State of the hydrogen industry & outlook for global supply chains

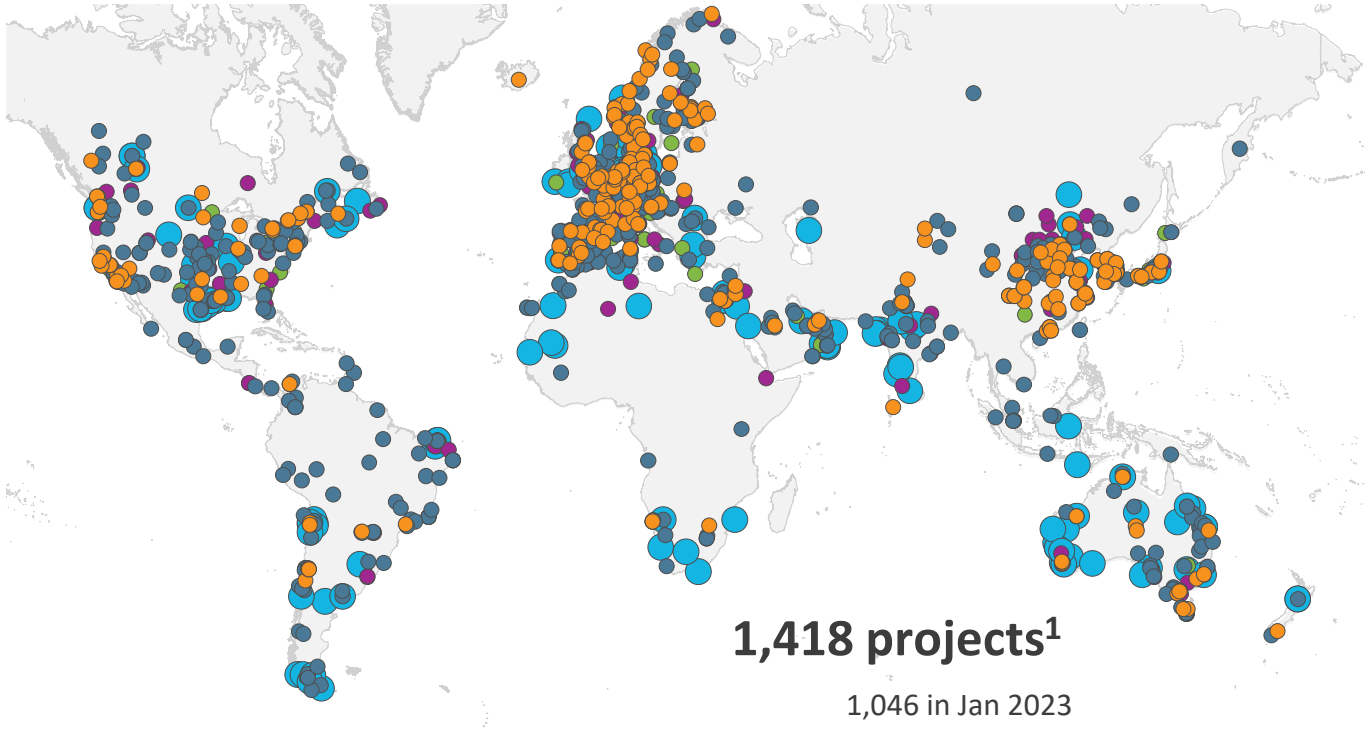
IECEx International Hydrogen Conference

May 2024

Hydrogen Council

Strong momentum with more than 1,400 projects announced globally

AS OF OCT 18 2023



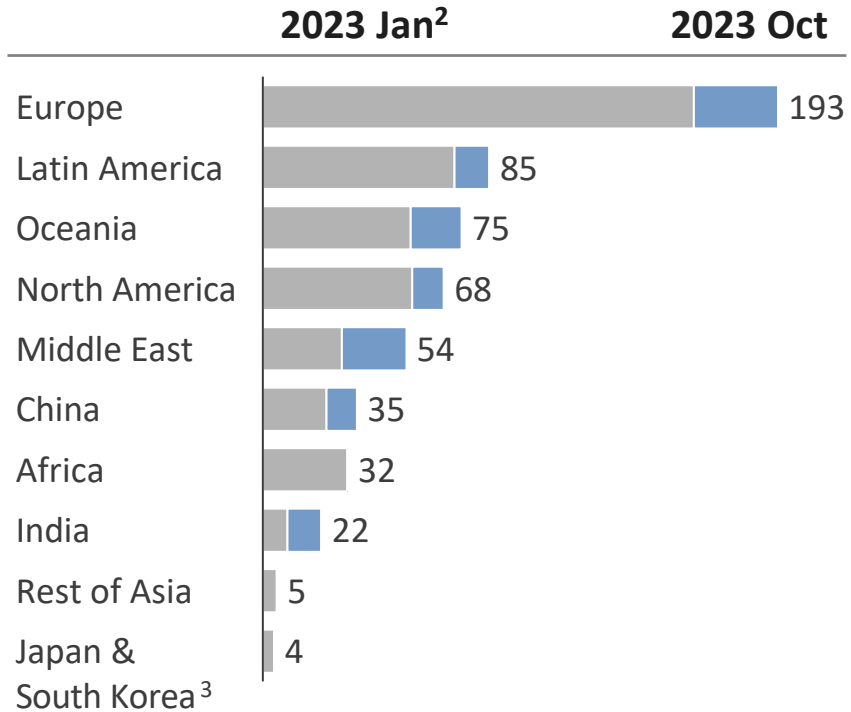
1,418 projects[1]

1,046 in Jan 2023

166	719	256	144	126
Giga-scale production	Large-scale industrial use	Transport	Integrated H_2 economy	Infrastructure projects

$570 B

investments required to develop projects announced until 2030



1. Project announcements below 1 MW are excluded. 7 projects have not announced project type
2. Jan 2023 values have been updated to most recent Capex estimations to keep values comparable
3. Restatement of 2023 Jan data for Japan & South Korea prevents comparison to Oct 2023 data

Source: Project & Investment tracker, as of Oct 2023, McKinsey

Ministry of Economic Affairs and Climate Policy

UNITED ARAB EMIRATES
MINISTRY OF ENERGY & INFRASTRUCTU

HYDROGEN INITIATIVE
AN INITIATIVE OF THE CLEAN ENERGY MINISTERIAL

UNIDO

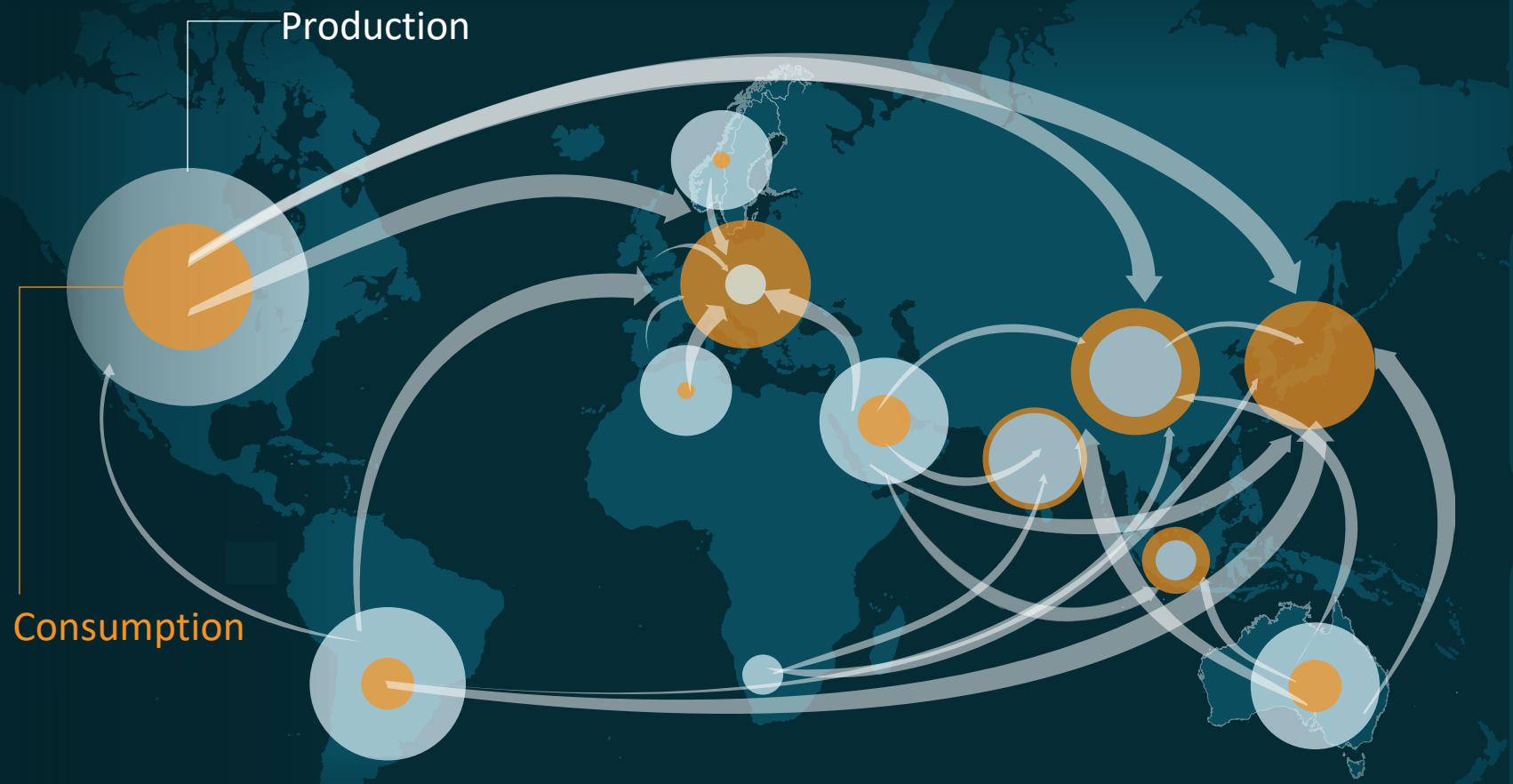
Hydrogen Council

Update:

International Hydrogen Trade Forum – Hydrogen Council 2nd Ministerial – Executive Roundtable

40% lower cost and up to 10 mn jobs created in the global H_2 economy by 2035

Socio-economic benefits unlocked by global trade routes



850 Mt CO_2
abated annually through clean hydrogen supply

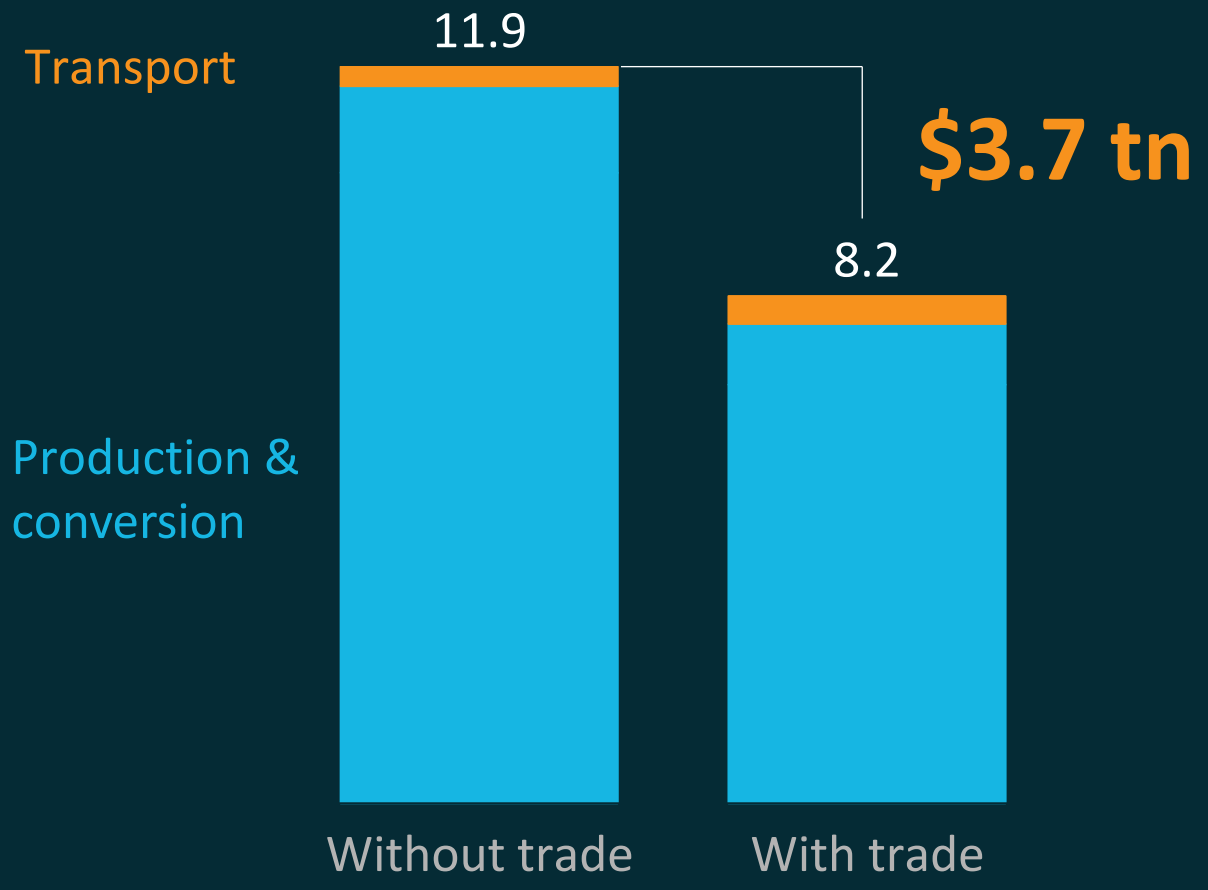
40% lower
cost for consumers from H_2 trade

7-10 mn
jobs created

Hydrogen Council McKinsey & Company

$3.7 tn in investments can be saved thanks to global trade by 2050

Accumulated global investments required through 2050, $tn



$25 saved for each $1

invested in H_2 and derivatives trade infrastructure through 2050

2.5x

expansion of infrastructure required to meet 2035 demand

$150 bn

investment required in cross-border transport to unlock trade by 2050

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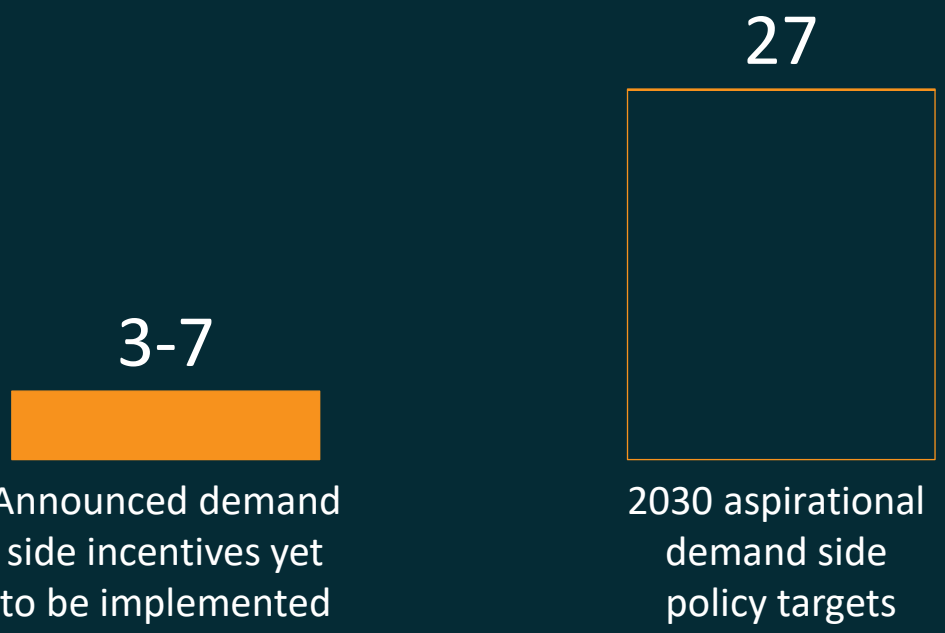
Implementing announced incentives eq. to 3-7 Mtpa key to kick-start the market

"Demand-pull" helps bridge the cost gap …

… triggering offtake commitments …

… unlocking scale and lower costs

Mandated and incentivized vs. aspirational demand targets, Mtpa H_2 eq. in Europe, Japan, South Korea



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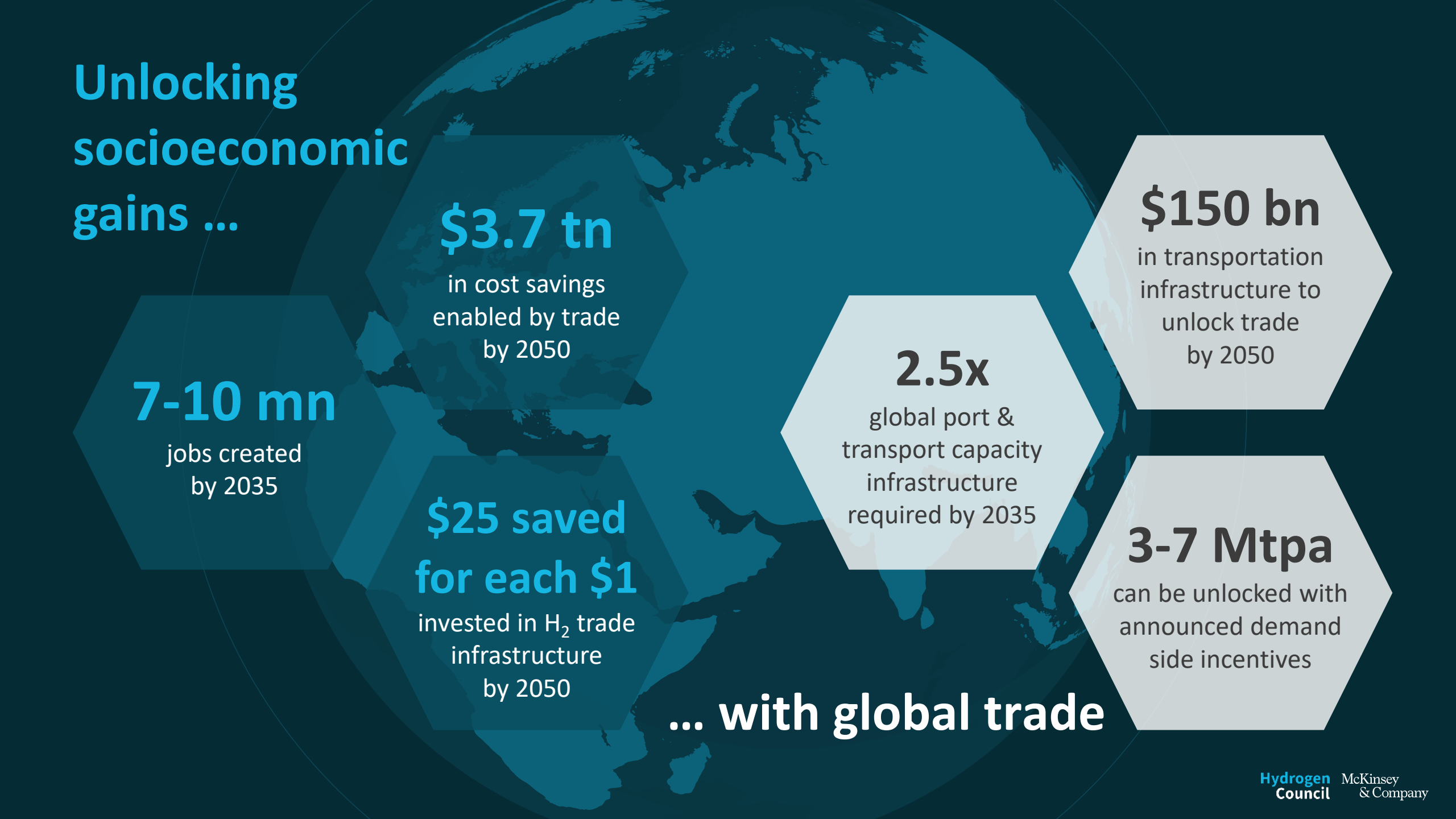
Unlocking socioeconomic gains …
$3.7 tn
in cost savings enabled by trade by 2050
7-10 mn
jobs created by 2035
$25 saved for each $1
invested in H_2 trade infrastructure by 2050
2.5x
global port & transport capacity infrastructure required by 2035
$150 bn
in transportation infrastructure to unlock trade by 2050
3-7 Mtpa
can be unlocked with announced demand side incentives
… with global trade
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Hydrogen Council

COP28 Hydrogen Outcomes

Hydrogen Council

COP28 Hydrogen Outcomes

Lead Outcomes

1	Declaration of Intent on mutual recognition of certification schemes for hydrogen and its derivatives	Assess
2	ISO Methodology for GHG emissions assessment for Hydrogen on an LCA basis	Evidence
3	Public-Private Action Statement on unlocking trade corridors	Deploy

Platform Outcomes

A	SDG Compass for the Hydrogen Economy	Steward
B	Diversity, Equality and Inclusion Platform for Hydrogen	Empower

Declaration of Intent on Mutual Recognition of Certification Schemes for Renewable and Low-Carbon Hydrogen and Hydrogen Derivatives

Covers 80% of future global market	Promotes reliability and trust	Advances interoperability	Lays out implementation pathway
• Declaration endorsed by 40 countries representing prospective importers and exporters	• Certification schemes key to evidence the sustainability attributes of hydrogen and its derivatives	• Mutual recognition of certification schemes is instrumental to avoid market fragmentation	• IPHE & IEA H2 TCP to lead technical implementation and report progress at G20/CEM in Brazil

ISO methodology ISO/TS 19870:2023 for GHG emissions assessment of hydrogen on a life-cycle analysis basis

Covers multiple production and transportation pathways	Provides full life-cycle assessment	Covers methane emissions	Sets the basis for a suite of standards
• Including electrolysis- and CCS-enabled production and transportation as LH2, ammonia and LOHC	• Covers all stages of the life-cycle analysis - from cradle to delivery gate, including production, conversion/conditioning, and transport	• Includes upstream methane emissions for hydrogen produced from methane	• Provides the foundation for a suite of standards for production, conditioning/ conversion and transport of hydrogen

IHTF-HC Public-Private Action Statement

COP28UAE

Focus area	Actions on the public side	Actions on the private side
Permitting	Identify relevant solutions for accelerating permit-granting processes	Identify good practices and ensure high quality of permitting requests
Deployment at scale	Develop robust demand-pull measures in key end use sectors and the enabling infrastructure	Ensure hydrogen and its derivatives ecosystem and supply chain readiness for deployment at scale to meet the growing demand
International standards	Collaborate on the development of international technical standards through Standard Development Organisations to facilitate global, cross-border trade of hydrogen and derivatives	Identify and actively facilitate the development of key technical standards for cross-border trade infrastructure for key carriers (including LH2, ammonia, e-fuels)
Mutual recognition of certification schemes	Agree to monitor progress with mutual recognition of certification schemes	Commit resources to and support at technical level mutual recognition of certification schemes
SDG benefits	Maximize socio-economic benefits and local value creation supporting economic and industrial development in particular in exporting countries	Strengthen and maintain engagement with local communities and actively integrate SDGs into business models