Shoring up demand
Identifying effective instruments that support clean hydrogen demand build-up

Report launch webinar
November 2025

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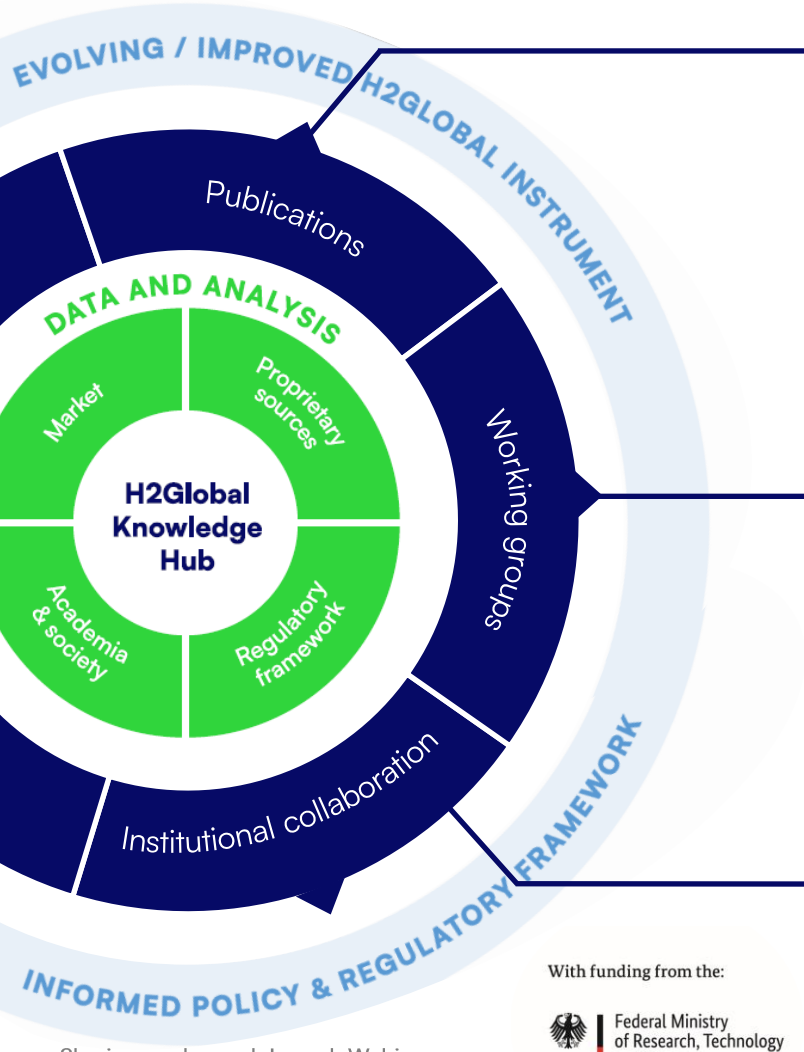
This report is part of the H2Global Knowledge Hub



THREE PUBLICATIONS IN 2025

- Shoring up demand: Identifying effective instruments that support clean hydrogen demand build-up
- Matter of trust: Securing a Social License to operate for clean hydrogen projects
- From ports to offtakers: Scaling last-mile hydrogen infrastructure

CONTRIBUTION OF INDUSTRY EXPERTS COVERING THE WHOLE HYDROGEN VALUE CHAIN

- Regular virtual knowledge exchanges and in-person workshops
- Representation from finance, supply, infrastructure, demand, and manufacturing

COLLABORATION WITH KNOWLEDGE PARTNERS FROM:

- Center on Global Energy Policies at Columbia University
- IEA
- OECD
- Oxford Institute for Energy Studies
- World Bank
- Hydrogen Council

With funding from the:
Federal Ministry of Research, Technology and Space

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Agenda

1 Challenge

- Scaling market demand through effective demand-side support instruments

2 Analysis

- Identification of risk profiles across diverse offtake sectors
- Meta-study on cost-of-difference (CoD)
- Assessment of demand support instruments' impact on offtaker risk profiles

3 Case studies

- Case study review of demand support instruments in Germany, Japan, & U.S.

4 Recommendations

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The challenge

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Projected demand for clean hydrogen and its derivatives is high
but firm offtake commitments remain low

Share of supply volume with firm offtake:

2.2%

in 2025

What inhibits demand uptake?

*Net zero emission scenarios

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Analysis

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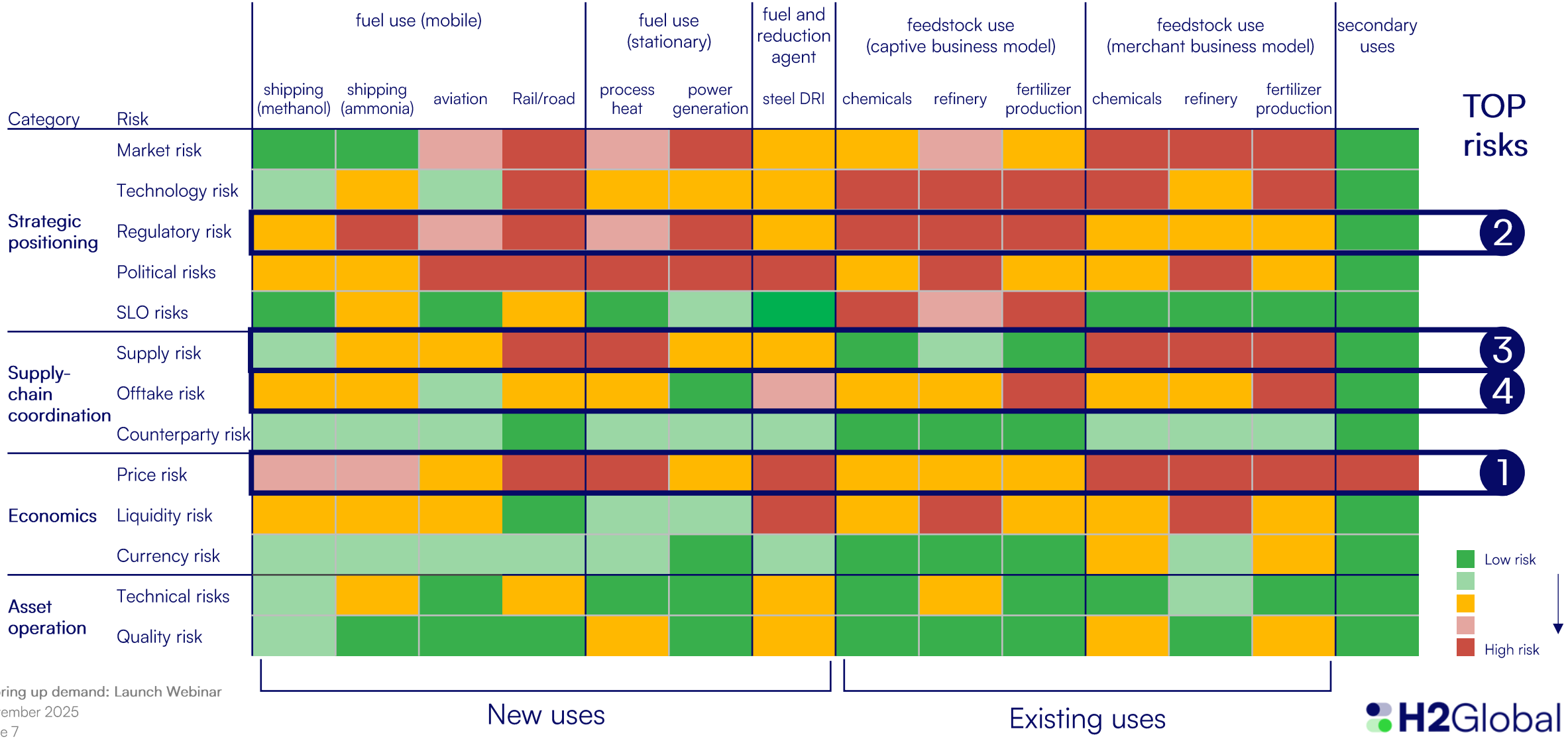
Risk profiles differ greatly across offtakers,
but price risk stands out as the most relevant risk across sectors



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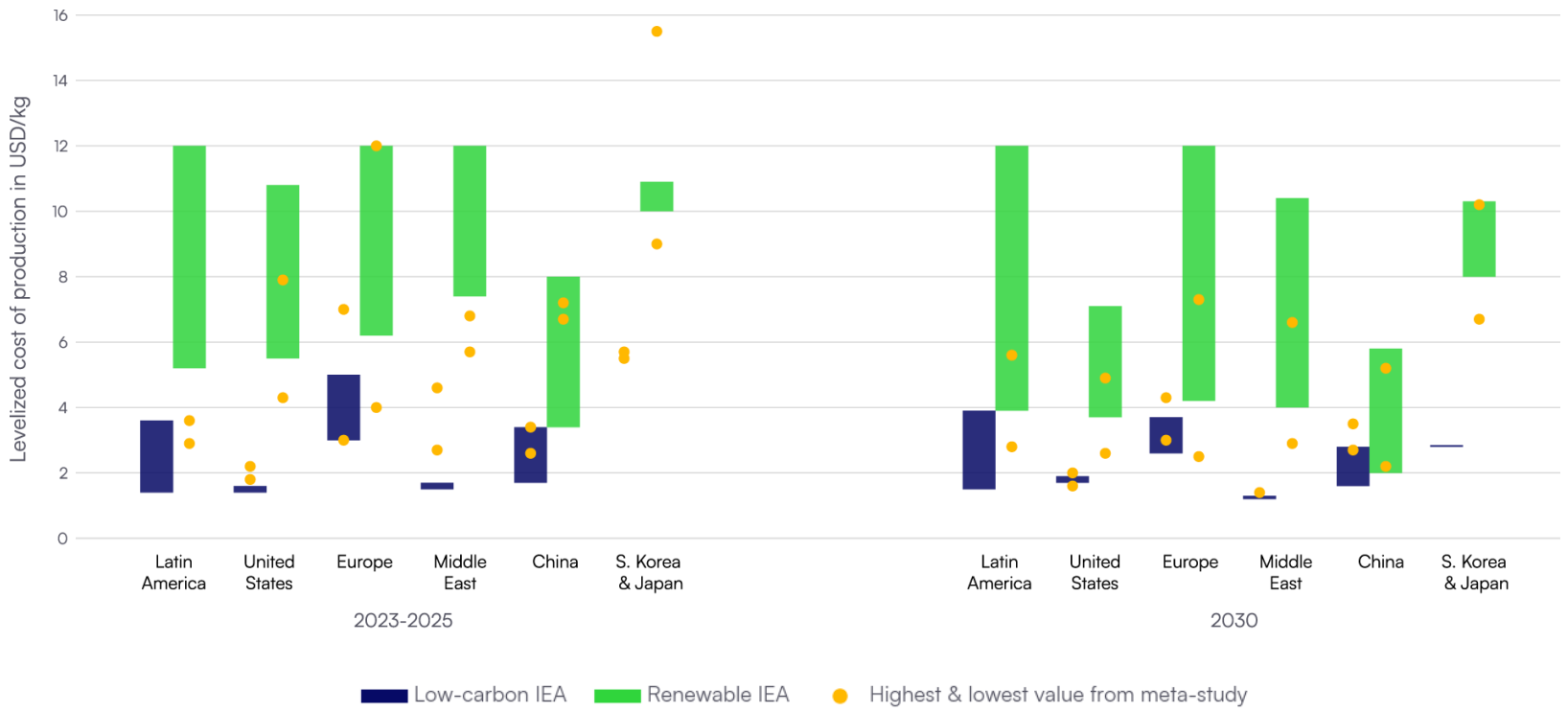
Levelized cost of hydrogen (LCOH) ranges contain significant uncertainty, due to varying renewable power and gas prices

Overview of LCOH ranges from 16 studies across six regions



Takeaways

- 2023-2025: The United States and the Middle East lead the world with the lowest projected costs for low-carbon hydrogen
- By 2030, China has the lowest LCOH for renewable hydrogen thanks to good renewable resources, and lower electrolyzer costs.

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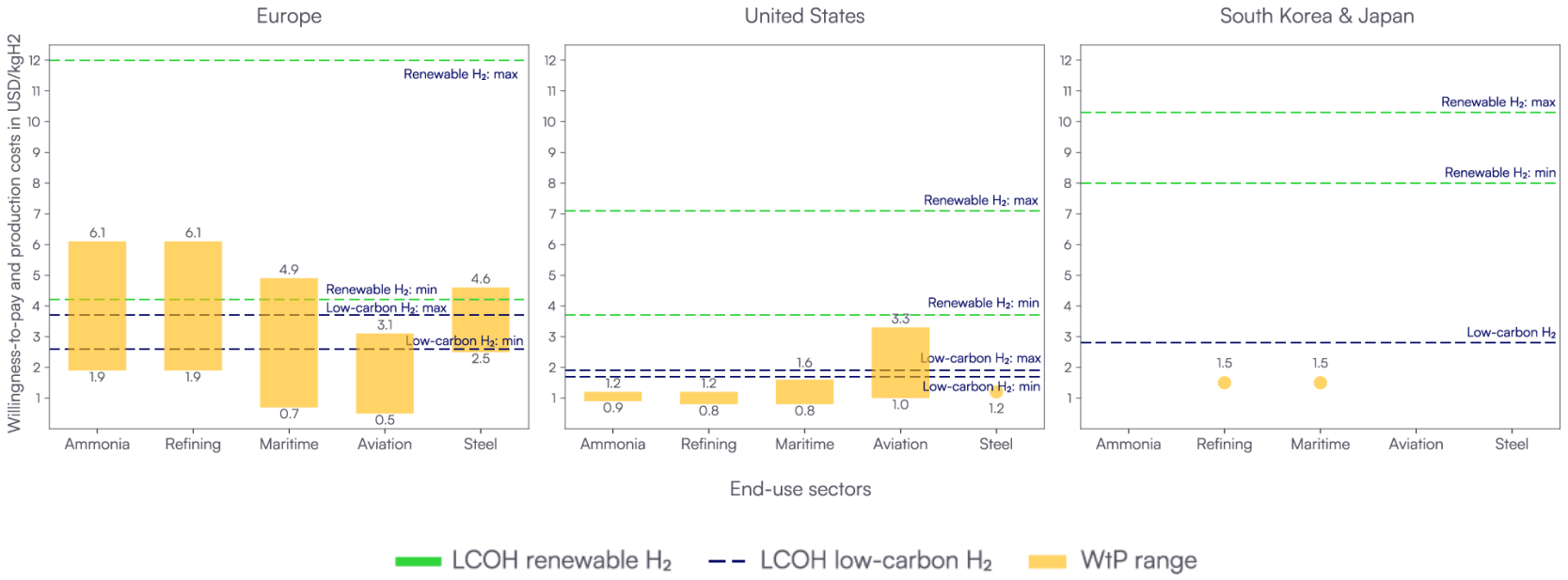
Willingness-to-pay (WtP) remains low and regulation-dependent, resulting in a cost-of-difference (CoD) gap between 0.4 USD/kg to 11.5 USD/kg.

Overview of CoD for clean hydrogen from 3 studies conducted by 2030



Takeaways

- European offtakers are expected to show a higher WtP due to stricter demand-side policies—such as carbon pricing and binding targets
- US offtakers' WtP remains consistently below even the lowest LCOH estimates, except for aviation
- Data on WtP in Japan and South Korea is limited

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Demand support tools address price risks and other risks, with different effects on each assessed risk

Excerpt of 31 demand-support tools scored against 8 key risks

	Price risk		Regulatory risk		Supply risk		Offtake risk	
Instrument	Score	Ranking	Score	Ranking	Score	Ranking	Score	Ranking
Political risk insurance	3	5	5	1	3	4	4	2
Mass balancing	4	3	3	4	4	3	5	1
Fiscal incentives / tax breaks	4	3	1.5	7	1.5	7	3	3
CAPEX support	3.5	4	1	8	1	8	1	6

Examples:

CAPEX support, political risk insurance and fiscal incentives have different effect on mitigating price risks

Fiscal benefits and tax breaks are strong tools to mitigate price and offtake risks, though less effective for supply and regulatory risk

Average risk mitigation score

Every instrument received

- A base score from 0-3 for its own effect on each risk
- A “cross-support” score from 0-2 rewarding a contribution to the mitigation of multiple key risks
- A total score representing the average across risks

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Regulatory tools such as quotas, mandates, bans, and phase-outs are the most effective in mitigating risks.

Most effective tools include wide-scope **sticks** like regulatory interventions and carbon pricing, but face political hurdles

Basic enabling instruments affect several risks simultaneously with a low to medium effect

Effective carrots target **individual projects** with a more specific and narrow risk mitigation purpose.

Highly specific instruments are best-in-class for individual risks and complement the policy mix.

Instrument	Score	Ranking
Quotas and mandates	4.4	1
Bans and phase out of alternative technology	4.4	1
Carbon tax	4.1	2
Emission trading system (ETS)	4.0	3
Carbon border adjustment mechanism	3.9	4
Ecolabeling and guarantees of origin	3.9	4
Book and Claim	3.9	4
Political risk insurance	3.8	5
Mass balancing	3.6	6
Direct public procurement of clean fuels	3.6	6
Green lead markets	3.6	6
Reduced regulatory requirements	3.5	7
Double-sided auctions	3.4	8
(Carbon) Contracts-for-Difference	3.4	8
Special Economic Zones / Hubs	3.4	8
Demand aggregation	3.3	9
Public infrastructure provision	3.0	10
Fixed premia	2.9	11

Instrument	Score	Ranking
(Partial) loan guarantee and credit default swaps	1.9	15
CAPEX support	1.7	16

Average risk mitigation score

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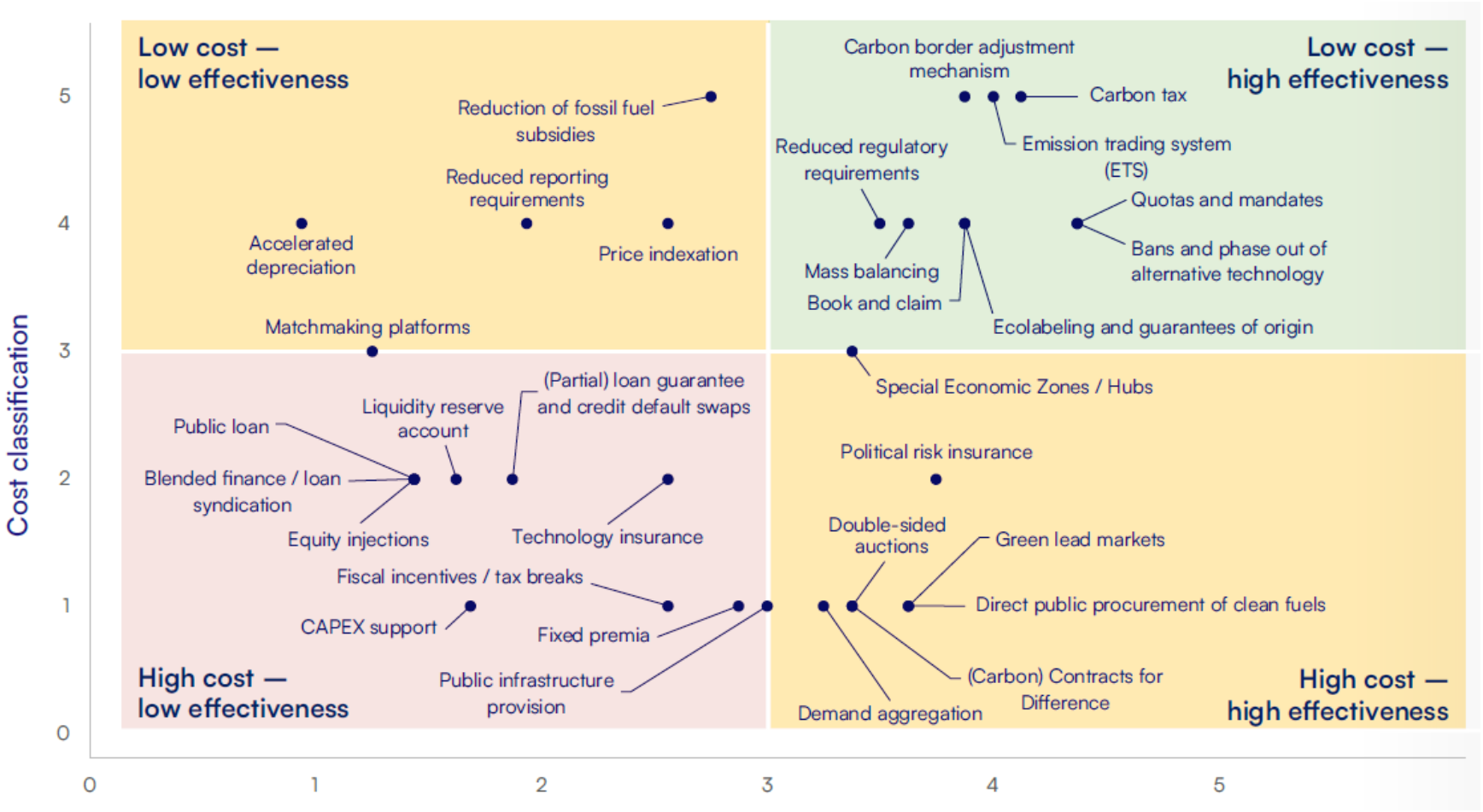
Many of the most effective instruments are also efficient, but other instruments can be implemented more easily



Takeaways

- Despite advantages, policymakers do not fully leverage quotas and carbon pricing
- Instruments with a high cost and effect profile can achieve significant side-benefits

Legend	Cost classification	Effectiveness score
5	revenue	Highly effective
4	negligible cost	More effective
3	administrative cost	Effective
2	potential payment to companies	Less effective
1	certain payment to companies	Least effective

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Case studies

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Germany shows strong demand-side action, highly focused on regulatory measures at European level

Instruments

- **Road**
  - Public Infrastructure
  - H2Global Mechanism
- **Process heating**
  - Carbon-Contracts-for-Difference
  - IPCEI
- **Steel**
  - EU ETS
  - EU CBAM
- **Chemical**
  - EU Quotas

Existing instruments

Limitations

- **Ineffective carbon prices and quotas:** Wide-scope instruments in their current design do not unfold their potential
- **Pending allocation of funds:** Significant available funds from the *Sondervermögen* are not yet assigned to support projects

Recommendations

- Introduce hydrogen-specific CCfDs
- Allocate funds for sector-targeted H2Global auctions
- Advocate for a higher price floor or a steeper reduction trajectory for allowances within the EU ETS

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Japan has deployed various demand support instruments, however, most are either regional or limited to specific sectors

Instruments

- **Road**
- **Power Generation**
- **Steel**
- **Chemical**

- Hydrogen Hubs Development Plan
- Contracts-for-difference
- Auctions
- Cost-shared premium
- CAPEX support to strategic sectors
- Public Infrastructure investment
- Carbon pricing

Limitations

- **Fragmented instrument landscape:** Some instruments are deployed only at the regional level.
- **Limited coverage:** Focused on specific sectors, narrowing overall impact.

Recommendations

Existing instruments

- Strengthen carbon pricing
- Scale up auction mechanisms

New instruments

- Sharpen bans and phase-outs of alternative technologies
- Implement quotas and mandates

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The United States shows limited demand-side action, mostly at the state level and uncertain due to political context

Instruments

Road

Aviation

Steel

Chemical

- Regional Clean Hydrogen Hubs
- Targeted CAPEX support
- Commercial Vehicle Tax Credits
- Clean Transport Mandates and Incentives
- Regional Clean Fuel Standards
- Buy Clean Initiatives
- Regional Carbon Pricing
- Book-and-Claim
- Joint Procurement Platforms

Limitations

- **Fragmented instrument landscape:** Some instruments are deployed only at the regional level
- **Political uncertainty:** Several instruments have been discontinued following political changes

Recommendations

- Implement carbon pricing and ETS
- Adopt quotas and mandates
- Scale up auction mechanisms

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Recommendations

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Risks and policy effectiveness: Key findings

Key observations

CoD remains the most significant barrier for clean hydrogen offtakers

- Regulatory and political risks strongly vary across jurisdictions
- Legislation from international bodies like IMO can significantly mitigate risks
- Different business models face different risks
  - *Captive* business models offer greater control over supply risks but face more profound political and social acceptance challenges
  - *Merchant* business models face greater exposure to supply and price risks due to their reliance on more volatile markets

Most effective and efficient policy instruments

- **Quotas, mandates, bans, and phase-outs** increase WtP while managing long-term market expectations
- **Carbon pricing** increases WtP and generates revenue for reinvestment
- **Guarantees of origin, certification schemes and flexible value-chain custody designs** are key to tackling supply, price and liquidity risk

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Recommendations
for a strong policy mix

Economic Instruments

- **Double-sided auctions** cover price and supply chain risks effectively
- **Contracts-for-difference** tackle price risk, reduce liquidity pressure, and offer flexible supplier selection

Enabling conditions

- **Green lead markets and direct public procurement** address offtake risk
- **Hydrogen hubs** leverage synergies from co-location and reduce infrastructure needs
- **Guarantees of origin, certification schemes, and value chain custody** reduce supply and price risks

De-risking and finance instruments

- **(Partial) loan guarantees** mitigate liquidity risk and require limited budget

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Recommendations
for individual case studies

Germany

- **Enhance financial support** by investing more in infrastructure, lead markets, and project-specific support instruments like H2Global & *Klimaschutzverträge*.
- Provide partial loan guarantees and fund targeted sector auctions.

Japan

- Introduce nation-wide carbon pricing with a significant carbon tax or a nation-wide emissions trading system (ETS)
- Consolidate fragmented policy tools

United States

- Implement federal-level demand support policies
- Establish a nation-wide ETS
- Implement a CBAM as a complementary tool

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