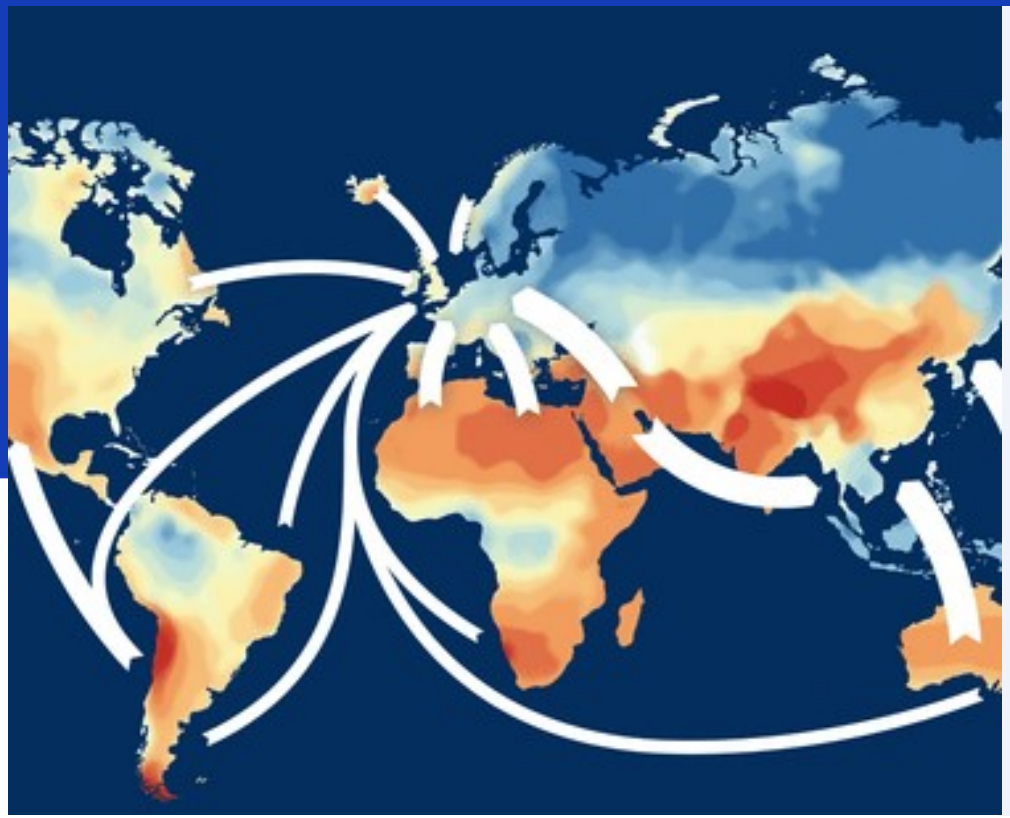
SHIP>NL sessie XI

Drs. M.C.M. Rijkers

Start presentation

TNO innovation for life

Agenda SHIP>NL sessie 20 December 2023



1. Welkom
2. Deep dive: Financiering van Internationale schone waterstofprojecten
   Dolf Gielen | Wereldbank
3. Afsluiting

Huisregels

- Camera aan, microfoon op ‘mute’
- Vragen?
  - Plaats verduidelijkingsvragen in de meeting chat; of
  - Steek je hand op!
- De moderator zorgt ervoor dat je vraag beantwoord wordt (eventueel achteraf).
- Slides worden na de sessie gedeeld en zijn te vinden op SHIPNL: Sustainable Hydrogen Import Program Netherlands | Nationaal Waterstof Programma

- We bespreken uiteraard geen marktgevoelige zaken.

- Chatham house rules: De besproken informatie mag gedeeld worden, maar zonder de spreker te onthullen.

Meerjarig kennisprogramma met 5 lijnen

- **In deze sessie:**

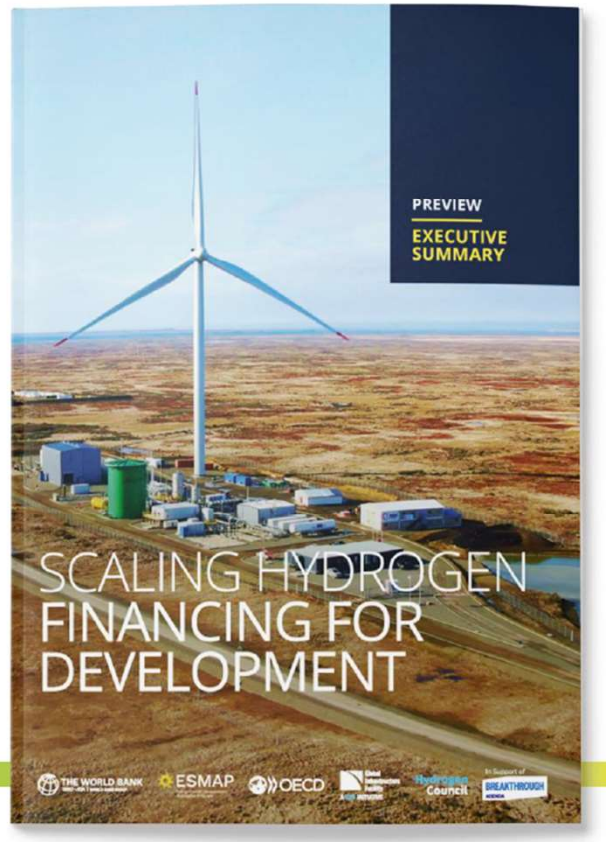
1 Technisch economisch	2 Beleid	3 Markt	4 Internationaal	5 Omgeving
▪ Inzicht in importketens productie-conversie-transport-opslag-reconversie-gebruik ▪ Vraagontwikkeling, scenario's ▪ Infrastructuur & systeemintegratie: corridors, benutten bestaande infra. ▪ Technology assessments, R&D	▪ Impact van 'Fit for 55', REDII, Delegated acts, ETS/CBAM, etc. ▪ Impact van certificering en CO2 allocatie: emissiefactoren, LCA ketenanalyse, etc. ▪ Financiering en stimulering (EU & NL): IPCEI, PCI, TEN-E, JTF, EIB, Horizon Europe, MOOI, DEI, MIEK, SDE++, etc	▪ Marktmodellen: bilaterale contracten, vrije handel, waterstofbeurs ▪ Internationale handelsstromen: verwachte vraag- en aanbodvolumes en transportstromen ▪ Importtarieven, trade agreements en handelsbeperkingen, WTO, etc.	▪ Samenwerking met omringende EU/niet-EU importlanden om corridors te ontwikkelen ▪ Concurrentie met omringende EU/niet-EU importlanden ▪ Geopolitieke aspecten: strategische voorraden, afhankelijkheid, politieke stabiliteit van exportlanden	▪ Ruimtegebruik van ketenelementen ▪ Veiligheid: brandbaarheid, zorgwekkende stoffen, risicocontouren, etc ▪ Milieu: stikstof, lekkage ▪ Maatschappelijke acceptatie ▪ MVO / samenhang met SDG's in exportlanden

Financiering van Internationale schone waterstofprojecten

- Dolf Gielen | Hydrogen lead World Bank

SCALING HYDROGEN FINANCING FOR DEVELOPMENT

DOLF GIELEN
SAIL
20 DECEMBER 2023



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ESMAP
Energy Sector Management Assistance Program

H4D Partnership
Membership has tripled during the last year
Santiago de Chile 2nd in-person meeting 24-26 October 2023

World Bank Group Hydrogen activities

World Bank Group – 189 member countries

Public sector support
for developing countries

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Technical assistance
Concessional financing
Grants
Risk mitigation instruments

Private sector support
in developing countries

IFC

Upstream Project Support
Project Financing
Grants
Concessional Financing

Private sector support

MIGA

Political risk insurance
Credit enhancement
Trade finance

Advice Advice

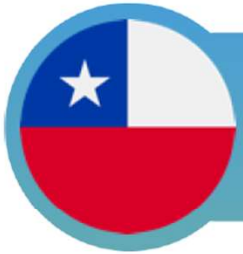
Hydrogen for Development Partnership

H4D Partnership

WORLD BANK GROUP
THE WORLD BANK IBRD • IDA | IFC International Finance Corporation | MIGA Multilateral Investment Guarantee Agency

ESMAP Energy Sector Management Assistance Program

WBG hydrogen: country lending ops led by IBRD-IDA



CHILE PROJECT → **$150M Approved IPF FY23** → **Blended finance for electrolyzer CAPEX and risk mitigation instruments**

INDIA PROJECT → **$1.5B Approved DPL FY23 (phase 1)** **$1.5B for approval FY24 (phase 2)** → **Policy support** Offtake Equipment manufacturing RE power access

MAURITANIA PROJECT → **$155M IPF (for approval FY24)** → **Blended finance and capacity building**

BRAZIL PROJECT → **$125M (phase 1) IPF (for approval FY24)** → **Blended finance and infrastructure**

Interest to replicate facility in Colombia and Brazil

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OECD

Global Infrastructure Facility
A G20 INITIATIVE

Hydrogen Council

BREAKTHROUGH AGENDA

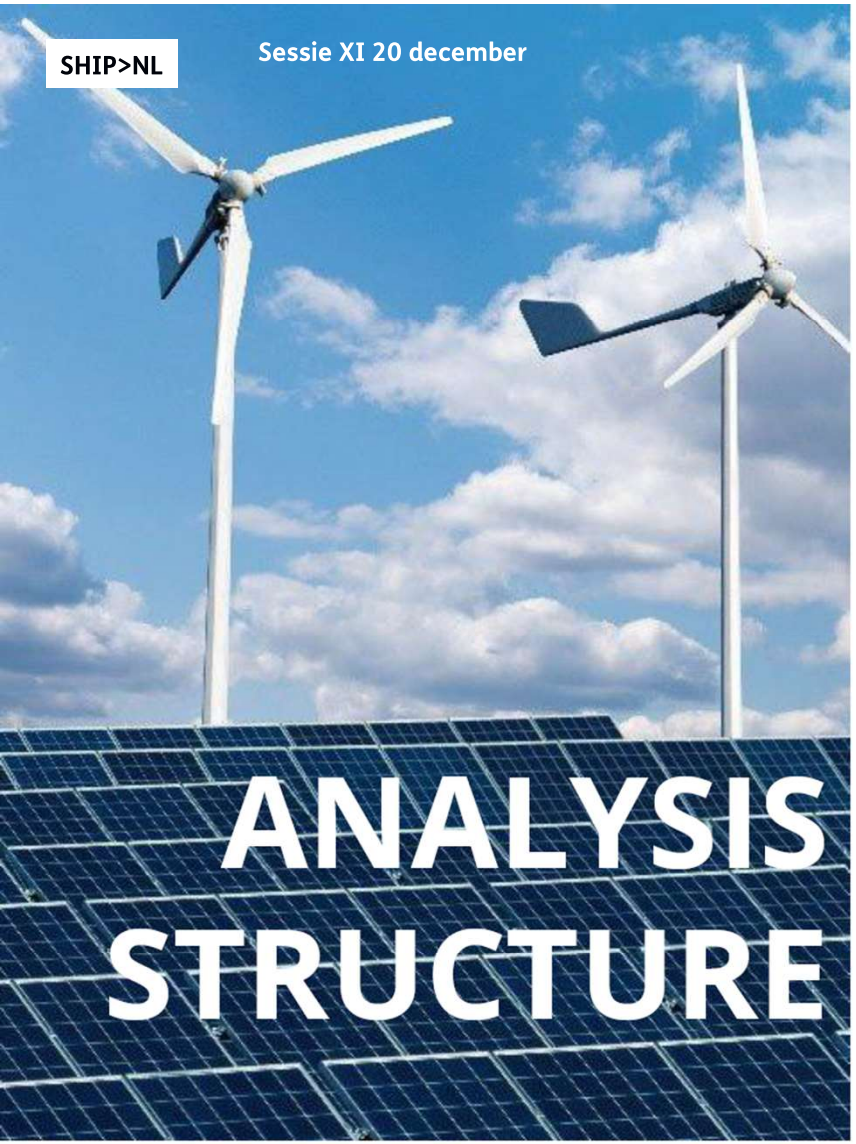
ESMAP
Energy Sector Management Assistance Program

The World Bank
in collaboration with:

OECD
Global Infrastructure Facility
Hydrogen Council

In support of
Breakthrough Agenda and **COP28**

Extensive support from and consultation with MDBs, governments, investors, financing institutions, H4D partners, and stakeholders.



1 What is the expected size of the industry?
Scenarios, projections, business models, projects

2 What is the magnitude of the cost gap? Economic analysis: investment needs, financing needs, subsidy needs

3 What are the risks hindering financing and mitigation instruments to overcome them?

4 What to do ?
Implications for policy makers and DFIs

5 Recommendations for COP28 and decision makers

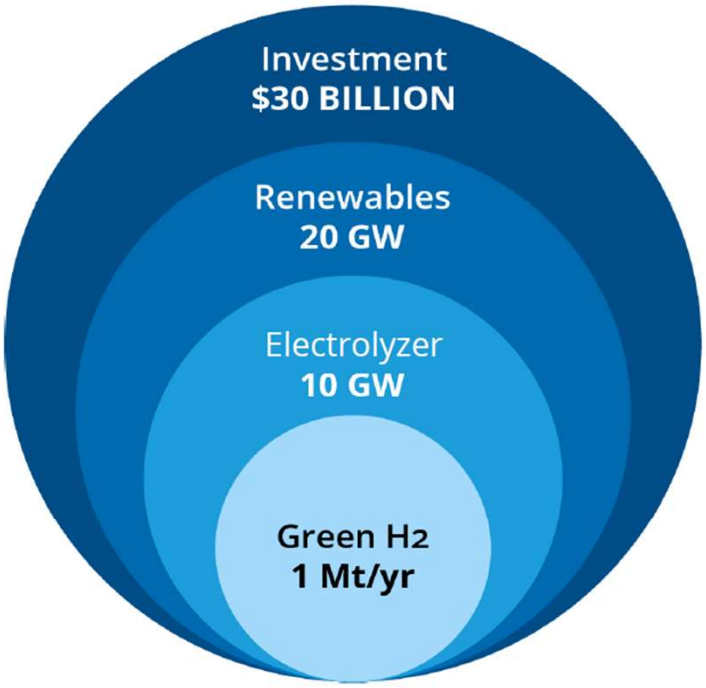
A Very Capital-Intensive Industry

US $100 billion

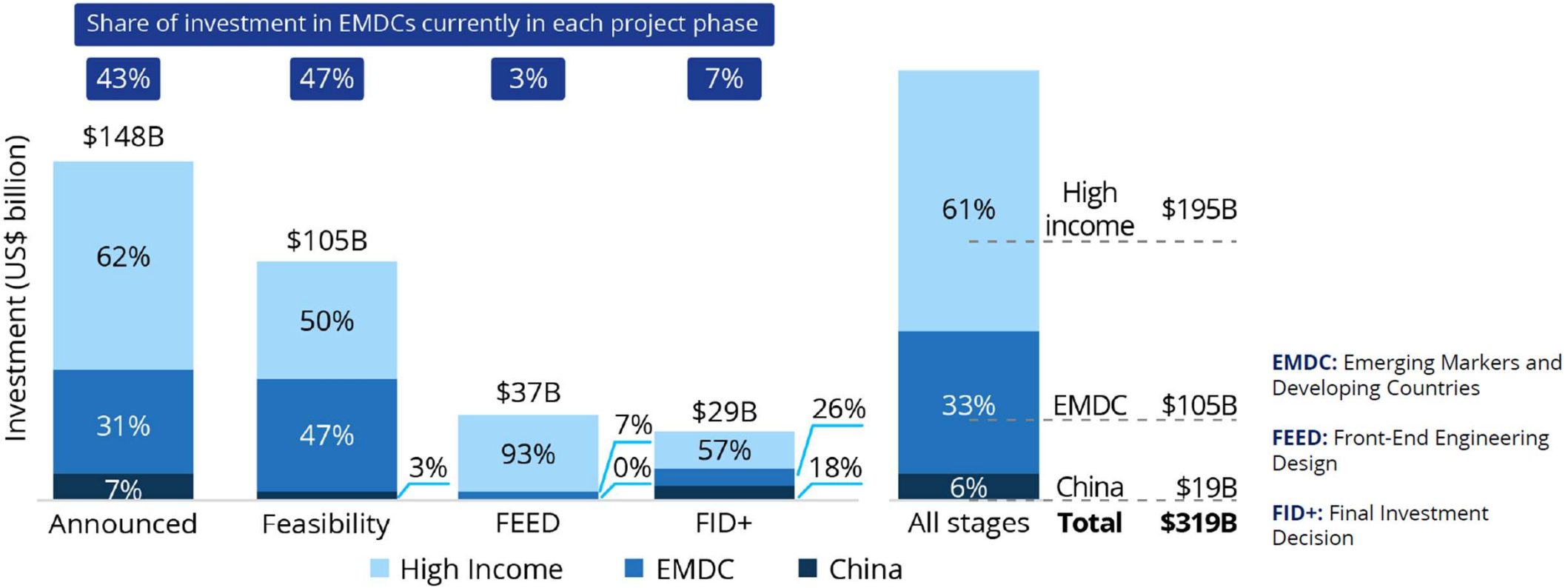
Required per year by developing countries between now and 2030 for H2 production, transport and use

- 80% of production investment needs for renewable hydrogen, 20% for low-carbon
- 20 Mt in EMDC – 100 NEOM-size projects – financing gap 10-40 bln/yr
- Bulkiness of commercial scale projects is an issue
- Rising interest rates and rising electrolyzer cost make initial renewable hydrogen projects more difficult
- Initial projects are typically "on the books" of large companies

1 → 10 → 20 → 30

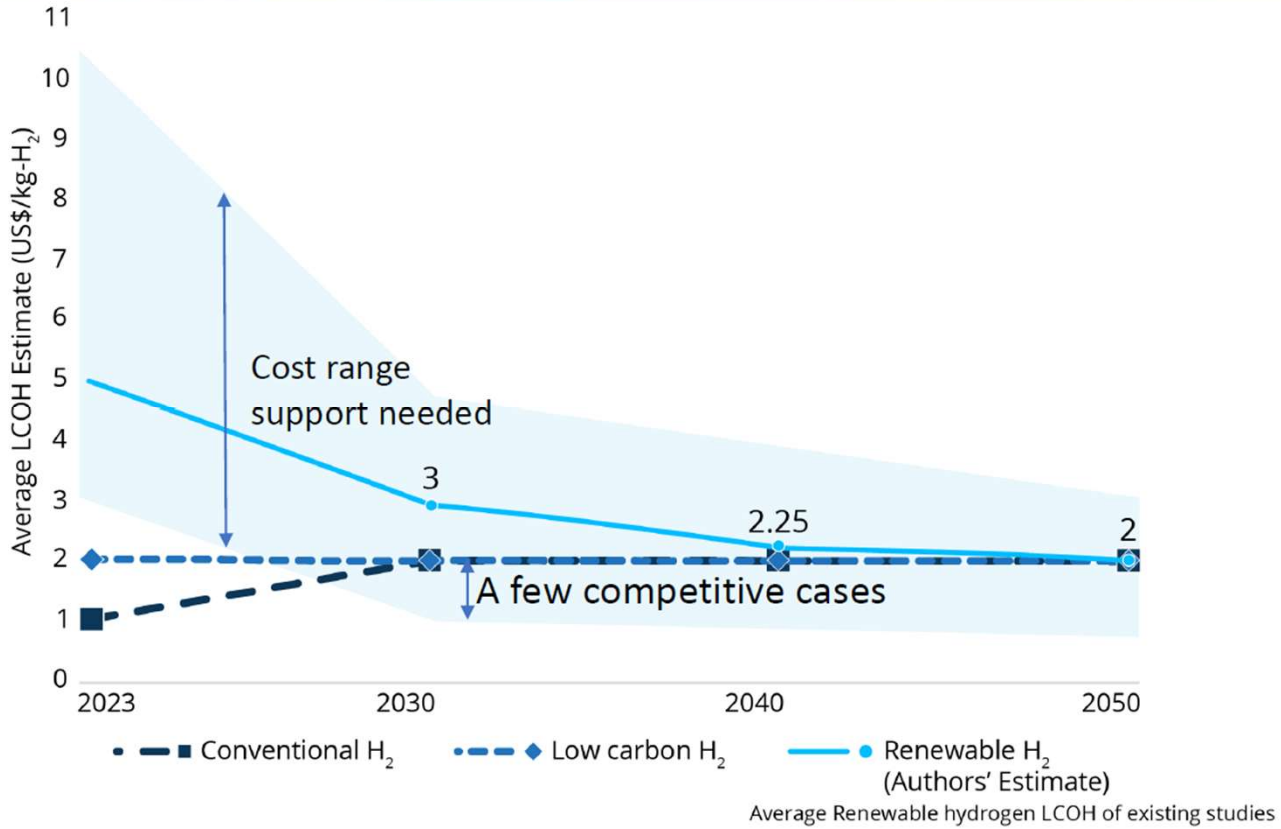


Projects in Developing Countries are Lagging Behind Many Announcements but Few FID



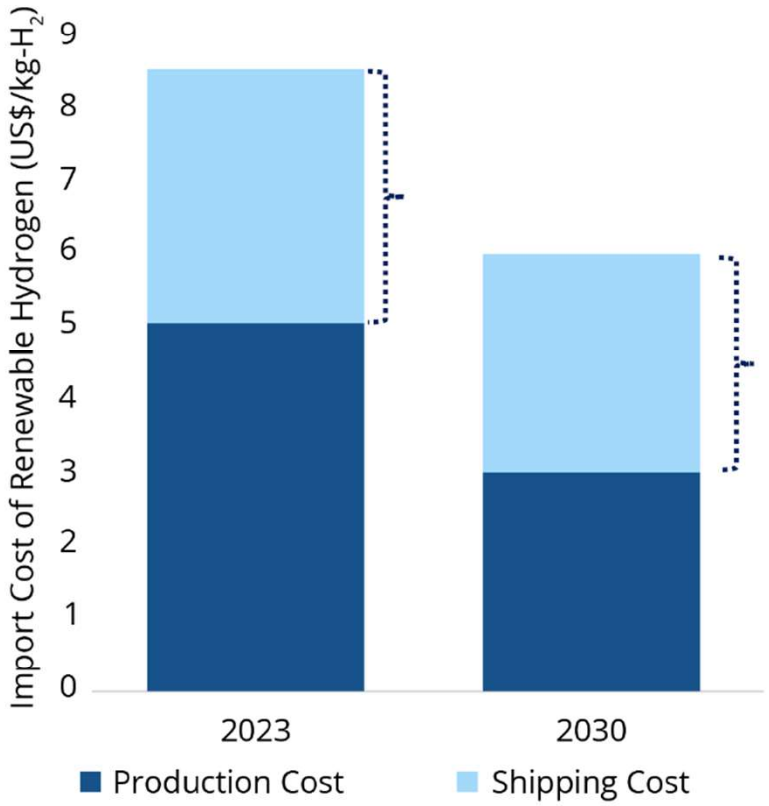
Source: Hydrogen Council (2023); McKinsey (2023).
Note: Investment numbers exclude the renewable power component. FID+ refers to any project at or beyond the FID stage.

Green hydrogen production will only become cost effective through robust innovation, deployment support and carbon pricing and carbon financing



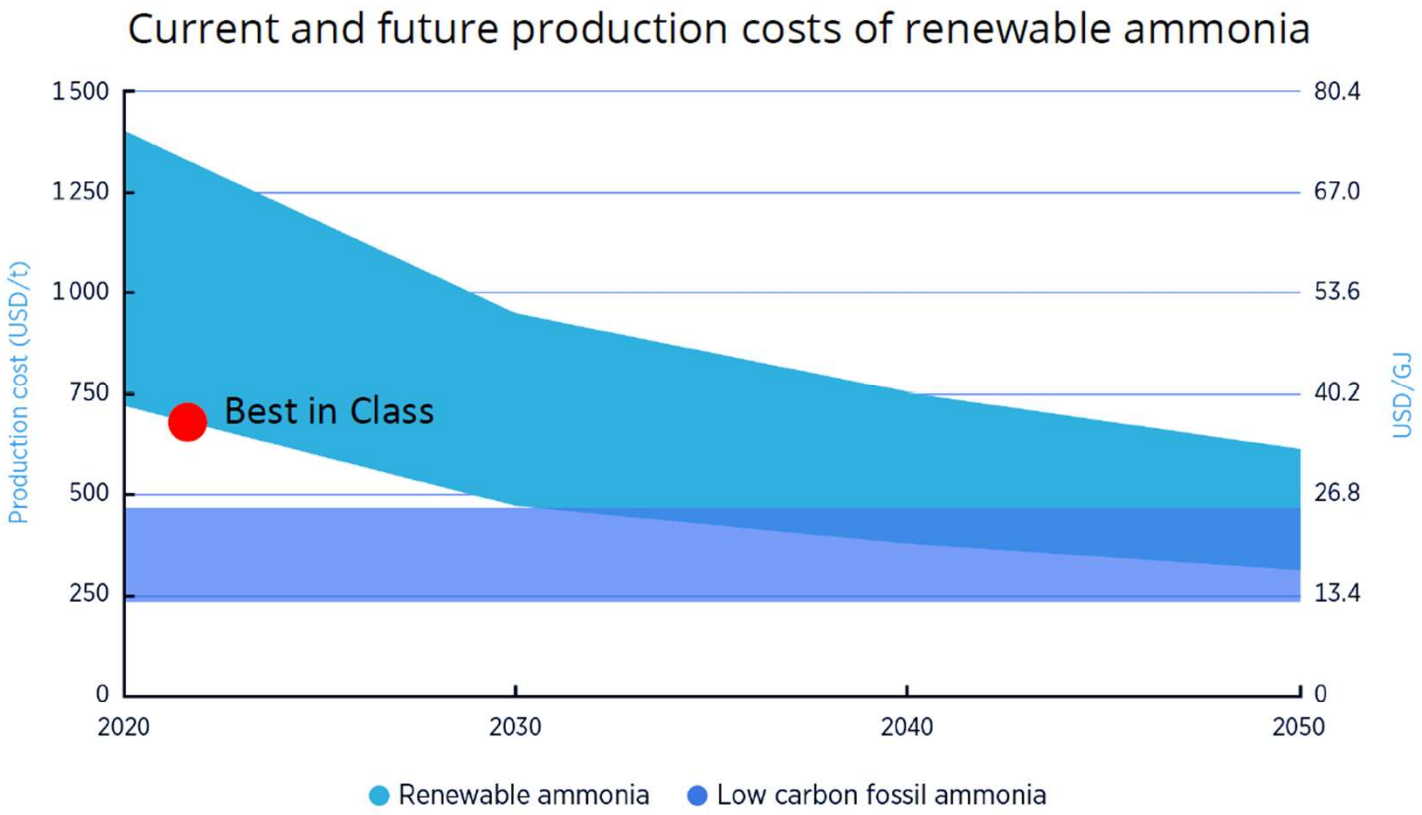
Source: Authors' estimates for renewable hydrogen and compiled range of estimates for different types of hydrogen based on 26 global studies published after 2021.

The importance of shipping cost for total supply cost



Source: Authors' estimates.

Production Costs - By 2050 costs expected to fall to USD 310-610/t



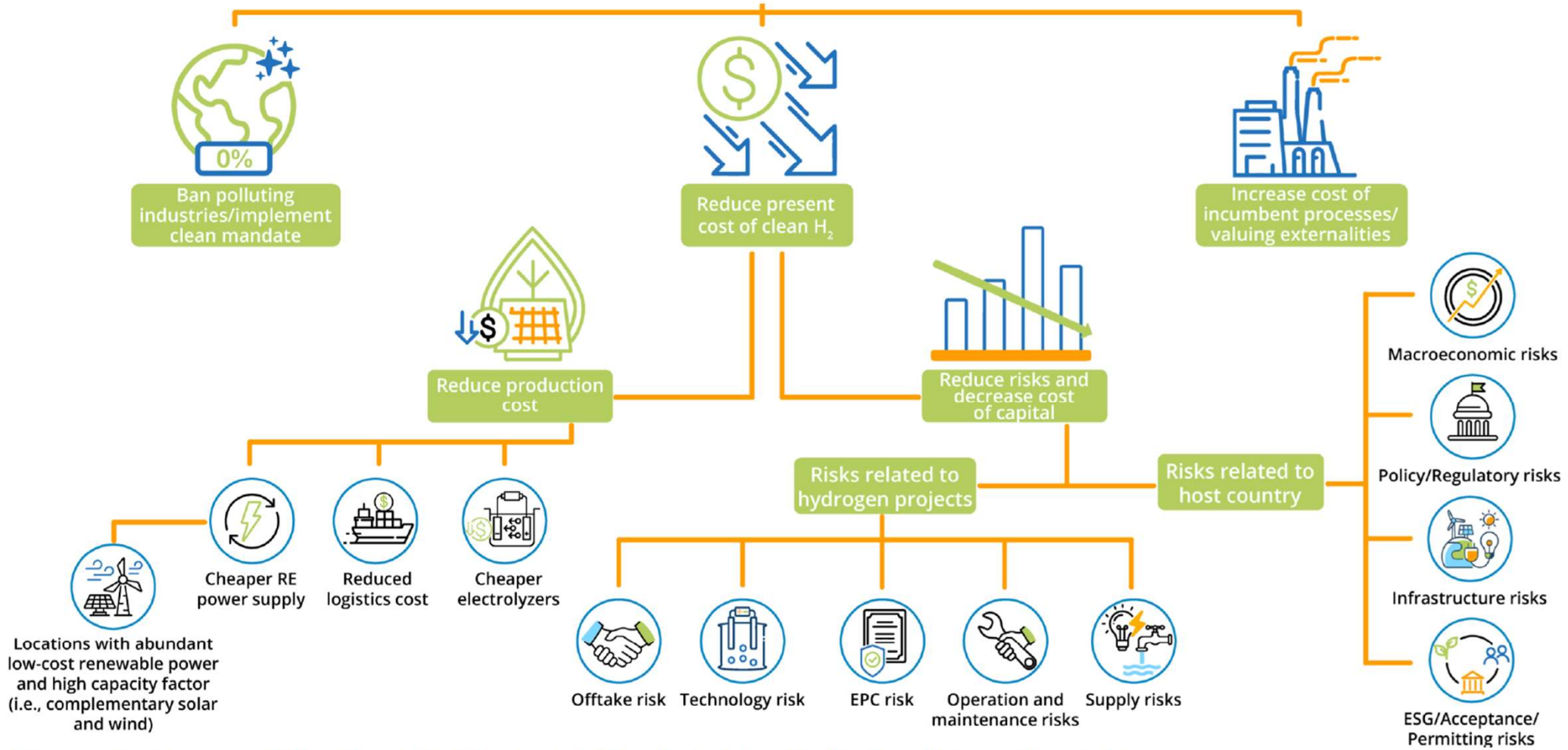
Source: IRENA and AEA, 2022

- Ammonia spot price peaked in 2022, back to normal since
- Green ammonia production cost in good locations are lower than spot prices
- Hydrogen cost dominate renewable ammonia production cost (nearly 200 kg hydrogen/t ammonia)
- Many estimates but no public prices for green hydrogen or renewable ammonia at this moment – H2Global and European Hydrogen Bank will create some clarity through auctions

Markets and projects

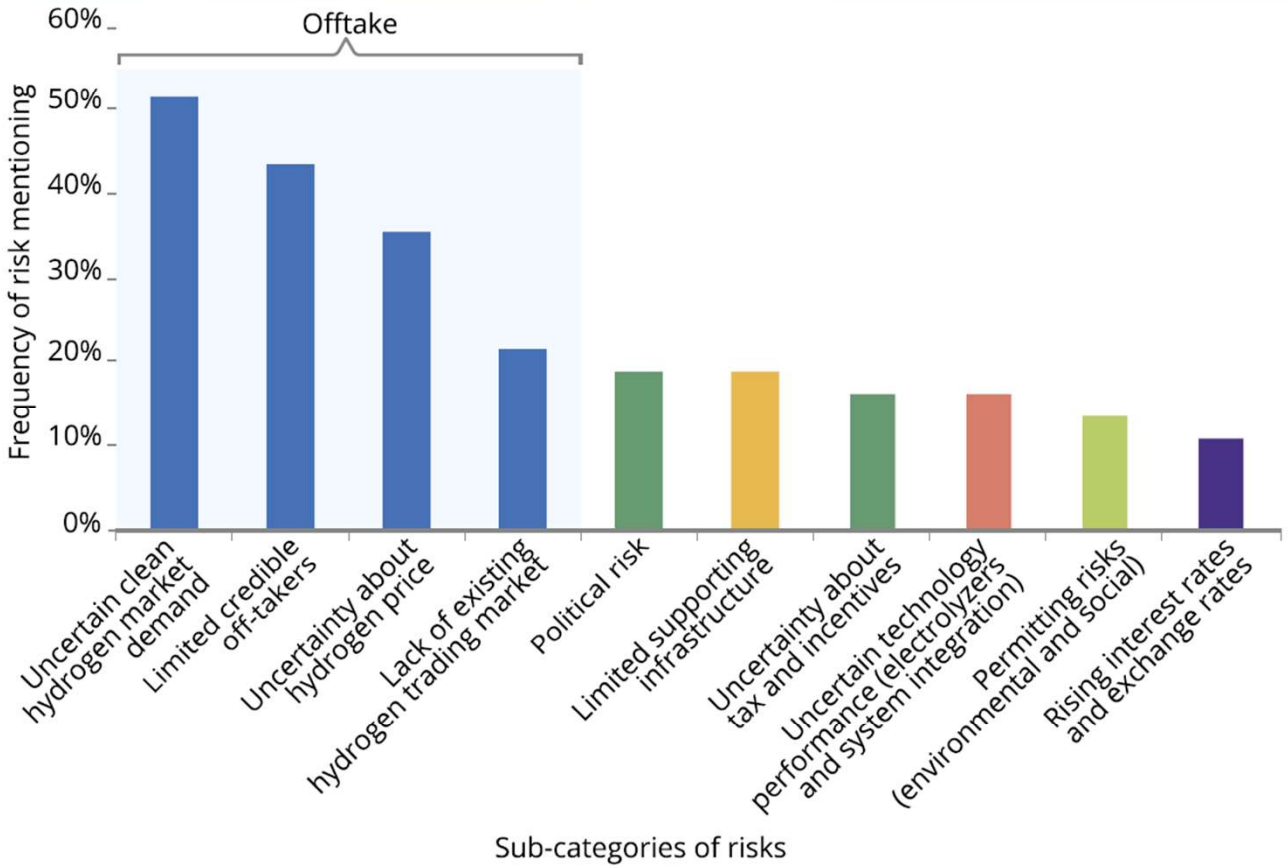
- Most advanced hydrogen projects are ammonia projects
- Ammonia for power – Japan and Korea – possibly 5 Mt by 2030
- Shipping
  - 90 ammonia-ready vessels (Clarkson data Jan 2023), 2 dual-fuel vessels (Exmar), CMB/Bocimar orders etc
  - DNV database 2 vessels + 1 tug boat on order
  - WinGD engineering, Warsila, MAN engine & systems design
- Nitrogen fertilizer prices vary widely
  - Early opportunities where prices are high and import dependency is high
  - CBAM – 100 USD/t CO2 translates into 150 USD/t ammonia more expensive grey
- Ammonia as hydrogen carrier – but cracking is relatively inefficient and therefore costly

Business Case



EPC: Engineering, Procurement and Construction; ESG: Environmental, Social and Governance; RE: Renewable Energy; H_2: Hydrogen
Source: Authors' analysis

Top Risks in EMDCs
Risk Mitigation Enables Hydrogen Projects to Secure Financing

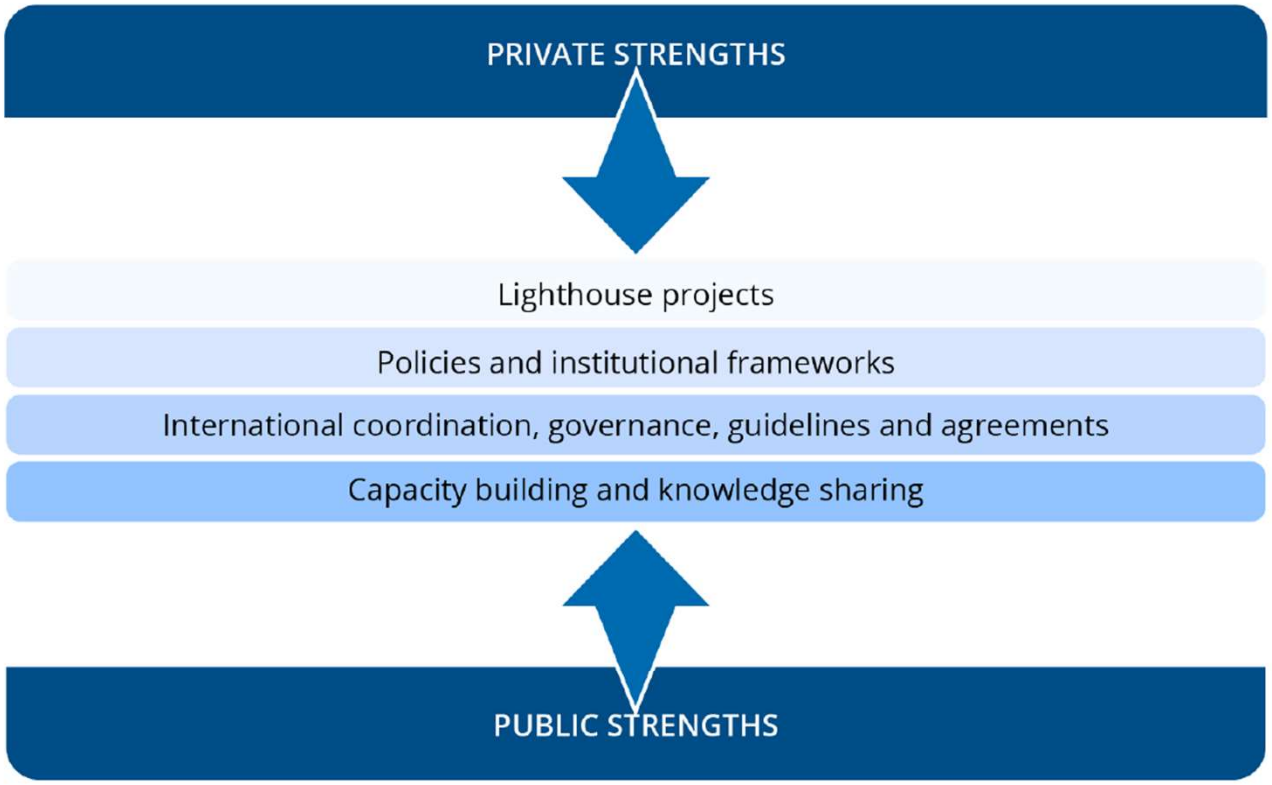


Source: Authors' analysis.

Offtake Risk

- Synonymous with “this stuff is more expensive, who will pay the premium”
- Offtake contracts specify price, duration, volume
- Delivery location and quality
- Generally offtake contact is shorter than the project life (NEOM exception)
- An MoU or a press release is not the same as an offtake contract
- Chicken or egg problems:
  - Who signs a long term contact when prices are expected to fall
  - Not project, no contract. No contract, no project.
- Possible solutions: regulated users, first movers (eg in shipping), carbon pricing, government support

Action Agenda to Accelerate Global Deployment of Hydrogen



Proposed solution: 10-GW Lighthouse projects in EMDCs

- Understand issues at specific project and supply chain level
- Debottleneck project pipeline in EMDCs
- Help to bring projects to FID
- A diverse set of countries and project environments (different products, etc.)
- Focus on existing pipeline of projects in 100 MW to GW scale
- Target >10 projects, more than 10 GW of electrolysis capacity deployed by 2030
- Initially specific countries and DFIs approached

From MoU to Action

- Many projects are stuck in early stages of development
- Need for a concerted effort to bring fairly sized projects to Final Investment Decision and reduce cost – 10 GW lighthouse initiative
- Important infrastructure needs warrant attention
- More focus on demand and offtake needed
- Innovative financing solutions including blended financing and risk mitigation are needed to enhance competitiveness

THANK YOU

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Energy Sector Management Assistance Program

Volgende kennissessies

- Volgende F2F sessies, 15.00 – 17.00 uur:
  - Woensdag 17 januari
  - Woensdag 20 maart
  - Woensdag 15 mei
  - Woensdag 10 juli
  - Woensdag 18 september
  - Woensdag 20 november
- Volgende Online sessies, 16.00 – 17.00:
  - Woensdag 21 februari
  - Woensdag 17 april
  - Woensdag 19 juni
  - Woensdag 16 oktober
  - Woensdag 18 december

17 januari	Agenda o.v.b.
14.30 – 15.00	Ontvangst
15.00 – 17.00	Kennissessie: • Tour de table • Financiering van projecten in ontwikkelingslanden | InvestInternational
17.00 – 18.00	Borrel

Sessie XI 20 december

Happy holidays!

SHIP>NL Sessie IX 18 oktober

Hartelijk dank voor uw aandacht

Vragen? Neem gerust contact met mij op:

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De slides van alle sessies zijn te vinden op:
SHIPNL: Sustainable Hydrogen Import Program Netherlands | Nationaal Waterstof Programma