TNO innovation for life

SHIP>NL
SUSTAINABLE HYDROGEN IMPORT PROGRAM

AGENDA

SHIP>NL SESSIE X 21 DECEMBER 2022

15:00-15:30 WELKOM EN TOUR DE TABLE

15:30-16:30 DEEP DIVE: ICSR RISK ANALYSIS OF HYDROGEN IMPORT| ARCADIS

16:30-16:45 UPDATE: STATUS HYCHANGE CERTIFICERING

16:45-16:55 DISCUSSIE: VOORSTEL GROENVERMOGEN

16:55-17:00 AFSLUITING

TNO innovation for life

‘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

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

Synthese

UPDATES | TOUR DE TABLE

DEEP DIVE: ICSR RISK ANALYSIS OF HYDROGEN

Sofia Lopez Carrasco, Milda Malinauskiene, Siebren Wijtzes| Arcadis

ICSR Risk Analysis of Hydrogen Import

Presentation of the initial results in the Kennisbijeenkomst SHIP.NL

21st December 2022

Agenda

1 About us

2 The assignment: Tasks & Approach

3 Supply Chain Risks & Opportunities

4 Country Level Risk Analysis

5 Relevant EU Directives

6 Discussion

1. About us

Sofía López Carrasco

Project Manager &
Social Expert

sofia.lopezcarrasco@arcadis.com

Milda Malinauskiene

Content Coordinator

Carlos Garfias

Environmental Expert

Siebren Wijtzes

Technical Advisor

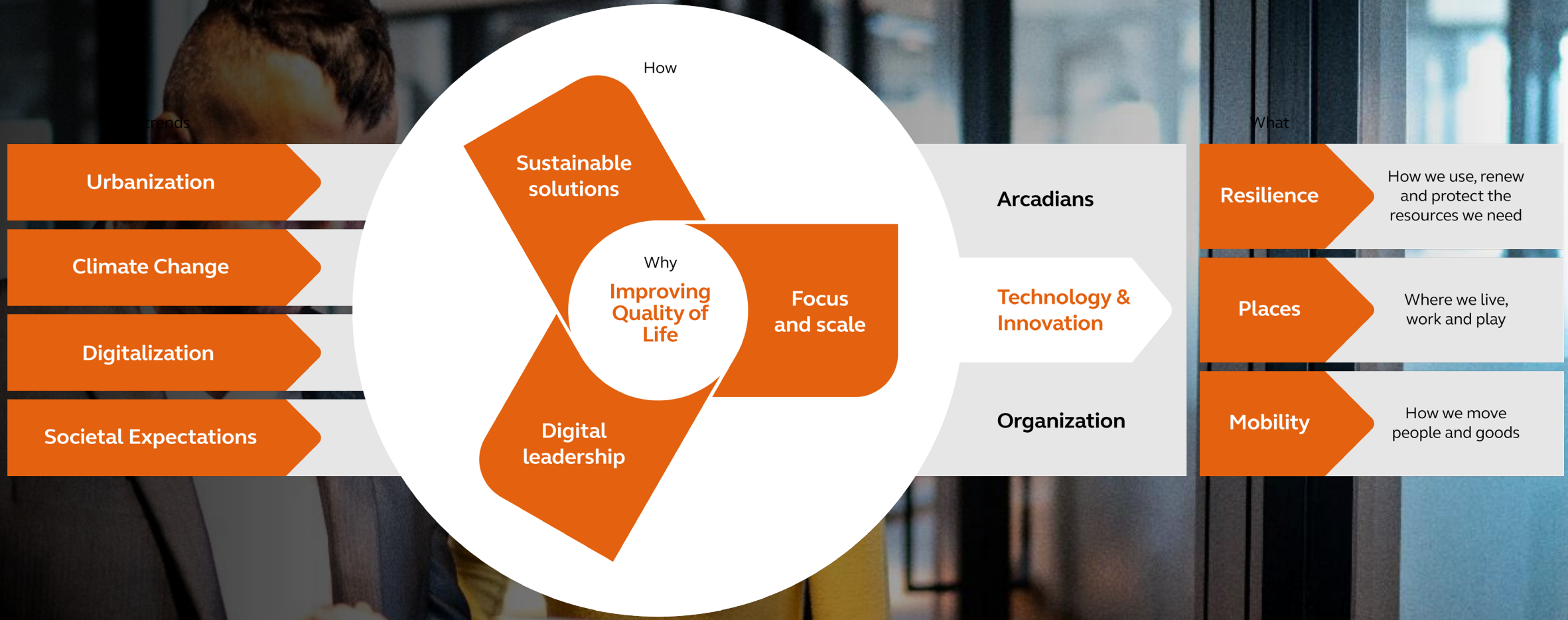
Ruben Hage

Junior Consultant

Arcadis' Global network of experts

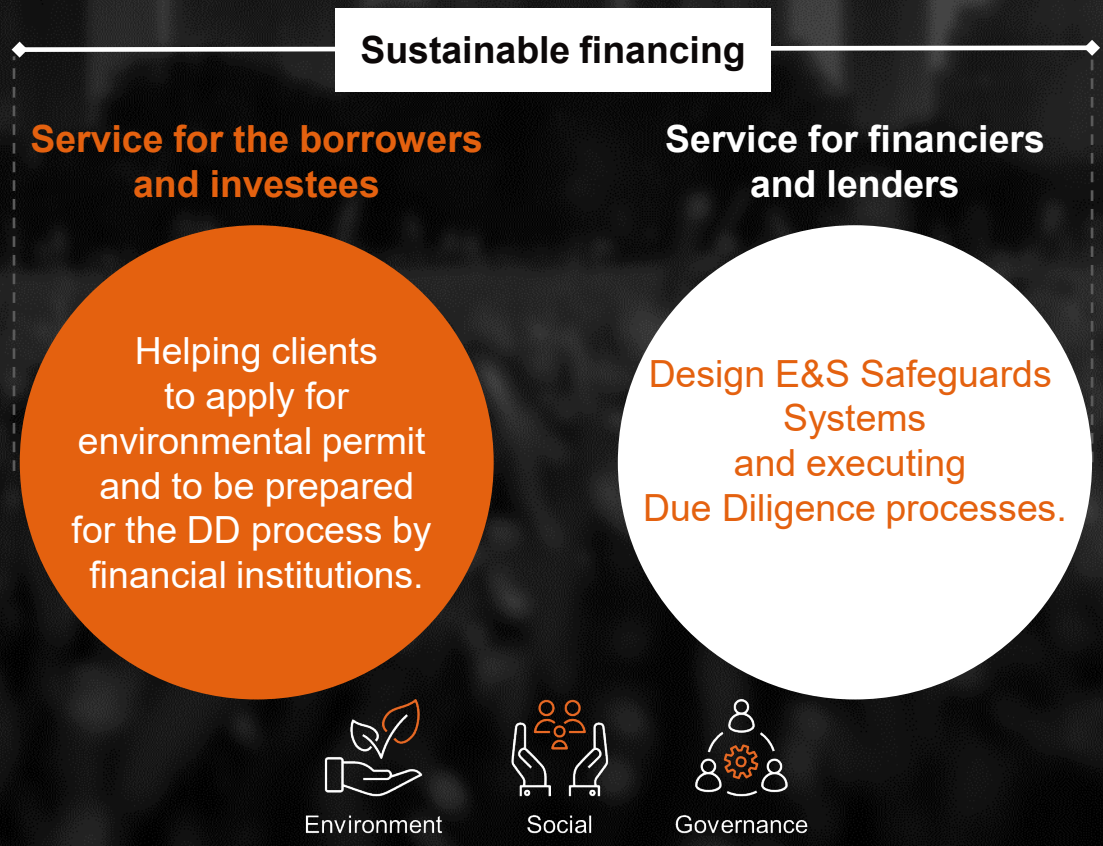
36.000 specialists worldwide, in 40 offices, with expertise in the whole variety of environmental and social topics.

Our Strategy & Business areas



Arcadis Netherlands ESG Services

Assuring sustainable
and ethical management
of Environmental,
Social and Governance (ESG)
risks and impacts that can
affect the investment process.



Arcadis Netherlands ESG team

Core Team

- We have a mix of both local and global expertise, and we are used to working with multidisciplinary teams.
- We have access to the best subject matter experts from around the world, who are in the different offices of Arcadis.
- We have experience working with E&S international standards and safeguard systems.
- Our technical awareness, mixed with our systems thinking gives us a unique perspective.

Global team

- **36.000 specialists worldwide**, in 40 offices, with expertise in the whole variety of environmental and social studies.
- A **network of independent specialists and consultancy companies** in Africa, Asia and the Americas.

2. The assignment: Tasks & Approach

Objectives of the service

	1	2	3
OBJECTIVE	Identify potential ICSR risks in the different steps of the hydrogen value chain	Investigate which ICSR risks are relevant for potential export countries	Compare key EU regulation against the identified risks
TASKS	1. Map the hydrogen supply chain; and 2. Identify potential ICRS risks and opportunities.	3. List countries to be analyzed; and 4. Analyze ICSR risks in selected countries.	Against 2 key regulations 5. Corporate Sustainability reporting Directive (CSRD); and 6. Corporate Sustainability Due Diligence Directive (CSDD)

1

Assessment of supply chain risks & opportunities

Criteria selection based on existing frameworks and studies

- MVO Nederland CSR framework
- PtX Hub Berlin study
- Oeko-Institut study
- CSDD Proposal

Supply chain analysis by Arcadis hydrogen experts

- Asessment of relevance of risks and opportunities based on significance and probability

List of risks and opportunities

Topic	Potential supply chain element risks and opportunities	Inputs		Hydrogen production		Conversion & transformation	Transportation & distribution	Storage
		Green	Blue	Green	Blue			

2

Country level risk screening

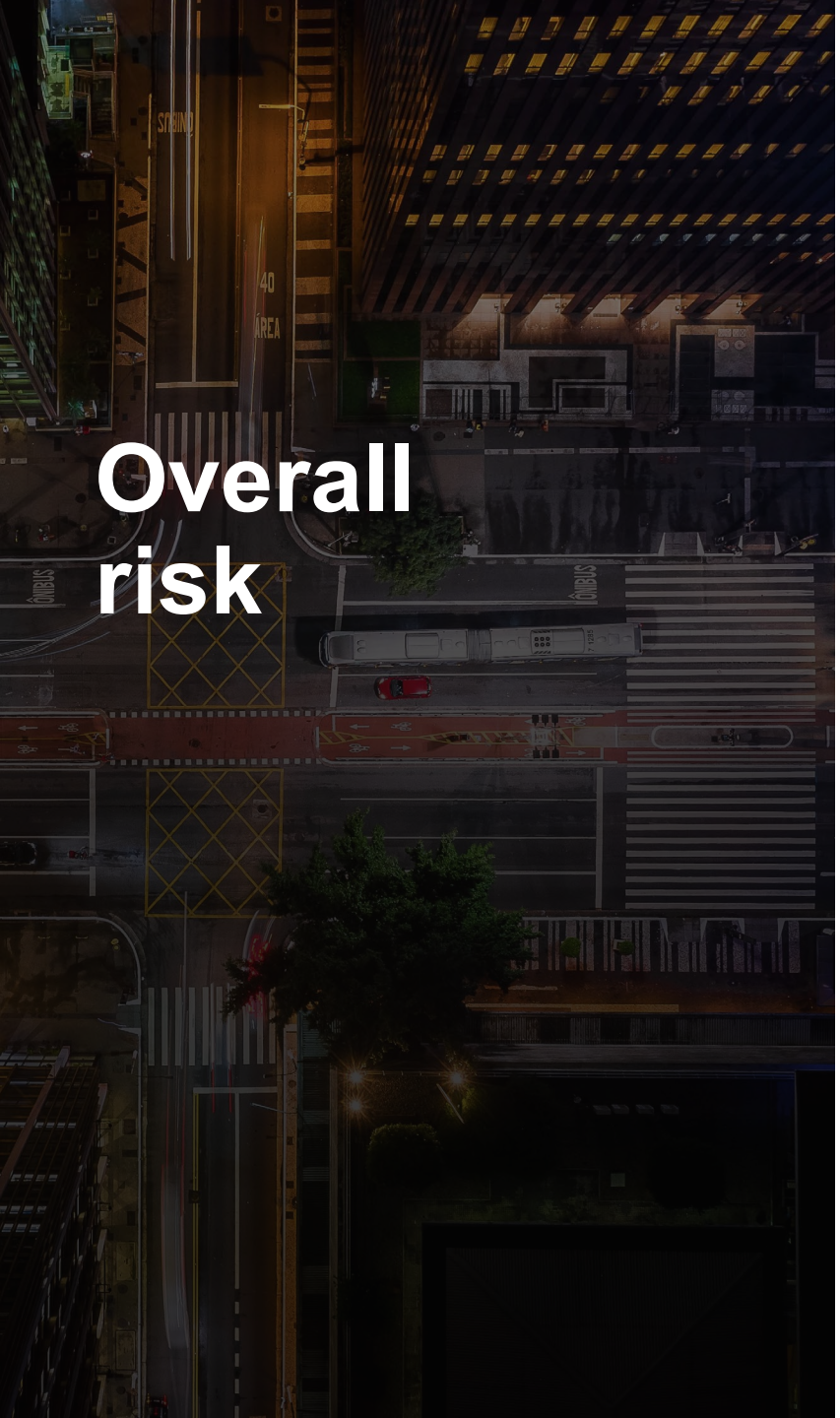
Desktop study of publicly available information, including databases and indexes

Environmental Performance Index · MVO Nederland · Global Peace Index 2022 · Walk Free Global Slavery Index · Transparency International the global coalition against corruption · the GlobalEconomy.com Business and economic data for 200 countries · GIWPS Georgetown Institute for Women, Peace and Security · Worldwide Governance Indicators

Conclusion by Arcadis ESG experts

Assessment of relevance of risks for a specific country

Topics that are triggered for further analysis



Overall risk

Country Risk

- Relevance for a country
- Governance of E&S topics

1

2

Activity specific risk/opportunity

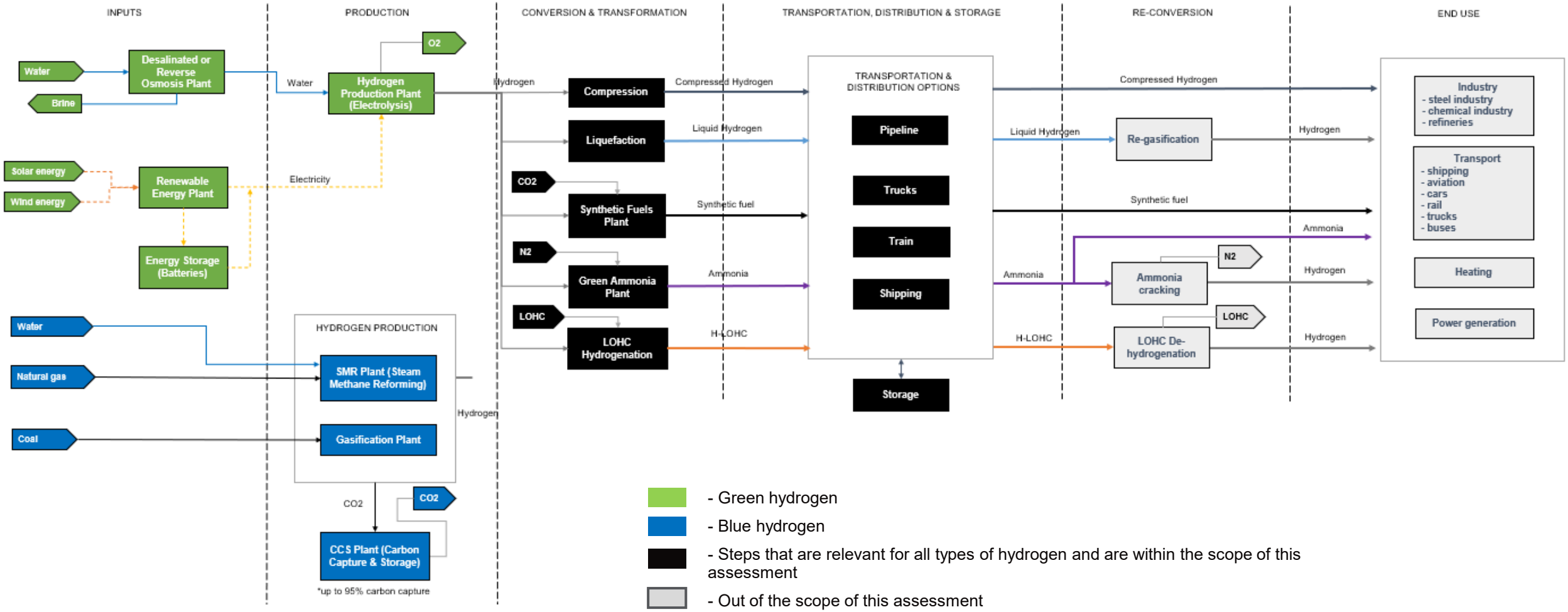
Relevance for a supply chain element

Overall contextual risk

Topic for which detailed project-specific analysis is recommended

3. Supply chain risks & opportunities

Hydrogen value chain



- Green hydrogen
- Blue hydrogen
- Steps that are relevant for all types of hydrogen and are within the scope of this assessment
- Out of the scope of this assessment

Environmental: risks and opportunities in the supply chain

Topics	Potential supply chain risk and opportunities	Hydrogen value chain: Inputs: Green hydrogen	Inputs: Blue hydrogen**	Production: Green hydrogen	Production: Blue hydrogen	Conversion & Transformation: Hydrogen compression	Conversion & Transformation: Hydrogen liquefaction	Conversion & Transformation: Synthetic fuels plant	Conversion & Transformation: Green ammonia plant	Conversion & Transformation: LOHC hydrogenation	Transportation & Distribution: Pipeline	Transportation & Distribution: Trucks	Transportation & Distribution: Train	Transportation & Distribution: Shipping	Storage
Biodiversity and deforestation	Activity can cause intervention, loss and/or fragmentation of ecosystems; alteration or disturbance of habitats	x	x	x	x	x	x	x	x	x	x				x
Biodiversity and deforestation	Activity can cause soil loss and/or erosion.	x	x	x	x	x	x	x	x	x	x				x
Air pollution	Activity generates significant amounts of emissions to air		x		x	x	x	x				x	x	x	
Air pollution	The activity generates low amounts of atmospheric emissions	x													
Waste & resources	Activity generates significant amounts of solid waste	x	x												
Waste & resources	Activity generates significant amounts of hazardous waste	x	x												
Waste & resources	Activity requires significant amounts of hazardous substances		x		x	x	x	x	x	x	x	x	x	x	x
Waste & resources	Activity requires Critical Raw Materials (CRM), according to the EU list, such as iridium, platinum, tantalum, cobalt and nickel	x		x											
Waste & resources	Activity requires carbon sources (as a raw material)		x		x			x		x		x	x	x	
Climate and energy	Activity requires significant amounts of electricity		x	x	x	x	x	x	x	x			x		x
Climate and energy	Activity requires significant amounts of electricity			x											
Climate and energy	Activity requires significant amounts of heat energy or cooling			x	x		x	x	x	x		x	x	x	x
Climate and energy	Activity requires significant amounts of fuel		x		x							x	x	x	
Water use & water availability	Activity requires significant amounts of fresh water	x	x	x	x										
Water use & water availability	Activity requires water desalination or other treatment	x	x												
Water use & water availability	Activity requires water desalination or other treatment	x	x												
Water use & water availability	Activity generates significant amounts of wastewater (including brine from desalination)	x	x												
Land restoration and regeneration	Activity requires cleaning up and restoring of mining sites after use		x	x											

Key takeaways

- Green hydrogen production requires renewable energy sources; energy mix is an important risk element → **there is a need to assess the whole chain**
- Hydrogen production requires water; water **desalination** may allow for production in countries where water is scarce, but it is not without E&S risks
- Production of green energy and hydrogen requires critical raw materials, the **mining of which presents E&S risks.**
- Lack of demonstrated success of CCU technologies → **risk in terms of not being able to capture CO_2 emissions**

Legend

Risk Opportunity

Social: risks and opportunities in supply chain

Topics	Potential supply chain element risk and opportunities	Hydrogen value chain													
		Inputs		Production		Conversion & Transformation					Transportation & Distribution				
		Green	Blue**	Green	Blue	Hydrogen compression	Hydrogen liquefaction	Synthetic fuels plant	Green ammonia plant	LOHC hydrogenation	Pipeline	Trucks	Train	Shipping	Storage
Community health and safety (community impacts)	Activity generates significant noise and vibration emissions	x	x	x	x	x	x	x	x	x		x	x	x	x
Community health and safety (community impacts)	Explosion risks of plants, storage tanks, pipelines, etc. and products toxicity.		x	x	x	x	x	x	x	x	x	x	x	x	x
Community health and safety (community impacts)	Activity requires to develop additional infrastructure	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Land use & property rights	Activity requires relatively large areas of land and/or sea	x	x												
Land use & property rights	Activity is typically related to engagement with indigenous peoples	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Child labor	Child labor is a contextual risk for the industry	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Forced labor and human trafficking	Forced labor is a contextual risk for the industry	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Forced labor and human trafficking	Presence of migrant workers is a contextual risk for the industry	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Discrimination and gender	Discrimination and/or gender inequality is a contextual risk for the industry	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Wage & renumeration	Not providing living wage is a contextual risk for the industry	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Gender-based violence	Gender-based violence is a contextual risk for the industry	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Freedom of association and collective bargaining	Freedom of association and/or collective bargaining is a contextual risk for the industry	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Health and safety at work	Substantial occupational health and safety risks are typical for the activity	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Government influence	Activity requires political commitment	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Government influence	Government is typically participating in the companies in the value chain	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Government influence	Government is typically participating in the companies in the value chain	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Conflict and security	Activity typically requires security services	x	x	x	x	x	x	x	x	x	x	x	x	x	x

Key takeaways

- Some activities require large amount of **space**, which presents a risk, particularly if communities, and especially indigenous communities or other vulnerable groups, are present
- Activities present various **occupational health risks**, and health and safety is an important consideration.
- **Risks for community health and safety** must be safeguarded with appropriate infrastructure and protocols. Development of EPRP is key.
- Large scale activities and projects are subjected to **government influence and political commitment** (regulations, infrastructure, etc)

Legend

Risk Opportunity

Fair business: risks and opportunities in supply chain

Topics	Potential supply chain element risk and opportunities	Hydrogen value chain													
		Inputs		Production		Conversion & Transformation					Transportation & Distribution				
		Green	Blue**	Green	Blue	Hydrogen compression	Hydrogen liquefaction	Synthetic fuels plant	Green ammonia plant	LOHC hydrogenation	Pipeline	Trucks	Train	Shipping	Storage
Market distortion and competition	Domestic consumption			x	x										
Market distortion and competition	Use of national transport infrastructure			x	x										
Market distortion and competition	Opening of new export markets			x	x										
Market distortion and competition	Environmental and safety standards are not yet defined for the activity			x				x		x	x			x	
Market distortion and competition	Third parties (investors) typically have a significant stake in the industry	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Market distortion and competition	Third parties (investors) typically have a significant stake in the industry	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Taxation	Taxation is a contextual risk for the industry	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Corruption	Corruption is a contextual risk for the industry	x	x	x	x	x	x	x	x	x	x	x	x	x	x

Key takeaways

- Government involvement in large scale projects means that **corruption** presents a potential risk for hydrogen production and building associated infrastructure.
- **Lack of (inter)national regulation and frameworks specifically on hydrogen production and transport** presents an important risk.

Legend

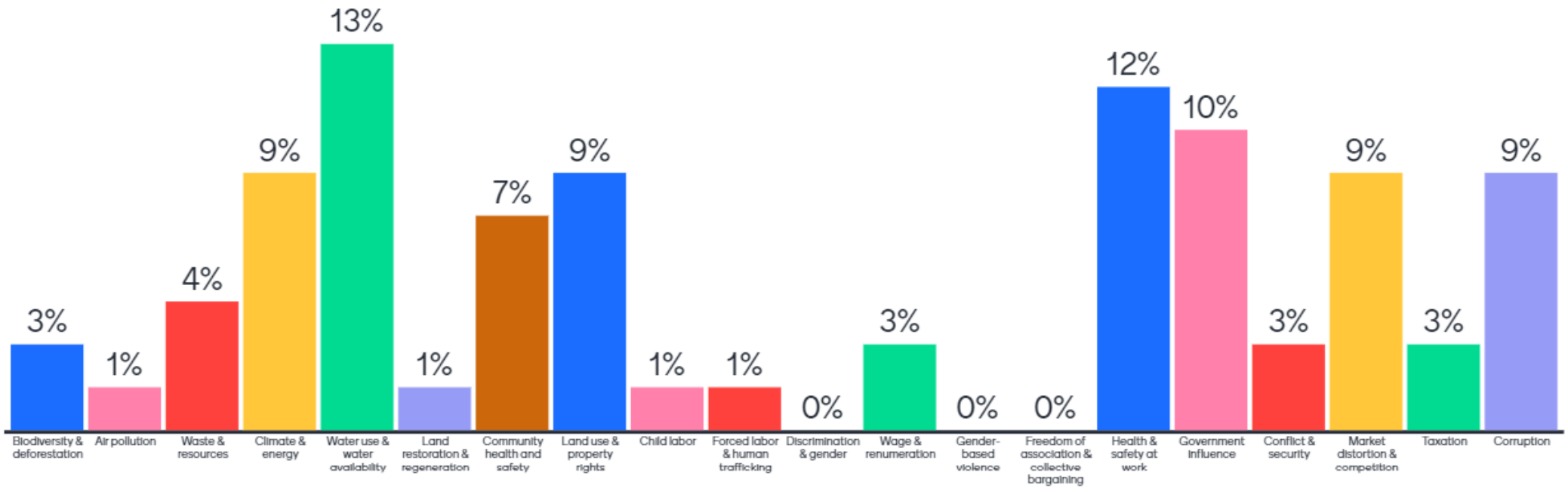
Risk Opportunity

Which topics will be most challenging to address for your organisation?

Go to **www.menti.com** and use the code: 6862 1379

Which topics will be most challenging to address for your organisation?

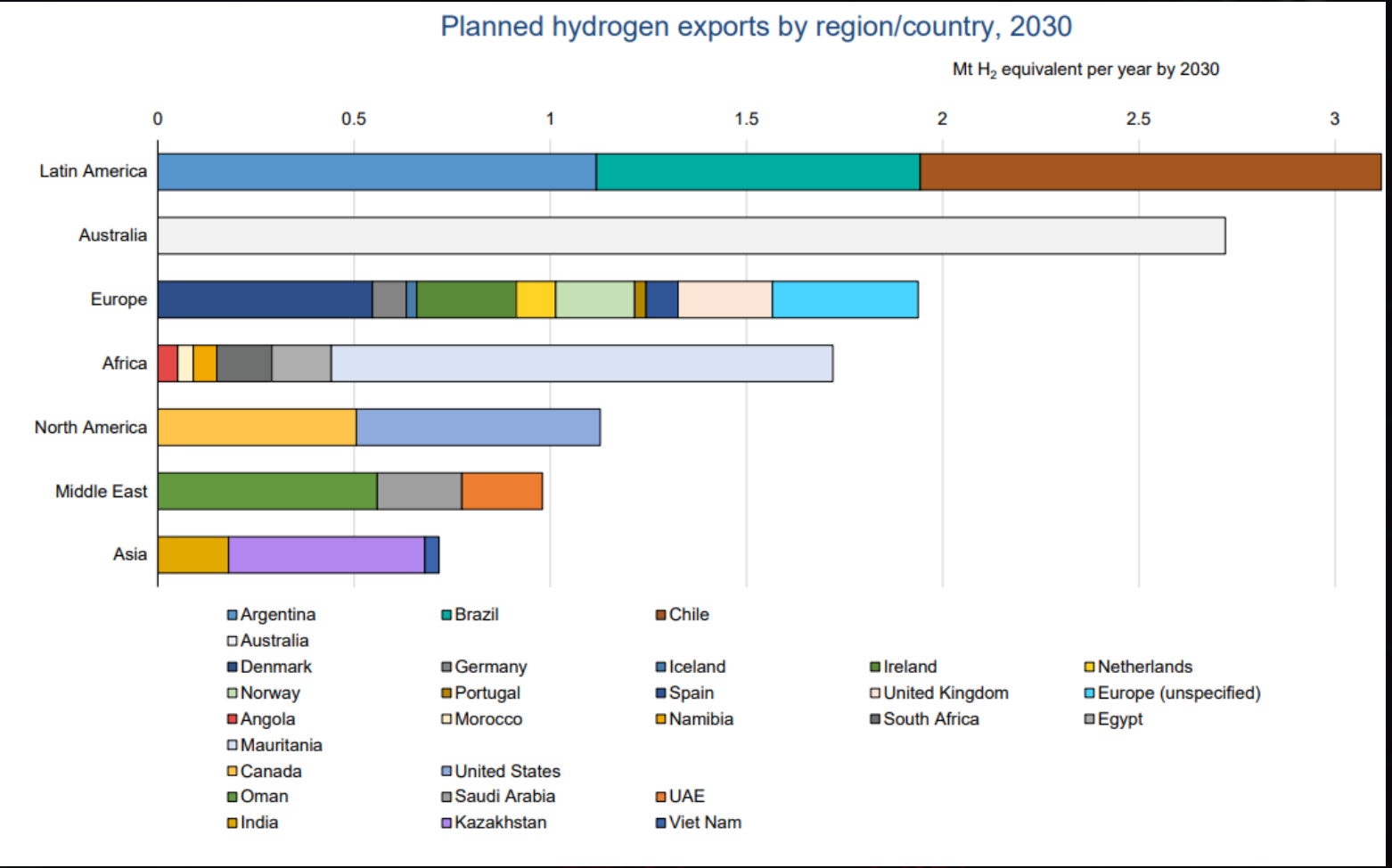
Mentimeter



17

4. Country level risk analysis

Selection of countries for the analysis



Global Hydrogen Review 2022 (windows.net)

Country	Hydrogen strategy with focus on export	Bilateral trade agreement or signed MoU's/SOIs
Chile	Yes	Yes
Oman	Yes	Yes
Australia	Yes	Yes
Denmark	Yes	Yes
South Africa	Yes	In Progress
USA	Yes	Yes
Kazakhstan	Yes	Yes

Risk categorization

Explanation of Risk Categories	
Triggers contextual project level analysis	This topic should be investigated prior to engaging in activity.
Does not trigger contextual project level analysis	This topic is not contextual risk for the projects.
Insufficient information available	Available information is not sufficient for the risk assessment.

In all cases, there should also be compliance with:

- Local regulations; and
- Dutch regulatory and policy framework.

Environmental ICSR risks in selected countries

Topic	Potential supply chain element risk	Potential country-level assessment criteria	Chile	Oman	Australia	Denmark	South Africa	USA	Kazakhstan
Biodiversity and deforestation	Activity can cause intervention, loss and/or fragmentation of ecosystems; alteration or disturbance of habitats	Biodiversity and ecosystems							
Biodiversity and deforestation	Activity can cause soil loss and/or erosion.	Soil loss, erosion, deforestation							
Air pollution	Activity generates significant amounts of emissions to air	Air quality							
Waste & resources	Activity generates significant amounts of solid waste	Waste management							
Waste & resources	Activity generates significant amounts of hazardous waste	Hazardous waste management							
Waste & resources	Activity requires significant amounts of hazardous substances	Hazardous substances							
Waste & resources	Activity requires Critical Raw Materials (CRM), according to the EU list, such as iridium, platinum, tantalum, cobalt and nickel.	Critical Raw Materials							
Waste & resources	Activity requires carbon sources (as a raw material)	Carbon sources: ambient air DAC, biogenic sources, industrial point sources CCU							
Climate and energy	Activity requires significant amounts of electricity	Energy mix, energy poverty, renewable energy sources, additionality							
Climate and energy	Activity requires significant amounts of heat energy or cooling	Energy mix, renewable energy sources, additionality							
Climate and energy	Activity requires significant amounts of fuel	Dependency on fuel import							
Water use & water availability	Activity requires significant amounts of fresh water	Water quality & availability							
Water use & water availability	Activity requires water desalination or other treatment	Water desalination							
Water use & water availability	Activity generates significant amounts of wastewater (including brine from desalination)	Wastewater management							
Land restoration and regeneration	Activity requires cleaning up and restoring of mining sites after use	Mining site restoration							

Key takeaways

- In all countries, project level analysis is triggered for: **Biodiversity and deforestation**, **CCU**, **energy mix**, and **water desalination**
- Activities in **Kazakhstan** require most project level analysis
- Activities in **Denmark** require least project level analysis

Legend

- Triggers project level analysis
- Does not trigger project level analysis
- Insufficient information available

Social ICSR risks in selected countries

Topic	Potential supply chain element risk	Potential country-level assessment criteria	Chile	Oman	Australia	Denmark	South Africa	USA	Kazakhstan
Community health and safety (community impacts)	Activity generates significant noise and vibration emissions	EIA framework, inclusion of noise/vibration							
Community health and safety (community impacts)	Explosion risks of plants, storage tanks, pipelines, etc. and products toxicity.	Safety regulations							
Community health and safety (community impacts)	Activity requires to develop additional infrastructure	EIA framework applicable for infrastructure projects							
Land use & property rights	Activity requires relatively large areas of land and/or sea	Population density							
Land use & property rights	Activity is typically related to engagement with indigenous peoples	Presence of indigenous peoples							
Child labor	Child labor is a contextual risk for the industry	Prevalence of child labor							
Forced labor and human trafficking	Forced labor is a contextual risk for the industry	Prevalence of forced labor							
Forced labor and human trafficking	Presence of migrant workers is a contextual risk for the industry	Migrant workers, conditions for migrant workers							
Discrimination and gender	Discrimination and/or gender inequality is a contextual risk for the industry	Discrimination and gender equality							
Wage & renumeration	Not providing living wage is a contextual risk for the industry	Living wage							
Gender-based violence	Gender-based violence is a contextual risk for the industry	Gender-based violence							
Freedom of association and collective bargaining	Freedom of association and/or collective bargaining is a contextual risk for the industry	Freedom of association and/or collective bargaining							
Health and safety at work	Substantial occupational health and safety risks are typical for the activity	Occupational health and safety							
Government influence	Activity requires political commitment	Political stability							
Conflict and security	Activity typically requires security services	Absence of violence							

Key takeaways

- In all countries, project level analysis triggered for: **forced labor**, **migrant worker conditions**, and **discrimination & gender equality**
- Activities in **Oman** require most project level analysis
- Activities in **Denmark** require least project level analysis

Legend

- Triggers project level analysis
- Does not trigger project level analysis
- Insufficient information available

Governance ICSR risks in selected countries

Topic	Potential supply chain element risk	Potential country-level assessment criteria	Chile	Oman	Australia	Denmark	South Africa	USA	Kazakhstan
Market distortion and competition	Environmental and safety standards are not yet defined for the activity	EIA regulation							
Market distortion and competition	Third parties (investors) typically have a significant stake in the industry	Regulatory quality, rule of law							
Taxation	Taxation is a contextual risk for the industry	Tax and enforcement							
Corruption	Corruption is a contextual risk for the industry	Control of corruption							

Key takeaways

- **Australia** requires least project level analysis
- **Kazakhstan** requires most project level analysis

Legend

- Triggers project level analysis
- Does not trigger project level analysis
- Insufficient information available

5. Relevant EU Directives

Corporate Sustainability Reporting Directive (CSRD) and the Corporate Sustainability Due Diligence Directive (CSDD)

What is the CSRD?

Under the CSRD, companies will be required to report on:

- The impact of the company on sustainability matters (including the value chain); and
- The impact of sustainability matters on the company's development, performance and position.

To whom will it apply*?

Year of reporting	Who?
2025 on the financial year 2024	companies already subject to the NFRD
2026 on the financial year 2025	large companies that are not currently subject to the NFRD
2027 on the financial year 2026	listed SMEs (except micro undertakings), small and non-complex credit institutions and captive insurance undertakings
2029 on the financial year 2028	third-country undertakings with net turnover above 150 million in the EU if they have at least one subsidiary or branch in the EU exceeding certain thresholds

*Council gives final green light to corporate sustainability reporting directive - Consilium (europa.eu)

What is the CSDD**?

- Imposes a corporate sustainability due diligence duty on companies; and
- Companies are required to identify and prevent, end, or mitigate and account for adverse environmental and human rights impacts in their own operations, their subsidiaries and their value chains.

To whom will it apply?

** Proposal adopted by Commission on 23 February 2022

EU Directives & Hydrogen Supply Chain risks: Environmental Topics

Topic	Comment	ESRS	CSDD
Biodiversity and deforestation	• Biodiversity and ecosystems • Soil loss, erosion, deforestation	ESRS E4 – Biodiversity and ecosystems	CSDD Annex Part I
Air pollution	• Air pollution	ESRS E2 – Pollution	General DD requirement
Waste & resources	• Waste, including hazardous waste • Hazardous substances, Critical Raw Materials, carbon sources	ESRS E5 – Resource use and circular economy ESRS E2 – Pollution ESRS E1 – Climate change	CSDD Annex Part II
Climate and energy	• Energy	ESRS E1 – Climate change ESRS E2 – Pollution	CSDD Annex Part II
Water use & water availability	• Water and wastewater	ESRS E3 – Water and marine resources ESRS E2 – Pollution	General DD requirement
Land restoration and regeneration	• E&S impacts related to mining site restoration	General requirement to report on impacts, risks and opportunities in the value chain	General DD requirement

* Proposal adopted by Commission on 23 February 2022

EU Directives & Hydrogen Supply Chain risks: Social Topics

Topic	Comment	ESRS	CSDD
Community health and safety (community impacts)	• Noise and vibration • Safety	ESRS E2 – Pollution	CSDD Annex Part I
Land use & property rights	• Communities, including indigenous peoples	ESRS S3 – Affected communities	CSDD Annex Part I
Child labor	• Child labor	ESRS S1 – Own workforce ESRS S2 – Workers in the value chain	CSDD Annex Part I
Forced labor and human trafficking	• Forced labor • Conditions for migrant workers	ESRS S1 – Own workforce ESRS S2 – Workers in the value chain	CSDD Annex Part I
Discrimination and gender	• Discrimination and gender equality	ESRS S1 – Own workforce ESRS S2 – Workers in the value chain ESRS S3 – Affected communities	CSDD Annex Part I
Wage & renumeration	• Living wage	ESRS S1 – Own workforce ESRS S2 – Workers in the value chain	CSDD Annex Part I
Gender-based violence	• Gender-based violence	ESRS S1 – Own workforce ESRS S2 – Workers in the value chain	CSDD Annex Part I
Freedom of association and collective bargaining	• Freedom of association and/or collective bargaining	ESRS S1 – Own workforce ESRS S2 – Workers in the value chain	CSDD Annex Part I
Health and safety at work	• Occupational health and safety	ESRS S1 – Own workforce ESRS S2 – Workers in the value chain	CSDD Annex Part I

* Proposal adopted by Commission on 23 February 2022

EU Directives & Hydrogen Supply Chain risks: Fair business Topics

Topic	Comment	ESRS	CSDD*
Government influence	• Political stability	ESRS G1 – Business conduct [1] ESRS S3 – Affected communities	General DD requirement
Conflict and security	• Security	ESRS S3 – Affected communities	CSDD Annex Part I
Market distortion and competition	• EIA regulation	General requirement to report on impacts, risks and opportunities in the value chain	General DD requirement
Taxation	• Tax	General requirement to report on impacts, risks and opportunities in the value chain	General DD requirement
Corruption	• Corruption	ESRS G1 – Business conduct [2]	General DD requirement

1. *ESRS G1 does not specifically mention political stability, but it does impose a disclosure requirement with regards to political influence and lobbying activities.*
2. *ESRS G1 does not specifically mention control of corruption, but it does impose a disclosure requirement with regards to prevention and detection of corruption and bribery, as well as a disclosure requirement with regards to confirmed incidents of corruption or bribery.*

* Proposal adopted by Commission on 23 February 2022

6. Discussion

How can governments collaborate with companies to make hydrogen value chain more sustainable?

Go to www.menti.com and use the code: 6862 1379

How can governments collaborate with companies to make hydrogen more sustainable?

Mentimeter

Develop and implement clear regulations with unambiguous conditions, norms and standards.

help with drafting and thinking about a pact of agreement

Governments can help by introducing some principles and behaviour suggestions

G2G alignment supports the set up of total new supply chains

Do discussions of what to expect and what is acceptable upfront and not afterwards, and make it part of our strategy.

Some import companies are working an initiative called Responsible Hydrogen Pact to work on these CSR standards

5

UPDATE: STATUS HYCHANGE CERTIFICERING

Bert den Ouden| HyXChange

HyXchange certificate update

SHIP meeting 21 December 2022

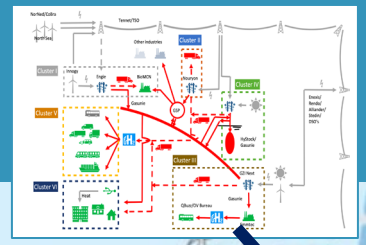
Bert den Ouden, HyXchange project director
bdnouden@wxs.nl
www.hyxchange,org

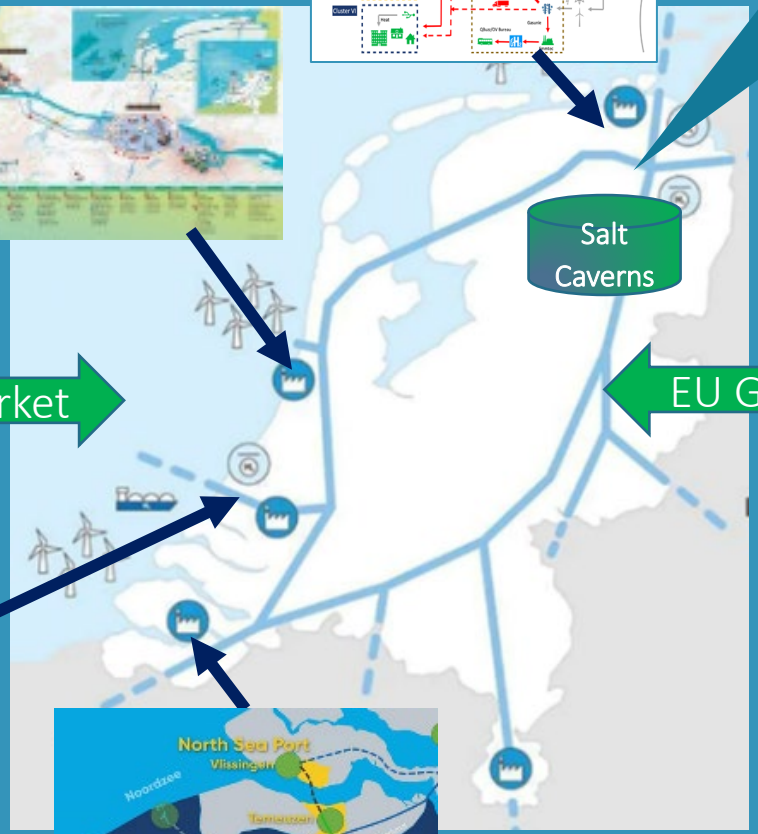
About HyXchange

Initiative by Gasunie TSO and 4 Sea Ports. 65 Market parties involved

One strand of multi-pipeline gas network in NL repurposed for H2. First stage 2026; Completed in 2030 Including salt cavern H2 storage

Global H2 carrier market

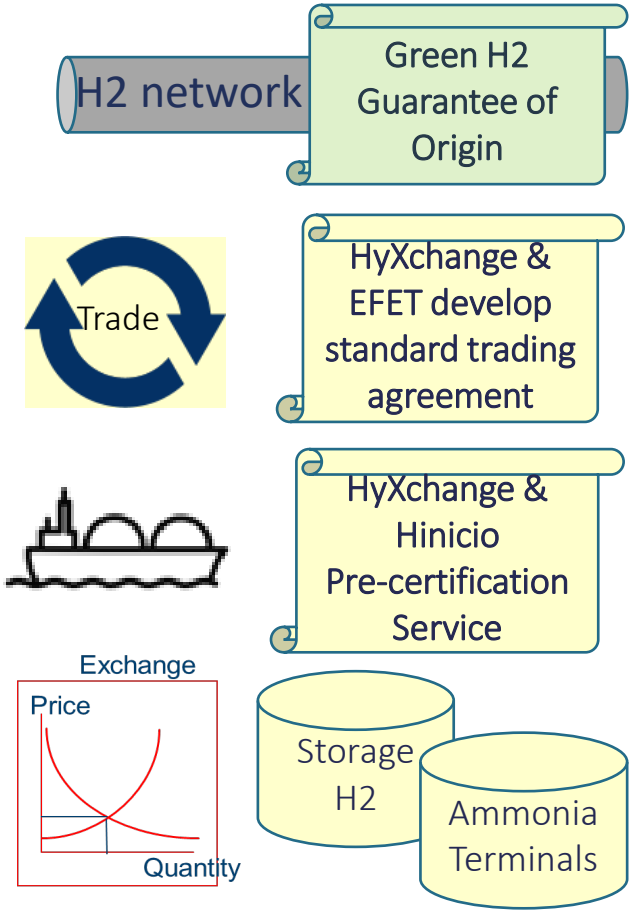




EU Gateway im/exports

Development activities HyXchange

- ❖ Pilot preparing Green Hydrogen Guarantees of Origin (GOs) now available in NL
  - ○ Standard contract for trading of Hydrogen GOs
- ❖ Pre-certification hydrogen carrier imports into Europe
  - ○ Simulation hydrogen spot market on national H2 grid
  - ○ Exploration of a price index product

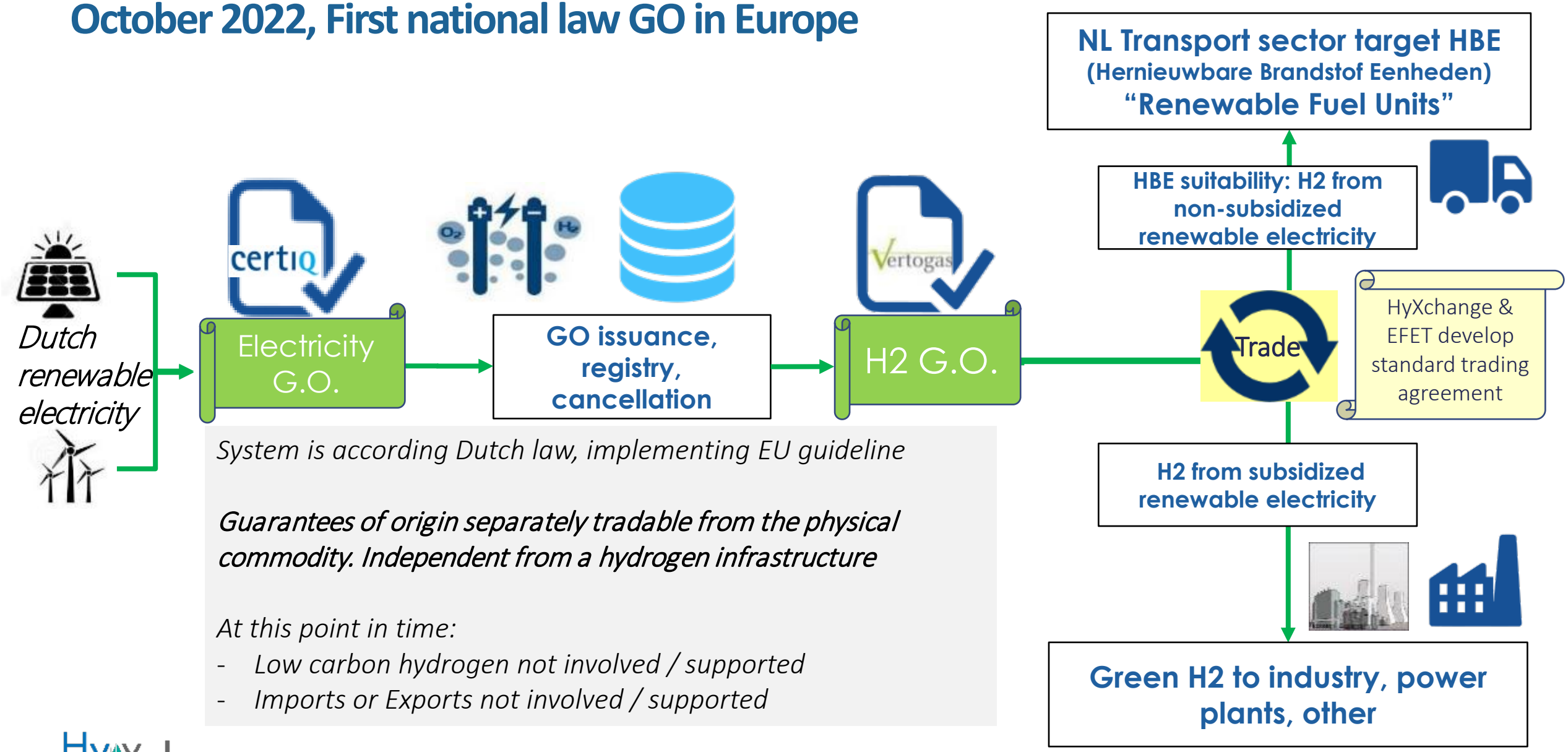


❖ *These activities conducted in co-operation with Hinicio*

HyXchange H2 certificate pilot: 18 parties, 3 months dry run
End report finalized. Findings used to improve live system.

- January – May 2022, conducted by HyXchange assisted by Hinicio (Certifhy designer)
- Dry run on new H2 GO system provided by Vertogas, certifying body (biogas, now also H2)
- GO and registration system test for green hydrogen, prepare go-live based on Dutch law
- GO low-carbon hydrogen: same format
- Pilot included registration, cancellation, splitting and trade
- Findings were taken into the live system in operation October 2022

Dutch GO system: After pilot, system started recently October 2022, First national law GO in Europe



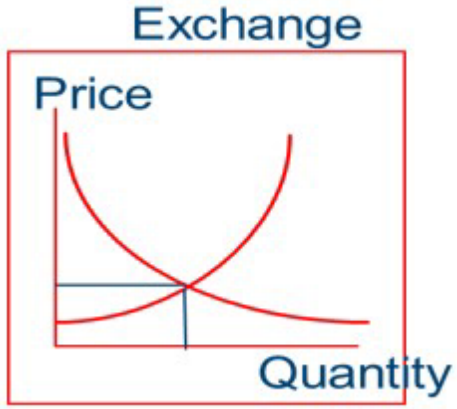
System is according Dutch law, implementing EU guideline

Guarantees of origin separately tradable from the physical commodity. Independent from a hydrogen infrastructure

At this point in time:

- *Low carbon hydrogen not involved / supported*
- *Imports or Exports not involved / supported*

Exploring a possible green H2 GO auction



Standard Guarantee of Origin trade agreement available as a basis

Platform / facility for:

- Producers selling green hydrogen GOs (apart from the hydrogen)
- Purchase of green GOs for conversion into HBE or any other purpose
- Re-trade of purchased GOs, closing of GO positions
- If possible, generation of a Green Hydrogen GO index.

Challenges and risks

- Start of the GO auction: will this be successful ?
  → Need for launching customers dedicating a production and/or trading volume

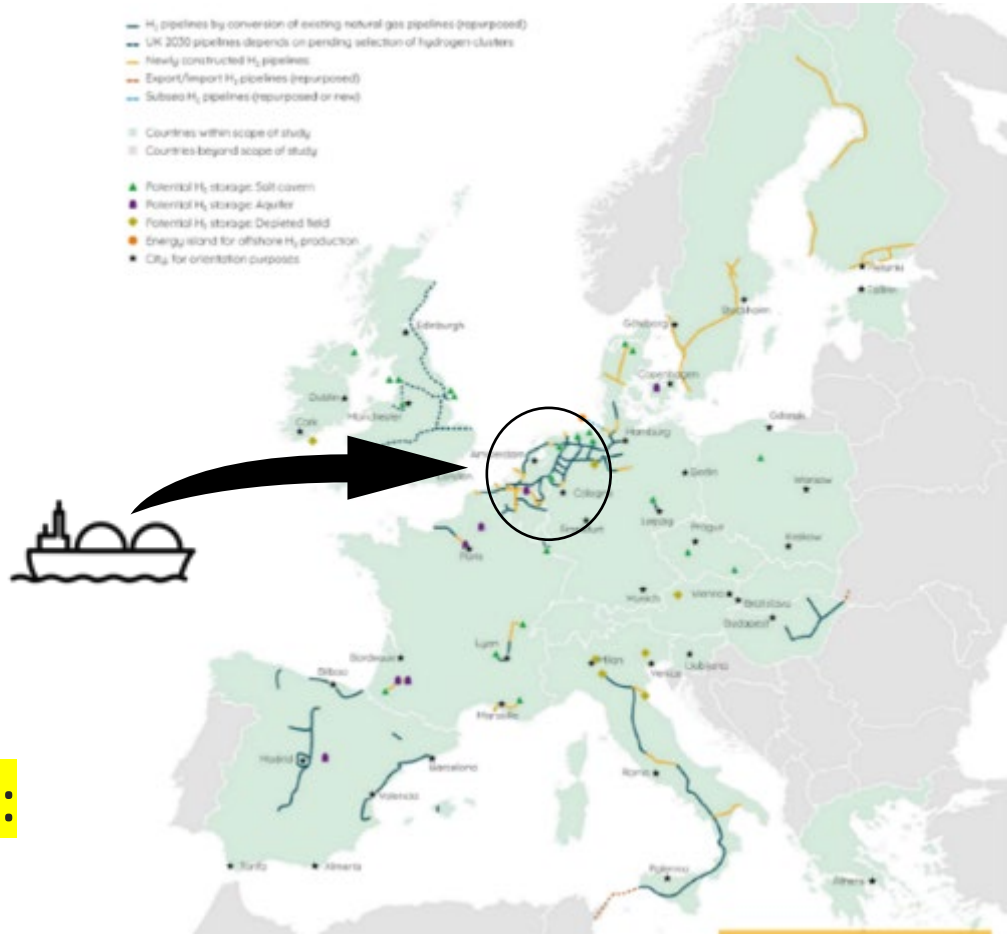
- Continuity: if the GO (book and claim) is replaced by EC certificates(mass balancing)
  - GO regime at least guaranteed for 2-3 years (2023 - 2025), but thereafter?
  - Not certain if (to what extent) GOs will be replaced: what will be the system chosen?

Can EC REDII mass balancing certificates be traded separately?

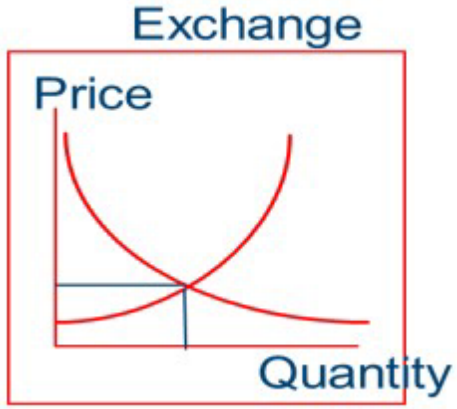
They are separately tradable on the grid ("one mass balancing point")

- GO's are separately tradable from the commodity
- EC LCA REDII H2 certificates, delegated Act: mass balancing, connected to the commodity
- Shipping imports: mass balancing, go with ship.
- ***Interconnected*** **H2 grid: one mass balancing point**
- Within that grid "No tracing of transactions": free trade of certificates, separately from commodity
- Monitoring all injected / withdrawn hydrogen: metered volume H2 + certificate input/output

→ HyXchange exploring how this would work in practice:



Auction can be evolving: from GO to REDII certificates



1. Starting now : based on Guarantees of Origin, book&claim
   - Need to get launching customers; possible to start in 2023
   - Trade the value of green hydrogen – even without infrastructure
   - The inly hydrogen trading tool in this stage
   - Generate green Hydrogen index

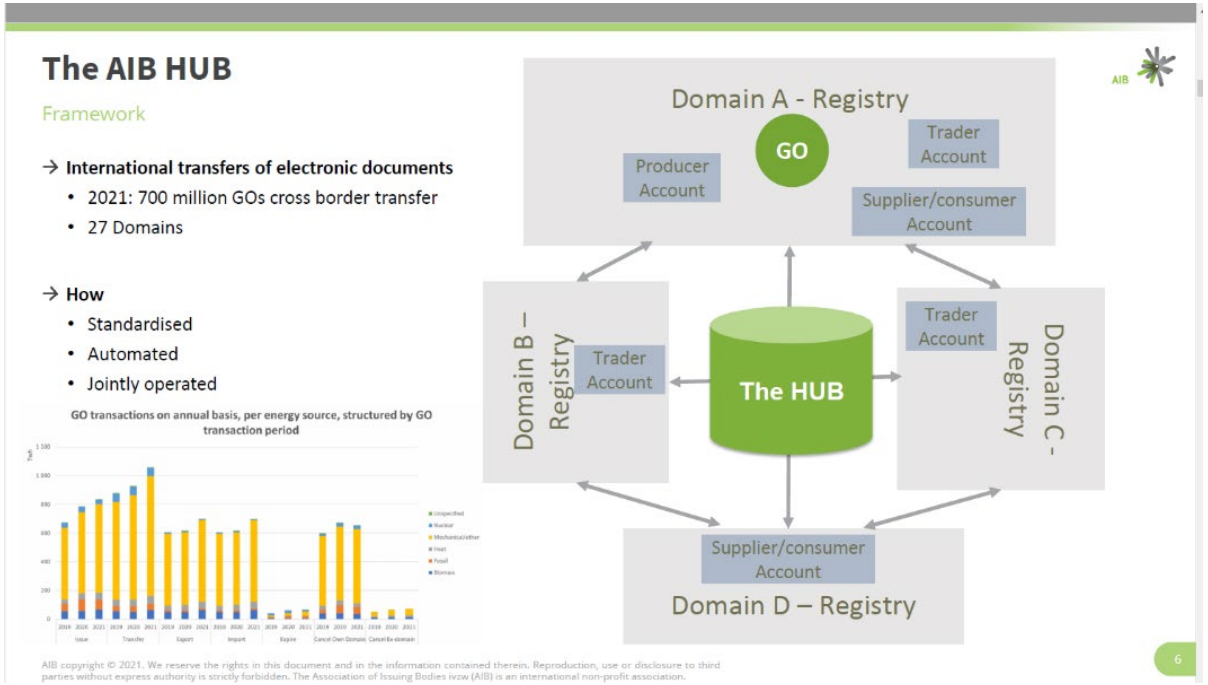
2. Evolving into : EC certificates: RED 2, based on mass balancing (separately tradable on interconnected H2 infrastructure)
   - Need to secure separate tradability on H2 infrastructure
   - Need support from the market parties for this transition model
   - Opportunity for administrative compliance system including bilateral trade (“HyClear”)

→ Design Trading system to facilitate first the one, then the other

HyXchange

Additional possibility: international GO's

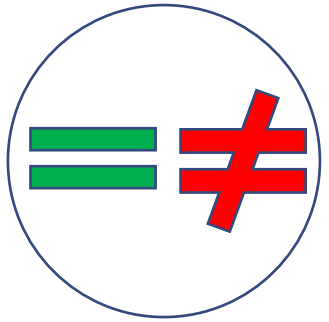
- AIB (Association of Issuing Bodies) creating international GO hub.
- Other countries willing to launch a Hydrogen GO system soon: Austria, Spain, Estonia. Drafts are circulating in Germany, Belgium
- No need to share infrastructure or border (book and claim system), but acceptance for targets can be problematic (e.g. for HBE's)
- Imports (based on Mass Balancing) could also count as basis for GOs? [See recent VEMW position paper]



International (EU) system: EU certificates based on RED2
Renewable Energy Directive: draft Delegated Acts

Delegated act on "Additionality": long discussion on strict demands "what is Green H2"

- **Temporal correlation**: time matching of renewable supply and electrolyzer
- **Geographical correlation:** renewable supply and electrolyzer in same area
- **Additionality requirement:** H2 only from renewable power built recently



Much debated……

AND

Delegated act on carbon footprint requirement: -70% (versus H2 from SMR)

- Not much debated, widely accepted
- Whole chain: renewable, electrolyzer, conversion into carrier, transportation, conversion from carrier (e.g. NH3) to H2

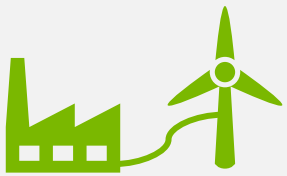
Why is this a problem? It doesn't need to be!

Many H2 imports are from semi-autonomous windfarms and solar farms. EU acceptance should be easy

Delegated Act (DA)

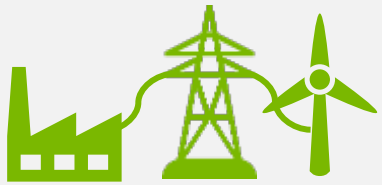
Case 1
Partial renewable hydrogen

- Renewable share of grid



Case 2
100% renewable hydrogen

- New renewable installation



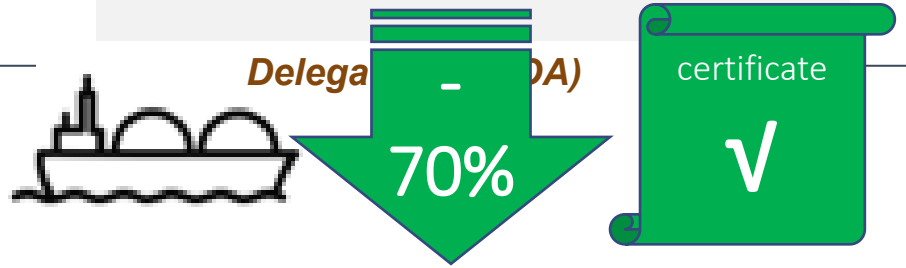
Case 3
100% renewable hydrogen

- Additionality
- Temporal correlation
- Geographical correlation

- < 3,4 kg CO_{2eq}/kg H_2 consumed

- < 3,4 kg CO_{2eq}/kg H_2 consumed

- < 3,4 kg CO_{2eq}/kg H_2 consumed



Pre-certification project service by HyXchange & Hinicio

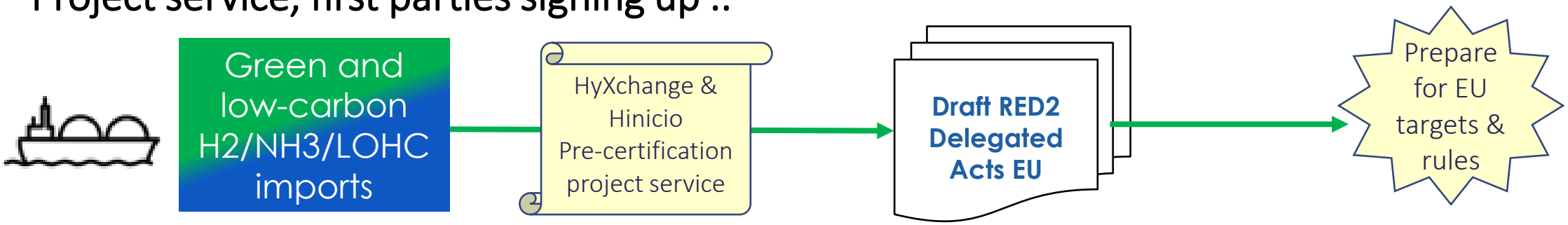
- Certification key enabler for international imports, trading of hydrogen counting for:

  targets for RFNBO hydrogen

  targets for percentage of renewable hydrogen in the industry

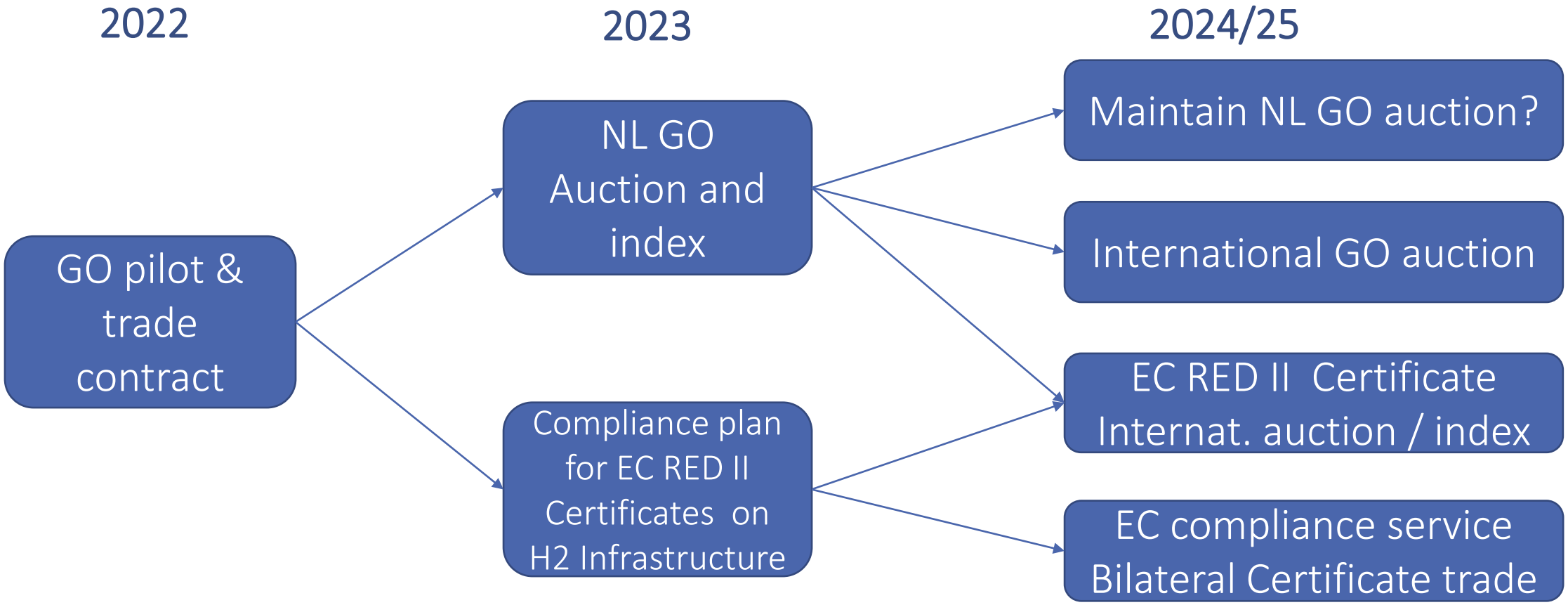
  exemption from CBAM charge

- Pre-certification: doing the homework for important projects – ahead of the final rules
- We enough about the draft rules to prepare for readiness; then hit the ground running
- Both green and low carbon Hydrogen (with same -70% criterion), Certifhy based
- Taking into account steps in between like ammonia conversion & transport
- Interesting learnings form recent RVO pilot
- Project service, first parties signing up ..



HyXchange

Evolution of Certificate auction trading: options



Design trading system and select service provider in advance for this evolution path. Currently in mind for this product: EPEX spot (with ECC clearing?); others are possible

Hydrogen backbone as trading hub for H2 and certificates

Discussie

DISCUSSIE: VOORSTEL GROENVERMOGEN

René Peters | TNO

VOORSTEL GROENVERMOGEN

Ontwikkeling groene waterstof importketens voor Nederland

- Behoefte: Routekaart / Stappenplan om tot import van duurzame waterstofdragers te komen.

- Voorstel: Opstellen routekaart
  - Welke landen zijn het meest geschikt om importketens mee te ontwikkelen?
  - Welke waterstofdragers zijn in welke situatie/toepassing/waardeketen het meest geschikt?
  - Hoe past de drager bij de capaciteit van het producerende land, de importerende haven en afnemende industriële sector? Zijn er voorkeur ketens?
  - Welke belemmeringen moeten worden weggenomen (PESTLE); hoe plaatsen we dit in de tijd (kritieke tijdpad)?

- Fasering:
  - Fase 1: Verkenning
  - Fase 2: Uitwerken en opstellen routekaart – meerjarig programma met verbinding naar SHIP>NL

  - Waar voorziet dit plan nog niet in jullie behoefte?
  - Hoe willen jullie betrokken zijn bij de uitvoering?

VOLGENDE KENNISSESSIES

VOORUITBLIK: KENNISSESSIES 2023

Behandeld in 2022

1 Technisch economisch

- Inzicht in importketens productie-conversie-transport-opslag-reconversie-gebruik
- Vraagontwikkeling, scenario's
- Infrastructuur & systeemintegratie: corridors, benutten bestaande infra.
- Technology assessments, R&D

2 Beleid

- 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

3 Markt

- Marktmodellen: bilaterale contracten, vrije handel, waterstofbeurs
- Internationale handelsstromen: verwachte vraag- en aanbodvolumes en transportstromen
- Importtarieven, trade agreements en handelsbeperkingen, WTO, etc.

4 Internationaal

- 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

5 Omgeving

- Ruimtegebruik van ketenelementen
- Veiligheid: brandbaarheid, zorgwekkende stoffen, risicocontouren, etc
- Milieu: stikstof, lekkage
- Maatschappelijke acceptatie
- MVO / samenhang met SDG's in exportlanden

Synthese

VOLGENDE KENNISSESSIE WOENSDAG 18 JANUARI

Face-2-Face

- Ministerie van EZK – Bezuidenhoutseweg 73, Den Haag

18 januari	Onderwerp	Spreker
14.30 – 15.00	Ontvangst	
15.00 – 15.30	Tour de table	
15.30 – 16.10	Deep Dive: Managing future security of low carbon hydrogen supply	Coby van der Linde | CIEP
16.10 – 17.00	Workshop: NL Propositie op World hydrogen summit 2023	Claire Hooft Graafland | RVO & Jorg Gigler | TKI Nieuw Gas
17.00 – 18.00	Borrel	

- Data overige F2F kennissessies
  - 15 maart
  - 17 mei
  - 19 juli
  - 20 september
  - 15 november
- Overige maanden online deep dives


Season's
Greetings!

HARTELIJK DANK VOOR UW AANDACHT

Vragen? Neem gerust contact met mij op:

Monique Rijkers

Monique.Rijkers@tno.nl

+31 6 23 34 65 16