

The geopolitics of hydrogen – three quantitative-qualitative scenarios

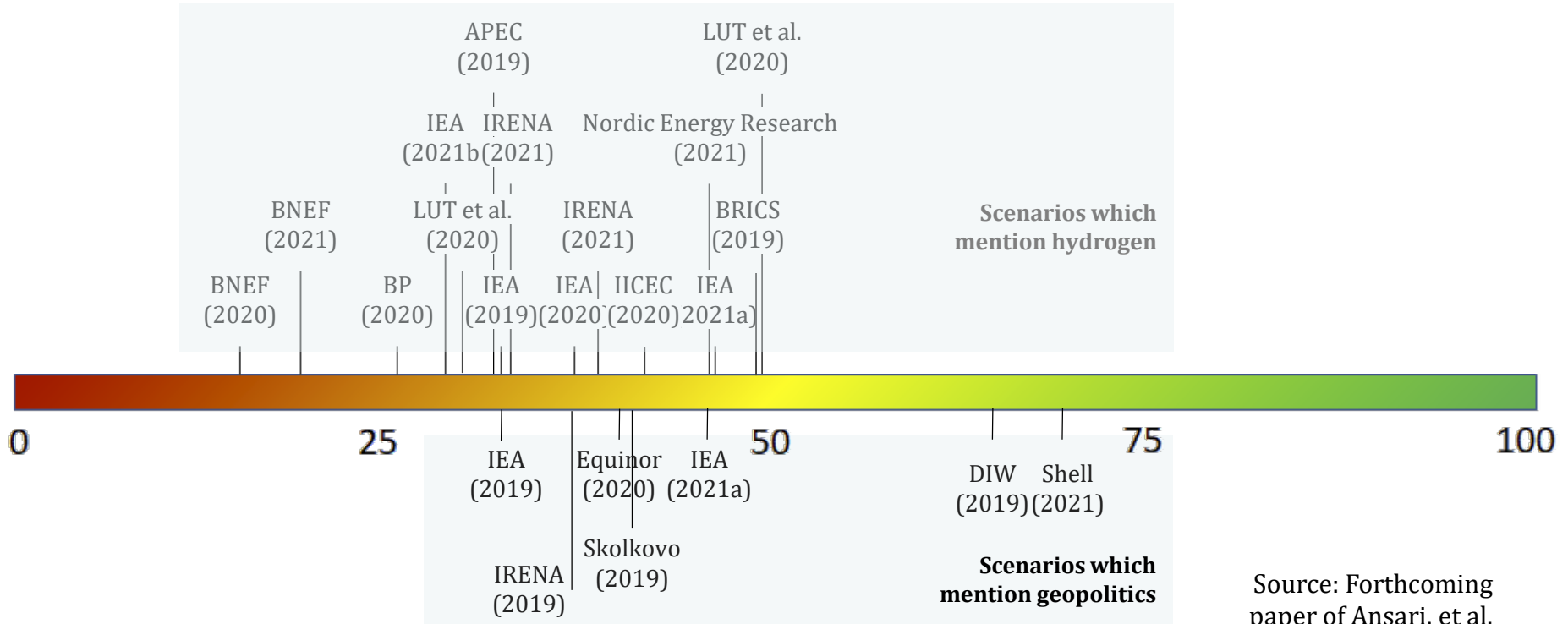
Rosa Melissa Gehrung

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Stiftung Wissenschaft und Politik
German Institute for
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Geopolitics and hydrogen in energy scenarios



Source: Forthcoming paper of Ansari, et al.

Outline of the research undertaking

Central Questions

- 1) What are plausible scenarios of the incipient geopolitics of hydrogen?
- 2) How do hydrogen trade flows differ from a world without geopolitical dynamics?
- 3) What are the implications for Germany/EU?

Methodology

Combination of qualitative & quantitative analysis that includes geopolitical factors and the international dimension

Creating holistic narratives and robust analyses

Scenario foresight (qualitative)

Multi-step participatory process with 15 experts and 3 workshops from 2022 to 2023:

- **Factor** identification and **impact** assessment
- **Projection**-based creative **scenario development**
- Formulation of **strategic options**

Numerical modelling (quantitative)

Numerical model **H2mod**

- Partial EQ model of H2 & gas value chains with market power
- MCP reformulated to a **convex NLP** (see Ansari & Holz, 2019)
- **Exogenous**: various costs, reserves, demand function
- **Endogenous**: prices, flows, investments



Three Hydrogen scenarios until 2040



“Hydrogen Realignment”



“Hydrogen (In)Dependence”

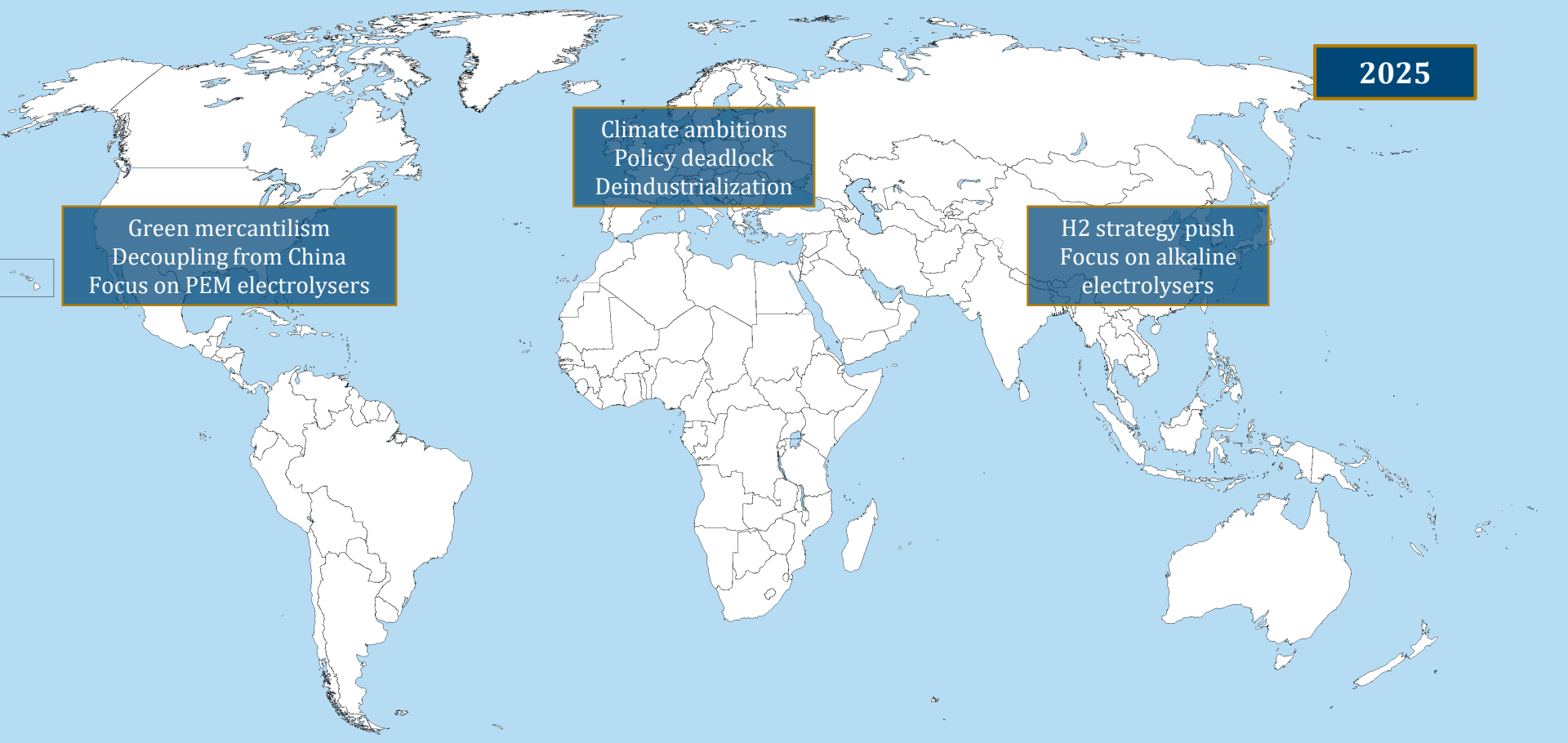


“Hydrogen Imperialism”

Hydrogen Realignment

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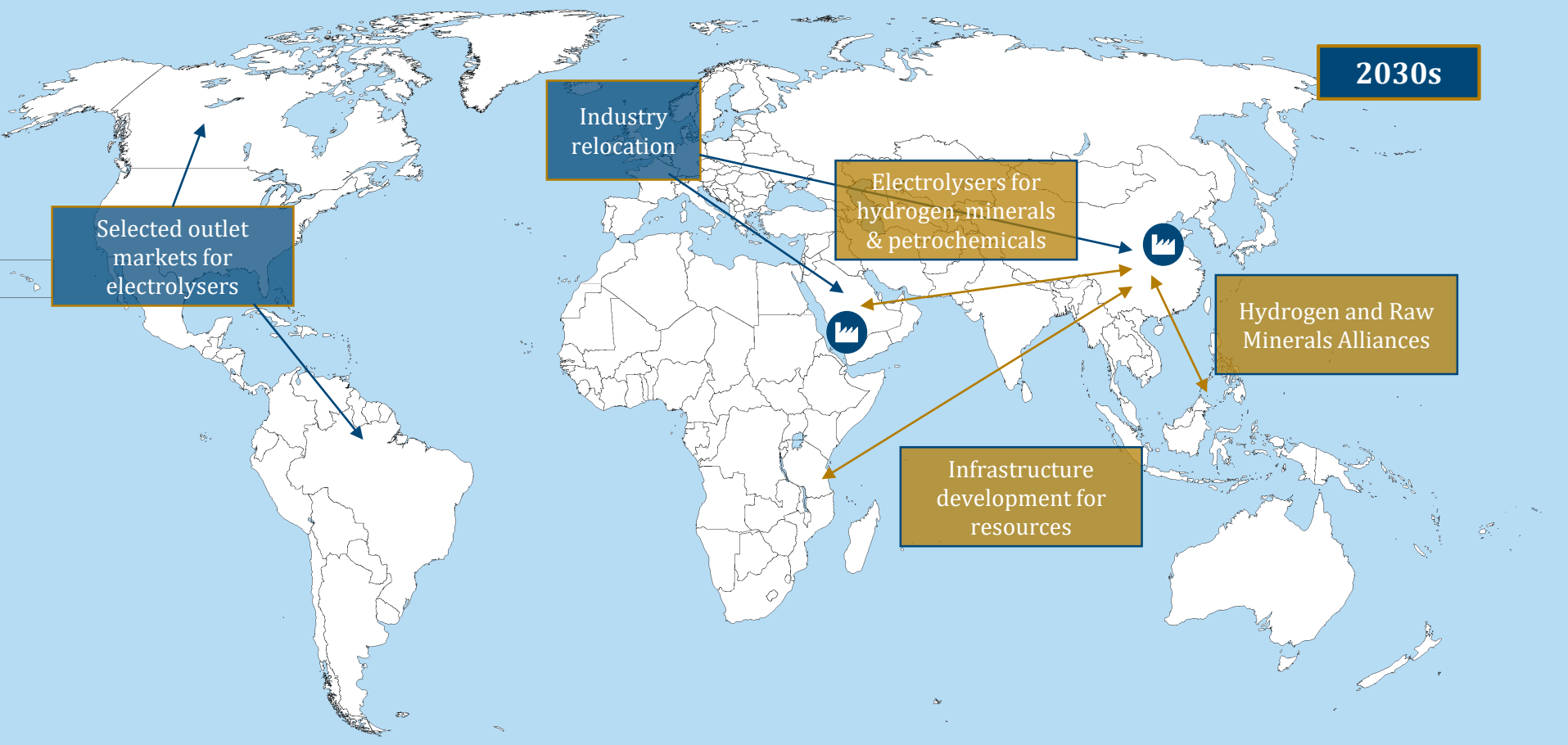
2025

Climate ambitions
Policy deadlock
Deindustrialization

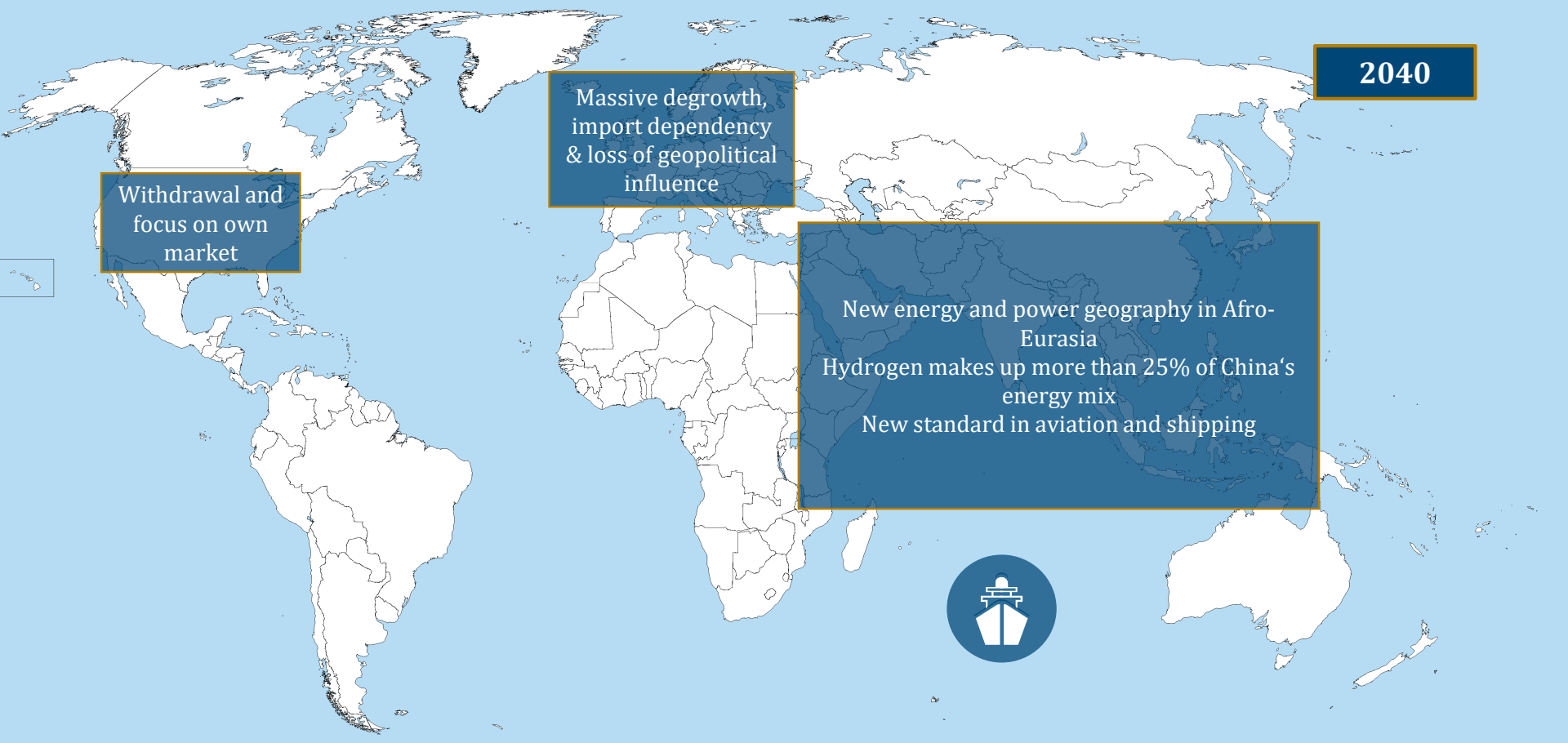
Green mercantilism
Decoupling from China
Focus on PEM electrolyzers

H2 strategy push
Focus on alkaline
electrolyzers

Hydrogen Realignment



Hydrogen Realignment

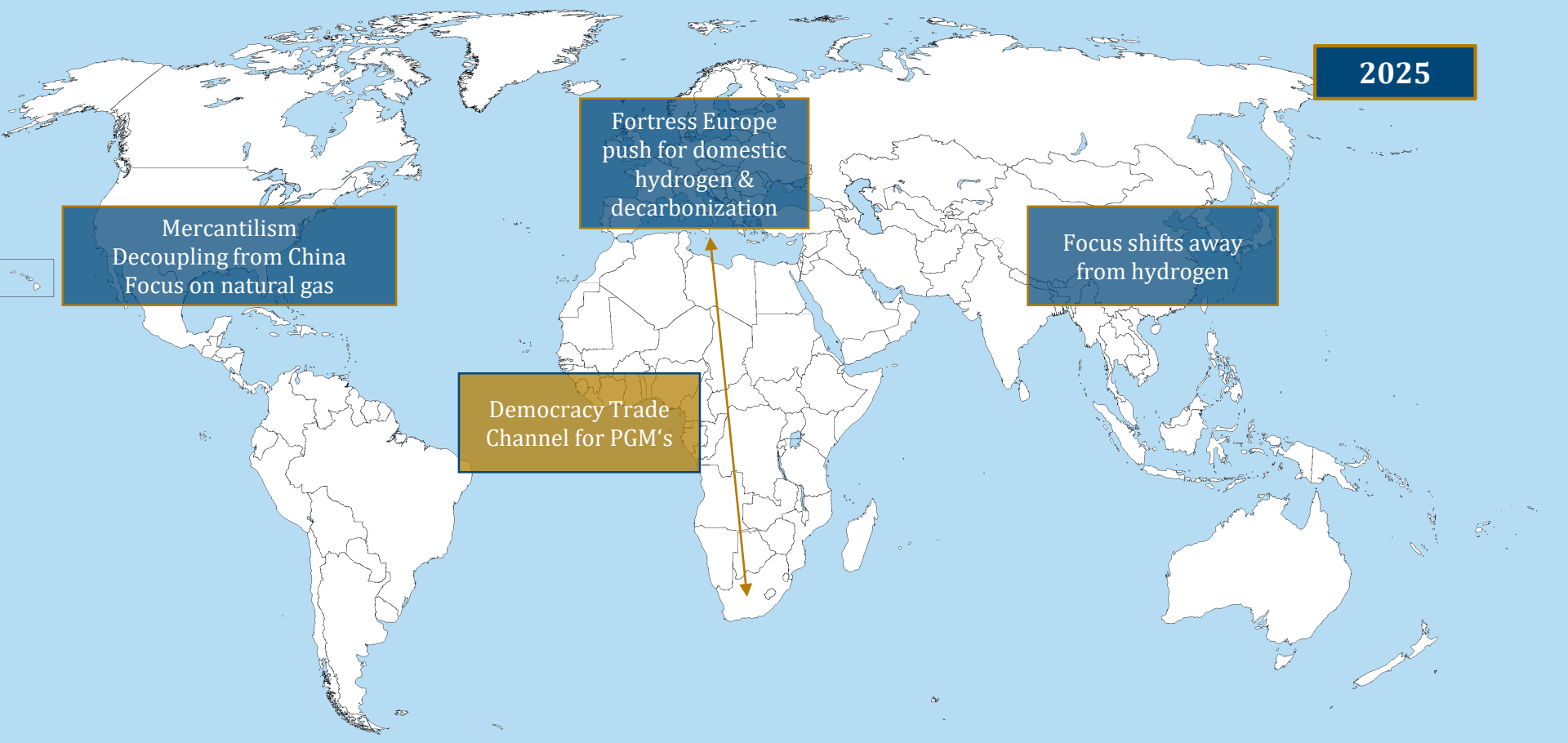


Hydrogen Realignment

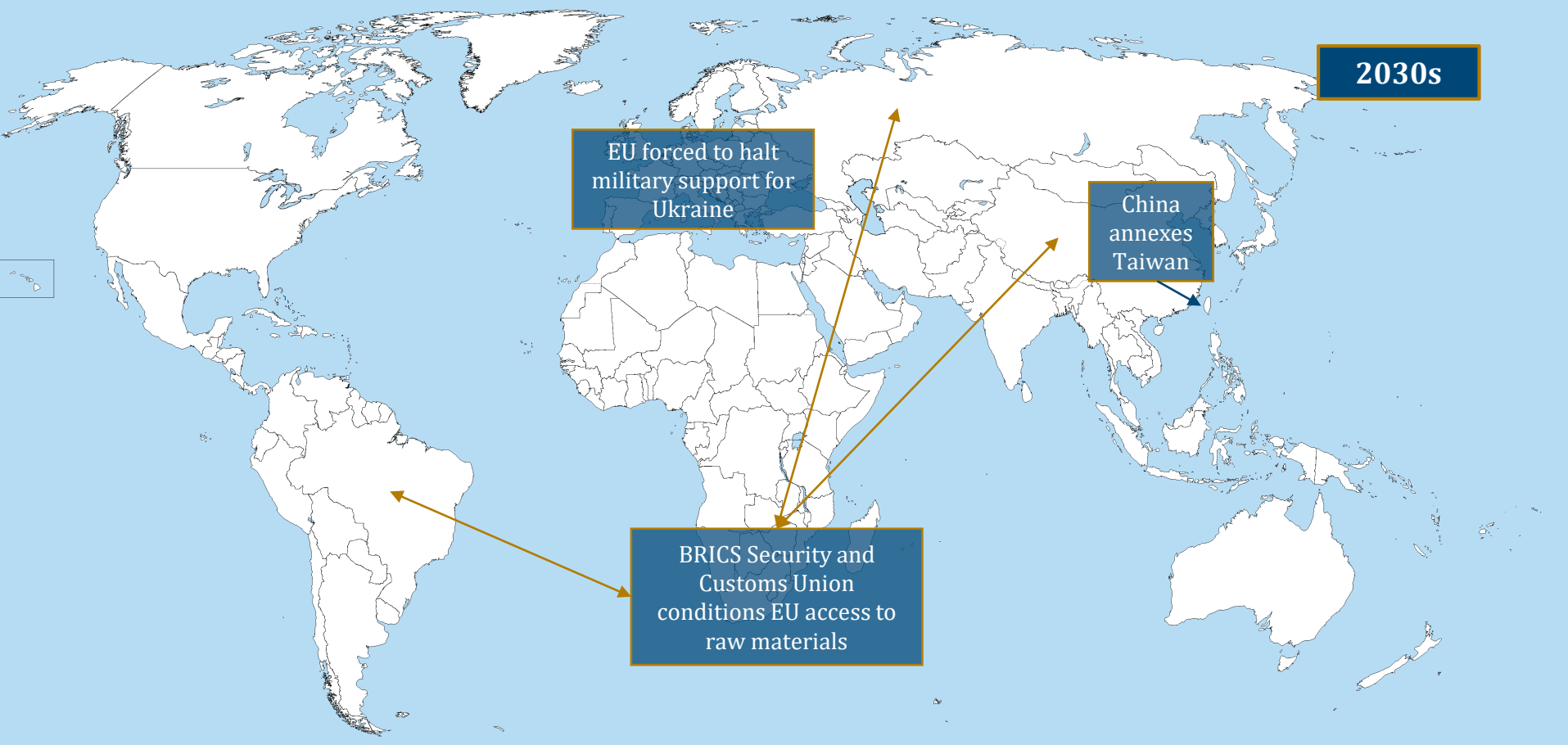
Hydrogen (In)Dependence

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Hydrogen (In)Dependence



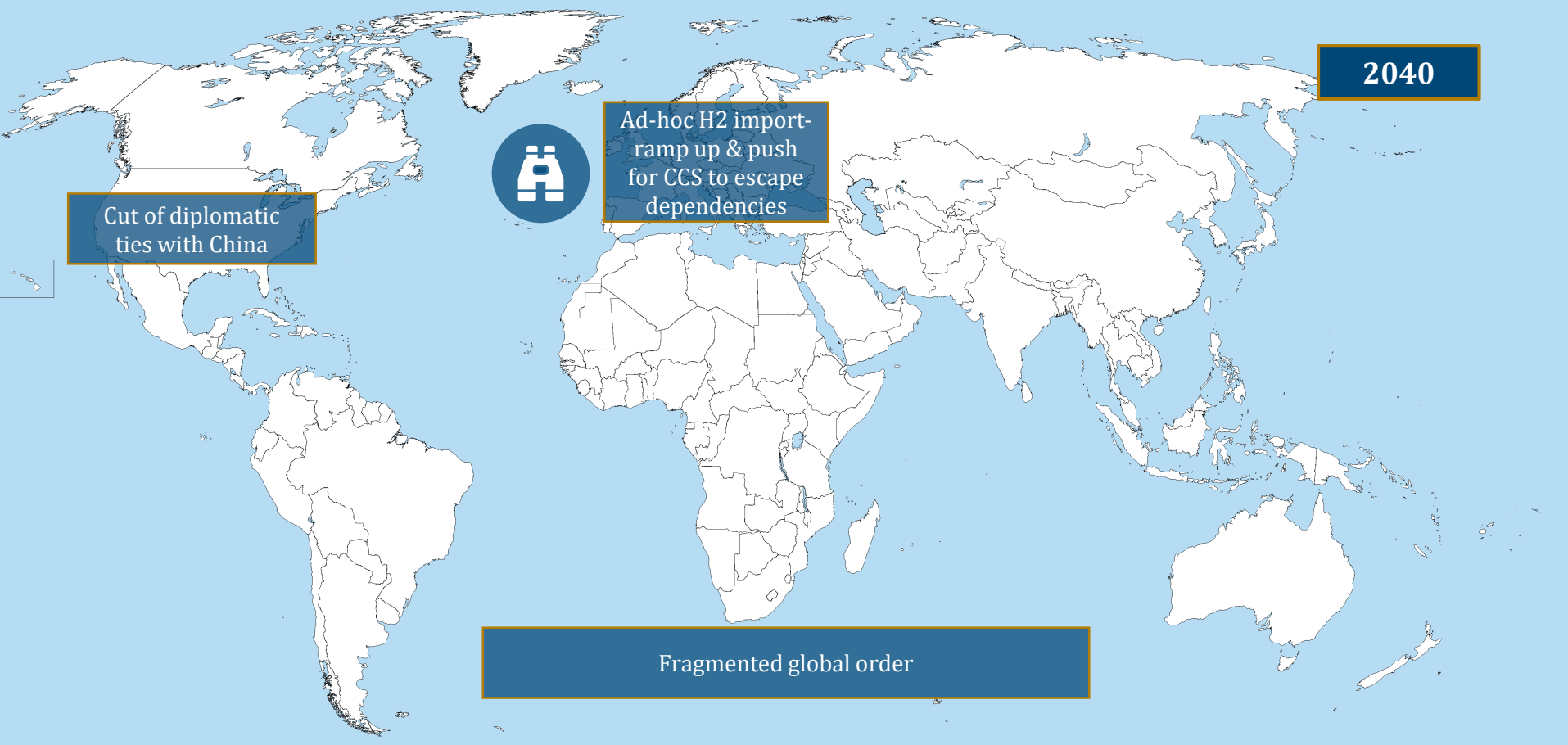
2030s

EU forced to halt
military support for
Ukraine

China
annexes
Taiwan

BRICS Security and
Customs Union
conditions EU access to
raw materials

Hydrogen (In)Dependence



2040



Ad-hoc H2 import-ramp up & push for CCS to escape dependencies

Cut of diplomatic ties with China

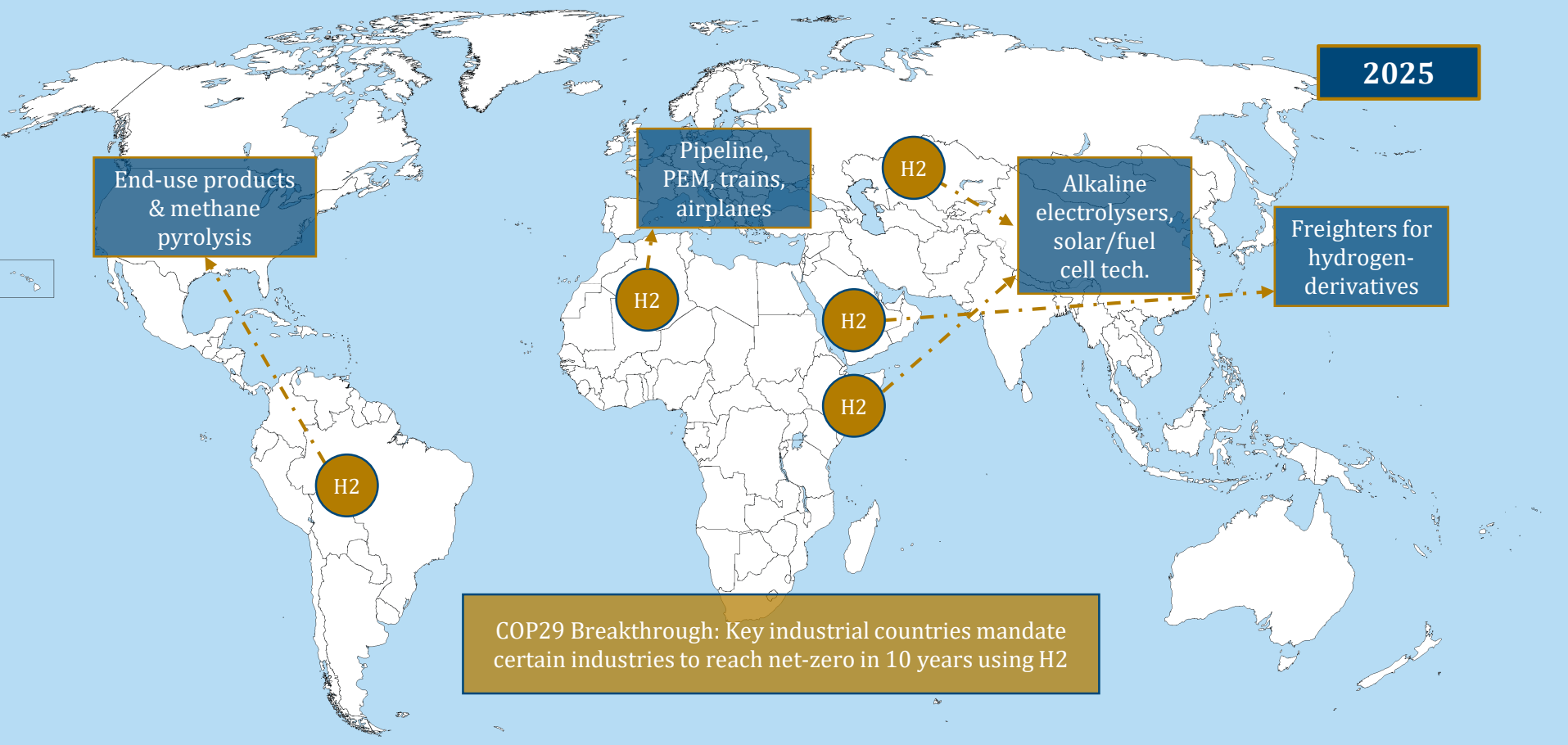
Fragmented global order

Hydrogen (In)Dependence

Hydrogen Imperialism

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Hydrogen Imperialism

A world map with a light blue background and white landmasses. Three dark blue callout boxes with white text are overlaid on the map. The top box is in the upper right corner, the middle box is in the center over the Atlantic and Europe, and the bottom box is a wide horizontal bar across the bottom of the map.

2030s

Military missions &
Authoritarian
hydrogen bargains

Insurgency threatens
H₂ supply routes to
Europe

Formation of the OHIC (US, EU, China, Japan, Korea)
Fixed import tariffs & split of technologies/supply chains
Division of exporters in the style of historical protectorates

Hydrogen Imperialism



Hydrogen Imperialism

(Preliminary) policy conclusions

Hydrogen realignment: watch your industries

- Hydrogen ramp-up comes with trade-offs
- Industry exodus erodes geopolitical influence

Hydrogen (In)Dependence: watch your value chains

- Dependencies will always exist; the question is how to manage them
- Need for cross-sector, cross-value-chain monitoring
- Friendshoring does not substitute diversification

Hydrogen Imperialism: watch your infrastructures

- H2 exports not necessarily a win for developing countries
- Concentrated import infrastructure risks excessive security costs ex-post
- Early global (H2) governance necessary to ease toxic political tensions

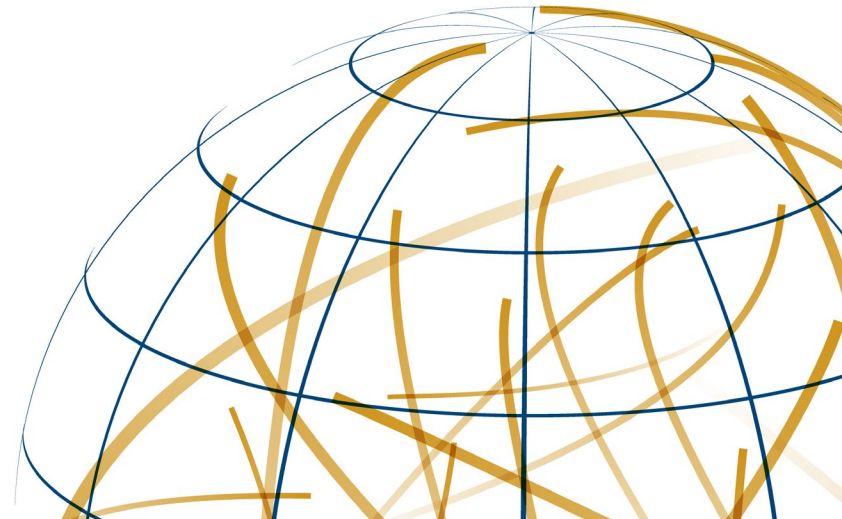
Thank you!

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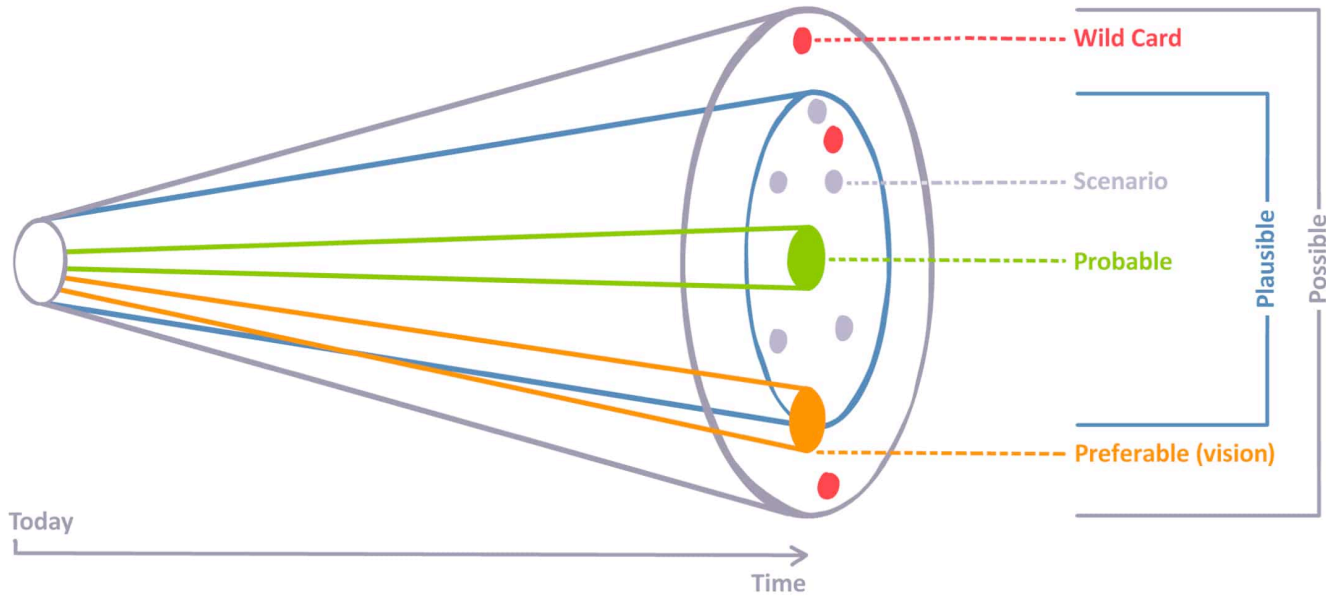
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SWP



Backup

Scenario Cone



SWP Workshop Series

1st workshop

20.09.2022

Development of factors
impacting the geo-
economics of hydrogen

2nd workshop

29. & 30.09.2022

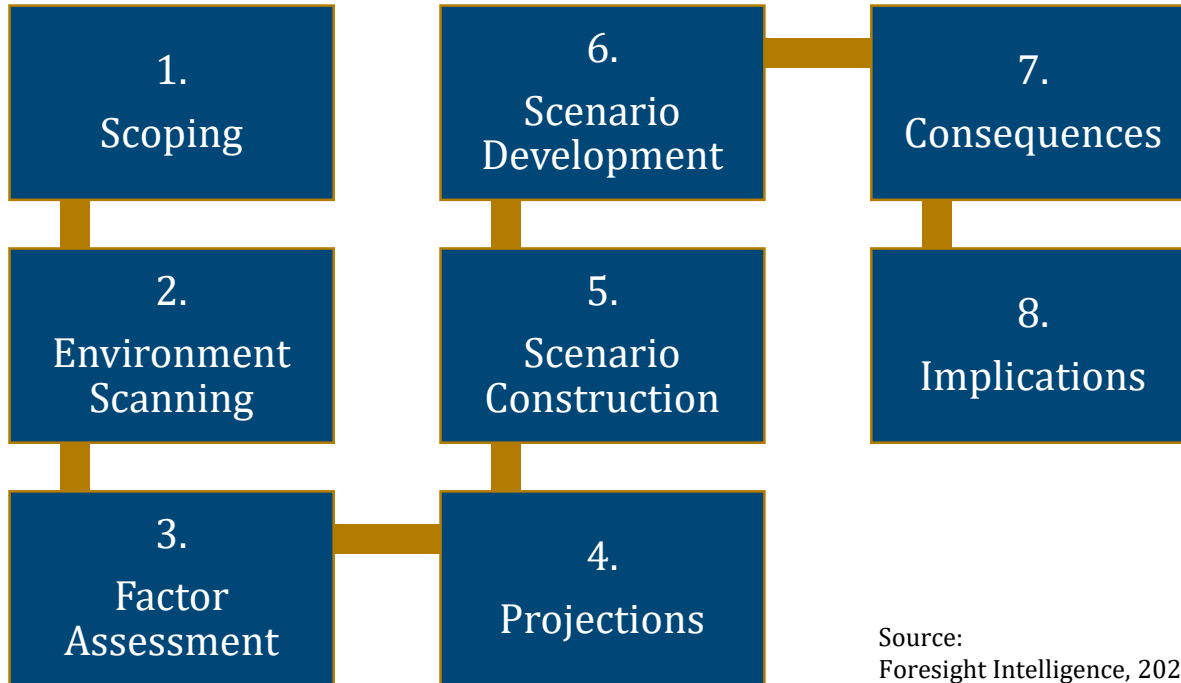
Development of
scenarios and selection
of three frameworks

3rd workshop

11.11.2022

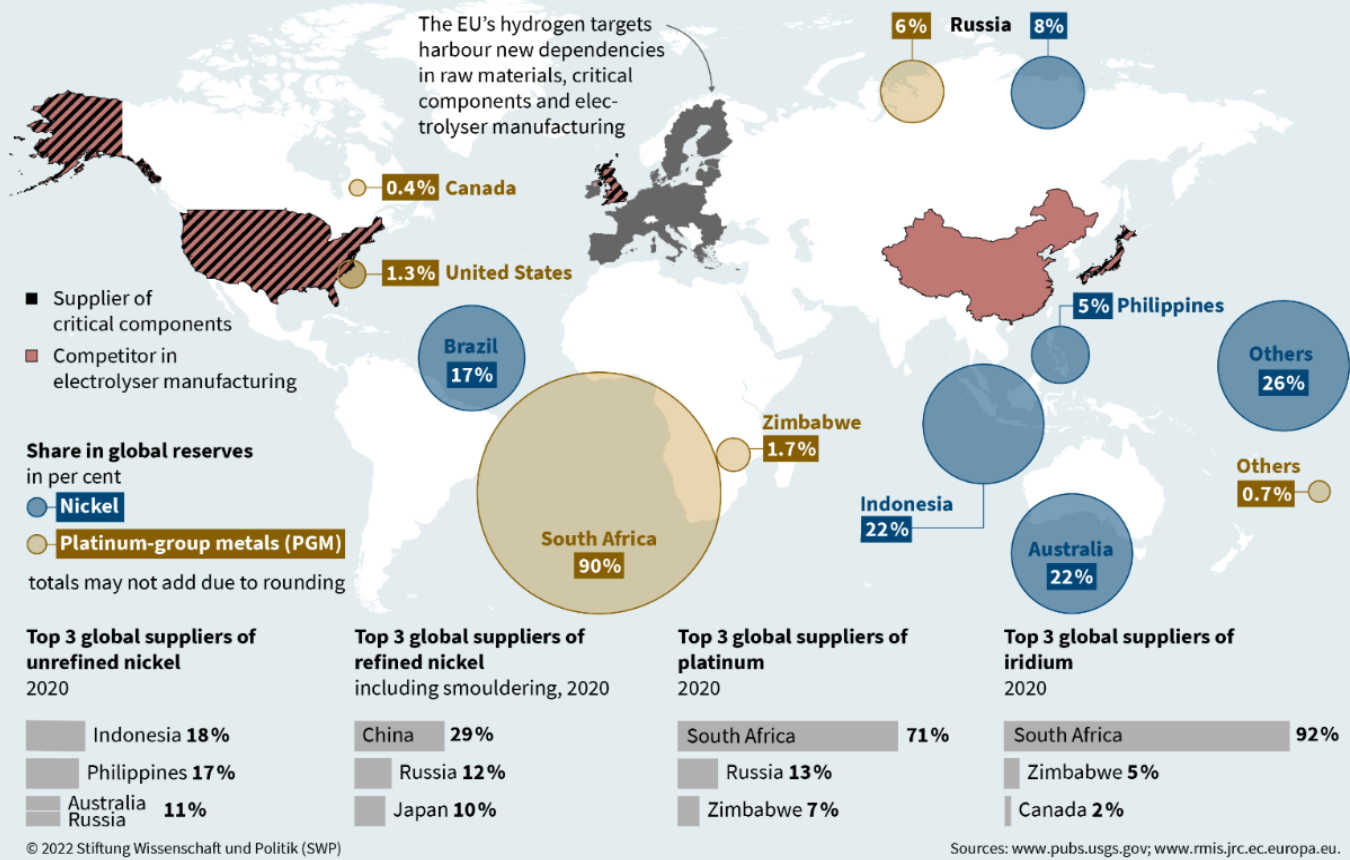
Development of strategic
options to cope with the
scenarios

Scenario Planning Process



Source:
Foresight Intelligence, 2022

Green hydrogen for the EU: Competitors in electrolysis manufacturing and raw materials suppliers



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Sources: www.pubs.usgs.gov; www.rmis.jrc.ec.europa.eu.

Sources: U. S. Geological Survey, Mineral Commodity Summaries 2022 (Reston, VA, 2022); Gian Andrea Blengini et al., Study on the EU's List of Critical Raw Materials (2020). Final Report (Luxembourg: Publications Office of the European Union, 2020)