ UNIDO focuses on three main priorities:





Examples of key UNIDO initiatives in clean hydrogen

Global Programme for Hydrogen in Industry

Aim: Promoting a just transition for industry in developing countries and transition economies (UNIDO flagship programme).

Launched in 2021, supported by the Governments of Germany, Austria and Italy.

(Programme size: USD 14.9m
Total co-financing: USD 141.5m)



Accelerate-to-Demonstrate (A2D) Facility

Aim: Accelerating the commercialization of innovative clean hydrogen solutions in developing countries

Launched on 15 May 2023



GEF-8 Global Clean Hydrogen Programme (GCHP)

Aim: Focuses on the production and application of hydrogen in industrial and transport sectors in developing economies. (UNIDO is implementing this programme.)

Approved on 9 February 2024
(USD 14.9m from GEF)



Overview of the Accelerate-to-Demonstrate (A2D) Facility

The Challenge

35% of the emissions reductions needed by 2050 come from technologies that are still in development and have not reached markets at commercial scale (IEA, 2023).

The Solution

The A2D Facility aims to accelerate the commercialization of innovative clean energy solutions in developing countries by supporting catalytic and scalable demonstration projects in:

- **Critical minerals**
- **Clean hydrogen**
- **Smart energy**
- **Industrial decarbonization**



Initial Funding and Timescales

- **Initial contribution of ~USD 80 million** from the UK Government (DESNZ)
- Initially operates from **April 2023 to March 2029**
- Projects supported through calls-for-proposals (first call in July 2024)
- **Grants of USD 1-5 million** per project.
- Main SDGs-of-focus:





Market assessment on accelerating innovation in clean hydrogen

What: the large-scale, new market assessment presents new evidence and analysis covering the landscape of clean hydrogen innovations, stakeholders, barriers, initiatives, Sustainable Development Goal (SDG) impacts, financial delivery mechanisms and existing projects.

Purpose: it fills an important gap by focusing on clean hydrogen value chain (across the upstream, midstream and downstream) in developing country contexts.



Access the report at
<https://a2dfacility.unido.org>
/ or scanning the QR code.



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Progress by innovation



Market Assessment Presentation

Ms. Maria Jose Riquelme Zambrano
Senior Consultant
Hinicio



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CLEAN HYDROGEN MARKET ASSESSMENT IN DEVELOPING COUNTRIES



CONTENTS



- ▶ Selection Criteria

- ▶ Key findings
 - ▶ Landscape of Technologies
 - ▶ Landscape of Innovators
 - ▶ Landscape of Stakeholders
 - ▶ Landscape of Initiatives
 - ▶ SDG Assessment

- ▶ Regional analysis





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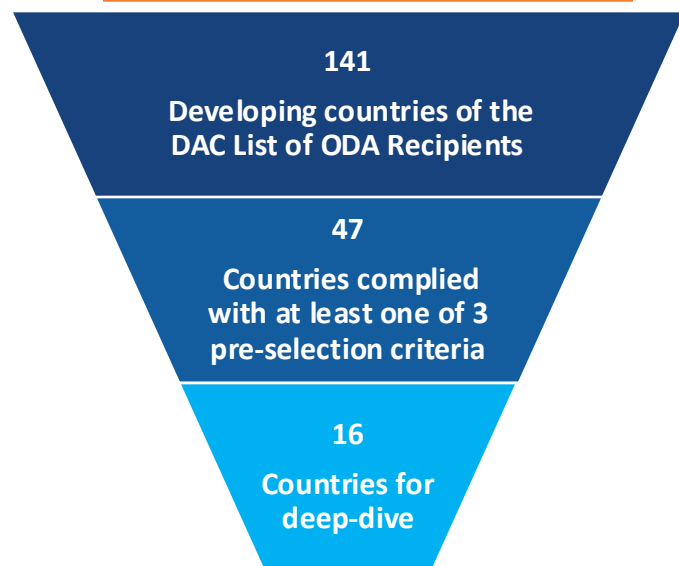


Selection criteria

Key elements of a successful hydrogen development ecosystem

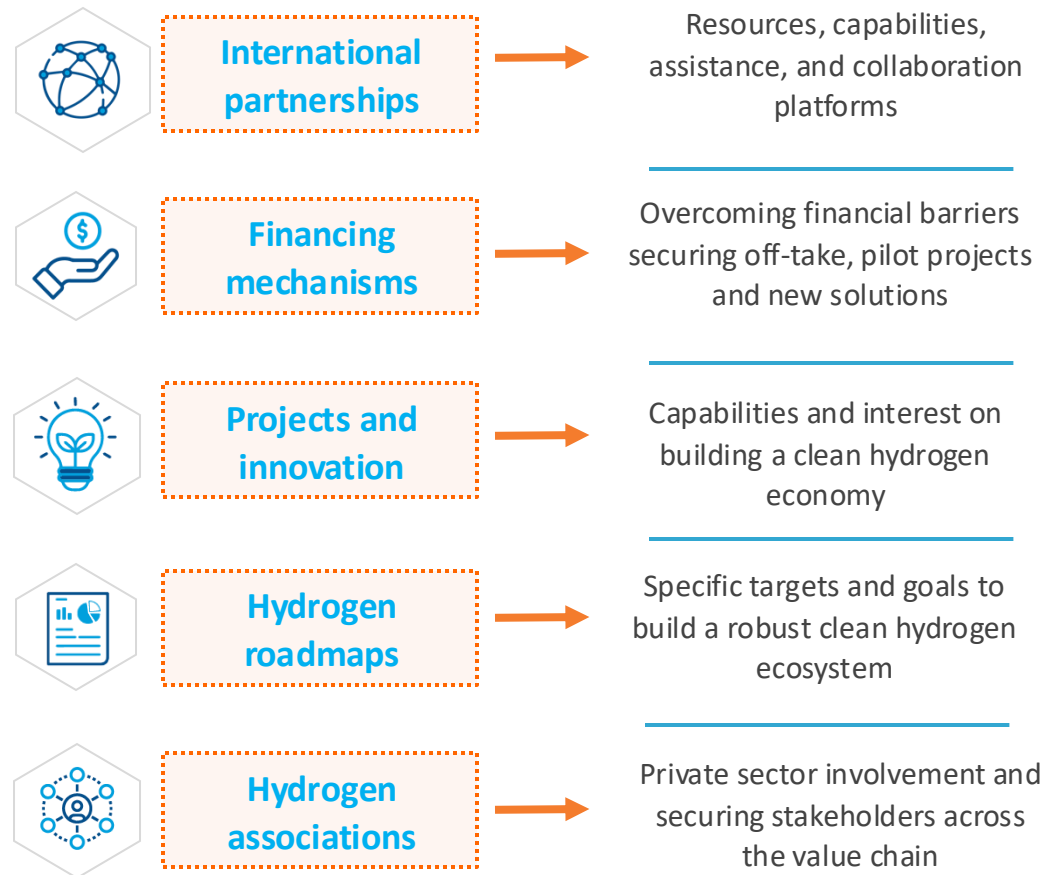
How were the pioneer countries identified?

DESCRIPTION OF THE FUNNEL



Asia	America	Africa	Europe
India	Argentina	Egypt	Türkiye
Indonesia	Brazil	Kenya	Ukraine
Malaysia	Colombia	Morocco	
Vietnam	Costa Rica	Namibia	
	Mexico	South Africa	

Which criteria were analysed and why?





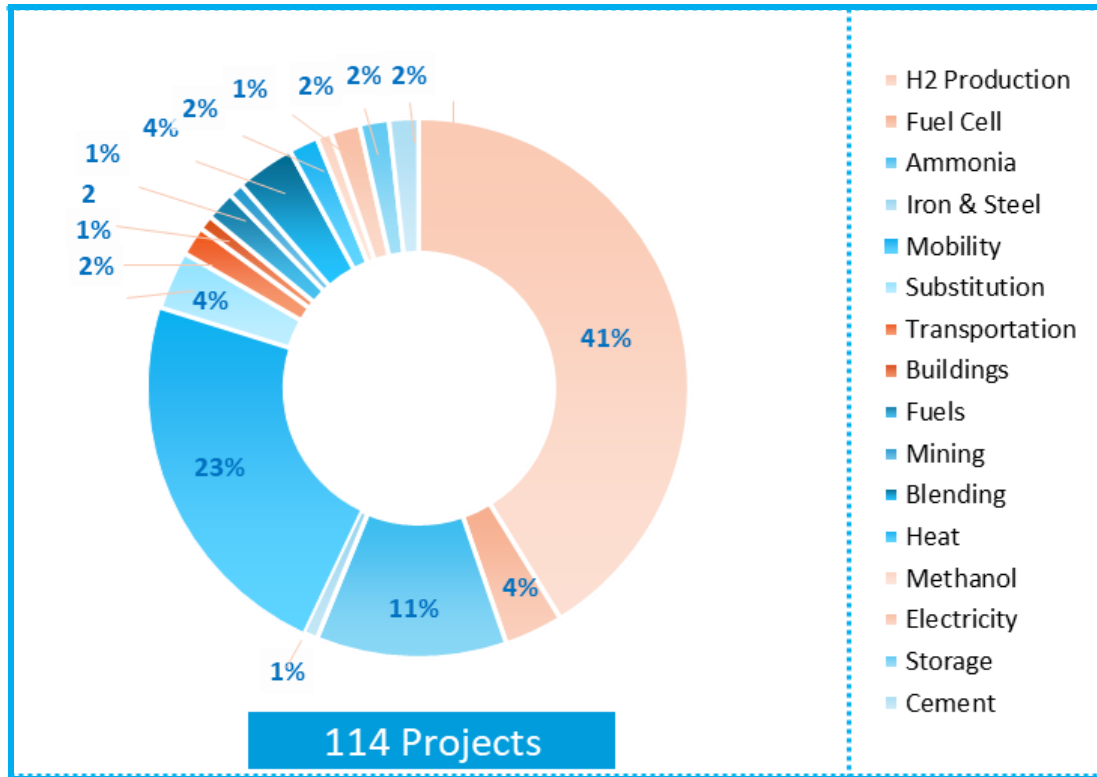
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CLEAN HYDROGEN LANDSCAPES

- Landscape of Technologies

Clean hydrogen technologies are being developed across 35 developing countries, with a particular focus on clean hydrogen production.



- ▶ Over 110 hydrogen projects with technologies in TRLs 6 to 9 in late-stage planning in 35 developing countries.
- ▶ **41% of the projects focus on hydrogen production**, followed by 23% on mobility, while less than 5% correspond to technologies for hydrogen use in the cement, iron, and steel industry.
- ▶ **LAC hosts 36% projects, Asia 29%, and Africa 25%.** The three regions are focusing mostly on clean hydrogen production technologies.



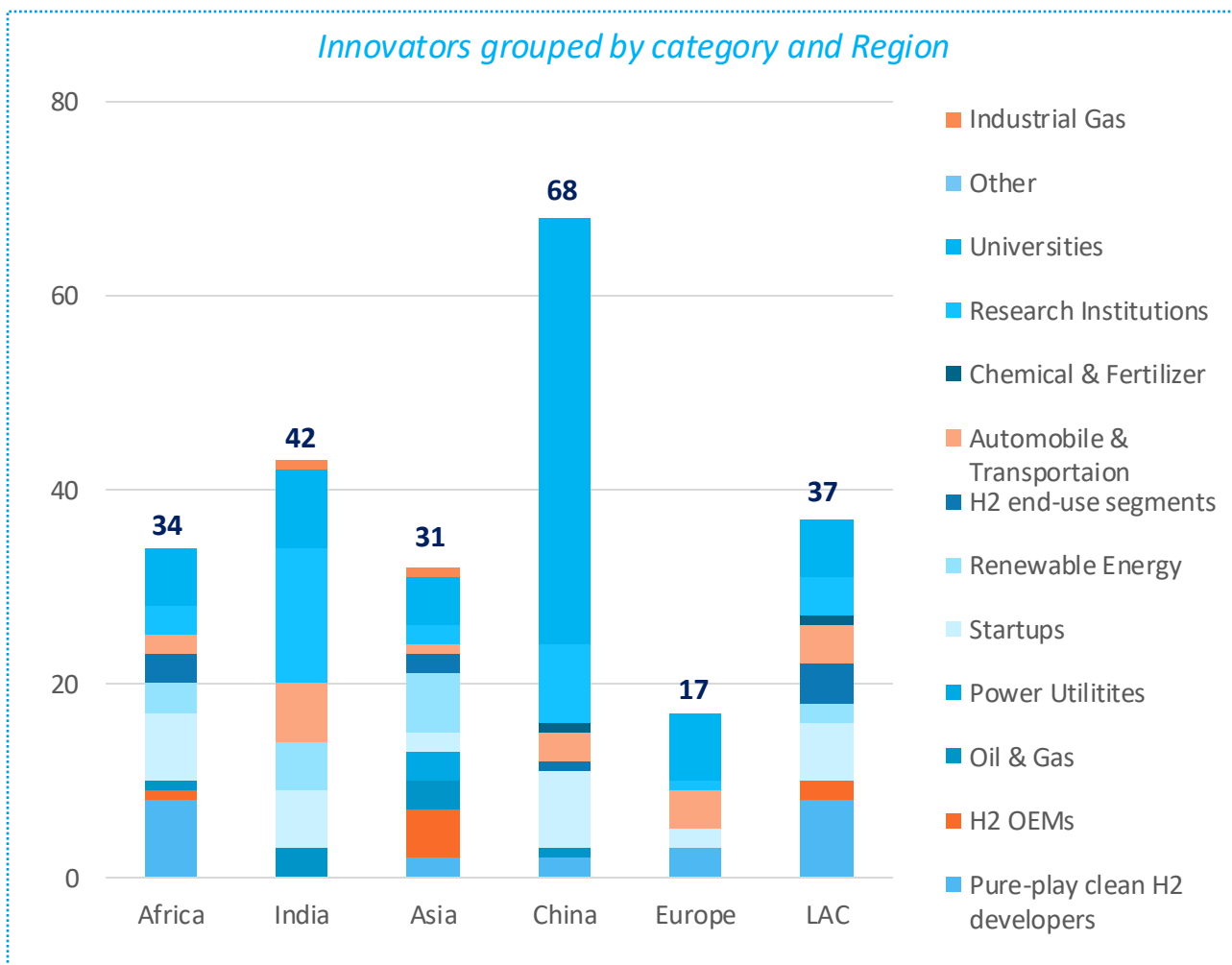
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CLEAN HYDROGEN LANDSCAPES

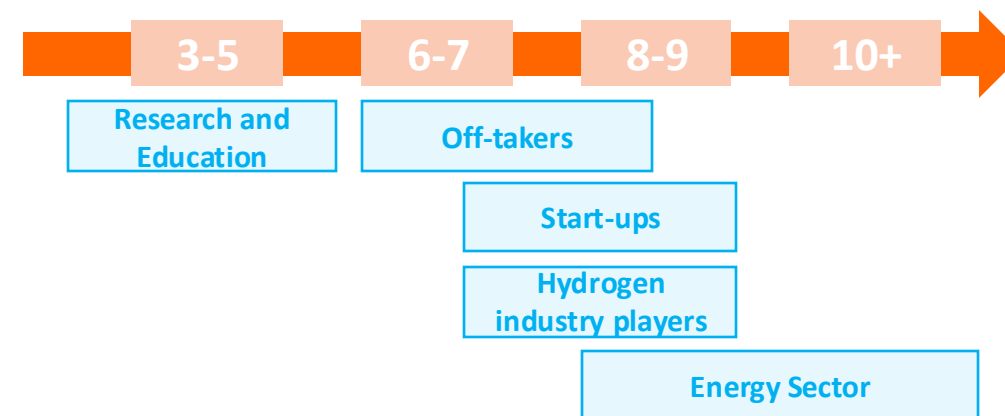
- Landscape of Innovators

More than 200 innovators were identified in developing countries, most of them from universities and research institutes in Asia

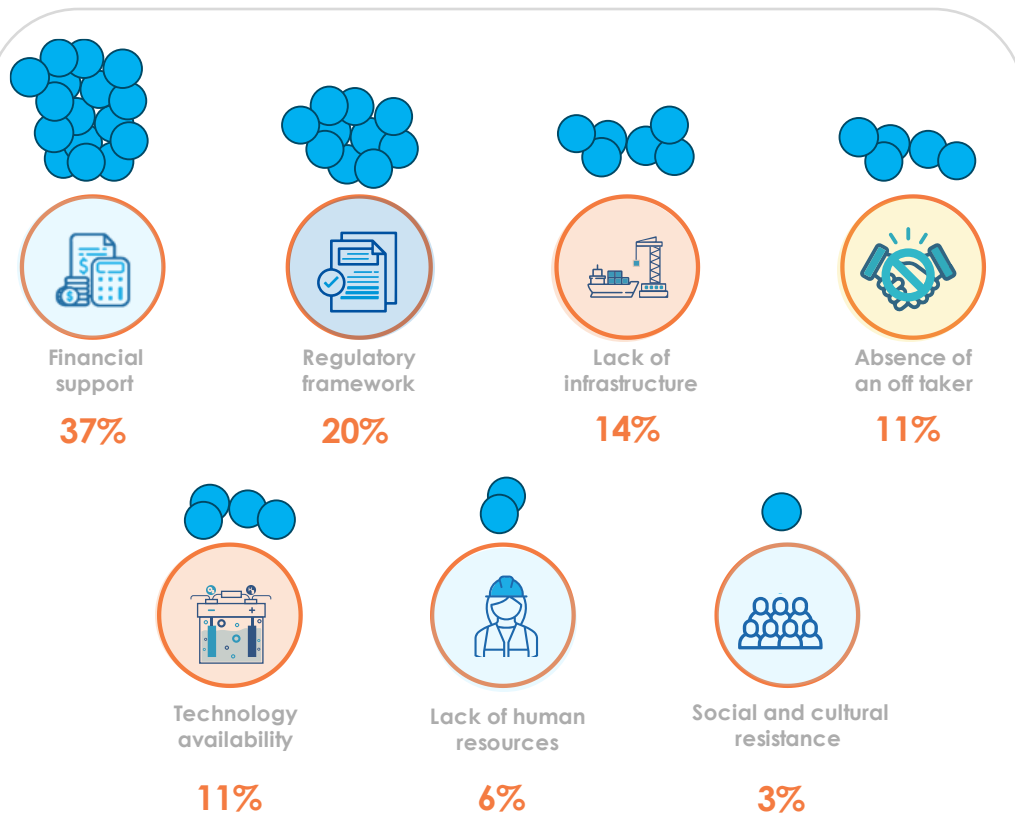


- ▶ Most innovators belong to universities (33.9%) and to research institutes (13.4%).
- ▶ Strong leadership from China and India, followed by LAC.
- ▶ Despite several projects led by educational centres, the industry sector is achieving higher TRLs, testing and adopting technologies in TRLs 6-9.

How are innovators advancing innovation to further stages?



Most of the barriers faced by innovators rely on financial limitations, lack of binding regulations and infrastructure



Result from interviews and surveys carried out with more than 70 projects developers from developing countries working on clean hydrogen projects



Macroeconomic Challenges

- Lack delivery mechanisms.
- Required financing to take projects to further stages.



Regulatory barriers

- No binding regulation.
- Roadmaps to translate into policies and laws.



Infrastructure & Technological Barriers

- Necessary laboratory equipment.
- Lack of infrastructure.



Off-Take and Market Risks

- Off-take agreements needed to secure funding.
- Market uncertainty.



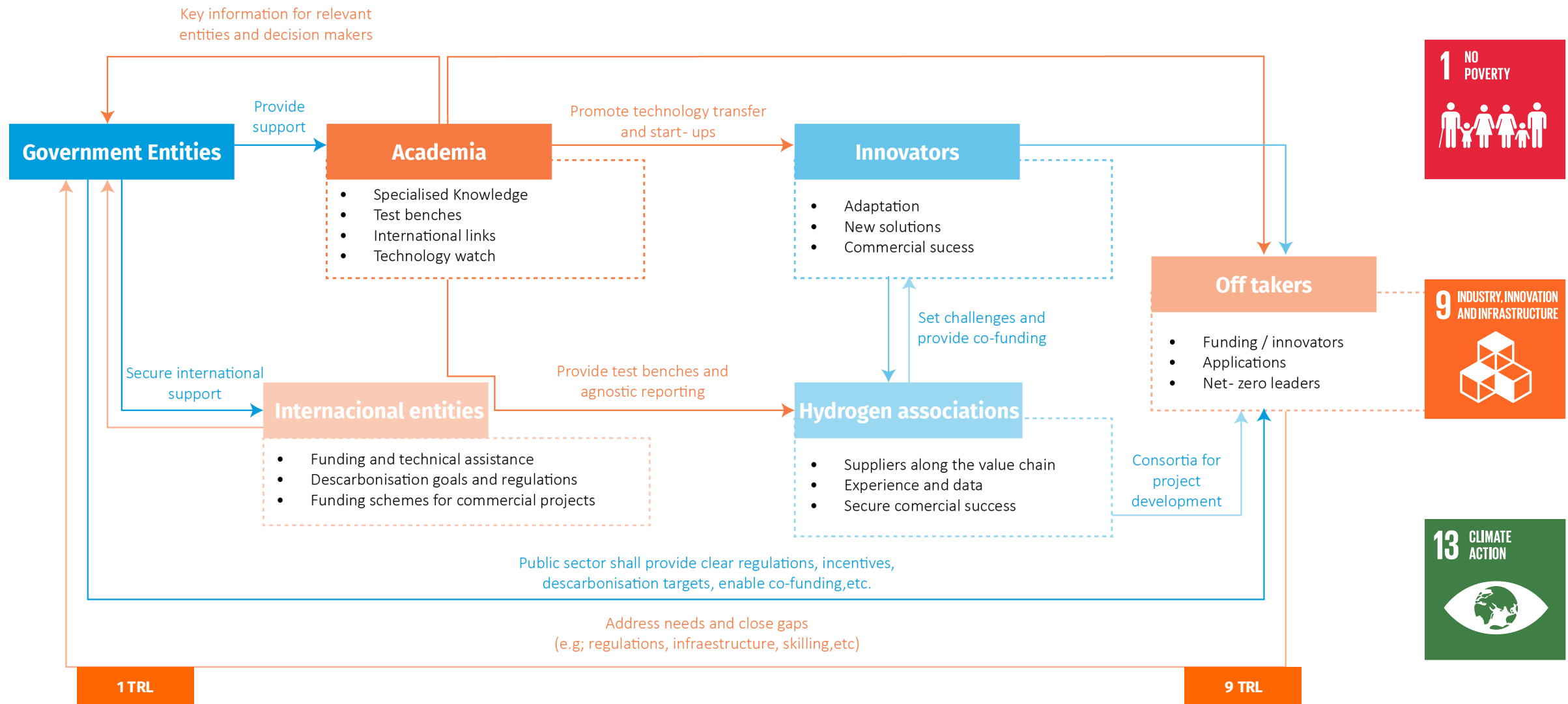
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Clean Hydrogen Landscapes

- Landscape of Stakeholders

A strong ecosystem can secure successful clean hydrogen projects





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Clean Hydrogen Landscapes

- Landscape of Initiatives

National, regional, and international initiatives were identified. National initiatives focus on policy and regulatory development, regional ones facilitate collaboration and knowledge sharing, while international efforts provide mostly technical assistance and funding. However, all face gaps in effectively promoting technology innovation.

Developing countries with national hydrogen strategy or roadmap



- ▶ 28 of the 141 developing countries (19.1%) have a published national hydrogen strategy or roadmap. Only 14.2% mention supporting innovation and technological development, and 12.7% state they will establish R&D programs.
- ▶ National hydrogen hubs are **being planned in 15+ developing countries**, but only China has a fully operational one.

National initiatives: how countries are advancing at a national level towards clean hydrogen

- ▶ **Regulations** shall be developed for clean hydrogen use and for hydrogen-based R&D.
- ▶ Introduction of **regulatory sandboxes** allow technologies to be tested in controlled experimental environments, and help governments understand the necessary regulatory requirements.
- ▶ There are **few certification schemes** for clean hydrogen in developing countries: China; Brazil; and 12 LAC countries implementing CertHiLAC.
- ▶ **National hydrogen hubs** are being planned in more than 15 developing countries, though China is the only country with a fully operational hub



Developing countries which have mostly introduced policy initiatives and regulatory frameworks to advance on clean hydrogen



Brazil



Egypt



India



Morocco



How are these countries advancing?

Certification Schemes

Tax credits

Budget allocation

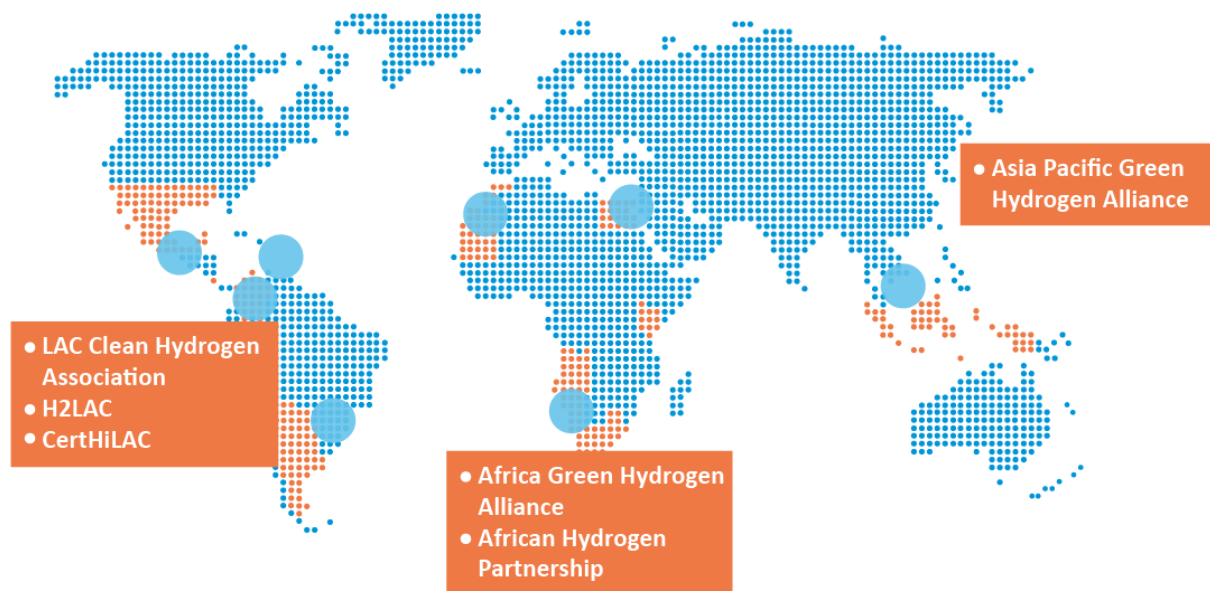
VAT exemptions

Laws for clean hydrogen use

Cash incentives

Regional and international initiatives are key for knowledge sharing and facilitating shared transport, storage, and technology infrastructure

Regional clean hydrogen initiatives



- Regional initiatives serve as platforms for sharing technical expertise and best practices, promoting knowledge exchange and capacity building.
- They enhance regional potential by reducing costs through shared investment and infrastructure.
- Nevertheless, there are not many regional initiatives in place as of today.

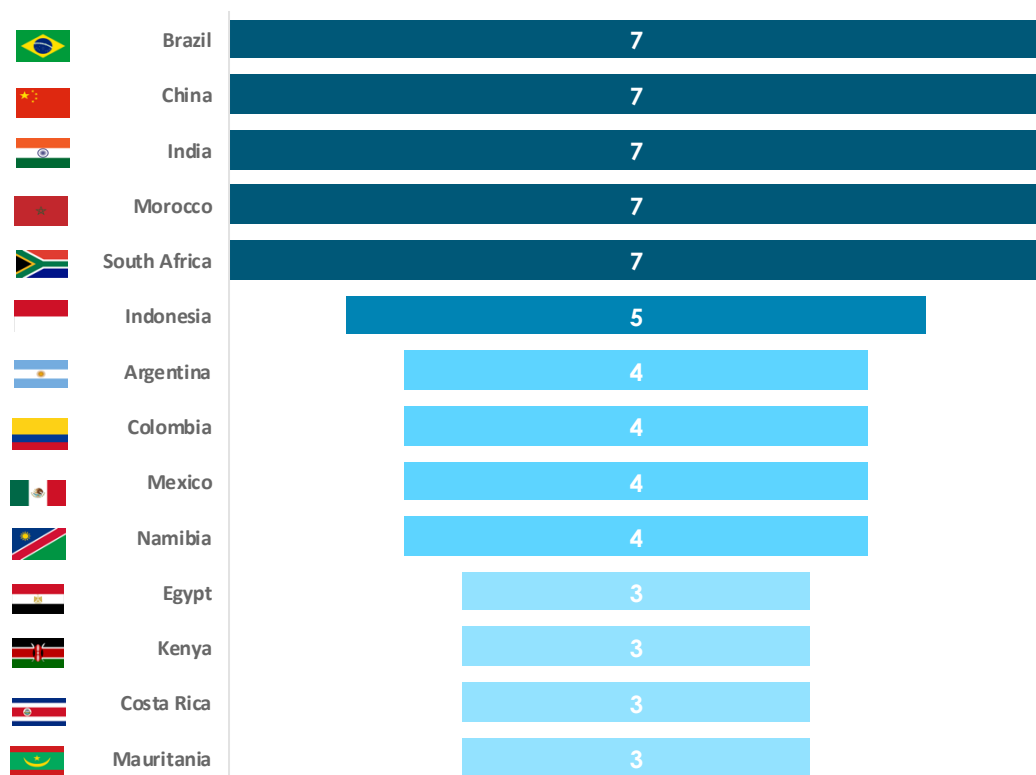


International cooperation and partnerships are crucial for developing countries to build a clean hydrogen market and foster innovation, where resources and capabilities for scaling-up are needed. These initiatives can serve as platforms for cooperation across different regions.

The identified gaps extend beyond specific issues and include the limited number of countries receiving support



Whom are they providing support?



How are they providing support?

International initiatives are concentrated on...

- Supporting Prefeasibility studies
- Development of regulatory frameworks
- Technical and financial assistance
- Global standards not focused on developing countries.

But there are topics that are still unattended...

- Lack of laboratories and materials, capacity and knowledge
- Hydrogen security protocols
- Infrastructure required for exporting
- Unattended segments of the clean hydrogen value chain as transport and storage
- Coordination between the countries and cross-country technological exchange
- Promotion of dialogue in the Global South to share regional perspectives



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Delivery Mechanisms

R&D Funding is growing but remains insufficient. Greater emphasis is needed to drive breakthroughs in clean hydrogen technologies in developing countries



Governments are launching R&D schemes, establishing centers of excellence, and providing research grants to promote technological advancements in clean hydrogen industry.



The private sector is extending CSR funding and forming partnerships with universities. State owned companies are important to drive innovation.



Clean hydrogen startups focused on research and innovation are attracting investor interests.



Governments are strengthening regulatory frameworks to encourage investments in research and innovation.



Delivery Mechanisms



RECOMMENDED FINANCIAL INSTRUMENTS TO DE-RISK INVESTMENTS

1	Supply Risks	Long term cost-efficient purchase agreements for renewable electricity with technical clauses for price volatility; infrastructure funds and public-private partnerships for renewable energy projects
2	Market/Off-Take Risks	Tax benefits, subsidies, quotas and blending mandates to boost local demand. Long-term purchase agreements, contracts for difference, along with guarantees by export credit agency and partial-risk/credit guarantees by DFIs and MDBs are recommended.
3	Infrastructure Barriers	Development finance from multilateral banks and DFIs to catalyze the construction of key infrastructure units, higher involvement of the government through public-private partnerships and the development of special economic zones and industrial clusters, such as hydrogen hubs
4	Macroeconomic Risks	Foreign exchange swaps, interest rate hedging, and derivatives, along with contracts for fixed-rate loans are encouraged.
5	Technological Risks	Define selection criteria to prioritize projects led by credible primary technology developers. Performance, product, and availability guarantees can be considered, though the high cost of coverage can be a deterrent



Collaboration between government, key stakeholders & financial institutions is essential to boost investors' confidence

In Namibia, the Government and Hyphen Hydrogen Energy engaged in extensive dialogues to create a 40-year concession agreement. Additionally, the government of Namibia secured an option for a 24% equity stake in the project through SDG One Fund, demonstrating its commitment and further de-risking investments.

In Latin America, DFIs and MDBs are actively working with governments to provide technical assistance in designing hydrogen roadmaps.

In India, the government is offering subsidies to encourage domestic manufacturing of electrolyzers and green hydrogen. It has also allocated budgetary support for pilot projects and research initiatives to support this infant industry and attract private players.





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SDGs Assessment

Clean hydrogen has the potential to contribute mainly to SDGs 1, 9 and 13

Direct Linkages



How are the countries progressing towards SDGs?

- ▶ Stimulating infrastructure development
- ▶ Fostering research and innovation
- ▶ Creating jobs
- ▶ Supporting decarbonisation of hard-to-abate sectors

Soft Linkages



- ▶ As the technology matures, drives socio-economic transformation
- ▶ Enhancing quality of life
- ▶ Contributing to the Net-Zero ambitions

Public and private sectors need to collaborate to address social and environmental risks of large-scale hydrogen projects



Job displacement in traditional sectors



Potential conflicts over water resources



- Forced resettlement of indigenous communities
- Potential land conflicts



Environmental Risks



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Regional analysis

Latin America and the Caribbean

The region can leverage its electricity matrix, with already more than 60% renewables, to produce clean hydrogen

41 Demonstration projects

Opportunities

- ▶ Electricity matrix comprising over 60% renewables
- ▶ Exportation of hydrogen and ammonia project developers.
- ▶ Applications include sustainable mobility and existing industries
- ▶ Local clean ammonia production to reduce dependence on imports
- ▶ Potential to export to Europe and the US

Barriers

- ▶ Lack of regulatory frameworks.
- ▶ Lack of technical expertise.
- ▶ Limitations in enabling infrastructure for hydrogen or derivatives.
- ▶ Potential resistance with local communities.

Potential Hubs



Asia

Asian target markets and domestic industrial demand will ensure the off-take of premium products

33 Demonstration projects

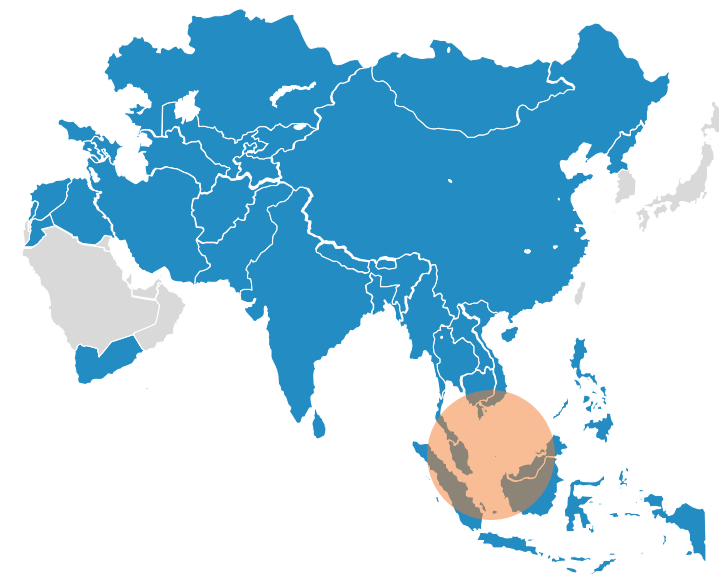
Opportunities

- ▶ Significant industry for clean hydrogen applications.
- ▶ Energy storage, clean hydrogen production, and mobility projects are found in all stages of development.
- ▶ Clean hydrogen production projects are currently in the late-stage planning phase.
- ▶ Proximity to potential off-takers as Japan, South Korea, and Singapore.

Barriers

- ▶ Regulatory diversity and varying levels of infrastructure development.
- ▶ Regional differences regarding access to technology and foreign or internal financial support.
- ▶ High dependence on fossil fuels.

Potential Hubs



Southeast Asian countries as Indonesia, Viet Nam and Malaysia. Singapore can be part of this hub to act as off taker and export point of developing countries hydrogen-based solutions.

Africa¹

Despite the many barriers faced by African countries, the region has the potential for clean hydrogen projects

28 Demonstration projects

Opportunities

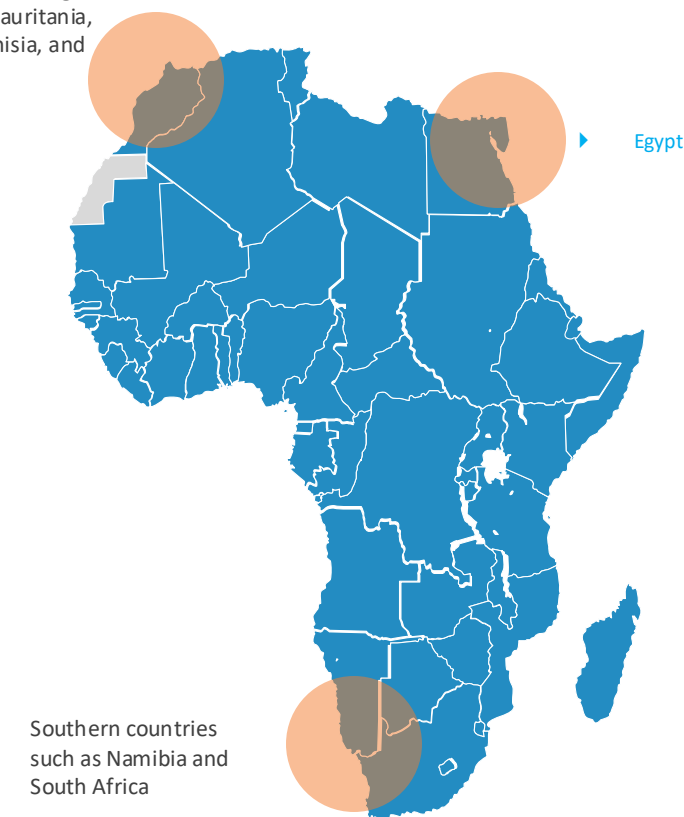
- ▶ Clean hydrogen projects primarily focus on clean hydrogen production and mobility applications.
- ▶ Hydrogen-based microgrids can be a solution to provide clean electricity to rural areas and isolated communities.

Barriers

- ▶ Non-industrialised countries
- ▶ Less than 25% of the population has energy access
- ▶ Limited number of innovators.
- ▶ High dependence on fossil fuels.
- ▶ Limited access to advanced technology and financial resources.
- ▶ Deficits in infrastructure for hydrogen or derivatives exportation and logistical challenges.
- ▶ Political and economic instability.

Potential Hubs

Northwestern African countries, including Morocco, Mauritania, Senegal, Tunisia, and Algeria

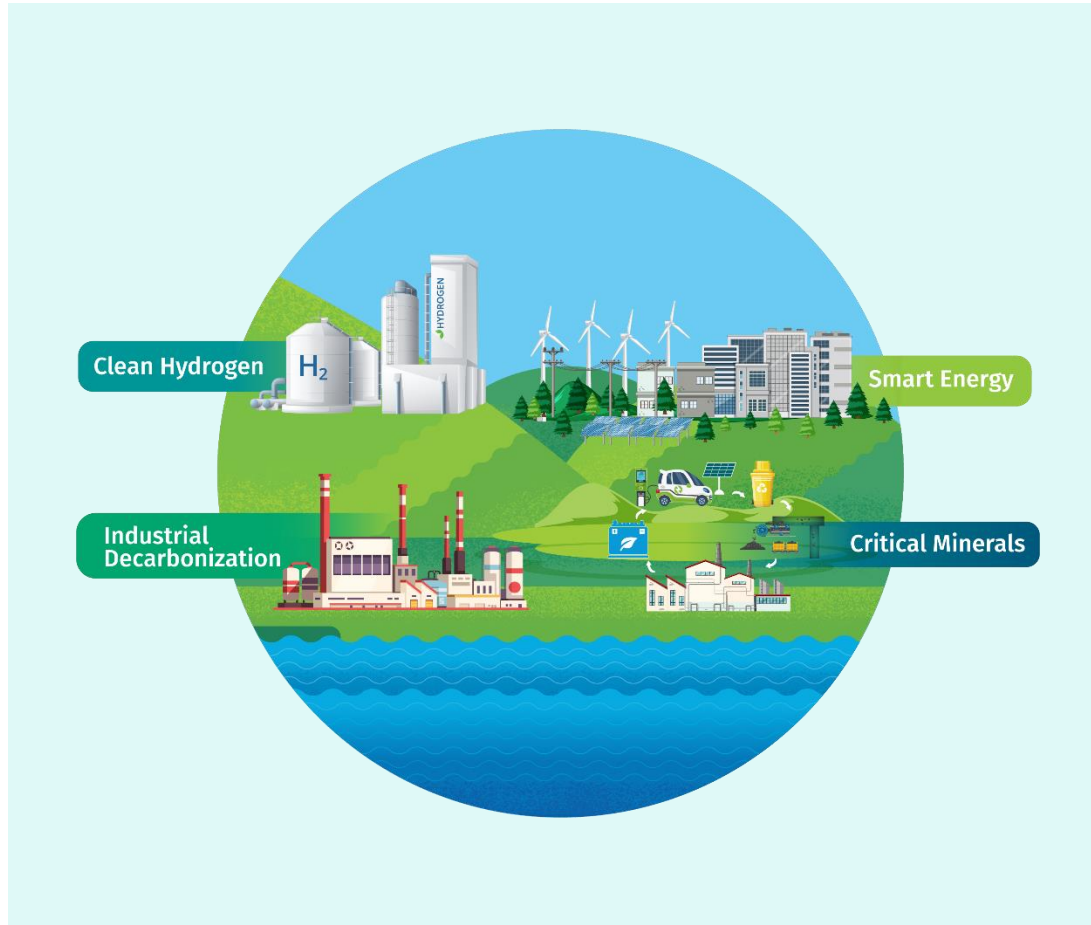


Southern countries such as Namibia and South Africa

1. MENA countries as Morocco and Egypt are considered within this regional analysis.

Key takeaways

- Private sector involvement is key
- Public and private sector need to collaborate
- Fostering a healthy innovation ecosystem is crucial
- Adaptation and research are necessary
- Most projects concentrate on hydrogen production and end-use applications
- Other value chain segments, such as hydrogen storage, transport, and alternative carriers, have made limited progress in developing countries
- We need to strengthen regional cooperation
- Still many challenges and barriers need to be address



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Join our other Market Assessment Webinars

Smart Energy and Industrial Decarbonization

Thursday, 28 Nov
2.00 – 3.00 p.m. (CET)



Further information on the A2D Facility:

- A2D Facility Website: a2dfacility.unido.org
- A2D Facility LinkedIn Account: [Accelerate-to-Demonstrate \(A2D\) Facility](#)
- A2D Facility Mailing List: [Join the mailing list here](#)
- A2D Facility Year 1 Annual Report: [Access the Annual Report here](#)



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A blue-tinted photograph of an industrial hydrogen storage tank. The tank is cylindrical and has 'H2' written on it in large white letters. A red handwheel valve is visible on top. The background is blurred, showing industrial structures and bokeh light effects.

CLEAN HYDROGEN MARKET ASSESSMENT IN DEVELOPING COUNTRIES