

Promotion of Green Hydrogen and PtX in South Africa – Expert Exchange Event Series – Webinar #2

Governance Systems and Enabling Policies for Green H₂



H₂

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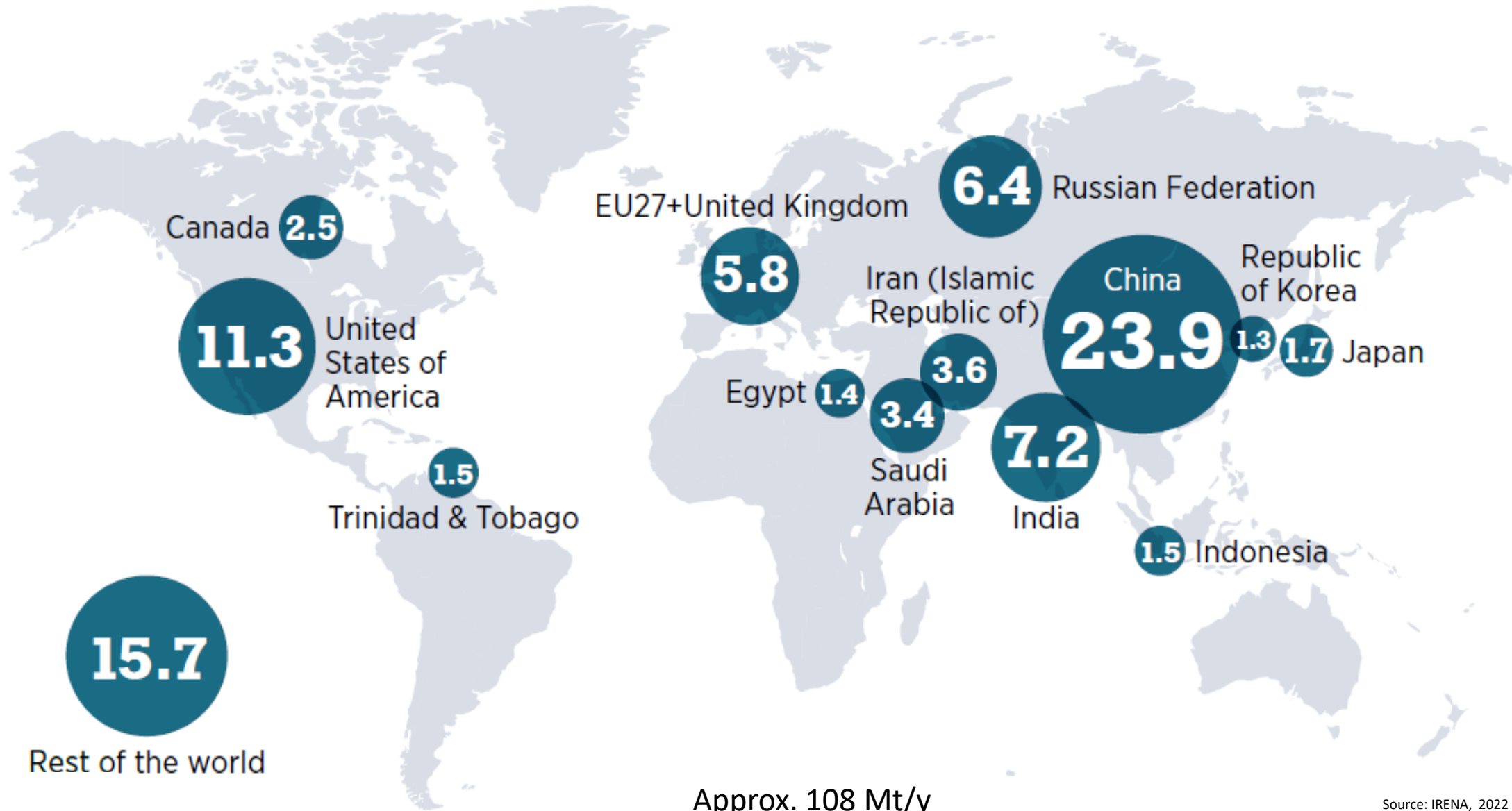
Contents

- **Clean hydrogen (H₂) enabling policies and roadmaps:**
 - Opportunities and Challenges
- **Guidelines for building a H₂ roadmap**
 - Theory of Change
 - Monitoring, Evaluation and Learning framework
- **The “Hydrogen Society Roadmap” of South Africa**



Opportunities and challenges

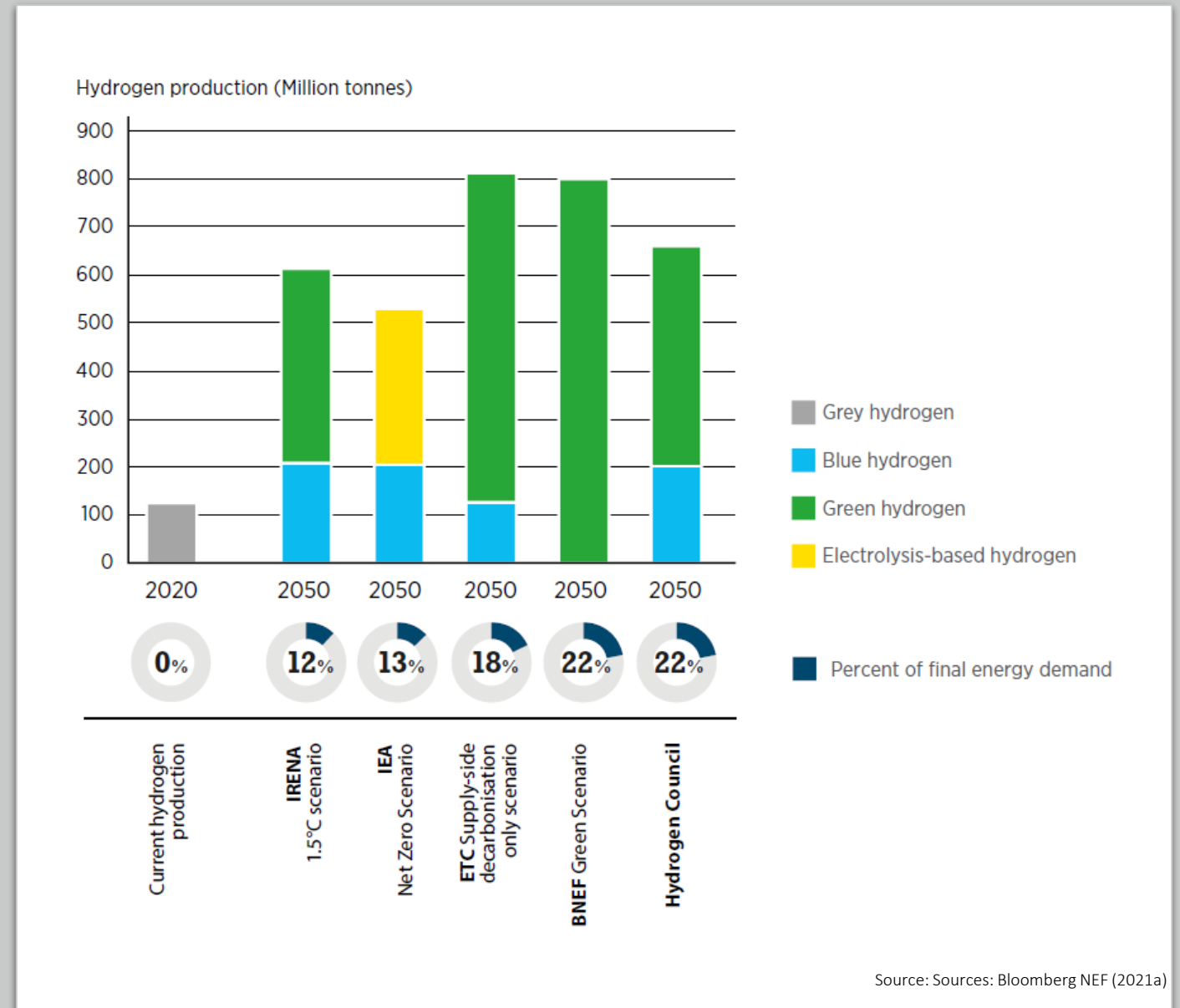
Hydrogen demand in 2020 (million tonnes per year, Mt/y)



Estimates for global hydrogen demand in 2050

Global clean H2 market opportunity

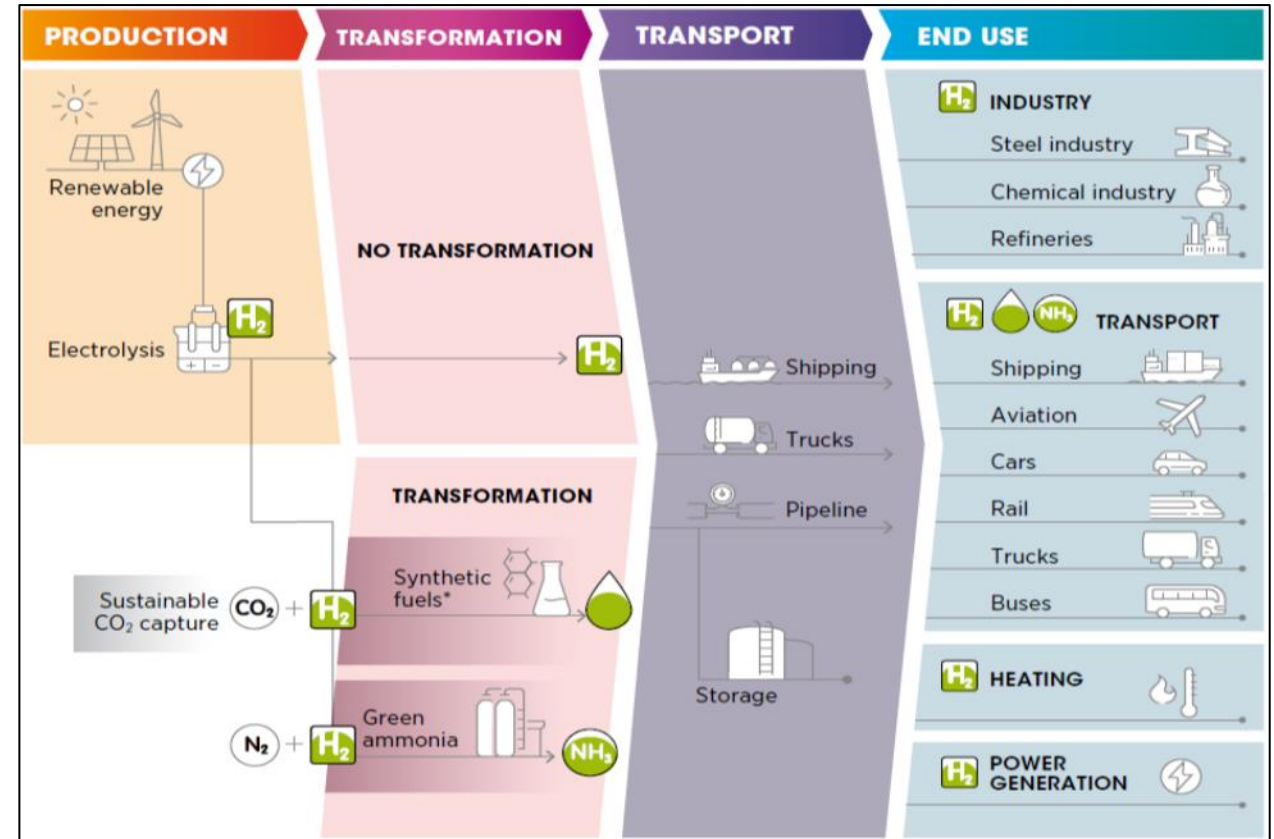
- Current H2 production is almost entirely from fossil sources (grey H2)
- Main studies forecast a growing H2 (blue and green) utilization in the global energy demand, in view of the **Paris Agreement** climate goal:
 - **keep the global temperature below 1.5°C by the end of this century.**
 - **The goal sets the pathway for a net zero-carbon energy system by 2050**



Green Hydrogen drivers

Green H₂ (GH₂) is experiencing a strong momentum thanks primarily to the following factors:

- the drop of **renewable electricity cost** (for GH₂ production)
- the surging and urgent need of countries to curb their CO_{2eq} emissions to meet their climate commitments under the **Paris Agreement**
- Technology improvement (**efficiency, working hours**) and **reduced costs** of key technologies:
 - **Reduction of electrolyzers' cost as the technology moves from kW to MW (and GW in the medium-long term)**
 - **Increased technology deployment and market maturity.**
- **H₂ flexibility** as energy vector: PtX and sector coupling



Green H₂ value chain (Source, IRENA)

Green H2 market barriers

- RE availability for GH2 production
- Technology
- Regulation codes and standards (RCS)
- Dedicated policy
- Costs
- Market limitation
- Access to finance
- Social acceptance

Tecno**l**ogy (supply and demand)

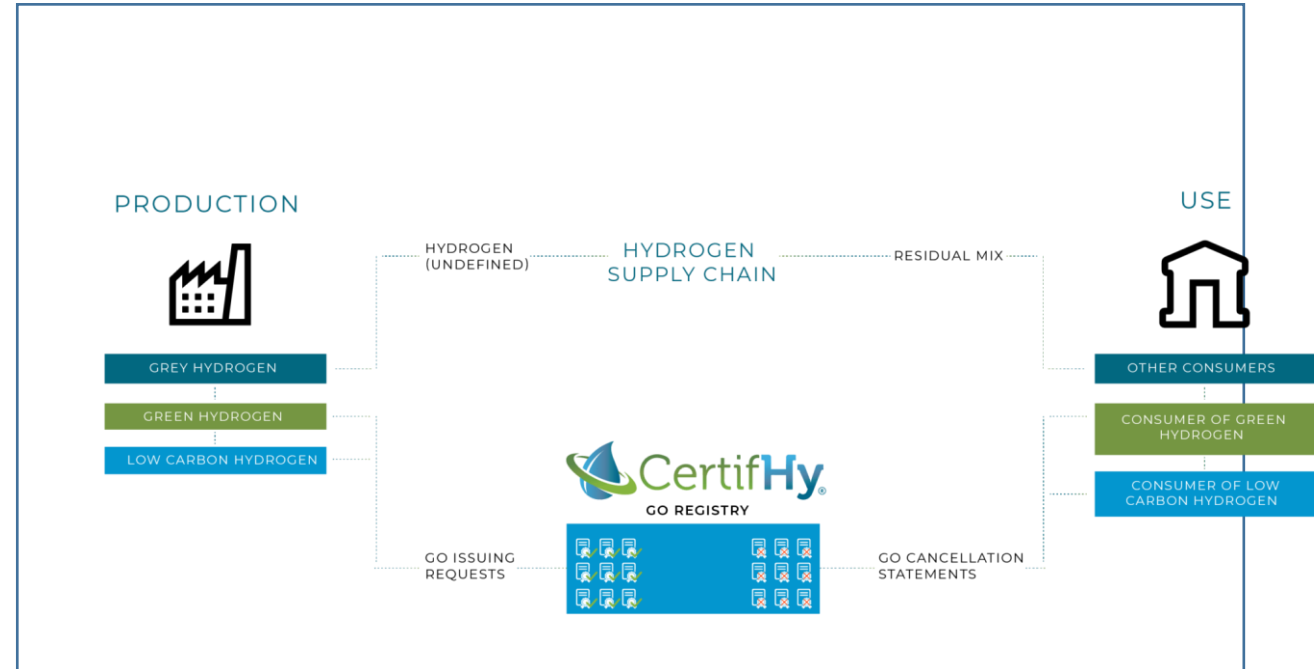
- **Maturity:** H2 technologies are mature (i.e. electrolysers, FCs), however reliable suppliers are necessary to ensure proper **efficiency** and **operating hours**
- **Competitiveness:** Strong competition with other energy technologies, especially batteries, for both **storage** and **power generation**
- Storage and transport of H2 are complex and include relevant energy losses
- The **operation and maintenance** of H2 systems and infrastructure require skilled labour

Regulation, codes and standards (RCS)

- RCS for H2 are not globally uniformed
- Clarity on RCS adoption is a requirement for the private sector to mitigate investment risk (technology deployment)

Garantee of Origin (GO)

- A GO mechanism is necessary to certify the source of green H2 and comply with export and decarbonization strategies and the regulation of carbon markets
- **CertifHY** GO scheme: established in the EU by the Clean Hydrogen JU



Schematic of the CertifHY GO



Costs barriers

- Green H2 is more expensive (3-5 times) than grey and blue H2 (1.5-2.5 USD/kg H2, IEA)
- CAPEX of the electrolyzers is high (2nd cost factor for H2 production)
- OPEX of the electrolyser depends mainly on the cost of electricity

Market barriers

- Lack of demand for “green products” (e.g., green ammonia, renewable fuels)
- Lack of buyers in the market willing to purchase green H2 at a higher cost compared to fossil fuel-based grey H2
 - **This is currently one of the biggest risks for green H2 business.**

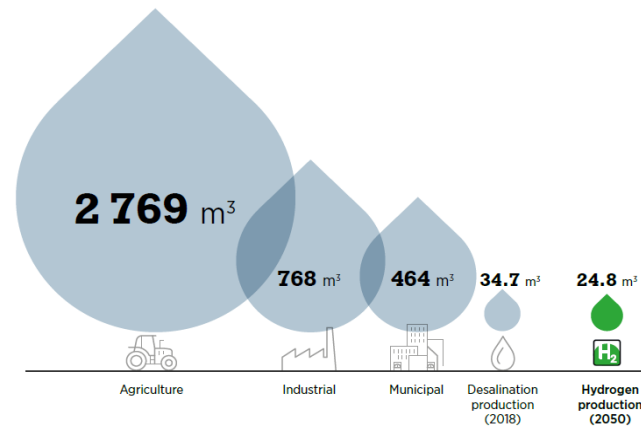
Policy barriers

- Lack of specific policies that recognize clean H2 in the policy framework (such as H2 gas, fuel, etc.)
- Need for integration with national policies in various areas:
 - Economic development
 - Energy
 - Climate
 - Industrial
 - Transport
 - Social
- Need for specific policy levers (such as **carbon pricing**) to reduce the GH2 price gap
- H2 roadmap and strategy are
 - pillars for the definition of dedicated/enabling policies and the development of (climate) action plans
 - key enablers for business development

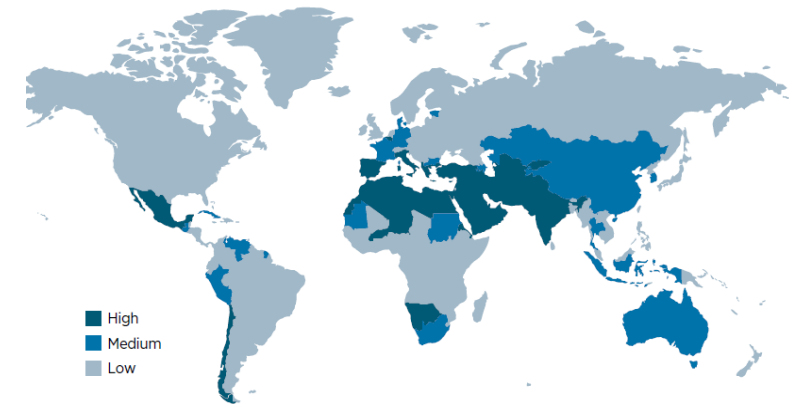
Social barriers

- Water availability:
 - It is a requirement for green H2 projects and must be carefully assessed vis-a-vis drinking water needs, especially in landlocked areas where desalination is not available.
- Social acceptance:
 - There is need to raise awareness of the benefits of green H2 technologies (dissemination) and eliminate myths (e.g., the H2 bomb) to reduce the perception of risk.
- Just transition:
 - Job losses from the fossil fuels based sectors in the transition towards net zero by 2050
 - GESI (Gender Equality and Social Inclusion)

Water consumption for H2 production in 2050 compared with selected sectors today (bn m3)



Map of water stress levels

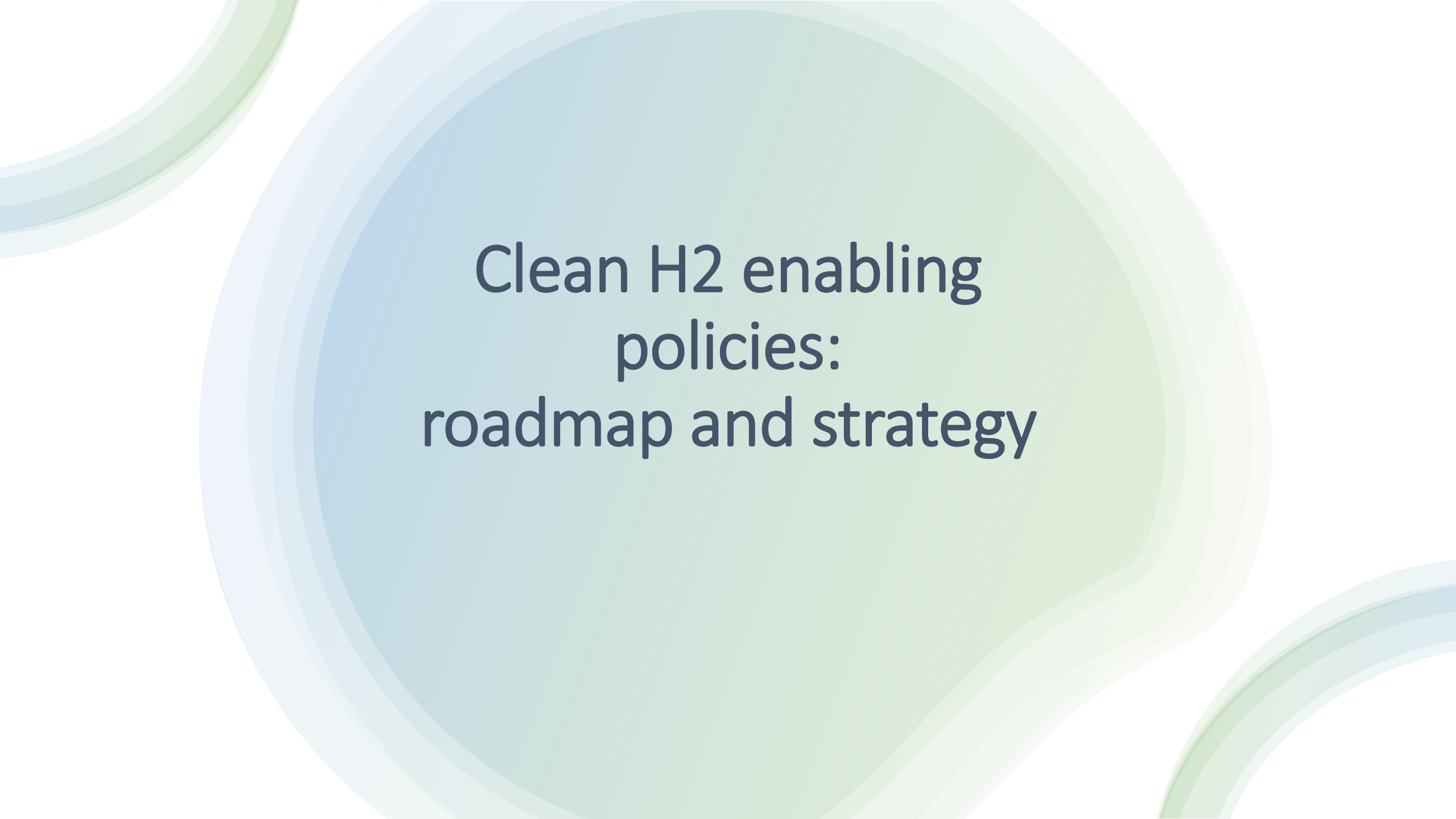


GH2 funding

- There is need for **blended finance** throughout the H2 value chain to develop clean H2 projects:
 - a mix of concessional and commercial finance (grant, loans, etc.)

EU examples of H2 eligible funding:

- Clean Hydrogen Joint Undertaking within the Horizon Europe program of the EC:
 - Budget: 1 billion € (2021-2027); focus on R&D, available grant between 70-100%
 - New call open for African countries published in March 2022
 - EFSD+ (European Fund for Sustainable Development)
- National and international funding and partnerships to foster projects and investments
 - H2 SA (branch of the H2 Global initiative by the German Gov.)

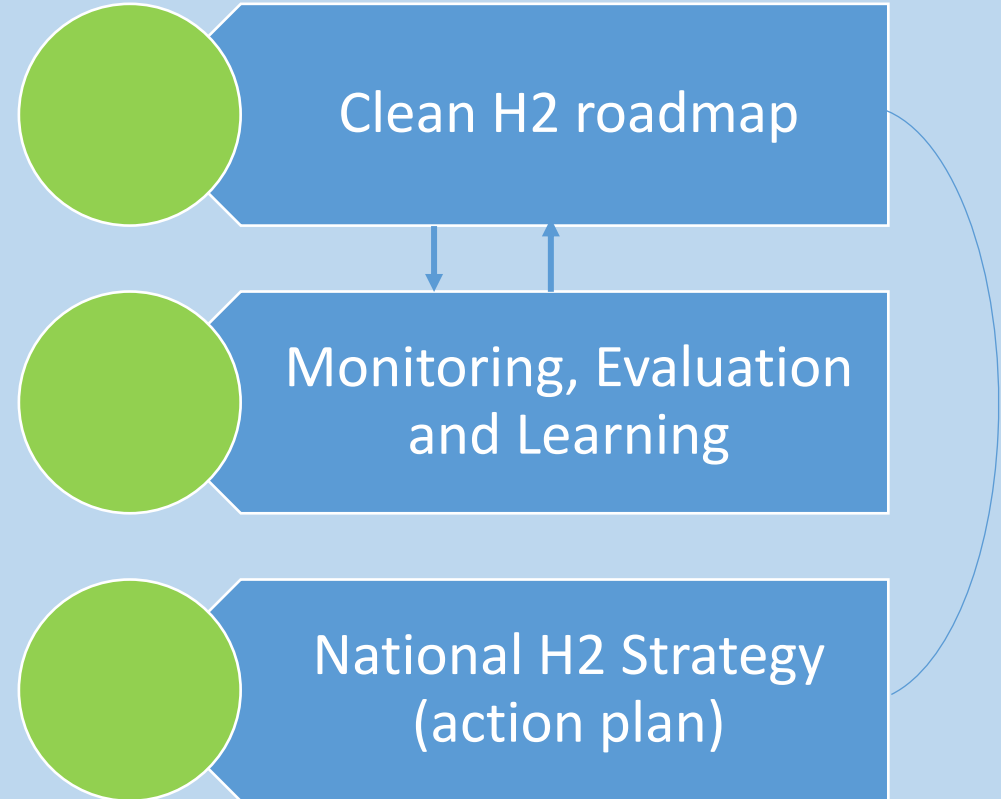
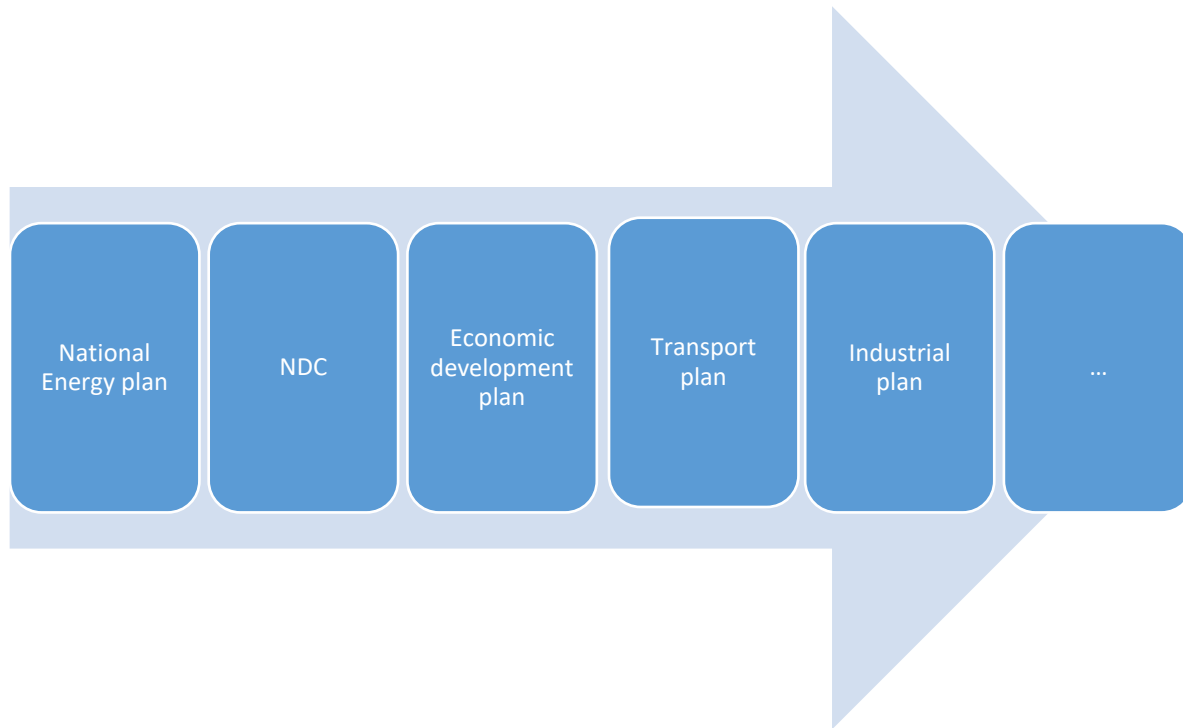


**Clean H2 enabling
policies:
roadmap and strategy**

Governance system and H2 enabling policy: main outputs

1. Roadmap (setting targets for an action plan)
 2. **National strategy**: projects' selection and prioritisation shared with stakeholders
 3. Monitoring, Evaluation and Learning (**MEL**) framework
- How to get there
 - Wide stakeholders involvement (participatory definition of targets, actions):
 - **Government representatives (Ministries, certification bodies, etc.)**
 - **Private sector**
 - **Academia/R&D**
 - **Civil society**

Work flow of a H2 Roadmap

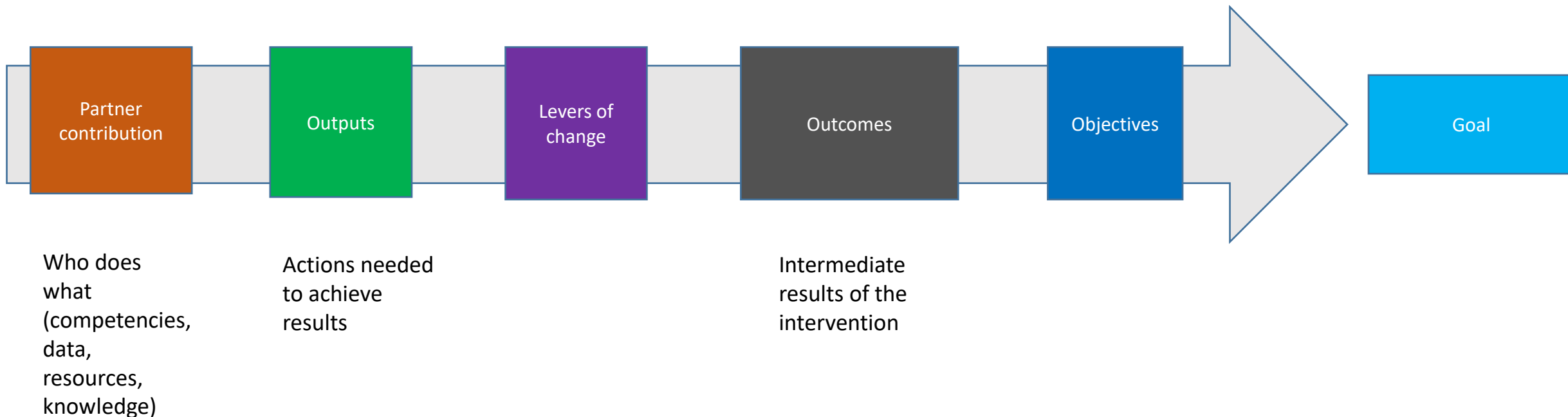


The roadmap process: opportunities and needs

- **Opportunities:**
 - Integration and alignment of national sectoral plans
 - Inclusion of GESI (gender equality and social inclusion) for the just transition
- **Needs:**
 - modelling team (techno-economic) to define/confirm sectoral goals (short term and up to 2050)
 - wide stakeholders' participation (public-private), including international actors
 - governmental entity to act as focal point and lead the Roadmap/Strategy development

Fundamentals of the roadmap: Theory of Change

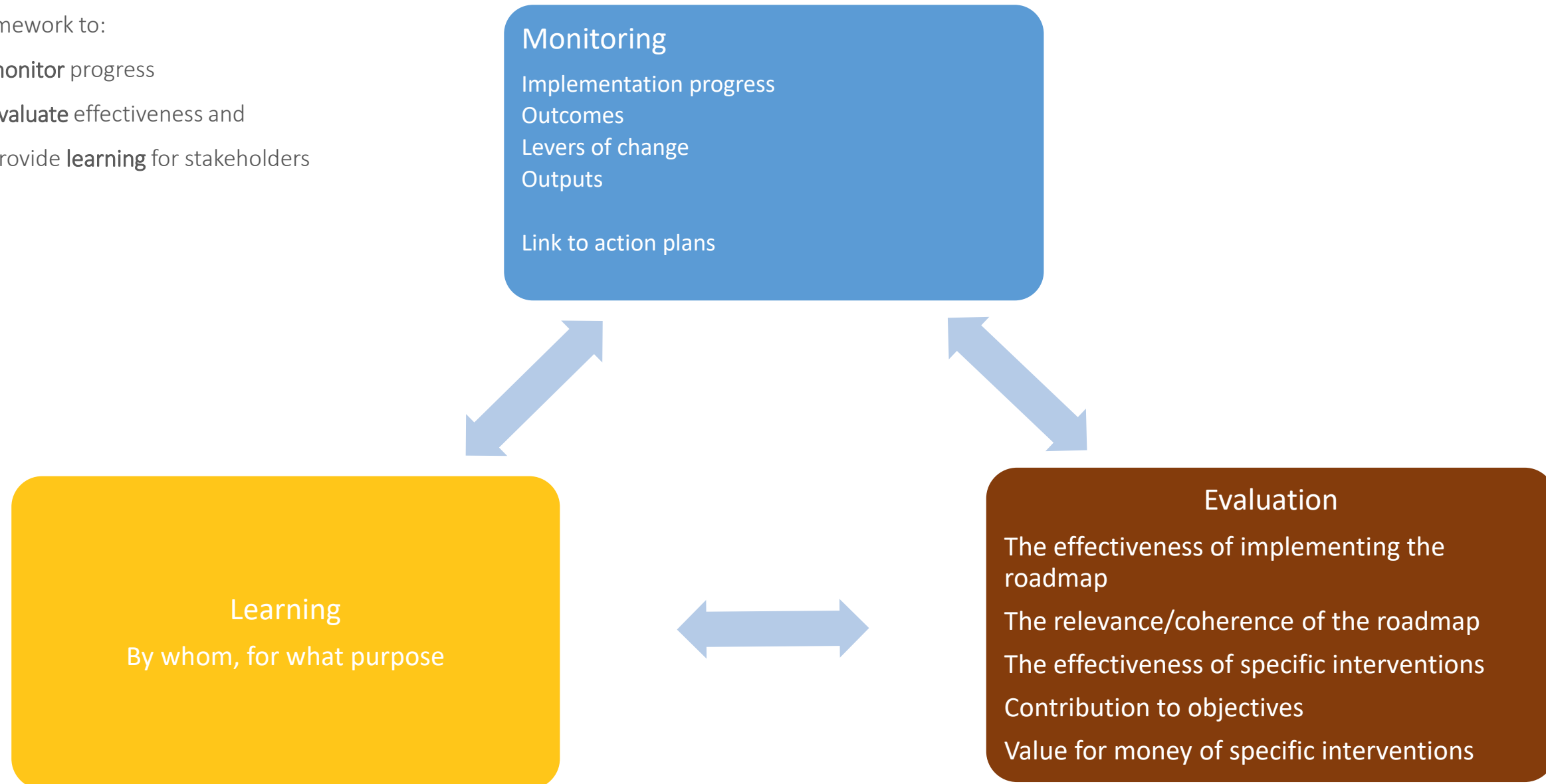
- Conceptual framework explaining how a policy/intervention is supposed to lead to a chain of results
- Enables policymakers to think through policy development
- Informs what should be monitored and how the policy should be evaluated



Fundamentals of the roadmap: MEL Framework

A framework to:

- **monitor** progress
- **evaluate** effectiveness and
- provide **learning** for stakeholders



Monitoring

- Need for KPIs selection and
- Periodic check and update

Indicator	Disaggregation	Explication	Source	Frequency	Baseline	Targets			
						2025	2030	2040	2050
Green H2 production									
GW of electrolysis installed	Green, blue, grey H2; H2 derivatives	Gives evidence on market development and is needed to inform the guarantee of origin scheme	Certification Body/ Relevant Ministry	annual	-		1GW	6GW	12 GW
M tons of H2 produced									

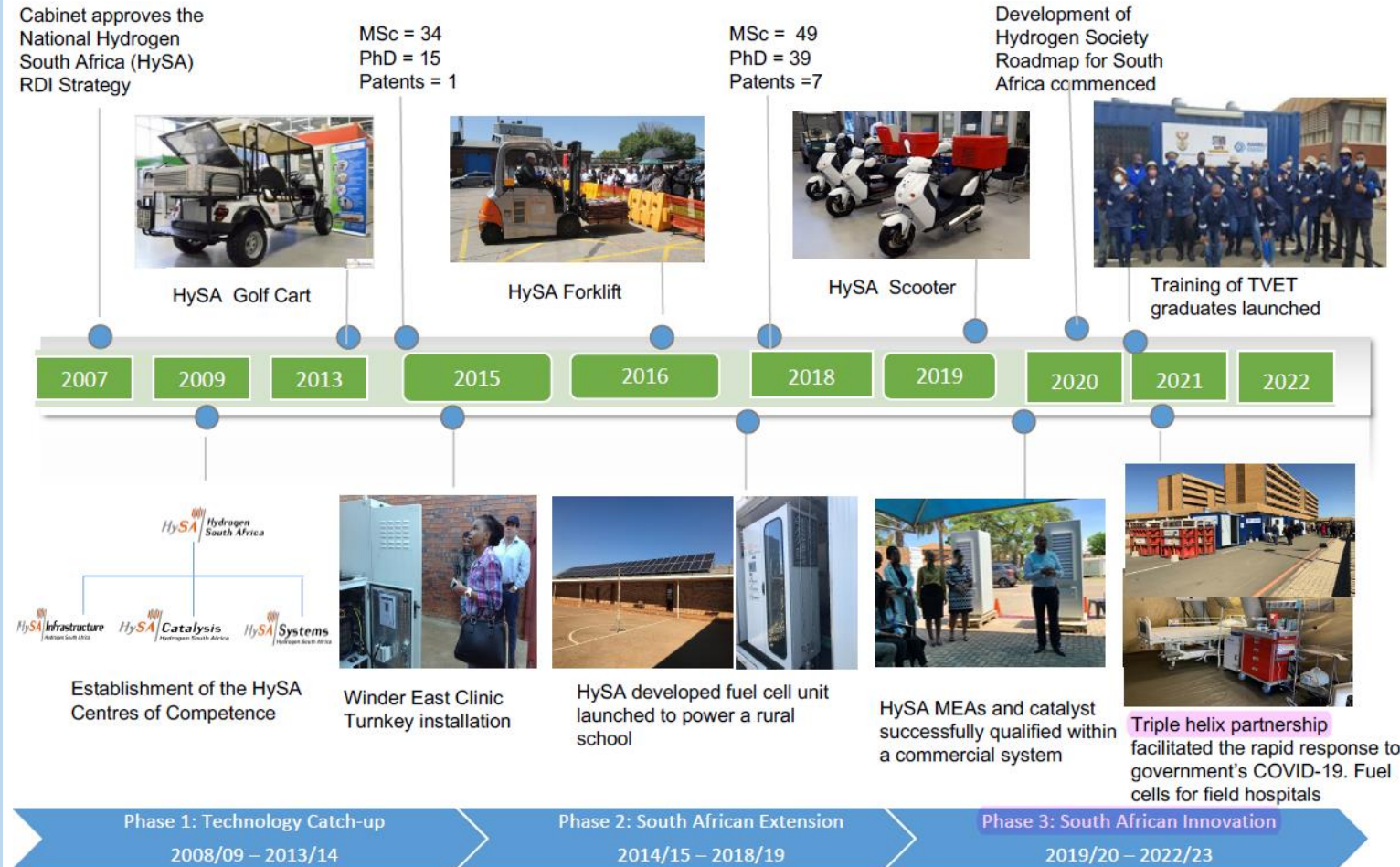
Example of monitoring table



The Hydrogen Society Roadmap of South Africa

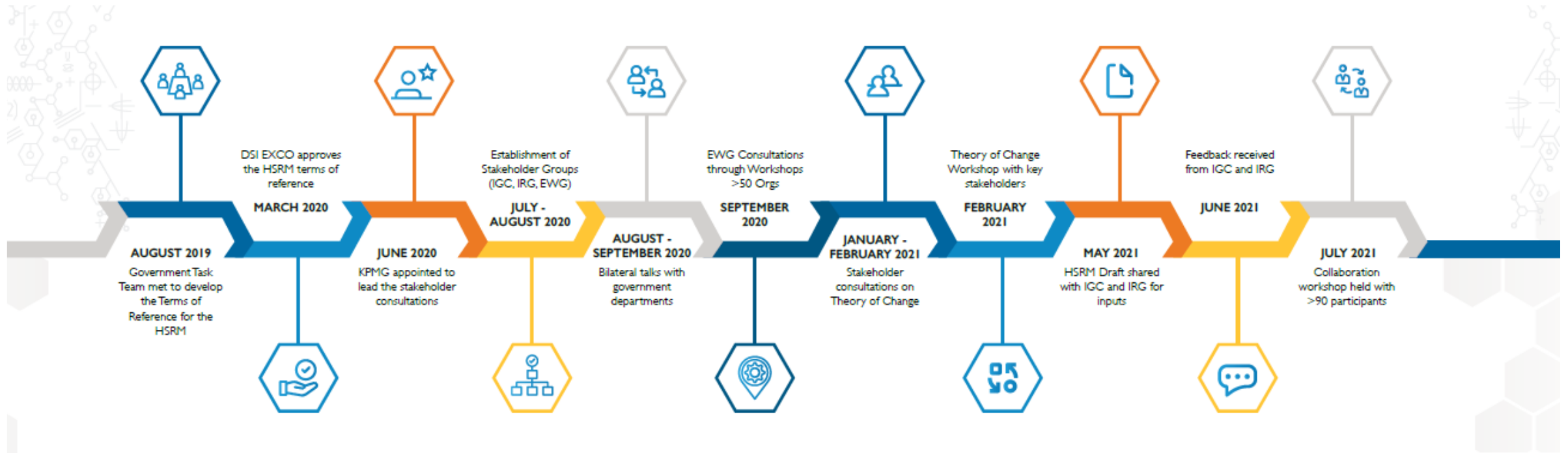
South Africa comparative advantage

- Local knowledge on H2 technologies
- HySA R&D program:
 - Built in 2007, is the national H2 backbone



HySA programme

The Hydrogen Society Roadmap journey



ACADEMIA/COUNCILS/ R&I



GOVERNMENT/PARASTATAL



INDUSTRIAL REFERENCE GROUP

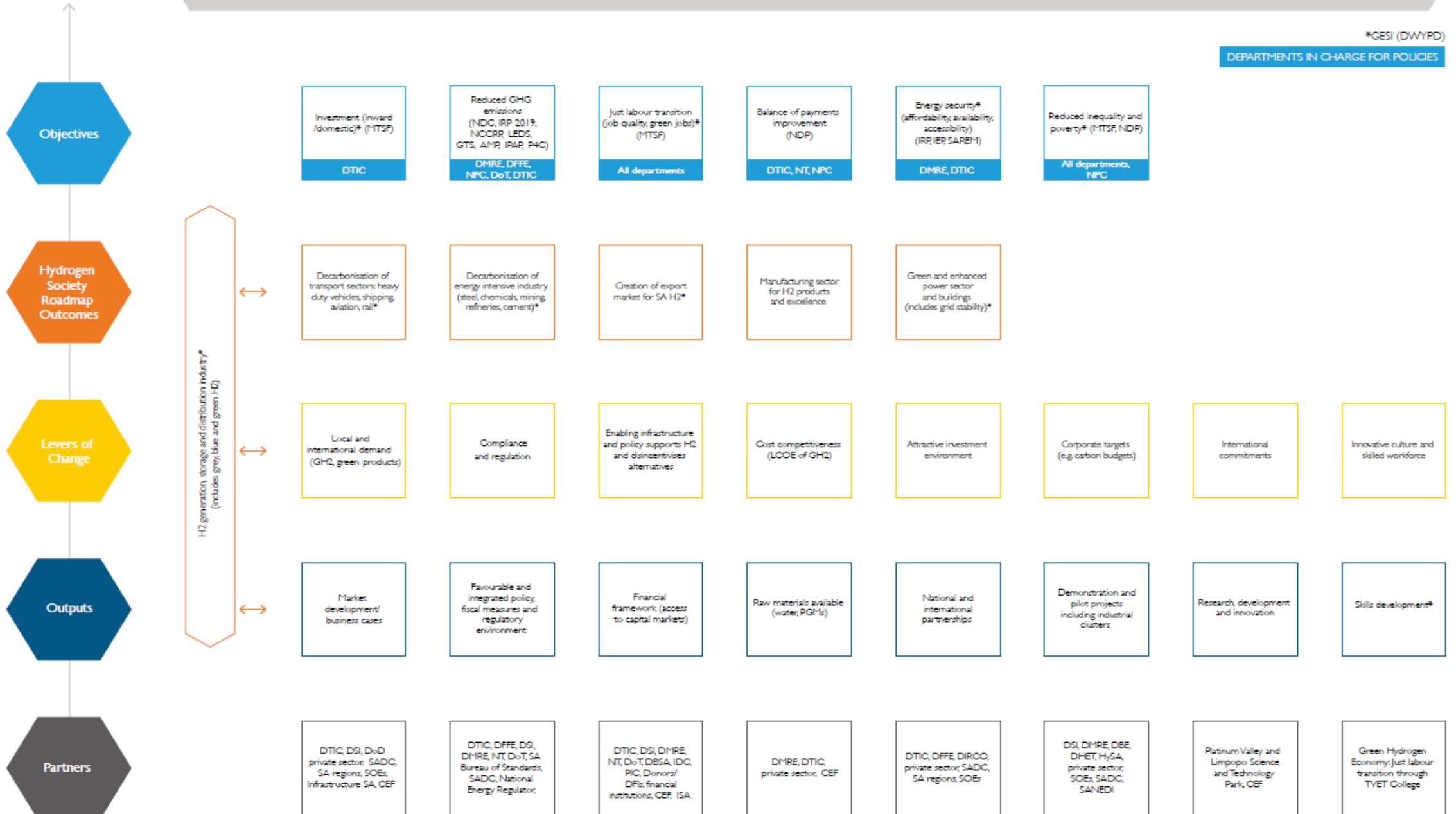


Theory of Change

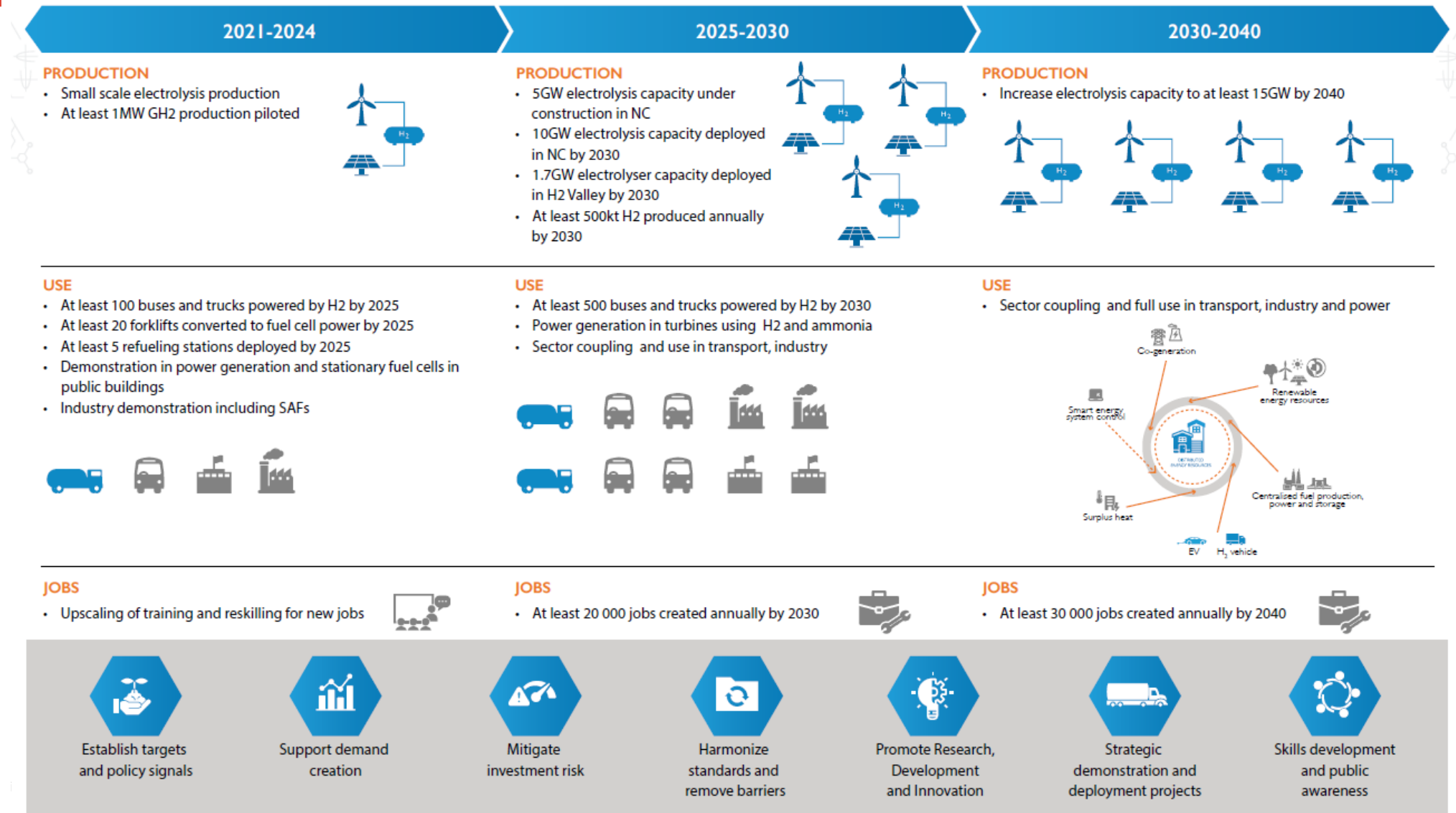
VISION AND GOAL: JUST AND INCLUSIVE NET-ZERO CARBON ECONOMIC GROWTH FOR SOCIETAL WELLBEING BY 2050 (NDP)

*GESI (DWYPD)

DEPARTMENTS IN CHARGE FOR POLICIES



Action plan



Conclusions

- Governance Systems and Enabling Policies for Green H2 need to address all market barriers
- Relevance of H2 roadmaps/strategies:
 - roadmap as a lever to integrate and update relevant national policies (energy, industrial, climate, etc.) and prepare the ground for clean H2 business
 - inclusion of H2 in next iterations of NDCs to raise their ambition
- **SA is a front runner** in the H2 sector thanks to the HySA program (since 2007) and local private sector capacity
- SA is regarded as an important player to kick-start H2 trade and H2 industry in the African region and globally
- The SA Roadmap is a strong example for other African countries to follow
- The **H2 strategy** is currently under development with the support of the German cooperation (GIZ) and will be ready by the end of this year

Thank you!

H₂

