Scaling Hydrogen Financing for Development

In support of

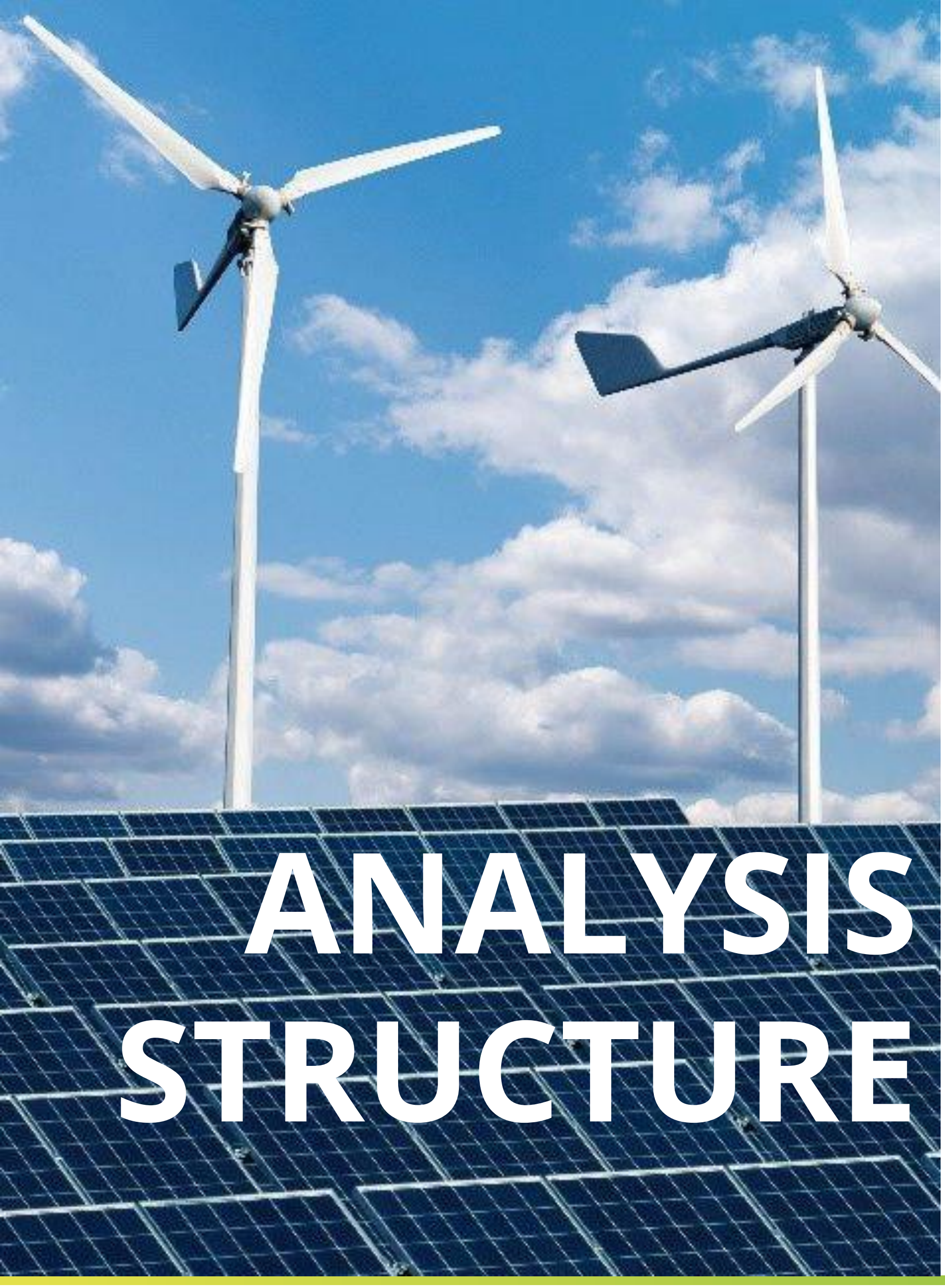
The World Bank

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.



ANALYSIS STRUCTURE

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

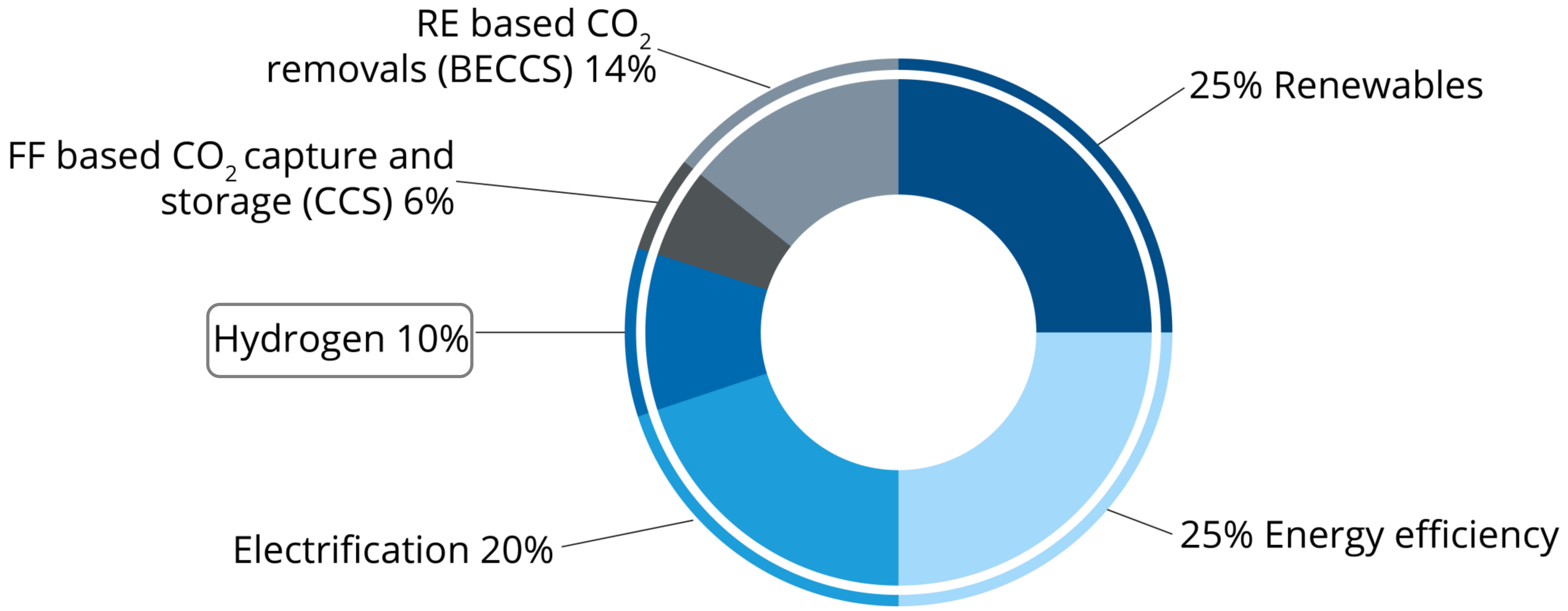
3 What are the risks hindering financing and
mitigation instruments to overcome them?

4 What to do ?
Implications for policy makers and DFIs

5 Recommendations for COP28
and decision makers

Renewables, efficiency and electrification dominate energy transition BUT clean hydrogen represents 10% of the solution

Reducing emissions by 2050 through six technological avenues



90% of all decarbonisation in 2050 will involve renewable energy through direct supply of low-cost power, efficiency, electrification, bioenergy with CCS and green hydrogen.

Source: IRENA

THE WORLD BANK IBRD • IDA   ESMAP Energy Sector Management Assistance Program   OECD   Global Infrastructure Facility A G20 INITIATIVE   Hydrogen Council

Current use in ammonia fertilizer production and refineries
Future use in steelmaking, shipping, aviation, trucks, electricity storage

Existing industry →

100 Mt of hydrogen produced and consumed per year as an **industrial feedstock** (refineries & ammonia production)

2% **clean hydrogen** (1% green, 1% blue), 98% grey hydrogen

900 Mt **of CO2 emissions/yr.** and upstream methane

4x – 6x **increase in hydrogen demand** by 2050

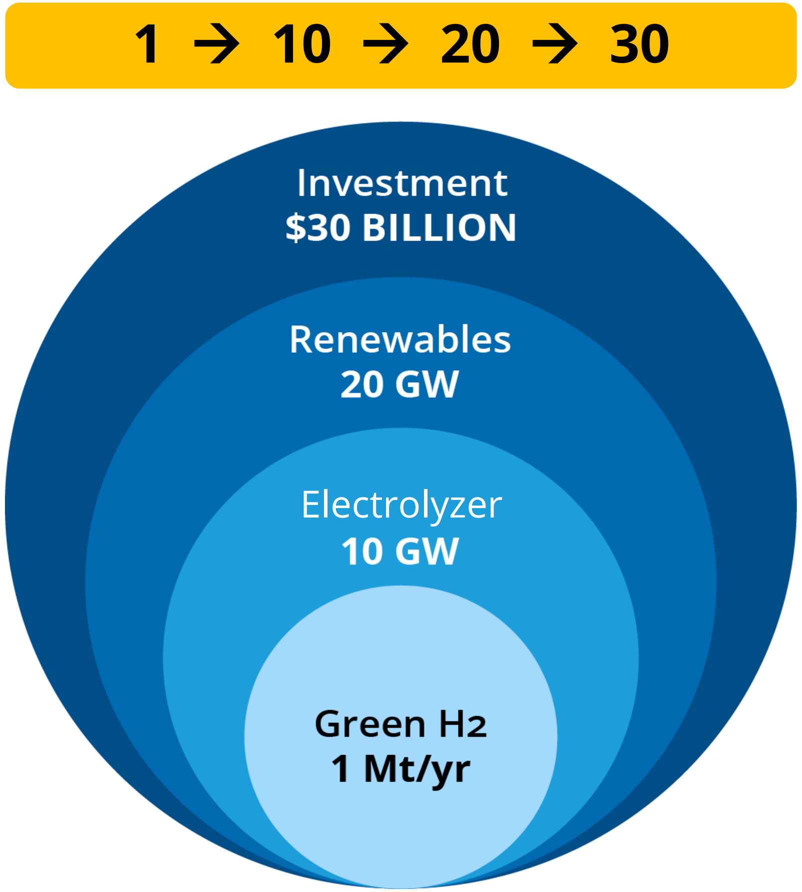
Green hydrogen is a key enabler in decarbonizing hard-to-abate sectors

A very capital-intensive industry

US $100 billion

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

- Expectation is **25% blue** and **75% green hydrogen** production in the next 25 years
- 80% of production investment needs for green hydrogen, 20% for blue
- 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 green hydrogen projects more difficult
- Initial projects are typically “on the books” of large companies



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Scaling Up Clean Hydrogen Financing Solutions for Development and Decarbonization

<2 Mt/yr. clean H_2 produced globally in 2022

<1 GW in global installed electrolyzer capacity for clean H_2 in 2022

Global financing gap of **$500B** until 2030. Need for policy measures to close gap

Global investment need until2030: **$2T**
$1T (production);
$0.5T (transport infrastructure);
$0.5T (end-use sectors)

Global clean H_2 production: **27 Mt** renewable and **13 Mt** low-carbon by 2030
260 GW in new solar and wind capacity needed

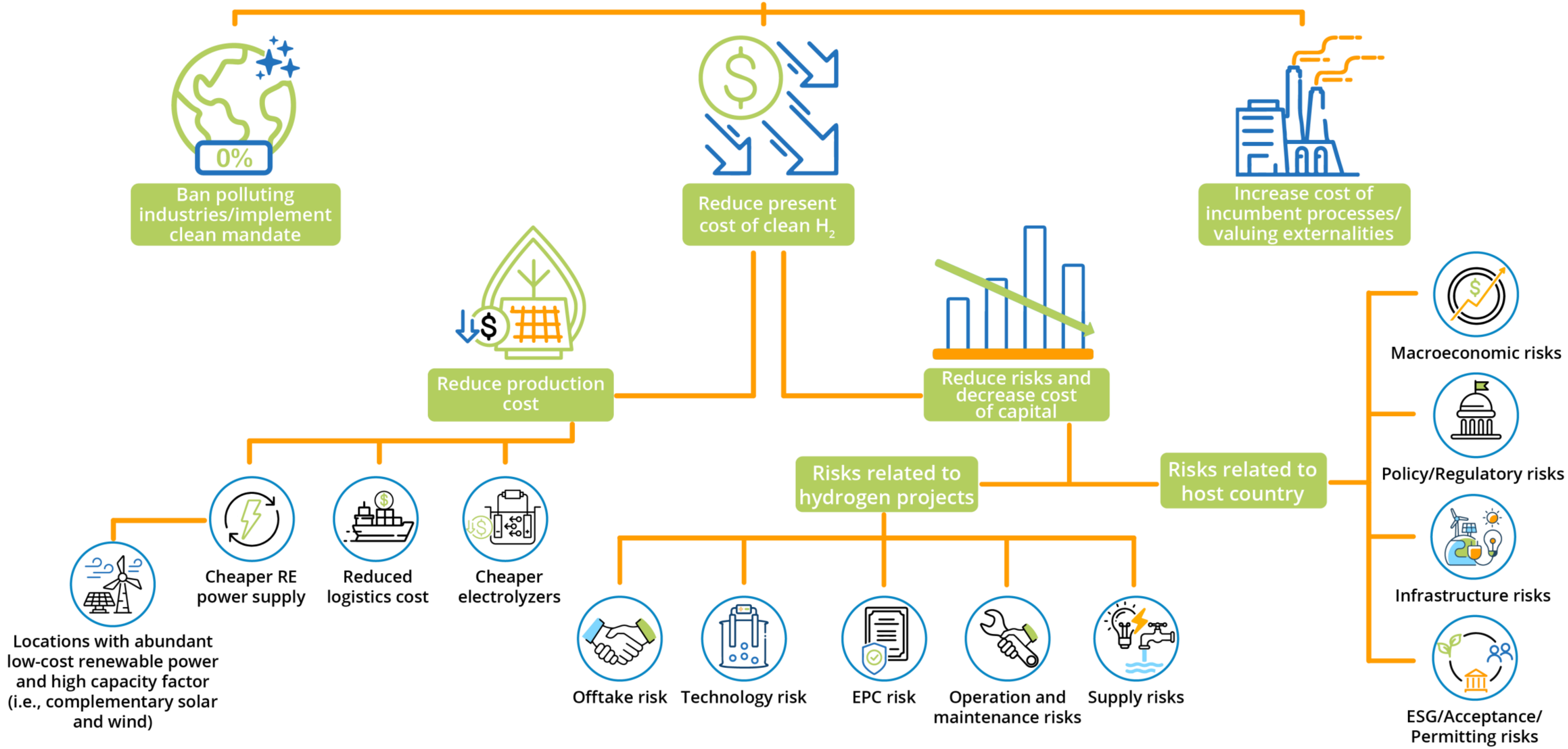
Renewable H_2 accounts for **80%** of production investment. Renewable power accounts for **60%** of EMDC investment needs

Global Clean H_2 demand (and production) **40 Mt** until 2030 with **20 Mt** expected in EMDCs

Total annual EMDC financing needs until 2030: **$100B/yr.**
Annual EMDC financing gap until 2030: **$10B-$40B/yr.**

EMDC: Emerging Markets and Developing Countries; $ refers to USD
Source: Authors' analysis

Business Case



EPC: Engineering, Procurement and Construction; ESG: Environmental, Social and Governance; RE: Renewable Energy; H2: Hydrogen
Source: Authors' analysis

Clean Hydrogen: Status, Projections, and Scenarios

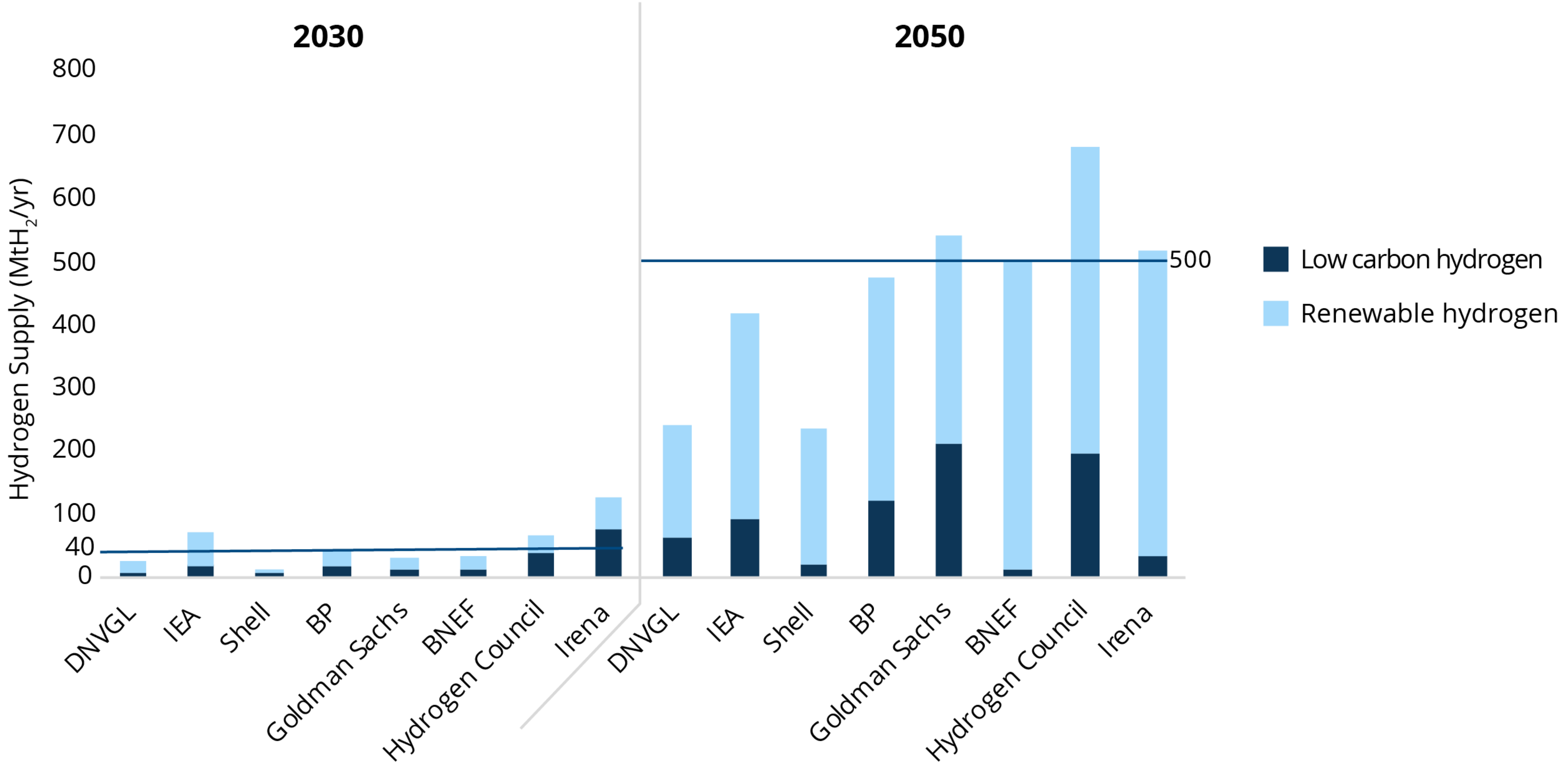
Key Points

- Clean hydrogen can play an important role in the energy transition, but current global production is very limited, representing less than 2 percent of total hydrogen production.
- A global supply of 40 Mt of clean hydrogen is expected by 2030. Clean hydrogen production from emerging markets and developing countries (EMDCs) can grow to half - 20 Mt by 2030.
- To comply with the 1.5°C scenario under the 2015 Paris Agreement on climate change, requires annual investments of almost $1 trillion between now and 2050, more than a 150-fold increase from present levels.
- Less than 10 percent of all projects announced worldwide have reached the stage known as "final investment decision" (FID). These projects represent investments of $29 billion and will produce 2 Mt a year of clean hydrogen: 1.1 Mt of low-carbon hydrogen (all in North America) and 1 Mt of renewable hydrogen.
- Presently, 39 percent of all global clean hydrogen projects under development are in EMDCs. Six large renewable hydrogen projects (>100 MW capacity) in EMDCs have reached the FID stage, three of them in China.
- The projected hydrogen growth need translates into an investment need of $100 billion per year between now and 2030 in EMDCs.

Key Points

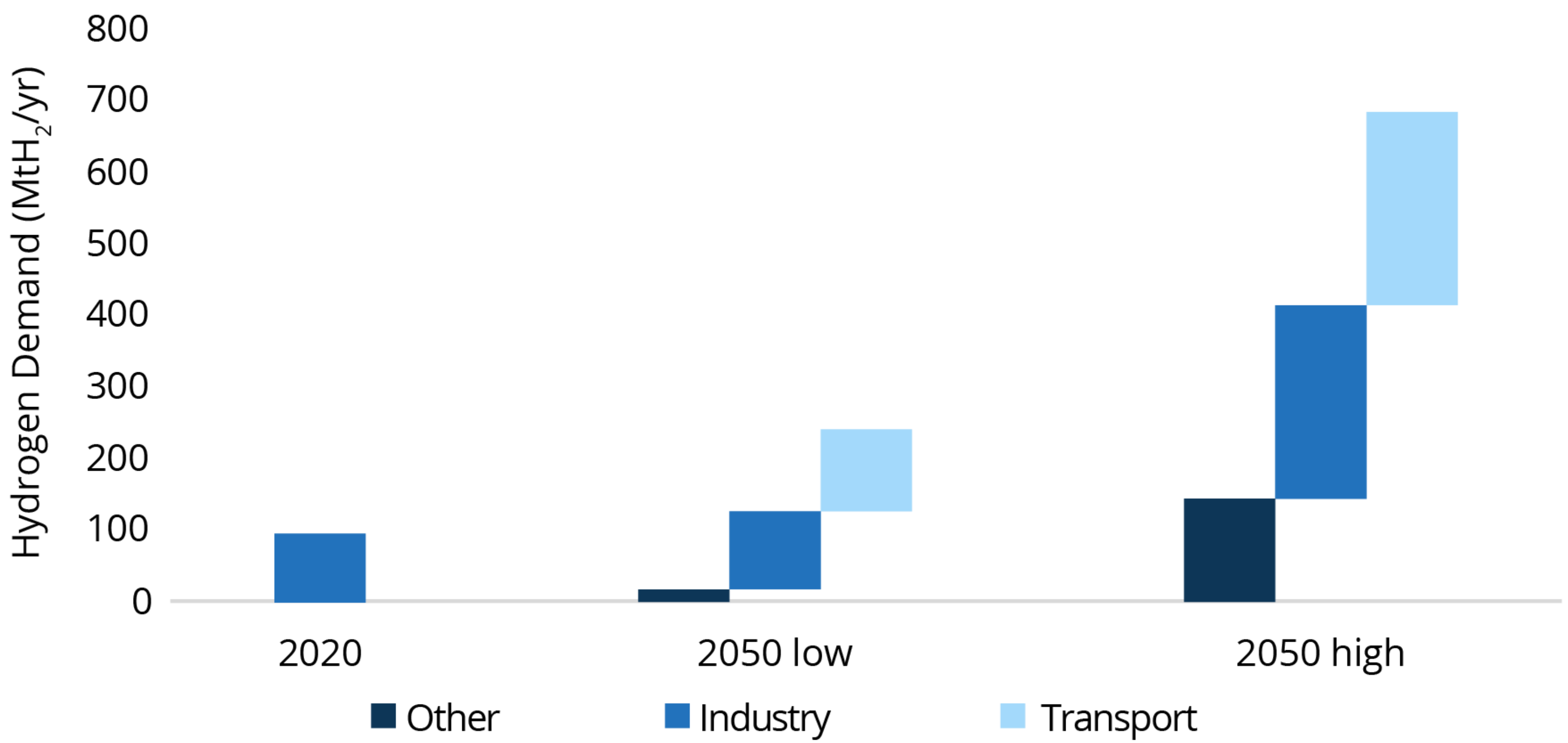
- Clean ammonia projects amounting to 133 Mt have been announced in EMDCs. Of the total capacity, only 1.6 Mt is under construction (representing 1.2 percent of the announced projects).
- A quarter of the 4.5 Mt e-methanol projects that are expected worldwide by 2027 is set to be located in EMDCs.
- Total global renewable steel production capacity announced as of August 2023 could amount to 40 Mt by 2030, which would imply hydrogen demand of around 4 Mt. Capacity announcements in developing countries are growing fast.
- Modeling studies suggest that 25 to 31 percent of hydrogen production will be traded internationally by 2050, roughly half through pipelines and half as hydrogen or hydrogen-derived commodity shipments. The prospect of such trade is a production opportunity for EMDCs.
- The capacity under development in EMDCs represents less than 10 Mt of hydrogen by 2030, but the number of projects under development is growing.
- Four key business models appear to drive hydrogen development.

Hydrogen in the Global Energy Transition and Decarbonization Scenarios – 40 Mt by 2030 and 500 Mt by 2050



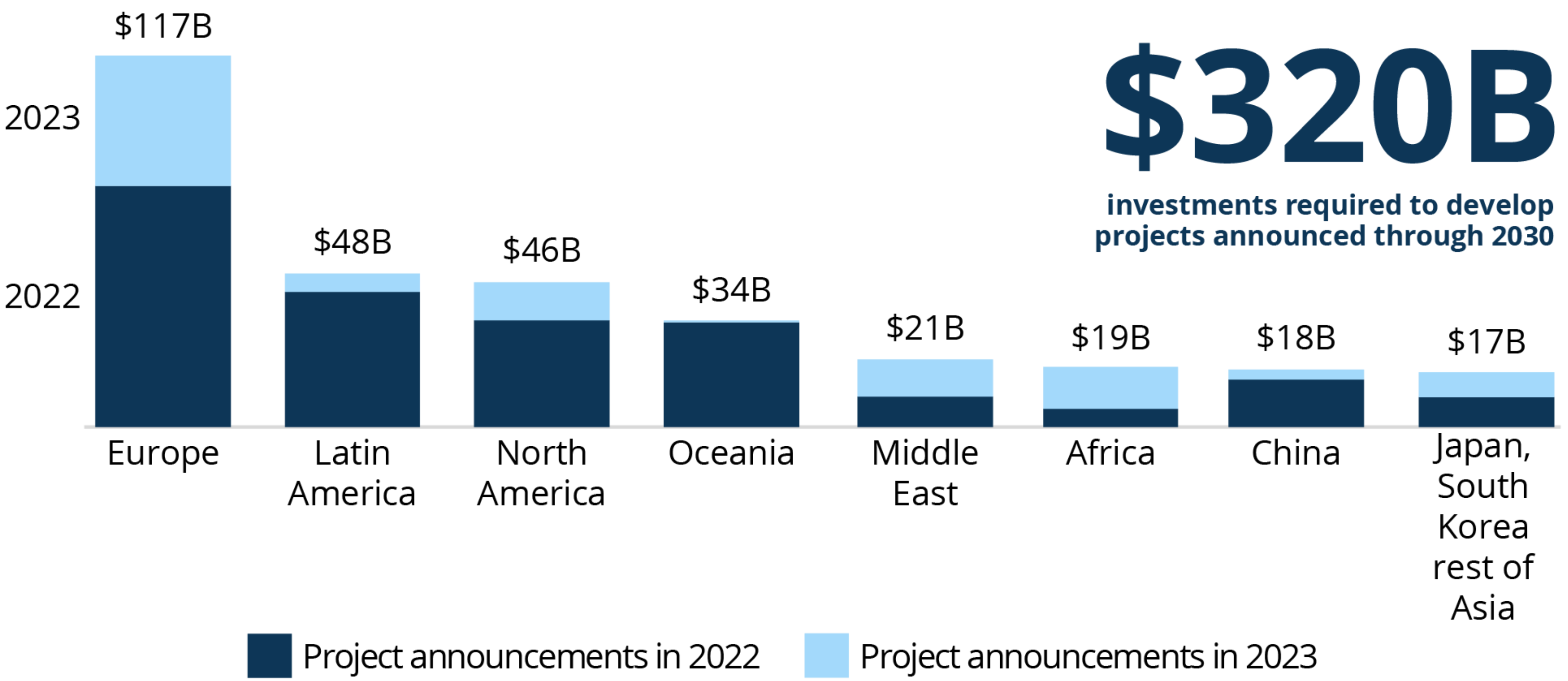
Sources: DNVGL, IEA, Shell, BP, Goldman Sachs, BloombergNEF, Hydrogen Council, IRENA

Global Hydrogen Consumption Scenarios
Industry and Transport applications dominate



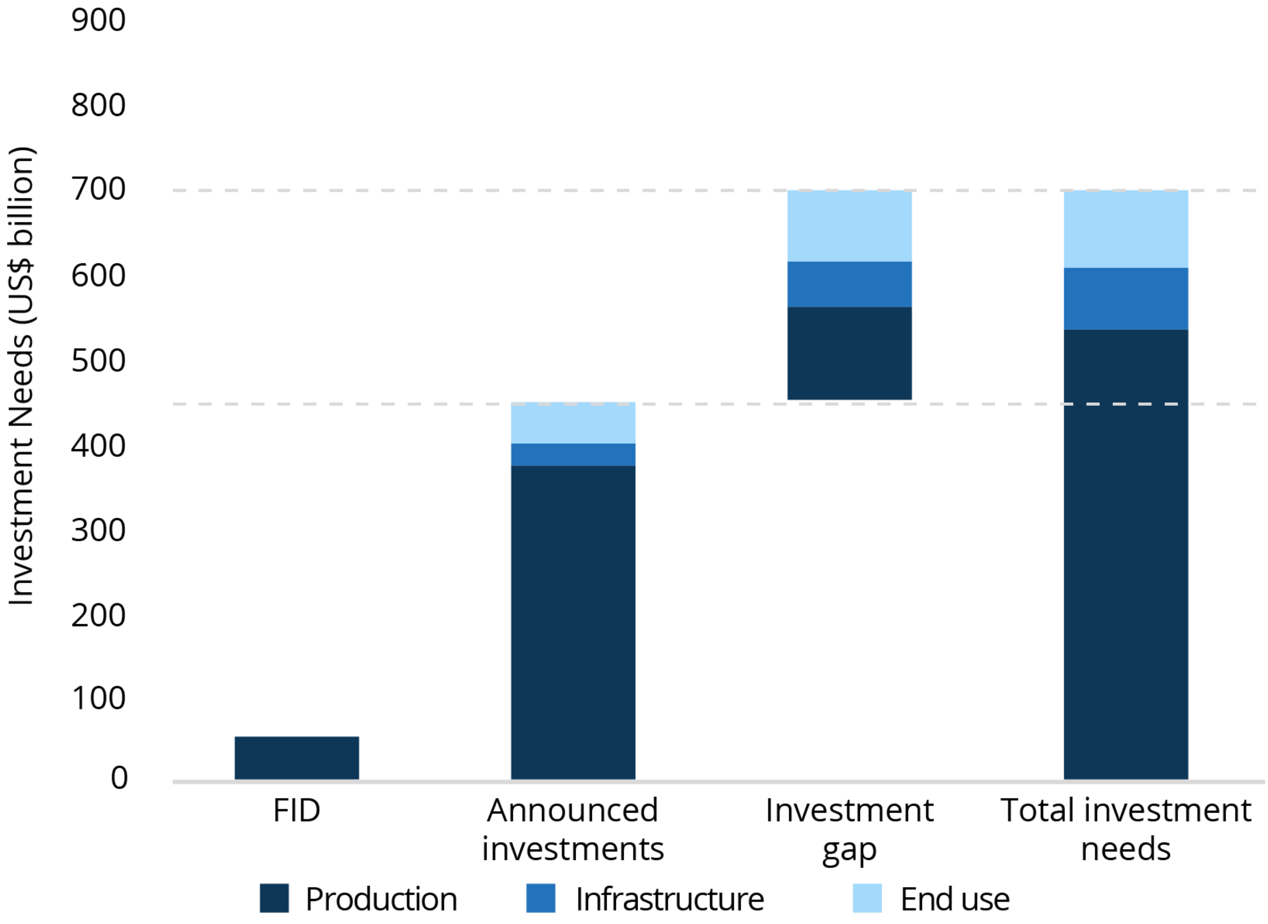
Source: Shell/DNV GL and Hydrogen Council Net Zero scenario.
Note: The industry and transport use cases include hydrogen derivatives such as ammonia, methanol, and synthetic jet fuel.

Investment Needed to Develop Announced Projects Covering the Hydrogen Value Chain Through 2030 (billions of U.S. Dollars), and Project Investment Volume Growth 2020–23



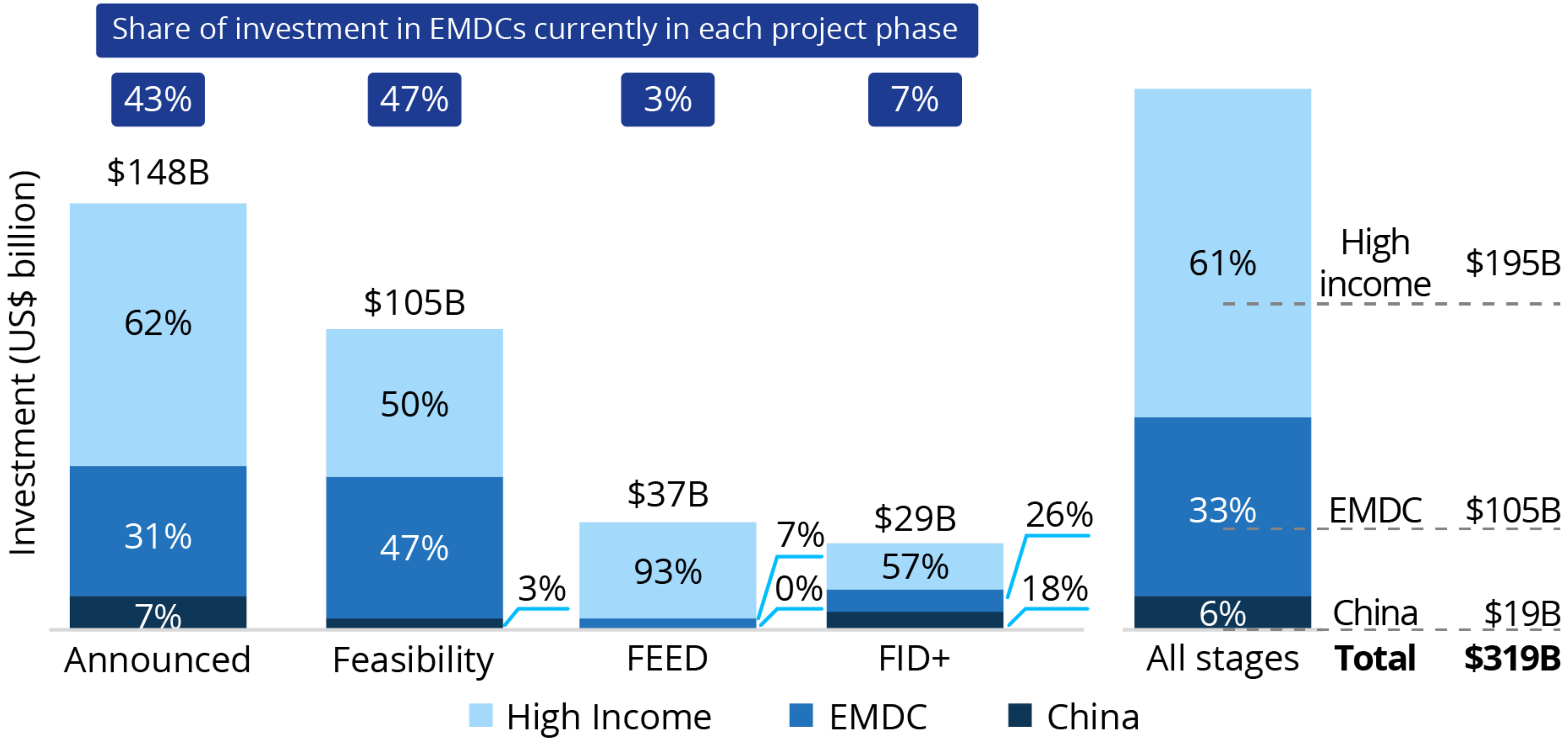
Source: The figure was adapted from Hydrogen Council 2022.
Note: Dark blue represents project investments in 2022; light blue, project announcements in 2023 across the value chain. Excludes the renewable power component.

EMDC Investment Needs Through 2030 USD 100 bln/yr



Source: World Bank analysis based on Hydrogen Council and McKinsey (2023).

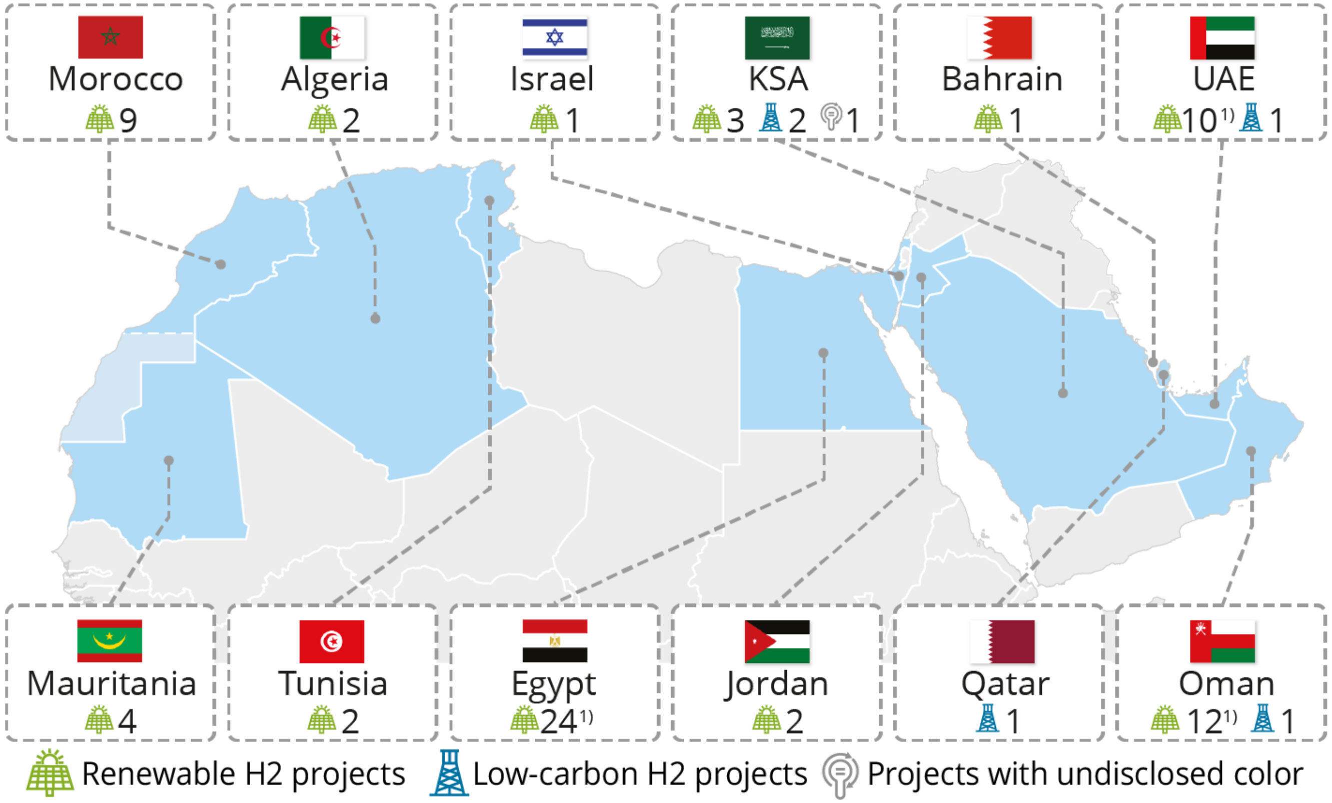
Breakdown of the Global Clean Hydrogen Project Pipeline by Country Group and Project Phase Through 2030 (In US$ billion)



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.

Clean Hydrogen Project Announcements in the Middle East & North Africa, by Country (as of Q3 2023)

Total of 76 projects across MENA with >85% projects geared towards producing renewable hydrogen



1) Includes some yellow H2 projects

IBRD 47560 | OCTOBER 2023

Source: DII and Roland Berger 2023.

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Categorization and Examples of Business Models

Model 1

Decarbonizing existing processes

Oil refineries deploying clean hydrogen

Examples:

Adnoc, Ecopetrol, Exxon Mobil, Reliance, Saudi Aramco, Shell, Sinopec

Gas producing and transporting companies deploying clean hydrogen

Examples: Gassco, Qatar Energy, SNAM

Fossil fuel-based power producers deploying hydrogen or ammonia in existing power plant

Examples: Utilities in Japan and Korea

Ammonia producers deploying clean hydrogen

Examples: Fertiglobe, OCI, Yara<

Model 2

Export model

Existing fossil fuel companies moving into clean hydrogen production

Examples: BP Australia, Equinor/Scatec Egypt, Sasol South Africa, Shell Oman, Total Eren Mauritania

New players entering the clean hydrogen industry

Examples: CWP Mauritania, Hyphen Namibia, Renewable Solutions (TSG) Vietnam<<<<<

Model 3

Utilities and OEMs going downstream to create larger markets

OEMS and renewable project developers:

Examples: Electricity utilities ACWA power (NEOM Saudi Arabia, Cambodia, Uzbekistan), Engie, Iberdrola

Orsted (offshore wind projects) and Vestas (wind turbines) plan to go into offshore hydrogen production; some Chinese photovoltaic manufacturers and the Chinese wind turbine manufacturer Enlit have entered hydrogen manufacturing.

Model 4

Hydrogen hubs

Hydrogen hubs are networks of hydrogen producers, consumers, and local connective infrastructure to accelerate the use of hydrogen as a clean energy carrier and feedstock. The hubs are not single facilities but refer to a collection of linked assets that will work together to develop the domestic hydrogen economy.

Examples: The Mission Innovation hydrogen Valleys platform counted 83 hydrogen valleys or hubs worldwide across 33 countries with a total investment volume of $ 140 bln as of September 1st https://h2v.eu/

2 Technical and Economic Cost Assessment

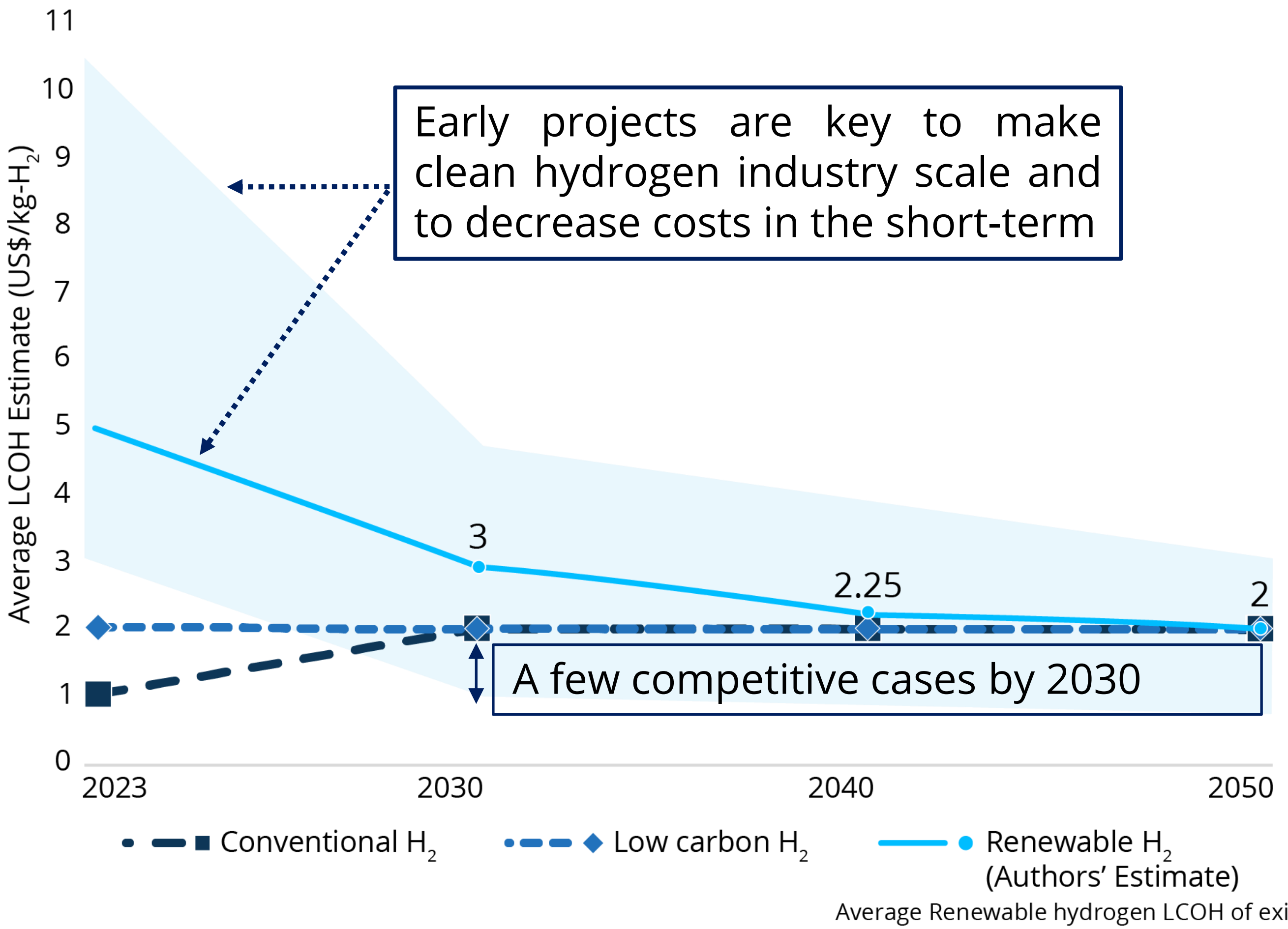
Key Points for Technical and Economic Cost Assessment

- **Insufficient information** available on costs and prices for clean hydrogen today to guide policymaking and investment decisions.
- More accurate hydrogen cost and pricing information is urgently needed.
- Clean hydrogen production costs vary widely by region, country, and project type.
  - Under favorable conditions, the production cost is
    - **\$1/kg-H_2 for conventional hydrogen** (correlated with natural gas price)
    - **\$2/kg-H_2 for low-carbon hydrogen** (produced from gas or other fossil fuels with CCS)
    - **\$3/ kg-H_2 for renewable hydrogen** (produced from solar/wind) for best-in-class projects; this can be greater than \$10/kg where renewable resources are inadequate and financing costs are high
- Desirable factors to produce cheap renewable H_2 **low-cost renewable power supply**, **low capital cost of electrolyzers, and access to low-cost financing.**
- Market information suggests **stable or rising electrolyzer costs in the last two years.**

Key Points for Technical and Economic Cost Assessment contd…

- Global cumulative investment of **US $1 trillion** (including in renewable power supply) is needed to reach a **clean hydrogen production capacity of 40 Mt per annum by 2030.** If we add cost of infrastructure and end use, this increases to **US $2 trillion**.
- Global gap between financing needed and financing available is **US $0.5 trillion** (best case scenario US $174 billion).
- **25% to 50% of the total global financial support would be directed to EMDCs** between now and 2030.
- EMDCs' share of the financial support needs ~**US $10-$40 billion annually between now and 2030**.
- **Transport and storage costs will affect the competitiveness** of renewable hydrogen.
- **Intercontinental shipping of hydrogen can double the landed cost of renewable hydrogen;** implications for **relocation of industrial production of green hydrogen derivatives**.
- National governments can reduce the financial support required through **(1) innovation, (2) careful choice of projects, (3) developing and supporting niche markets willing to pay a premium for clean hydrogen, (4) pricing the externalities of emissions greenhouse gases, and (5) access to low-cost financing.**
- **Early action could set in motion a virtuous cycle** of cost reductions and lower needs for financial support.

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



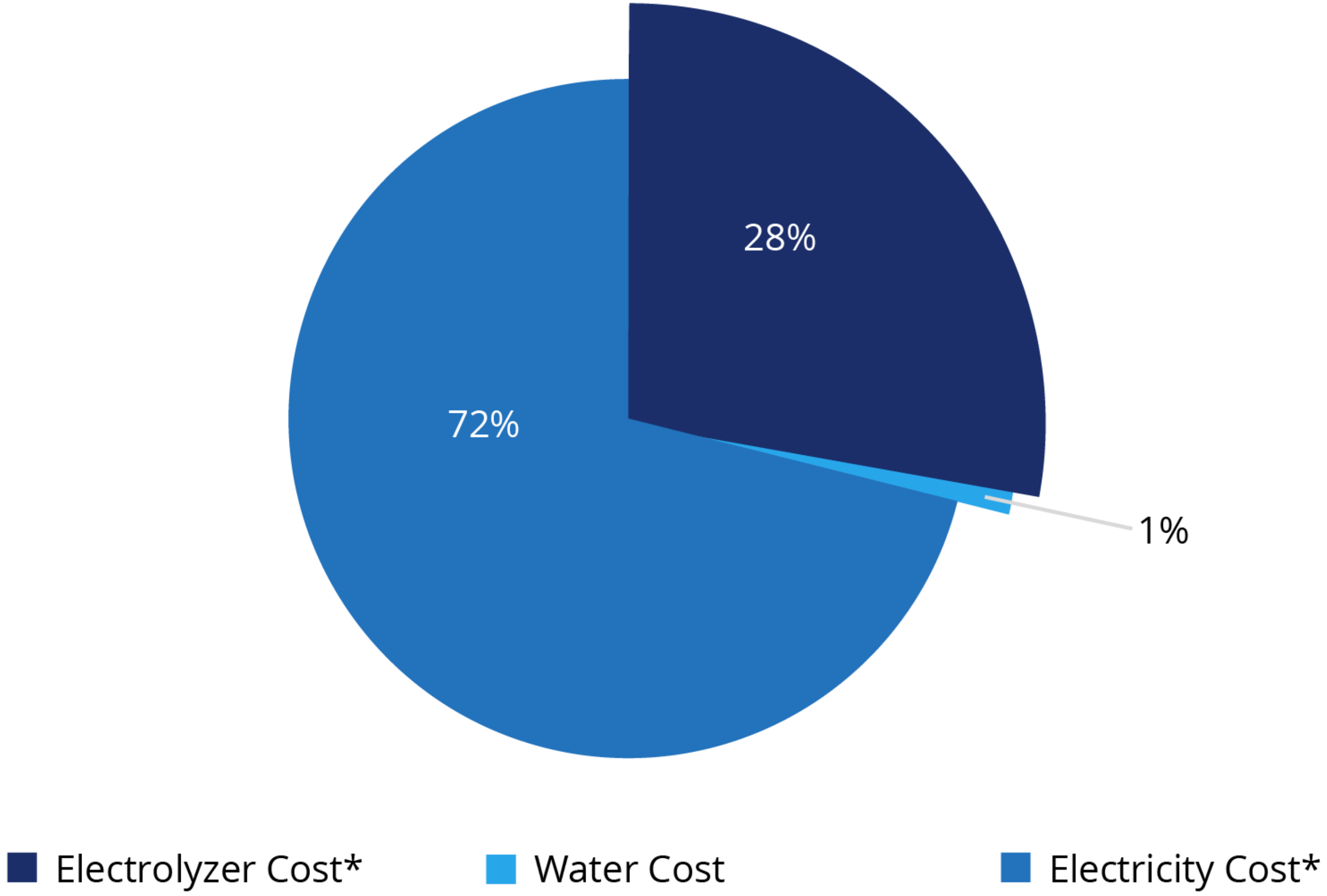
Hydrogen costs today follow **"1-2-3" rule i.e.**

- **$1/kg-H2** for conventional hydrogen
- **$2/kg-H2** for low-carbon hydrogen
- **$3/ kg-H2** for renewable hydrogen

The light blue shading represents range of cost estimates from existing studies for renewable H_2 today.

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

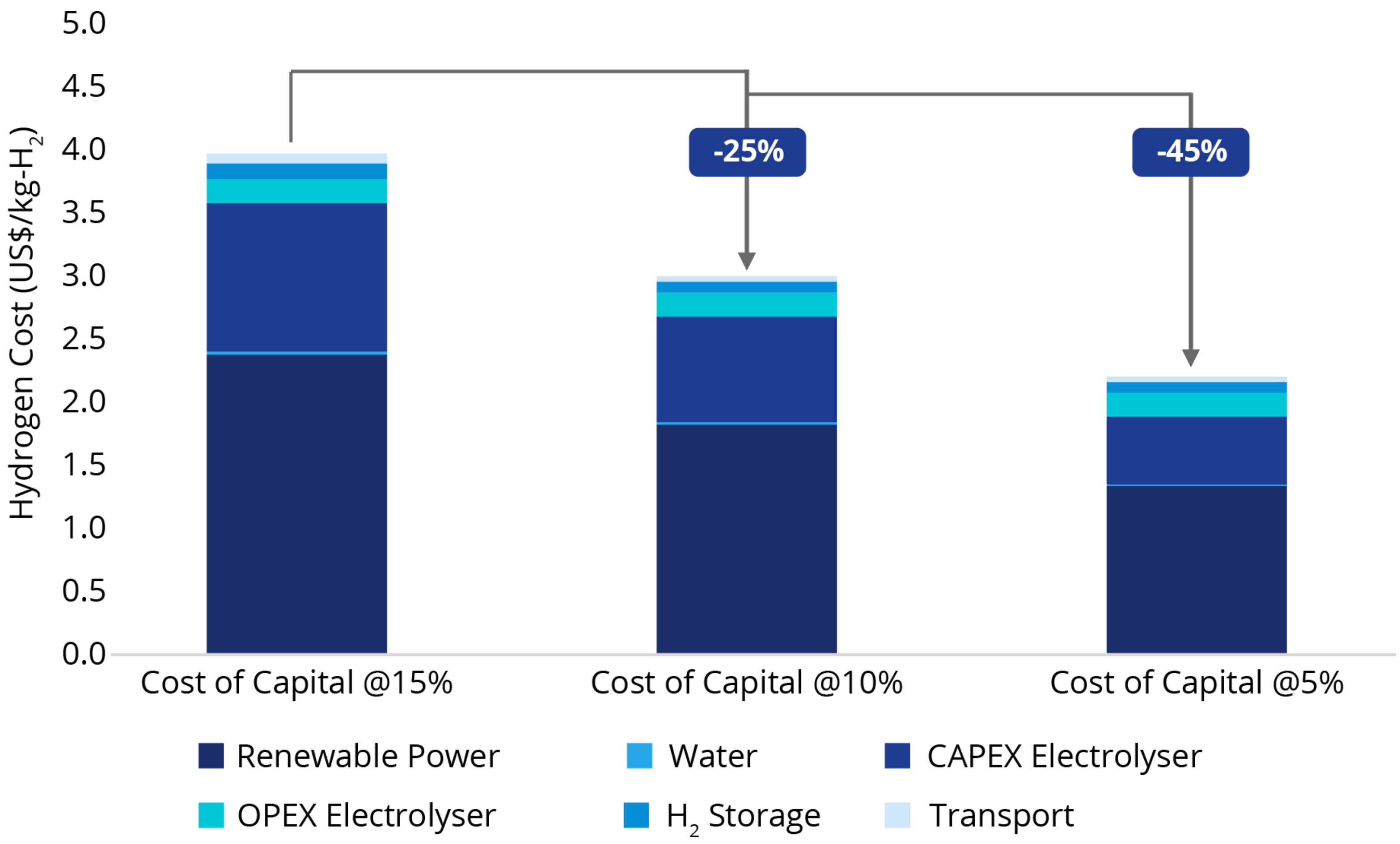
The breakdown of the best-in-class renewable hydrogen projects with an LCOH of $3/kg-$H_2$ illustrates the importance of cheap renewable power



* includes CAPEX and OPEX

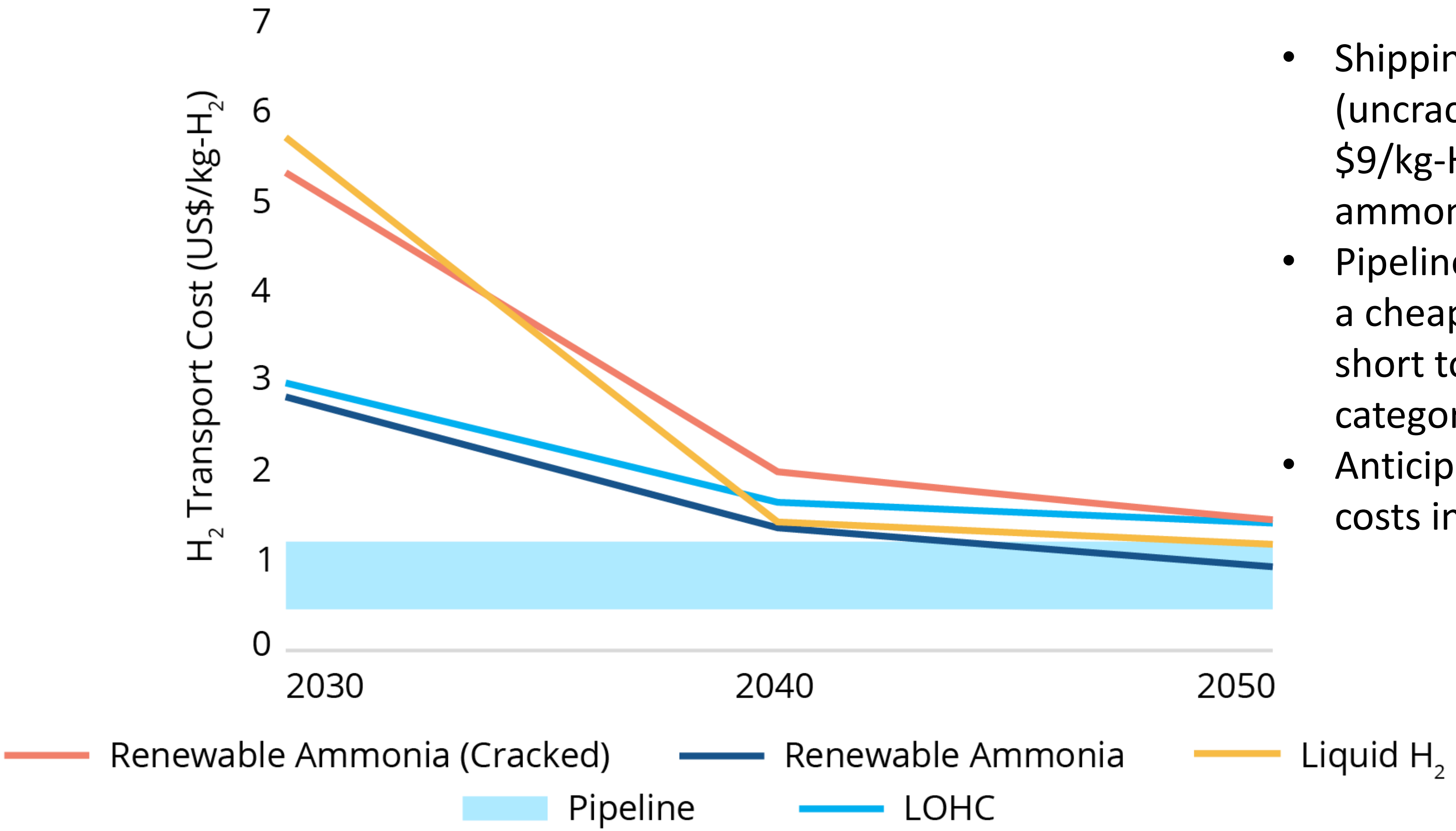
Source: Authors' calculation.

Cost of capital impacts LCOH for renewable hydrogen significantly



Source: Authors' estimates.

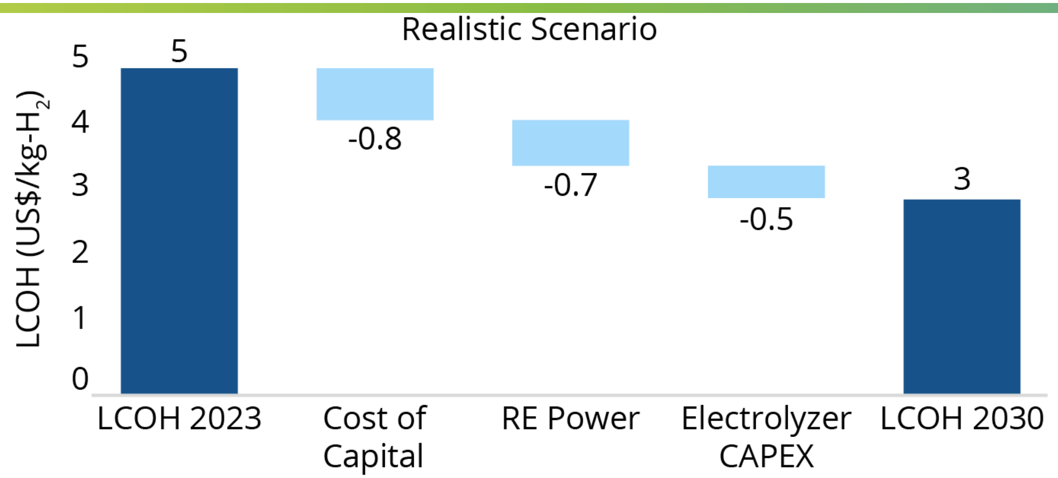
Transport and storage costs can impact hydrogen production cost significantly

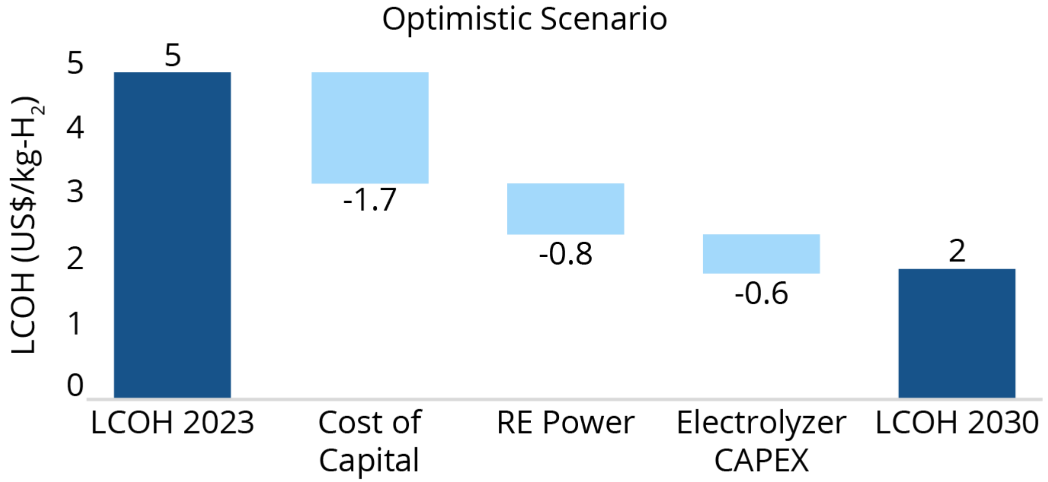


- Shipping cost: $3/kg-H2 (uncracked ammonia) and $9/kg-H2 (cracked ammonia)
- Pipeline will continue to be a cheaper option in the short to medium distance category
- Anticipated convergence of costs in the long term

Source: Authors' elaboration and projection based on data from Saygin et al. (2023), IRENA (2023), and IEA (2023)
LOHC: liquid organic hydrogen carrier

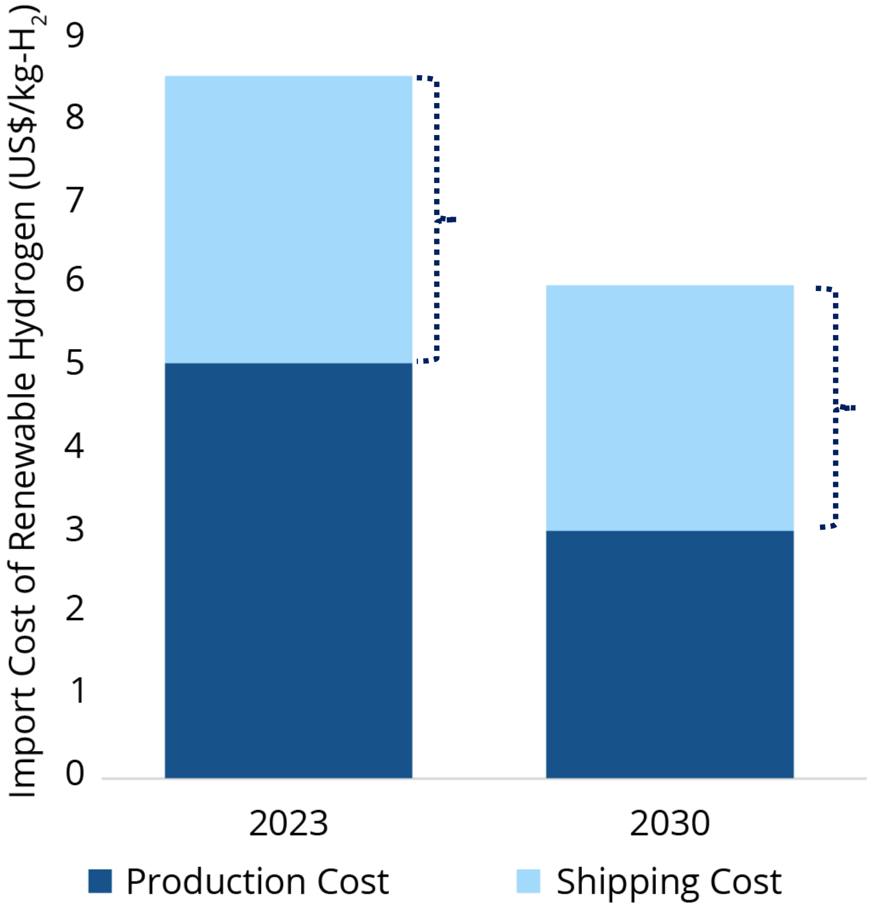
Projected reduction in LCOH for renewable hydrogen between 2023-2030 across scenarios; cost of capital continues to be a key determinant





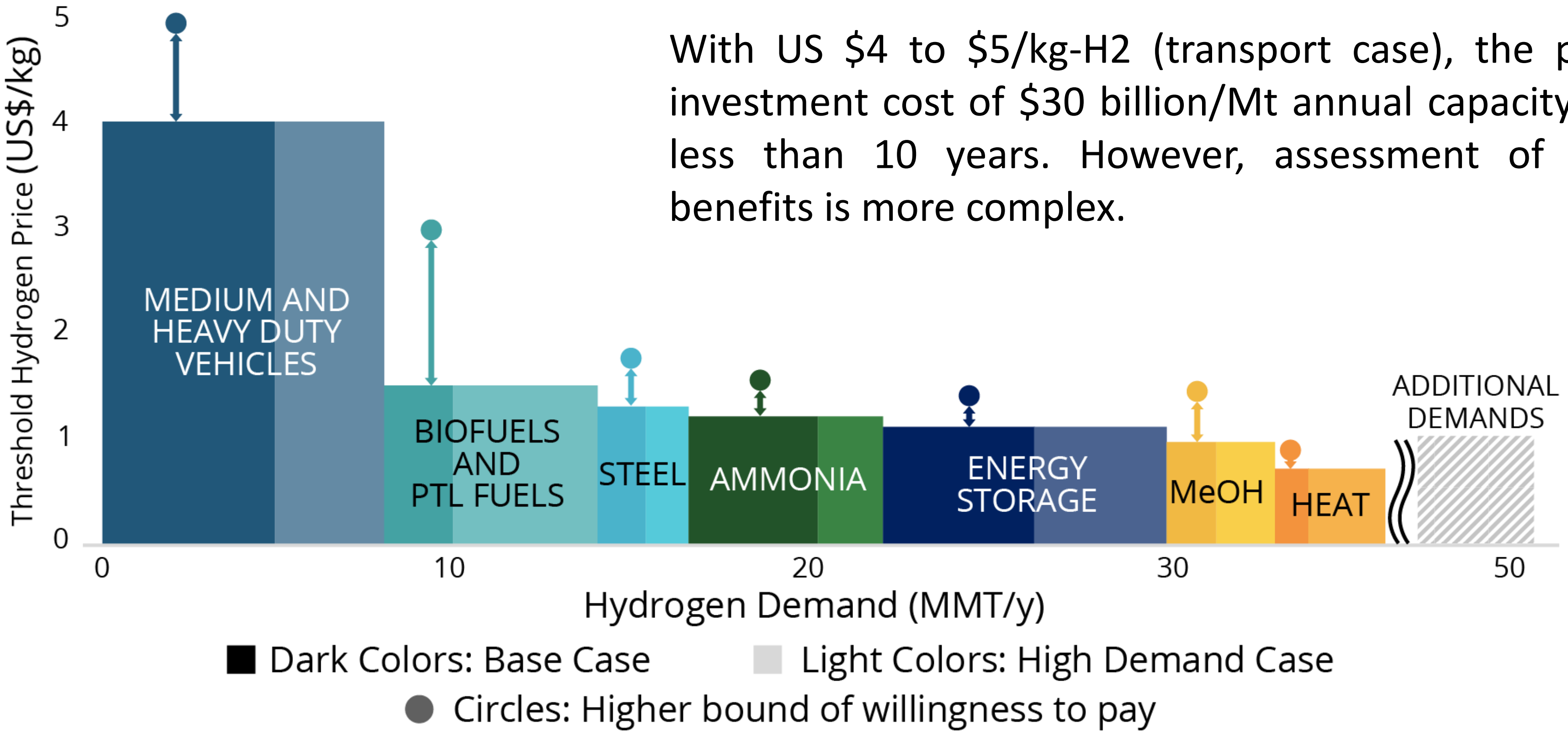
Source: Authors' estimates.

The importance of shipping cost for total supply cost



Source: Authors' estimates.

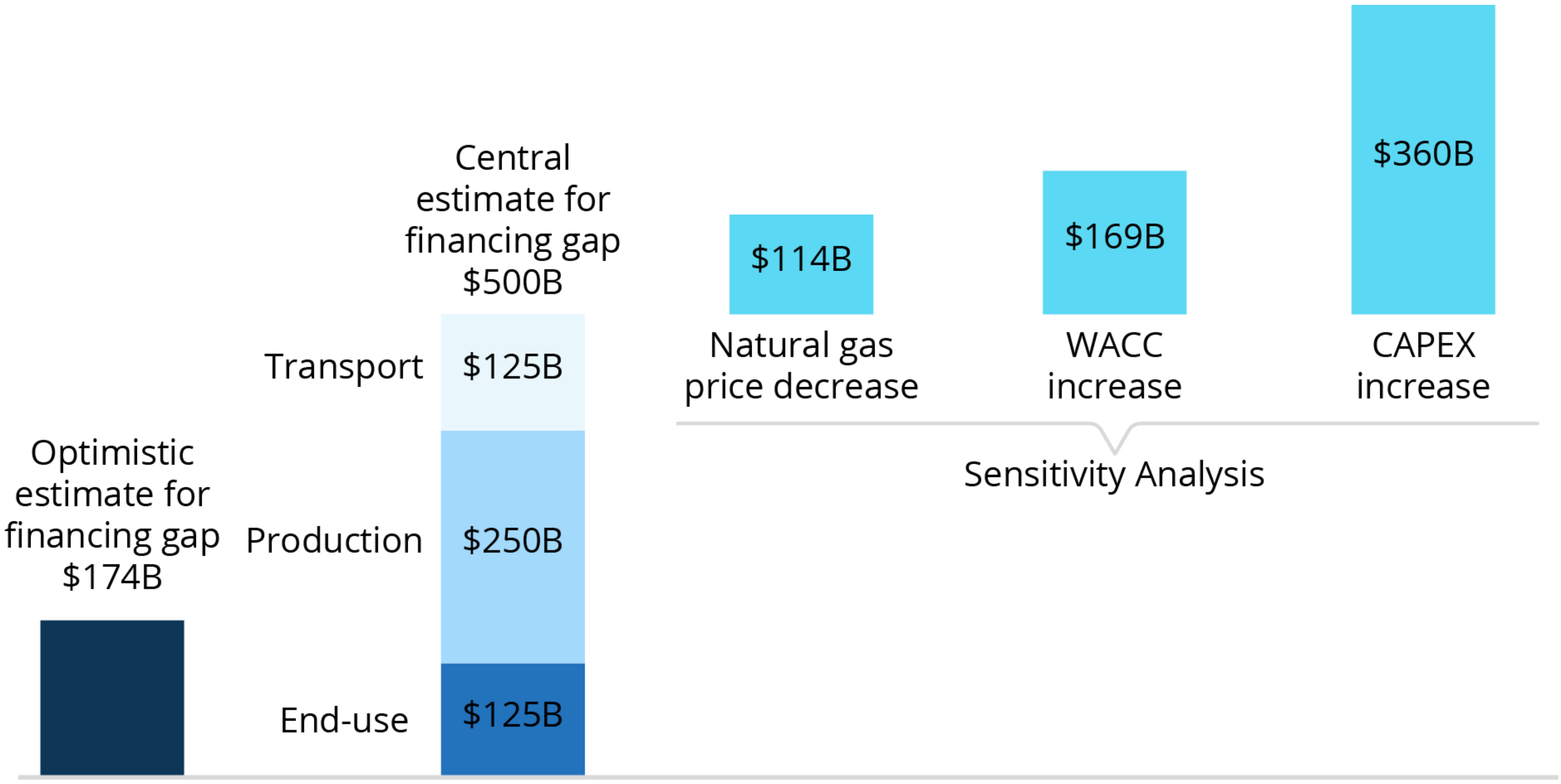
Willingness to pay for clean hydrogen in the United States



With US $4 to $5/kg-H2 (transport case), the payback of investment cost of $30 billion/Mt annual capacity would be less than 10 years. However, assessment of costs and benefits is more complex.

Source: US Department of Energy (DOE), 2023

Estimation of financing gap under various assumptions, 2023–30



Source: Authors' estimates.

3

Financing the Clean Hydrogen Value Chain: Risks and De-risking Mechanisms

Key Points

- Large clean hydrogen projects in emerging markets and developing countries (EMDCs) face high financing costs derived from actual and perceived risks, deterring investors to enter in this nascent industry.
- These risks can be divided into two categories: (A) those common to all large infrastructure projects in EMDCs, which can be subdivided in four sub-categories, and (B) those specific to the nascent low-carbon hydrogen industry, which can be subdivided in five sub-categories. Both categories of risk must be carefully evaluated to avoid unwarranted increases in the cost of clean hydrogen projects.
- Several risks influence the cost of capital for clean hydrogen projects (category B). These specific risks center on engineering, procurement, and construction (EPC) overruns, offtake default, technology nonperformance, withdrawal of regulatory incentives, and exchange rates.
- Implementing cost-effective and efficient de-risking mechanisms could substantially decrease the weighted average cost of capital, making projects economically viable, which will result in accelerating their deployment and reducing the financing gap.
- The World Bank and the Organisation for Economic Co-operation and Development (OECD) performed a robust market sounding among financiers and developers around the world to map the main risks hindering the financing for clean hydrogen projects in EMDCs.
- The results show the prevalence of six sub-categories of risks. In order of priority: offtake risks stand out, followed by equally weighted political and regulatory risks; infrastructure risks; permitting risks; and technology risks, and finally macroeconomic risks. The three sub-categories of risks that were given a lower priority are: design, construction and completion risks; operational and maintenance risks; and supply risks.

Key Points

- In today's nascent clean hydrogen industry, the degree of a particular project's risk largely depends on the actors involved. Evaluating the creditworthiness, experience, and credibility of project sponsors, EPC contractors, primary technology providers, and offtakers must feature prominently in any risk assessment. As such, it is critical that governments of EMDCs choose reputable partners.
- Risk assessments should be followed by both policy and financial de-risking mechanisms.
- Policy de-risking mechanisms aim at removing the root causes of risks through policy measures. They include instruments to support institutional capacity building, local skills development, the implementation of relevant laws, and the management of infrastructure assets.
- Financial de-risking mechanisms deploy financial measures to avoid or reduce project risk. Only through both categories of risk mitigation mechanisms can large-scale clean hydrogen projects in EMDCs achieve financial viability.
- Governments of EMDCs can collaborate with development finance institutions to devise and implement a wide spectrum of financial de-risking instruments for clean hydrogen projects, tailored to the needs and characteristics of each country. Such instruments include partial credit guarantees, partial risk guarantees, political risk insurance, liquidity reserve accounts, and local currency support.

Categories and sub-categories of risks affecting the financing of clean hydrogen projects, de-risking mechanisms and prevalence in project lifecycle.

Category A - Risks related to investing in large infrastructure assets in EMDCs

Risks	Policy or Financial Risk Mitigation Mechanisms	Prevalence in project lifecycle: Pre-FID	Prevalence in project lifecycle: Post-FID	Top risks
(I) Macroeconomic risks • Currency depreciation • High inflation • Spike in interest rates	• FX hedging • Build a robust project finance model • Interest rate swaps • Fixed rate loan	✓	✓	★
(II) Political and regulatory risks • Expropriation • Breach of contract • Absence, inconsistency, or modification of legal framework • War or civil unrest • Limitations in currency inconvertibility and transferability • Uncertainty about taxes and incentives	• Political risk insurance • Enhanced rule of law • Sound and predictable regulatory framework	✓	✓	★
(III) Infrastructure risks • Limited enabling infrastructure • Underestimation of enabling infrastructure • Delay in deployment of infrastructure	• Public-private partnerships • Hydrogen hubs • Development of a feasible infrastructure master plan • Regulation for shared infrastructure	✓		★
(IV) Permitting and compliance risks • Deficit in stakeholder acceptance • Delay or inability to obtain land rights • Delay or inability to obtain environmental permits • Delay or inability to obtain social permits	• Political risk insurance • One-stop shops • Capacity building for administrative authorities • Early community engagement • Incorporate Environmental, Health and Safety guidelines • E&S frameworks from MDBs • Shared water and power surplus	✓		★

Categories and sub-categories of risks affecting the financing of clean hydrogen projects, de-risking mechanisms and prevalence in project lifecycle.

Category B - Risks related to investing in clean hydrogen projects

Risk sub-category	Policy or Financial Risk Mitigation Mechanisms	Prevalence in project lifecycle: Pre-FID	Prevalence in project lifecycle: Post-FID	Top risks
(v) Offtake risks • Uncertain hydrogen demand • Limited credible offtakers • Uncertain price of clean hydrogen • Lack of hydrogen trading market • Offtake default	• Partial risk guarantee • Policy based guarantee • Partial credit guarantee • Long-term hydrogen purchase agreements • Credit default swaps • Credit enhancing instruments	✓	✓	★
(vi) Technology risks • Unforeseen electrolyzer degradation • Defective components • Underperformance • Failing system integration/BoP	• Performance guarantees • Insurance • Liquidity accounts • Select reputable technology provider		✓	★
(vii) Design, construction and completion risks • Underestimating costs • Time and cost overruns • Misinterpretation of project scope	• Turnkey EPC contracts • Construction All Risk and Delay Start-Up • Cost overrun guarantee • Completion and construction warranties • Contractors-all-risk insurance • Liquidated damages • Select experienced EPC		✓	
(viii) Operational and maintenance risks • Failure to achieve key performance metrics • Failure to provide scheduled and unscheduled maintenance • Limited skilled workers to operate and maintain project	• Reserve accounts • Maintenance coverage • Select reputable O&M company • Upskill and reskill workers		✓	
(ix) Supply risks • Power unavailability • Noncompliance with renewable power taxonomy from importing country • Water unavailability	• Long term Power Purchase Agreement (PPA) • Expansion of renewable power projects • Select reputable power/water suppliers • Sustainable water management		✓	

Source: Authors' analysis based on market sounding.

Financial De-risking Instrument Offered by MDBs and ECAs to Mitigate Political and Regulatory Risks

Instrument	Description
Political risk insurance	This de-risking instrument includes four forms of coverage for equity holders (1) expropriation, (2) war or civil unrest, (3) currency restrictions, and (4) breach of contract. MIGA, for example, proposes an instrument in which the cost is assumed by the private company, which will pay a risk-based premium typically in the range of 1 to 1.5 percent per annum of the investment amount being covered. Ninety percent of equity value can typically be covered, and 95 percent of debt (principal +interests).

Source: Authors' analysis

Financial and Policy De-risking Instruments Offered by MDBs to Mitigate Offtake Risks

Instrument	Description
Guarantees	Partial credit guarantees support public sector borrowing from commercial creditors to finance public investment projects. They cover commercial lenders against all risks during a specific period of the financing term of a loan for a public investment. Partial risk guarantees are used in limited-recourse private projects. They cover commercial lenders to a private sector investment project against default on a loan arising from a government-owned entity failing to perform its obligations with respect to the private investment project. Policy-based guarantees a portion of debt service on government borrowing (through loans or bonds) from commercial creditors but are not associated with specific public investment projects. Instead, they cover borrowings undertaken with the assurance that certain structural, institutional, and social policies and reforms will be carried out.

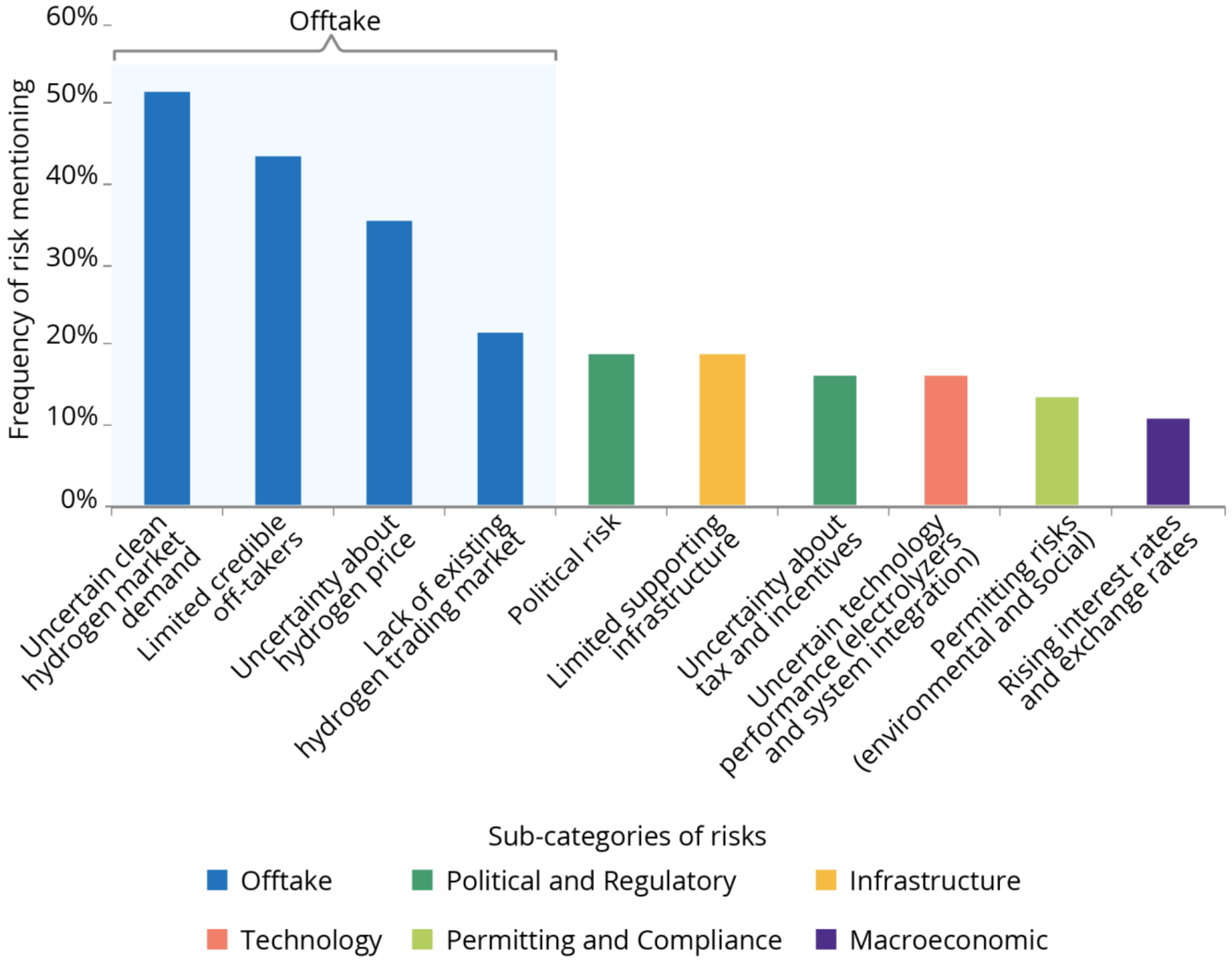
Source: Authors' analysis

Commercial Insurance Covering Specific Technology Risks

Instrument	Description
Liquidity accounts	This innovative risk-mitigation instrument is applicable where a concessional loan by a MDB is made to a public authority. The MDB constitutes a reserve account to guard against disruptions to the payment of the commercial lenders derived from the non-achievement of operational key performance from unforeseen technology disruptions caused by the electrolyzers.

Source: Authors' analysis

Top Risks in EMDCs that, if Mitigated, Would Enable Clean Hydrogen Projects to Secure Financing



Source: Authors' analysis.

Financial and Policy De-risking Mechanisms to Mitigate Top Risks

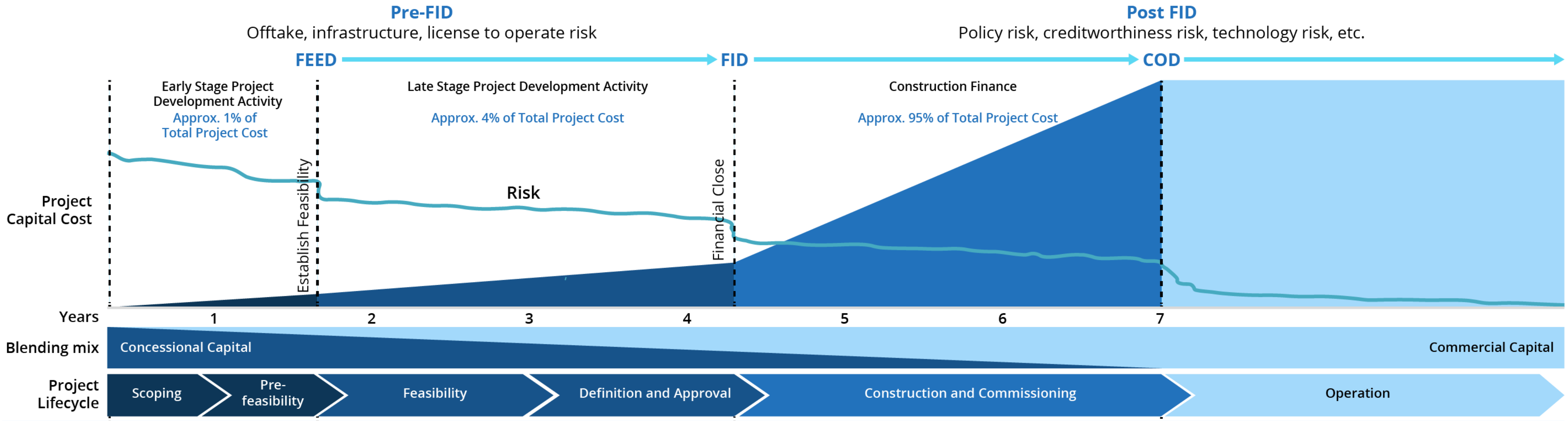
Risks	Financial and Policy De-Risking Mechanisms
Uncertain clean hydrogen market demand	Purchase obligations; public procurement; quotas; long-term hydrogen purchase agreement (HPA)
Limited credible off-takers	Partial risk/credit guarantees by MDBs; ECAs guarantees; credit defaults swaps; credit enhancing instruments
Uncertainty about hydrogen price	Contracts for Difference; long-term hydrogen purchase agreement (HPA), demand aggregators as H2Global
Lack of existing hydrogen trading market	Development of spot markets
Political risk (Expropriation, Breach of Contracts, War, Currency Inconvertibility and Transfer Restriction)	Political risk insurance; public equity investment

Financial and Policy De-risking Mechanisms to Mitigate Top Risks

Limited supporting infrastructure	Hydrogen hubs; public private partnerships
Uncertainty about tax and incentives	Carbon tax; political risk insurance; policy-based guarantee; rule of law
Uncertain technology performance	Performance warranty, guarantees, technology insurance
Permitting risks	Political risk insurance, capacity building, one-stop-shops, digitalization
Rising interest and exchange rates	FX swaps, interest rate hedging, derivatives

Source: Authors' analysis

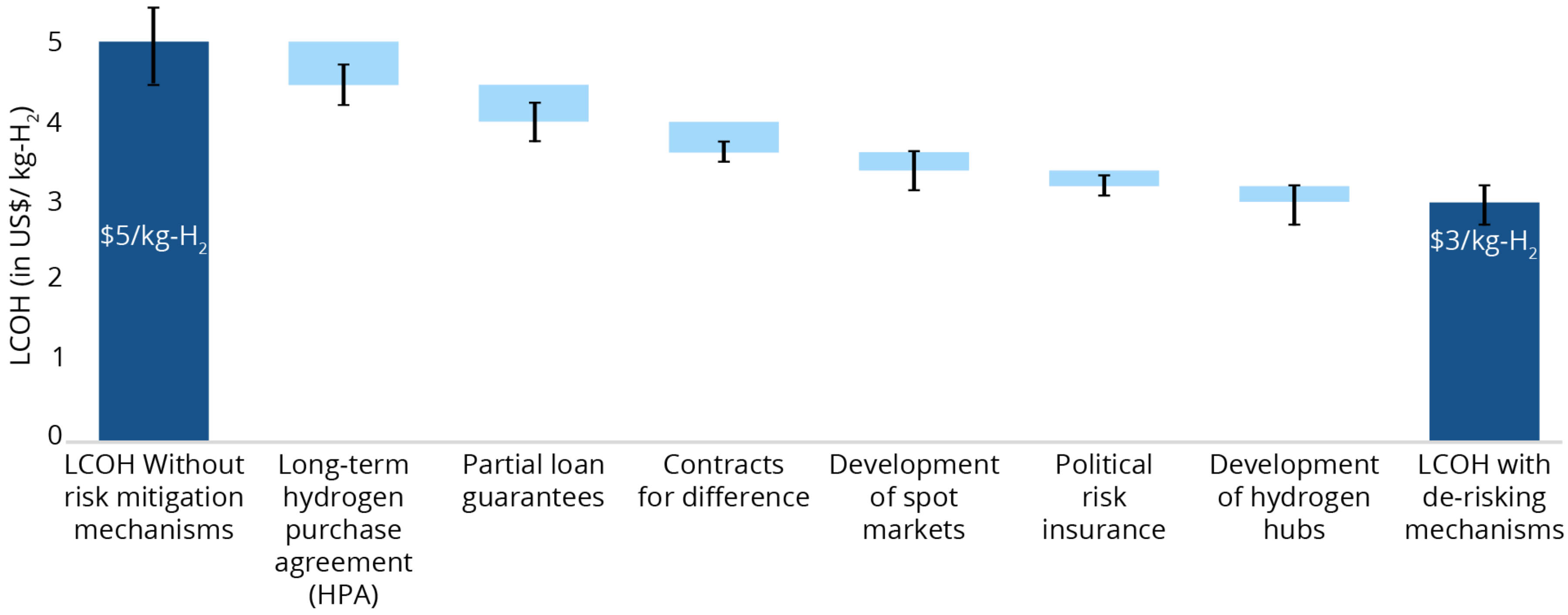
Risks, Costs, Financing Over the Life Cycle of a Clean Hydrogen Project



Equity Investors	• Donors • Governments • Project developers • Angel investors	• Donors • Governments • Project developers • Venture capitalists • High yield investors	• Project developers • Institutional investors	• Corporations • Institutional investors
Debt Investors	• DFIs	• MDBs • DFIs	• MDBs • DFIs • ECA • Commercial banks	• MDBs • Commercial banks • Bond investors
Sample Blended Finance Structure	• Grants	• Grants • Concessional finance	• Blended finance • Commercial debt • Equity investment • Risk mitigation instruments	• N/A - Exit to a commercial buyer of the asses

Source: Authors' analysis based on Financing of PtX Projects in Non-OECD Countries https://files.h2-global.de/H2G_Frankfurt-School_Financing-of-PtX-Projects.pdf and From ambition to reality, Worley, https://www.worley.com/our-thinking/from-ambition-to-reality.

Financial and Policy De-risking Mechanisms Lowering the Cost of Producing Hydrogen from $5 to $3/kg. The error bars represent 95% confidence intervals based on a standard normal distribution.



Source: Authors' analysis. Approach for determining the cost of each risk factor from OECD's forthcoming working paper.
Note: H2 = hydrogen; LCOH = levelized cost of hydrogen.
Lee, M. and D. Saygin (Forthcoming), "Financing cost impacts on cost competitiveness of green hydrogen in emerging and developing economies", OECD Environment Working Papers.

4 GROWING THE MARKET: FUNDS, POLICIES, AND THE ROLE OF MULTILATERAL DEVELOPMENT BANKS

Key Points

- There is no functioning market for clean hydrogen at present. To leverage private investment, policies need to look beyond fixing today's market and begin to build the market of the future. Clean hydrogen faces a substantial cost gap, as estimated in chapter 2. Even the most promising projects face high risks. As shown in the preceding chapters, proposed projects have yet to reach the final investment decision stage despite an announced $100–$300 billion in subsidies worldwide. If policy makers aim to achieve net-zero emissions by 2050, they must explicitly design policies to engage the private sector in developing a workable clean hydrogen market, on both the supply and demand sides. Such policies would consider the entire energy system, and all decarbonization pathways, rather than separating power and gas infrastructure from end uses.

- Policies promoting clean hydrogen in a few first-mover countries can spur development elsewhere and begin to shrink costs. Governments' willingness to share and absorb risks is critical to accelerate investment. Yet financial instruments in emerging markets and developing countries (EMDCs) are insufficient to mitigate the risks of a nascent clean hydrogen industry.

- Not all countries need to be among the first movers in clean hydrogen, but benefits await the competitive EMDCs that choose to participate in this process. Promoting clean hydrogen production in EMDCs supports climate mitigation now and in the future, as relevant resources—in particular renewable electricity—become increasingly available. Moreover, including EMDCs among first movers strengthens an international clean hydrogen value chain that may yield substantial socioeconomic development benefits. Aligning climate mitigation and development benefits is an opportunity to advance climate justice.

Key Points

- An appropriate clean hydrogen policy package would mitigate perceived risks and thus leverage private investment. Countries' choice of strategy determines the necessary level of intervention, as well as the appropriate policy design and pattern of public resource allocation. First movers may choose to focus on (1) the entire value chain; (2) limited exports from pilot projects to industrial countries; or (3) substantial exports from large plants, appropriate where natural resources are readily available at competitive rates. Where exports are planned to be substantial, it will be important to internalize segments of the upstream and downstream value chain to optimize socioeconomic benefits. In all cases, decision-makers must act today to strengthen regulatory frameworks for hydrogen. Predictable policy and streamlined regulation are two essential factors whose lack in a number of jurisdictions is stalling progress.

- Multilateral development banks (MDBs) and development finance institutions have a strategic role to play in supporting EMDCs willing to become first movers. They can support governments to attract private sector investment by improving enabling conditions, de-risking both clean hydrogen industry and individual projects, reducing costs, and promoting adequate financing instruments. Moreover, they can support countries in defining policy frameworks that catalyze local socioeconomic benefits and climate mitigation to align with national development agendas.

- MDBs must cooperate with one another to develop the clean hydrogen industry. Clean hydrogen is an especially interesting area in which to take a single-platform approach because the volume of resources, knowledge, and assistance needed far exceeds what any MDB alone can provide, even for a single country or a small-scale but big-picture "lighthouse" project. Cooperation is the only way to lower transaction costs, distribute the cost of risk mitigation, share existing knowledge, spur innovation, and attract private sector participation.

Note: DFI = development finance institution; H2 = hydrogen; MDB = multilateral development bank.

MDB Support Options to Accelerate Clean Hydrogen Projects

1. Supporting policies, market reforms, and regulatory adaptation to level the playing field for clean technologies

Activities

- Supporting green budgeting and fiscal reforms
- Designing carbon pricing and taxes
- Facilitating carbon emission tracking and emission policies
- Capturing international carbon pricing revenues (such as Article 6)
- Facilitating fossil fuel subsidy reforms
- Improving the adaptation of power market design to variable renewable features

Main supporting instruments

Knowledge products, technical assistance, development policy financing and results-based finance – not specific to clean hydrogen instruments but with high impact in the industry development

Targeted audience

Every country that requires MDBs support for the energy transition independently of the development of clean H2 strategy.

MDB Support Options to Accelerate Clean Hydrogen Projects

2. International public goods: promoting knowledge sharing and coordination to reduce transaction costs

Activities

- Promoting consistent global standards
- Establishing a common procurement framework and a standard set of bidding documents for DFI-financed public sector projects to help reduce the administrative burden for client countries
- Promoting clean hydrogen standards for international offtake agreements, avoiding hold-up delay situations
- Establishing good practices and standards for environmental and social procedures, which would provide clarity to project developers and client countries preparing and assessing clean hydrogen project proposals
- Supporting, globally applicable, low-carbon and renewable hydrogen standards and definitions with clear emission thresholds and sustainable development requirements
- Facilitating knowledge platform on projects, technical cooperations, and stakeholders' perceptions
- Enabling matchmaking platform

Main supporting instruments

Global or regional technical assistance and knowledge products.

Targeted audience

Involving all first movers' countries and stakeholders interested at the international clean hydrogen market development independent of each national strategy.

MDB Support Options to Accelerate Clean Hydrogen Projects

3. Supporting policy makers in strategic decisions and policy package implementation

Activities

- Providing independent advice, knowledge, and capacity building
- Financing strategies development and project preparation
- Ensuring a systematic approach for the clean hydrogen industry's development
- Supporting countries in designing a mechanism for efficient fund allocation
- Promoting and measuring socioeconomic benefits and progress of the operationalization of clean hydrogen toward the Sustainable Development Goals
- Support governments in developing a common infrastructure investment and use for hydrogen.

Main supporting instruments

Technical assistance, development policy financing, investment project financing, results-based finance and guarantees – based on country strategies (or sub-region-specific strategy).

Targeted audience

Countries (at national or sub-national levels) developing and operationalizing the clean hydrogen strategy.

MDB Support Options to Accelerate Clean Hydrogen Projects

4. Providing financing instruments and channeling international funds

Activities

- Providing financing for early-stage projects since the technologies are not yet mature
- Providing concessional financing and grants for early-stage projects that are not yet competitive
- Developing confidence, in turn reducing financing costs. MDBs' and DFIs' anchor effect -which is larger than their contributions-is the most important factor
- Crowding in private sector financing. In general, MDBs and DFIs can lead in meeting climate finance targets, for example, supporting least-developed countries and small island developing states. Country platforms such as the Just Energy Transition Partnership can help accelerate climate action and investments.
- Promoting efficient resource allocation mechanisms globally, such as the "auction-as-a-service" concept promoted by the European Hydrogen Bank

Main supporting instruments

Technical assistance, investment project financing, guarantees and results-based finance for specific hydrogen project.

Targeted audience

Stakeholders developing solid clean hydrogen projects aligned with countries clean hydrogen strategies.

DFI = Development Finance Institution; H_2 = hydrogen; MDB = Multilateral Development Bank.

5 Actions to Accelerate Clean Hydrogen for International Development

Key Points

- A four-point action plan is proposed to accelerate clean hydrogen deployment in emerging markets and developing countries (EMDCs).
- The 28th Conference of the Parties (to the United Nations Framework Convention on Climate Change (COP28) will be an occasion to discuss this plan, which centers on a series of renewable hydrogen lighthouse projects designed to increase investor confidence.
- Given its urgency, the effort should begin with promising projects from the existing pipeline, keeping in mind aspects such as diversity, replicability, and cost-effectiveness.
- Better coordination among participating international institutions will reduce transaction costs and speed up approvals—for example, through harmonization of approval and due diligence procedures.
- In the longer term, more transparent price information should be elicited through the development of hydrogen markets.
- A general capacity-building and knowledge-sharing effort is needed to bring governments up to speed with the clean hydrogen opportunity and its challenges.

Four Parts of an International Action Plan to Facilitate Private Investment in Clean Hydrogen

PRIVATE STRENGTHS

Lighthouse projects

Policies and institutional frameworks

International coordination, governance, guidelines and agreements

Capacity building and knowledge sharing

PUBLIC STRENGTHS

THANK YOU

In support of