

H2B-Roadmap for a gradual transformation of the steel industry and urban infrastructures with hydrogen in Bremen

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The need for reduction of CO₂ emissions will require a transformation of the steel manufacturing process in Bremen. This will imply the substitution of the fossil based process gas with green hydrogen. Through this transformation, new possibilities in manifold areas will arise at the Bremen industrial port. The roadmap aims to show the most cost efficient and ecological transformation path towards this goal.

Background

- Green hydrogen as promising energy carrier for the future
- Integration of a multi-MW electrolyser at the ArcelorMittal Bremen steel plant
- Direct use of product H₂ & O₂ as process gases
- Gradual elimination of fossil energy in the production process
- Storage and further distribution of H₂ in the city of Bremen and the north-western region of Germany, (see map)
- Sector coupling
- The electrolyser should serve as an energy-hub for the region, integrating stakeholders from society and industry



Image source: openstreetmaps.org

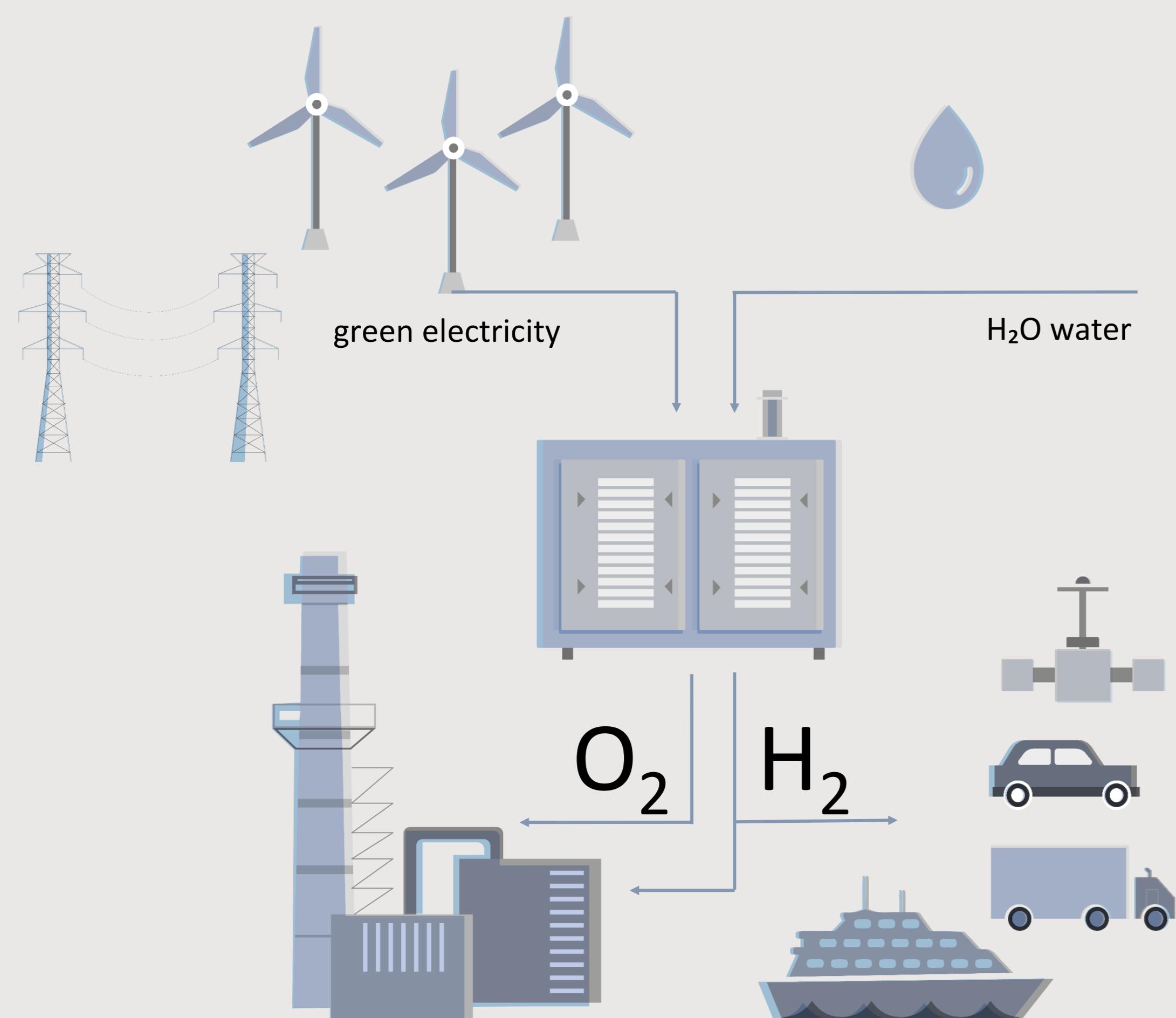


Figure 1: Schematic overview of the technologies involved in the project. Source: Authors' own compilation

Objectives

- Analytical system evaluations for enabling a hydrogen economy in the region
- Multi-criteria assessment (MCDA) of hydrogen production, storage and distribution taking technical, economical, ecological and reliability (resilience) into account
- Dynamic Modelling of electrolyzers with direct coupling to wind energy; on-grid, off-grid and grid connected operation
 - Flexibility potential
 - Detailed techno-economic assessment
- Socio-economic assessment of demand development and market ranges
 - Based on stakeholder dialogues
 - Scenarios for legal framing conditions
- Assessment of upper limit requirements for local production to identify H₂ import needs



Figure 3: Schematic overview of the planned H2B transformation platform around the industrial port Bremen. Source: adaptation of University Bremen swb / die Typonauten

Partners

Joint research partners



Professur für Volkswirtschaftslehre
Innovations- und Strukturökonomik

Associated project partners



Other contributors



Figure 2: Scientific, associated and practise Partners of the H2B project. Source: Authors' own compilation

Step-by-step approach of the Bremen's H2B-Roadmap

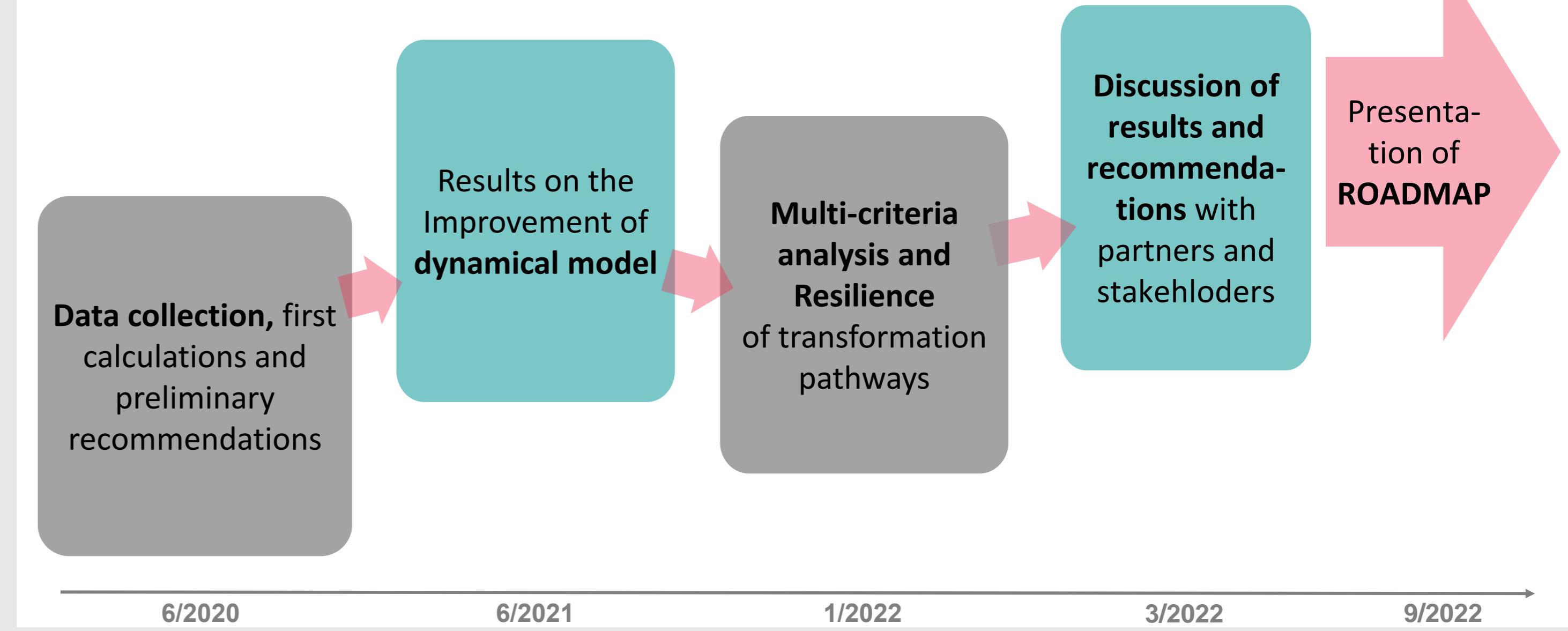


Figure 4: Illustration of the steps for development of the roadmap. Source: Authors' own compilation

Literature:

- Schnüller, C.; Thöming, J.; Wassermann, T.; Thier, P.; Gleich, A. von; Gößling-Reisemann, S. (2019): Socio-technical-economic assessment of power-to-X: Potentials and limitations for an integration into the German energy system, Energy Research & Social Science, Volume 51, Pages 187-197, ISSN 2214-6296, <https://doi.org/10.1016/j.erss.2019.01.017>
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