



Introduction and Objective

Hydrogen (H₂) will play a pivotal role in achieving the European Union (EU) **Green Deal's** goal of climate neutrality by 2050. However, without technical countermeasures, venting, depressurization, and fugitive emissions of H₂ could raise atmospheric H₂ levels. Since H₂ can react with hydroxyl radicals in the atmosphere, extending methane's lifetime and increasing ozone and water vapor production, it can be qualified as an **indirect greenhouse gas** [1]. To date, there is still uncertainty regarding the amount of the H₂ releases expected along the future H₂ value chain and the associated environmental impact [2,3]. A dedicated **normative framework**, including testing methodologies for hydrogen releases, does not exist.

The aim of the **NHyra** project is to address these critical knowledge gaps by assessing potential H₂ releases along the entire H₂ value chain and its measurement to contribute to H₂ value chain development with least climate impact.

About the project

Duration: Jan 2024 - Dec 2026

Budget: 3,5 M€

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Methods

- WP1 identifies the H₂ supply chains and units process to design a H₂ releases inventory
- WP2 develops the protocols and methodologies for quantification of H₂ releases in most critical elements of H₂ value chain

- WP3 validates the methodology and quantification of H₂ releases through experimental testing
- WP4 defines the H₂ releases mitigation strategy and estimates H₂ releases along the supply chain
- WP5 assesses total H₂ releases scenarios

- WP6 develops and implements activities related to dissemination, communication and exploitation
- WP7 ensures the smooth and timely project implementation

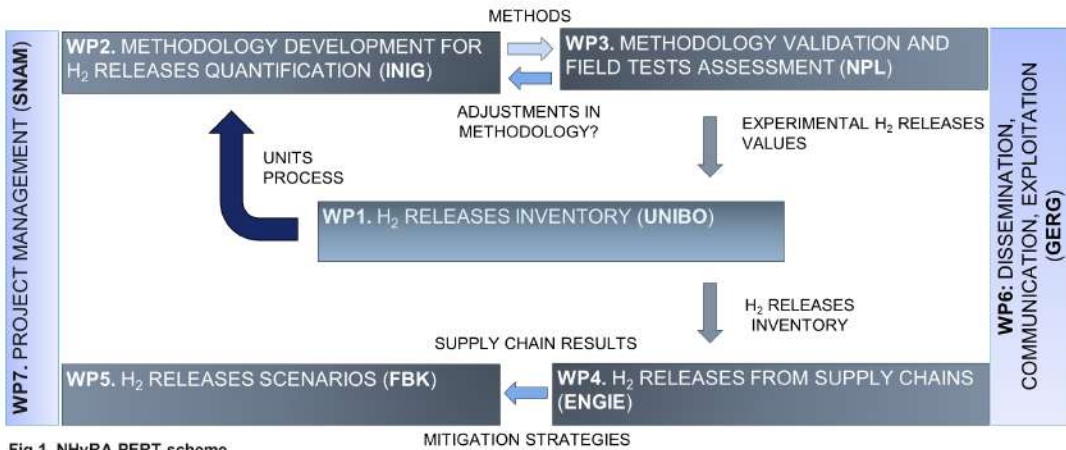


Fig 1. NHyra PERT scheme

Expected Outcomes

- Identification, quantification, and preparation of an **inventory** of the types of **anthropogenic H₂ releases** expected throughout the H₂ value chain.
- Development and validation of **reliable detection and quantification methods**, new data and rigorous calculation-based models to measure **H₂ releases** from the H₂ value chain in the middle (2030) and long term (2050).
- Provide **recommendations** for interested stakeholders, including **industrial and academic researchers** involved in the assessment of H₂ release and its impact on the atmosphere, but also to policy makers.
- Deliver a complete and detailed report about **H₂ economy scenarios** with a focus on possible benefits of **potential H₂ release mitigation strategies**.

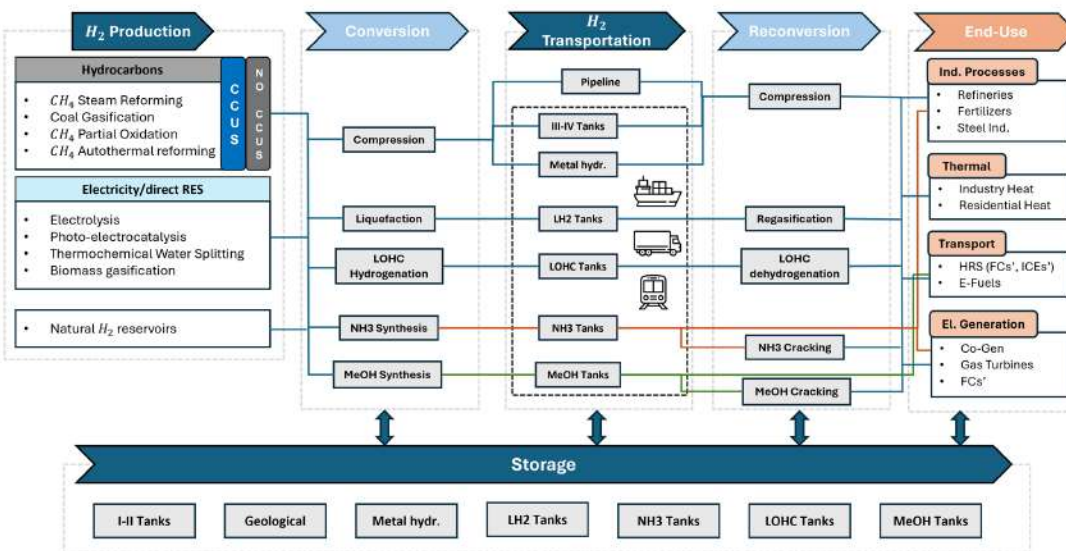


Fig 2. H₂ supply chains and evaluated technologies for NHyra (WP1)

References

- [1] Ocko, I. B. and Hamburg, S. P., *Climate consequences of hydrogen emissions*, Atmos. Chem. Phys., 22, 9349–9368, 2022
- [2] Arrigoni, A. and Bravo Diaz, L., *Hydrogen emissions from a hydrogen economy and their potential global warming impact*, EUR 31188 EN, Publications Office of the European Union, Luxembourg, 2022, JRC130362
- [3] Cooper J. et al., *Hydrogen emissions from the hydrogen value chain-emissions profile and impact to global warming*, Science of The Total Environment, Volume 830,2022, 154624



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