

Sustainability assessment of hydrogen valleys

Hydrogen Valleys: Driving Europe's competitiveness -
25 June 2025

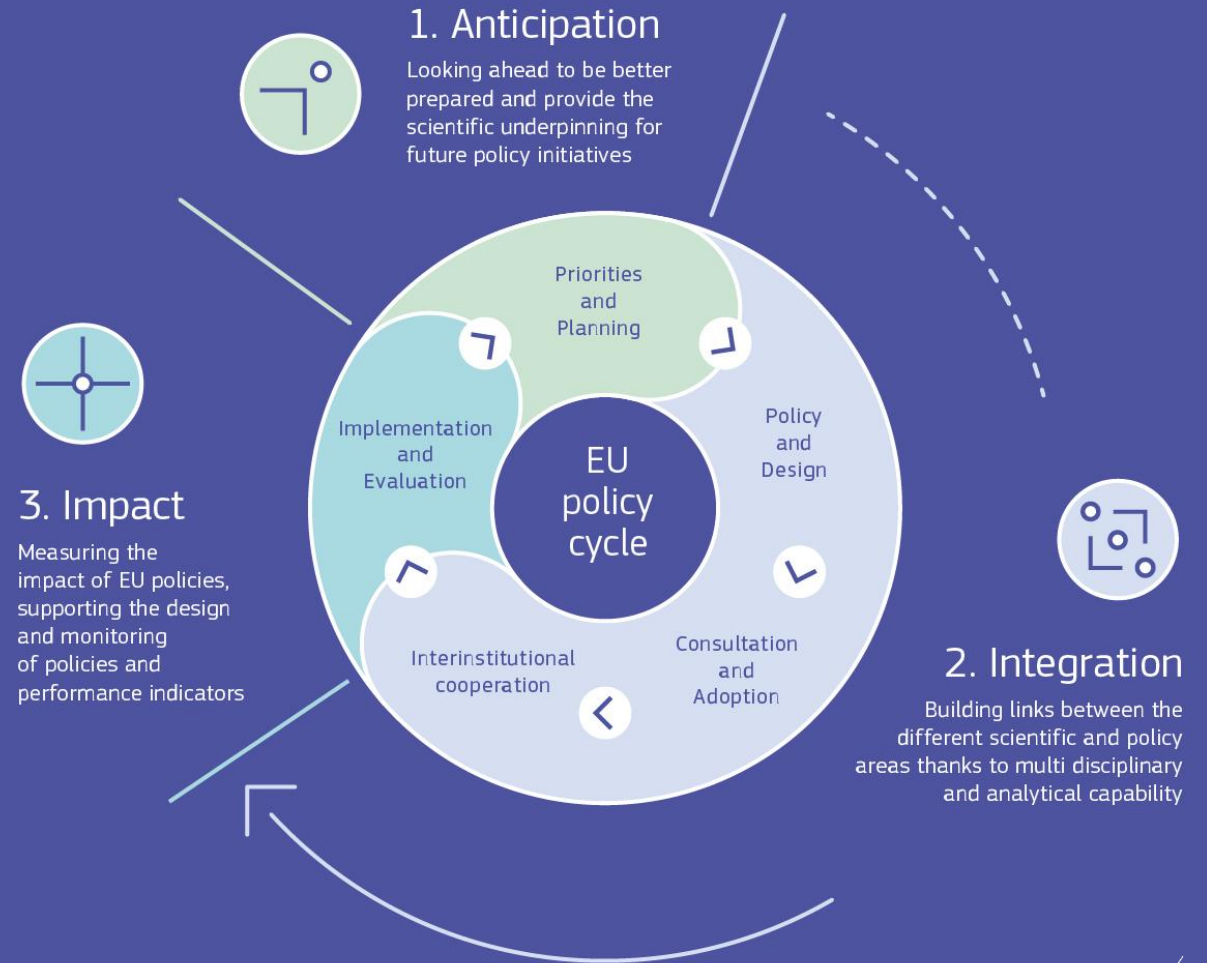
Marco Serafini, European Commission - JRC C.1

A. Arrigoni, T. D'Agostini, F. Dolci, F. Romano, E. Weidner

Our purpose

The Joint Research Centre provides independent, evidence-based knowledge and science, supporting EU policies to positively impact society.

The JRC's three core strengths underpin the full EU policy cycle



Collaboration with the Clean Hydrogen Partnership

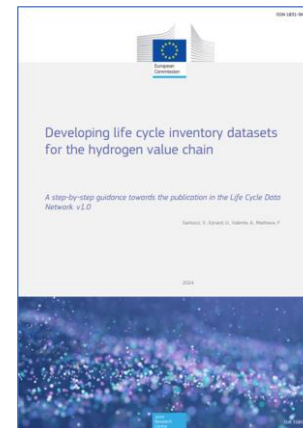
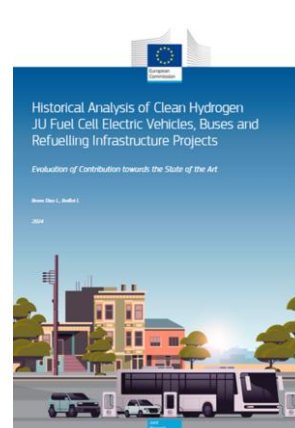
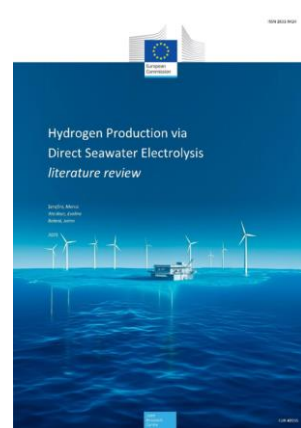
Multi annual framework contract

Standardisation
Harmonisation

Technology
Monitoring and
Assessment

Sustainability

Safety

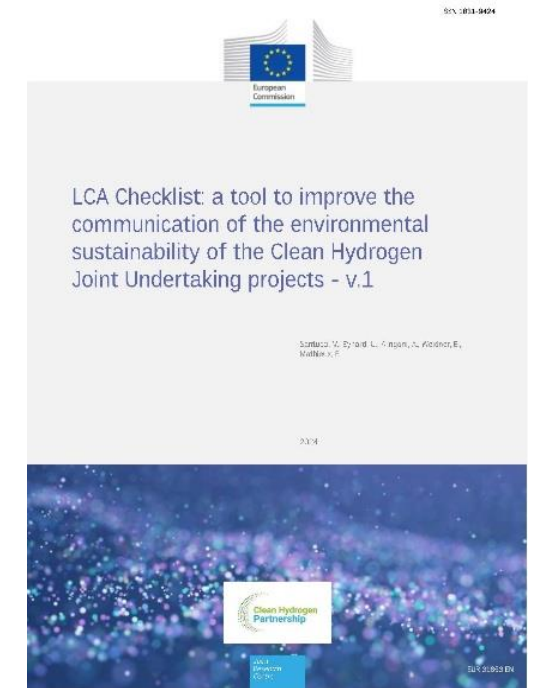


Collaboration with Clean Hydrogen Partnership for sustainability

From 2018 – **Review** of LCA deliverables from JU projects

From 2021 - Collaboration with SH2E project – **guidebook** for LCSA

From 2024 – Collaboration of the European Hydrogen Sustainability and Circularity Panel (**EHS&CP**)



Santucci, V. *et al.*, doi:10.2760/529754



<https://fc-hyguide.eu/>



<https://sh2e.eu>



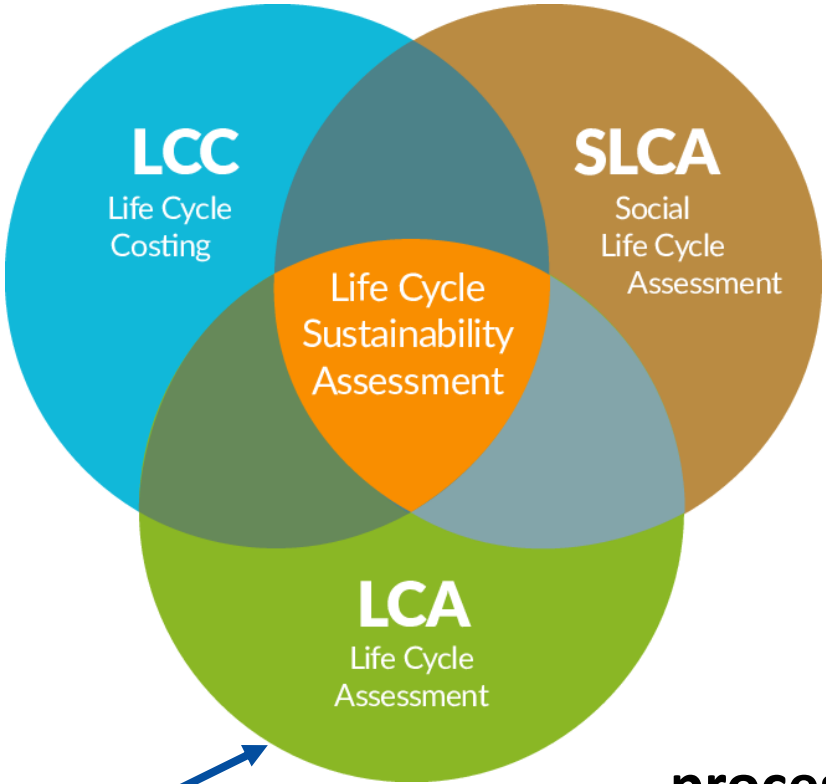
<https://www.clean-hydrogen.europa.eu>



Sustainability

The 3 pillars of sustainability

Economic



Social

Environmental

For improving processes/products, to monitor, report and communicate impacts



H2V Sustainability

Environmental impacts:

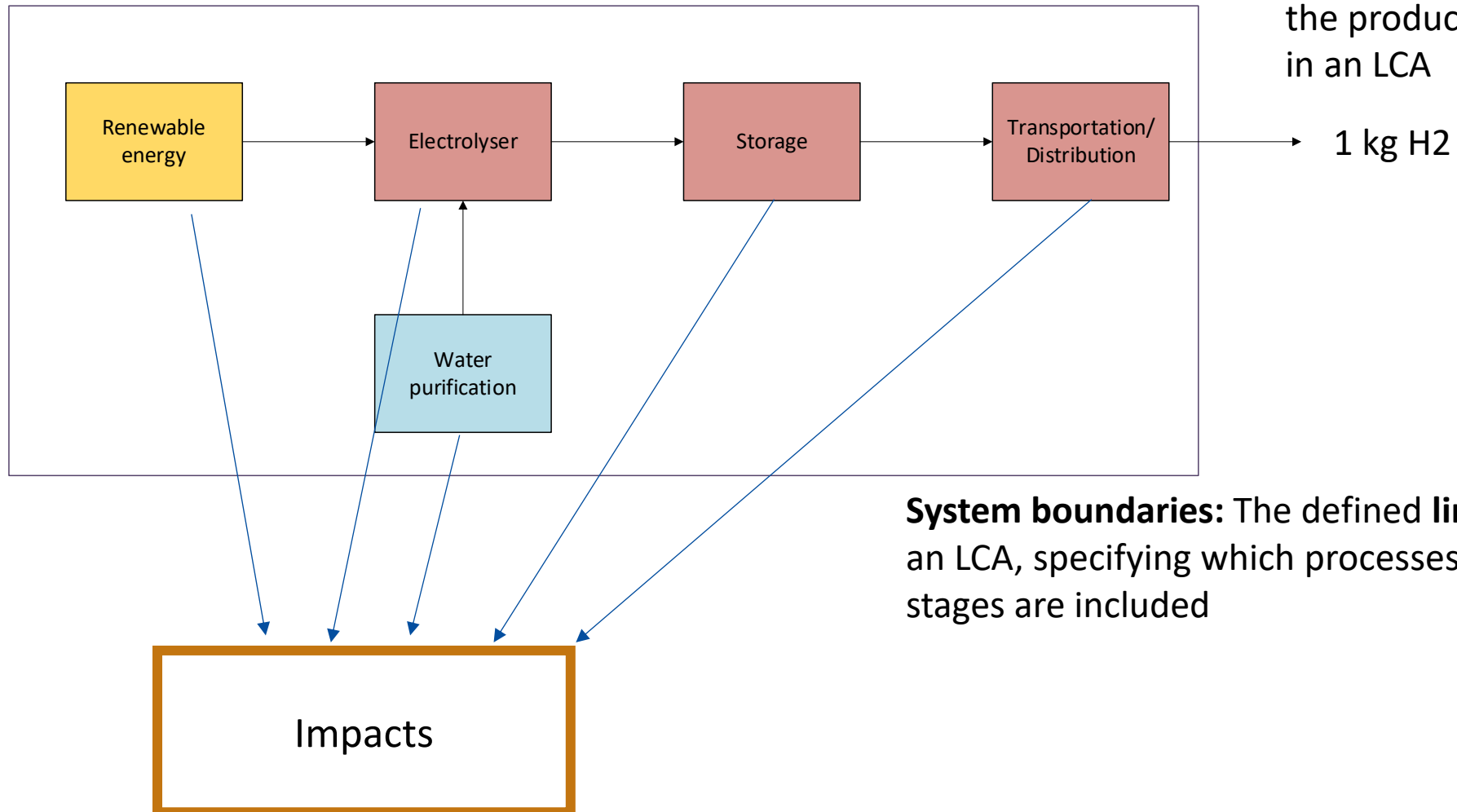
- Climate change
- Use of resources
- Land use
-

Social impacts:

- Job creation and work conditions
- Health and safety
- Energy security and resilience
- Community engagement
-



LCA of electrolyser



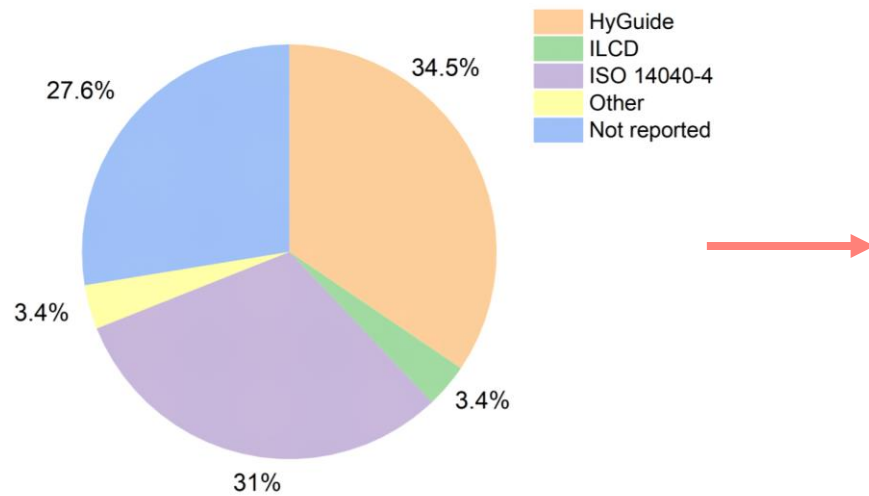
Functional Unit: A standardised measure of the product's **function** used as a reference in an LCA

1 kg H₂

System boundaries: The defined **limits** of an LCA, specifying which processes and stages are included



Review of environmental LCAs of JU projects



Source: JRC (2024)

Areas of improvement

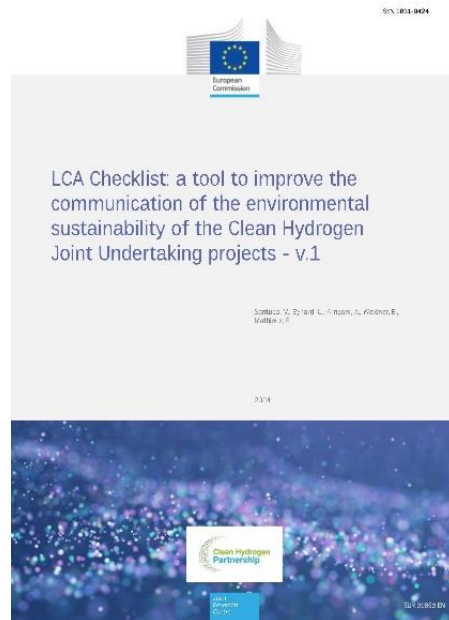
- Non-uniform guidelines followed by projects
- Absence of external review
- Methodological drawbacks
- Limited inventories
- Unfair comparison with other technologies

Addressing the challenges



European Hydrogen Sustainability
and Circularity Panel

<https://www.clean-hydrogen.europa.eu>



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Hydrogen node on the Life Cycle Data Network

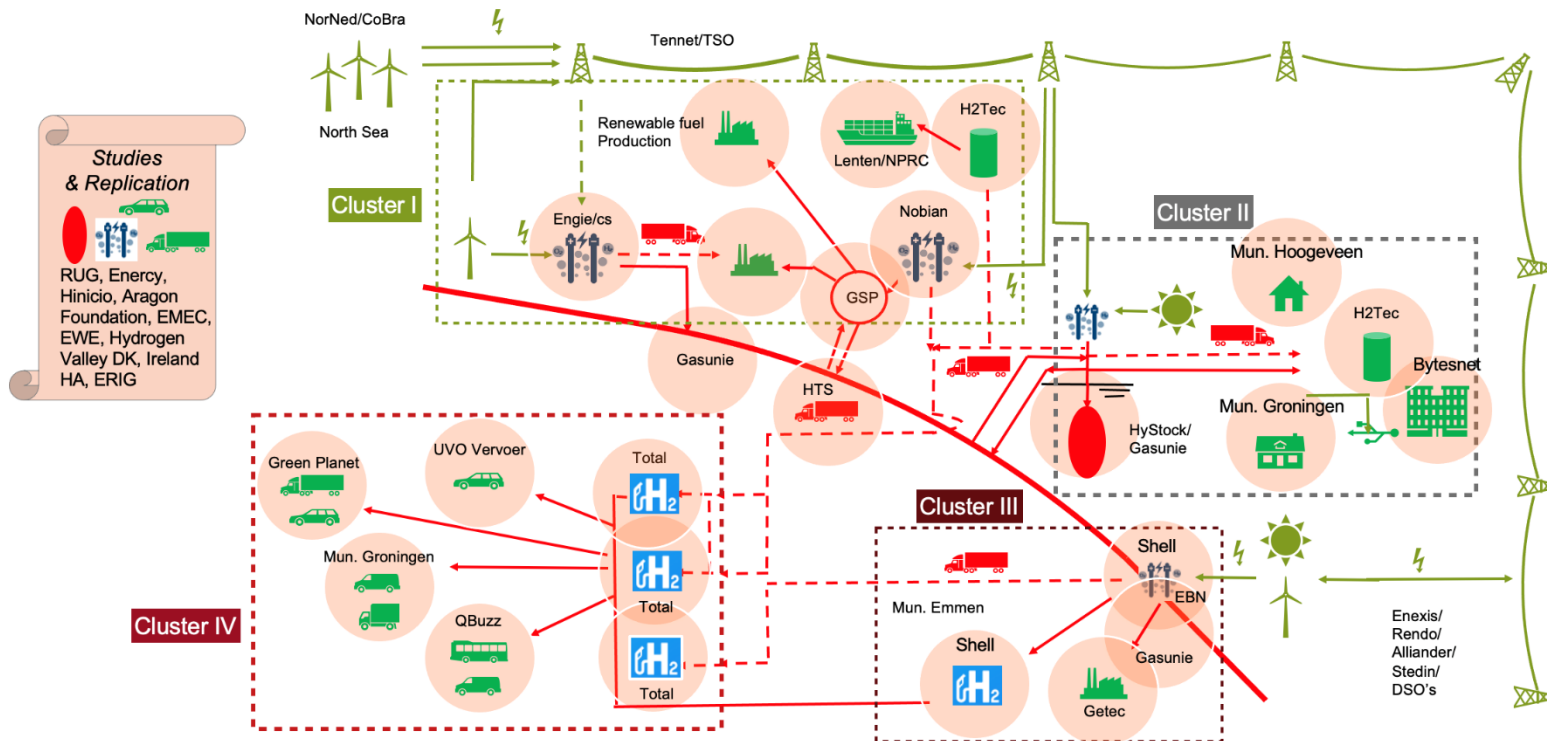


<https://eplca.jrc.ec.europa.eu/LCDN/index.html>



Challenges on LCA for H2 Valleys

Where is the **system boundary**?



Multiple functions:

- Production of biofuel
- Mobility
- Heat and energy supply
- Energy storage
- ...

What to use as reference?

What are the social impacts?

<https://heavennn.org>

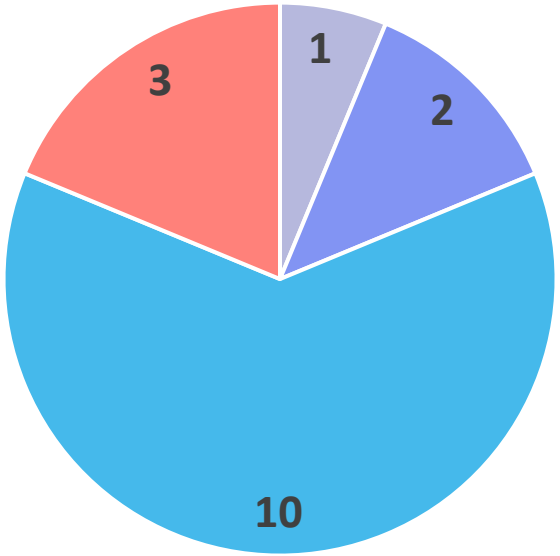
Analysis of published LCAs

Literature review	1	2	3	4
Functional unit	kg H2 consumed	kg H2 produced	MJ H2 produced	kg H2 produced
System boundaries	Single path for each end use	Geographically separated	Without end use	From production to use



JU H2 Valleys environmental LCA activities

LCA reports from Clean Hydrogen JU H2V projects



■ Finished ■ Preliminary ■ Planned ■ No LCA

Source: JRC (2025)

Specific guidelines on the sustainability assessment of hydrogen valleys will help to harmonise the results

Several projects plan social assessments



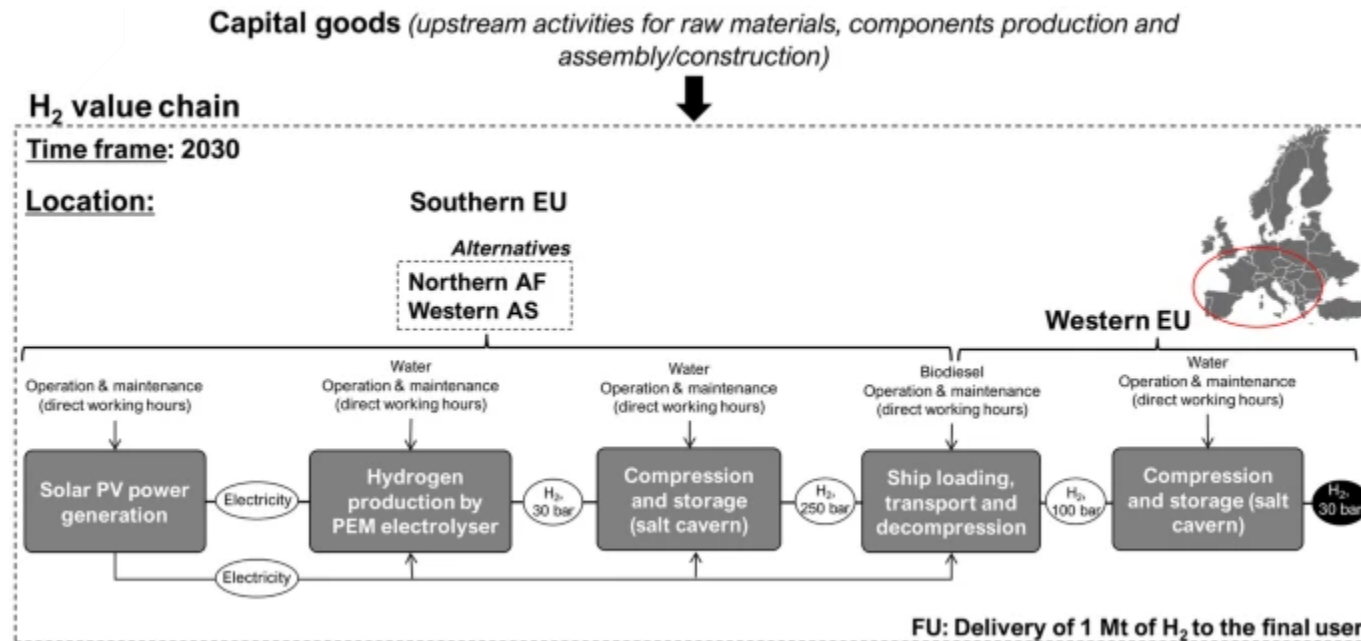
Social LCA activities

Social hotspot analysis of hydrogen delivery chain

SLCA framework for hydrogen technologies

Future activities

- Guidelines on the use of the framework
- Guidelines on the assessment of social impacts for hydrogen valleys

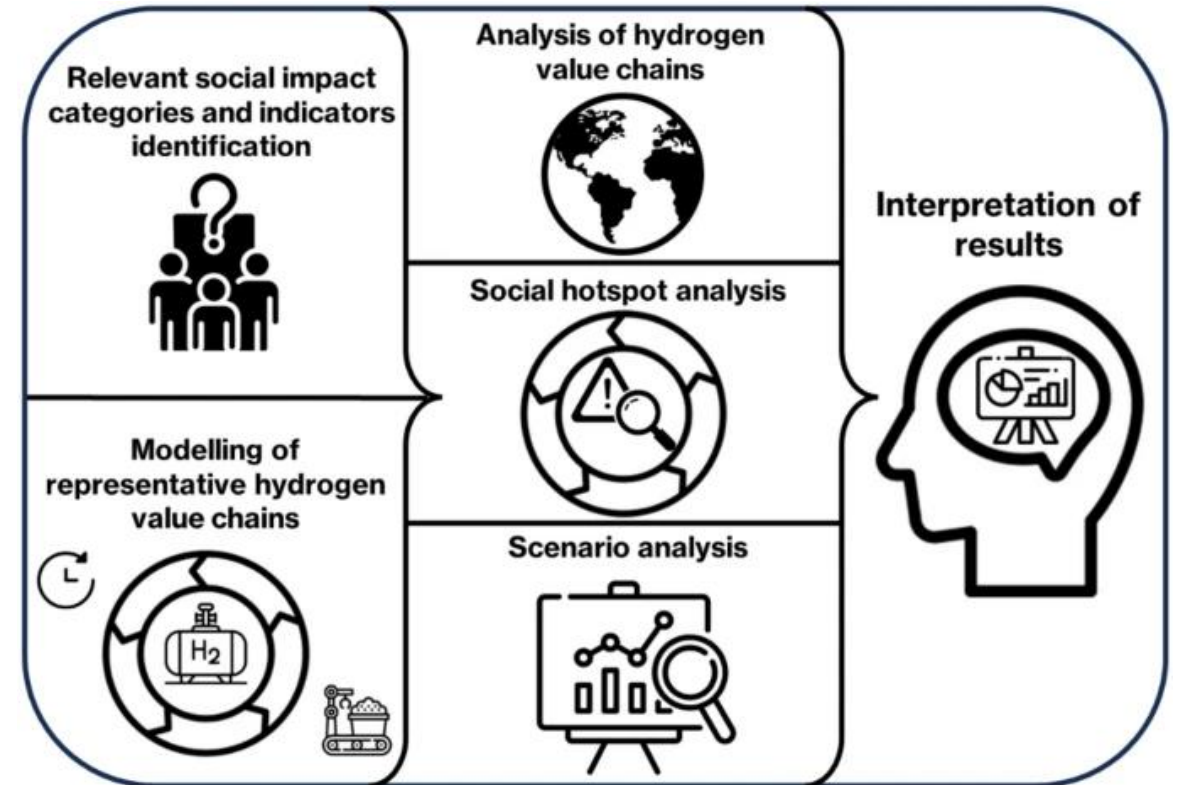


S-LCA for H2 Valleys

First step

Identify **key indicators**: overarching (supply chain risk, safety), technology-specific, **actor-specific**:

- **Local communities**: Economic development, environmental impact, risk, access to resources
- **Workers**: Accidents, labor conditions, remuneration
- **Society**: Innovation, job creation



H2 Valley sustainability workshop

Your support is needed to identify experts within your project and share with your network



JRC-H2Valley@ec.europa.eu

Thank you



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