ESTEP SPRING DISSEMINATION EVENT

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Hubs for Circularity in Europe: A Focus on Stakeholders

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ESTEP

HOTEL ★★★★ GALAXY JORDAN GROUP

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1. Research Problem

- The EU has been pushing to develop a framework for a collective transition to the circular economy (EC, 2014).
- Some actions towards a circular economy are:
  - EU Competitiveness Compass (European Commission, 2025)

- The **role of stakeholder engagement is underexplored** (Fobbe & Hilletofth, 2023; Vladimirova et al., 2018; Hein et al., 2017; Mortensen et al., 2023).
  - Limited attention to social justice and the challenges of stakeholder engagement in circular processes (Marin et al., 2018).

- **Circular economy** theory pointed out the need to **better understand the different dimensions**:
  - social (Ziegler et al., 2023)
  - political and ecological impacts of circularity (Friant et al.2020)

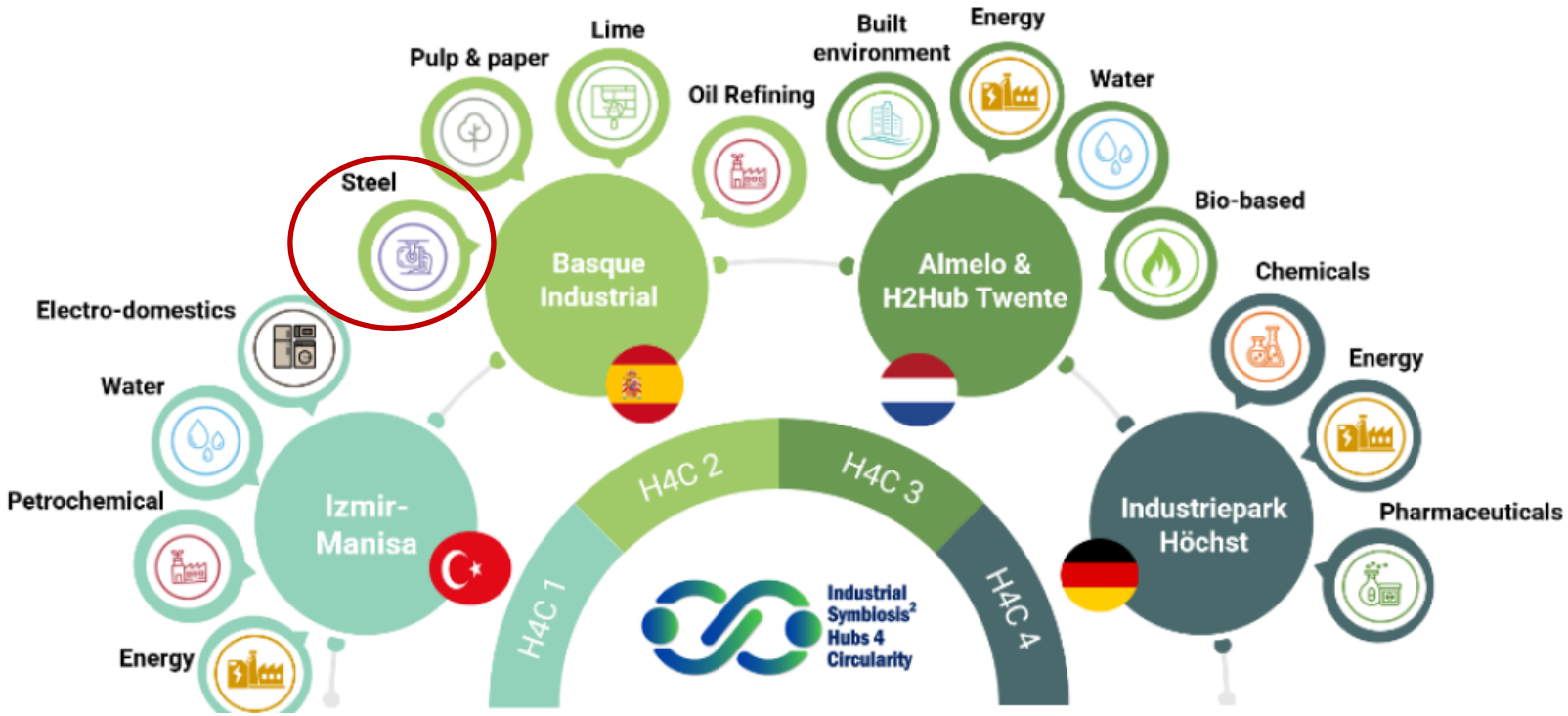
2. Context and motivation

- This project includes four circularity hubs in Germany, Spain, Netherlands, and Turkey (EU project IS2H4C - https://is2h4c-project.eu/).

- Three main goals of this research:
  a) Demonstrating near commercial scale IS through innovative technologies
  b) Ensuring sustainability covering people, planet and profit dimensions
  c) Novel financial schemes and social innovation approaches

This project has received funding from the European Union's HORIZON Research and Innovation Actions programme under grant agreement number 101138473

Overview of Involved hubs



Hubs4Circularity H4C provide spaces where diverse actors, such as businesses, governments, researchers, and civil society collaborate to accelerate the Circular Economy (CE) transition (https://is2h4c-project.eu/).

3. Methods

- Stakeholder engagement in European circularity hubs through participatory research and co-creation, living labs and expert discussion panels. More concretely:

  a) Stakeholder mapping and needs/relationships

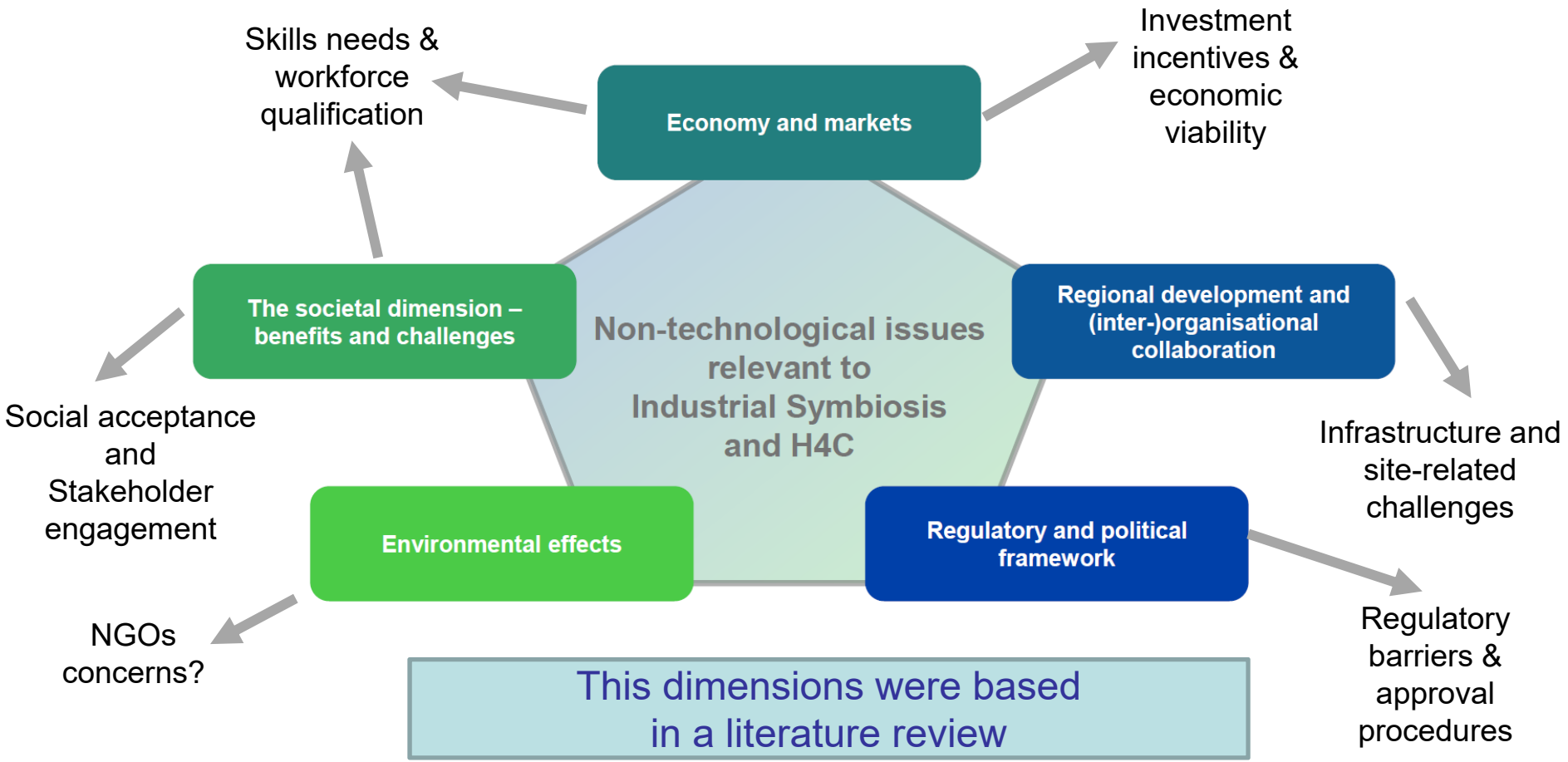
  b) Identifying non-technological key challenges

  c) Good practices of societal engagement

Based on e.g. desk research, questionnaires and semi-structured interviews with businesses along the hubs, citizens living in the vicinity of the hubs, policy makers

4. (Preliminary) Findings

Non-technological aspects of H4C



Key challenges for stakeholders

	German Hub	Dutch Hub	Basque Hub	Turkish Hub
Regulatory uncertainties	Regulation as uncertain driver for SAF demand	Lack of clear policies on hydrogen production, storage, and distribution	Long permitting processes, uncertain changes of legislation	Frequently changing, complicated
Economic challenges	Market and investment barriers	Limited financial incentives or subsidies	High capital need and operational expenditures	Market and investment barriers
Infrastructure	Infrastructure for hydrogen and renewable energies	Integrating hydrogen, electricity, and gas networks	Needed for H_2 & CO_2 transport, upgrade of electrical grid	
Societal and community relations	Societal impact of SAF	Concerns over the safety of emerging technologies	Social resistance against waste facilities, renewable energy installations, CO_2 storage	Acceptance and skilled labour as key challenges
Environmental effects	Which CO2 sources are acknowledged?			

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Overview of the Basque Hub

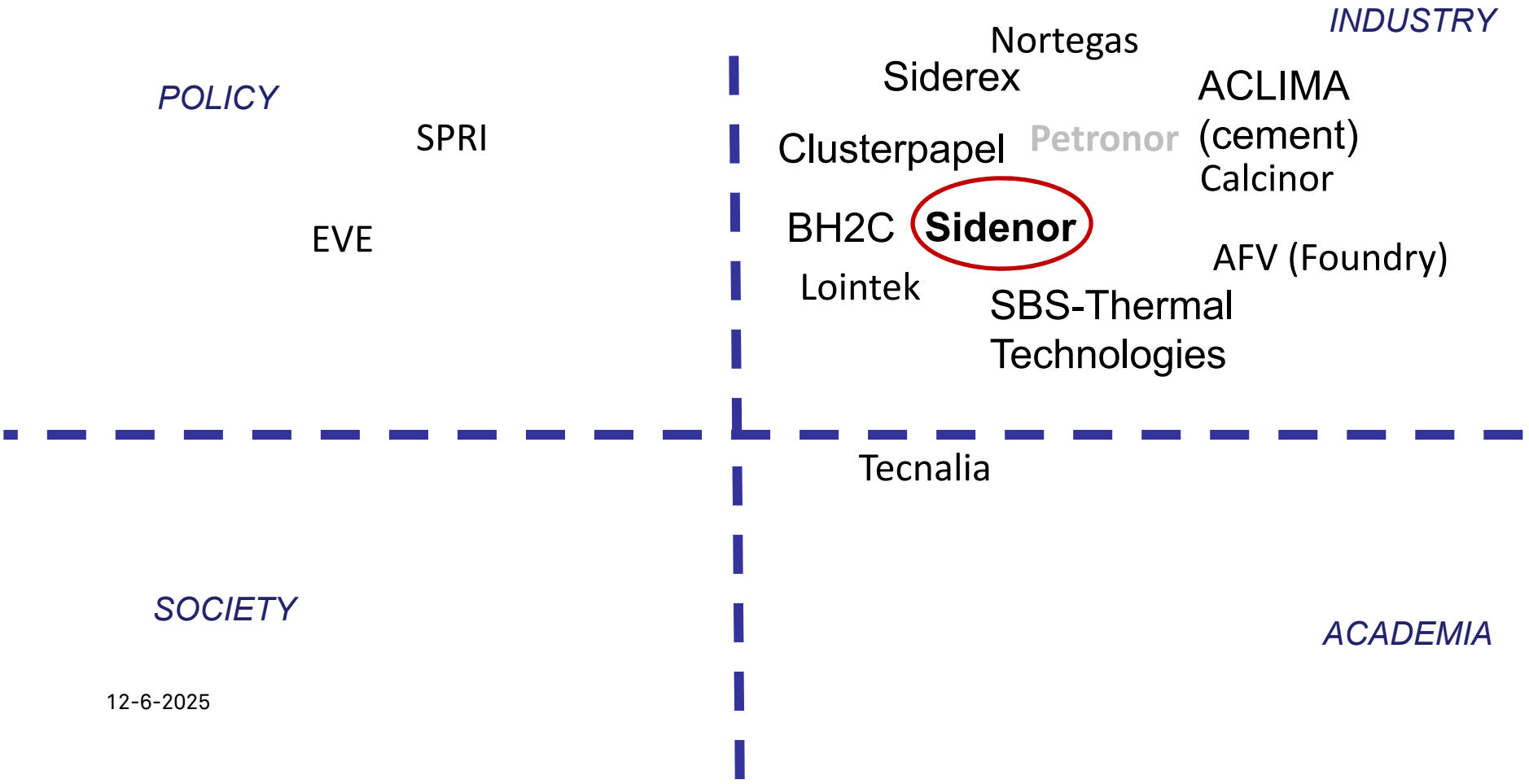
Location:

- Basque country
- Characterised by EII (steel, pulp&paper, cement, lime, foundry, oil refinery)

Focus of Industrial Symbiosis (IS):

- **Oxycombustion and use of green hydrogen**
- **CO_2 capture & utilisation (CCU) and carbonation of steel slugs:** adsorption technologies for CO_2 capture from lime production
- **E-methanol production:** CO_2 is converted into synthetic fuels

Stakeholders in the Basque Hub



12-6-2025

IS2H4C

Basque Hub

sidenor

BIH4C
Basque Industrial Hub for Circularity

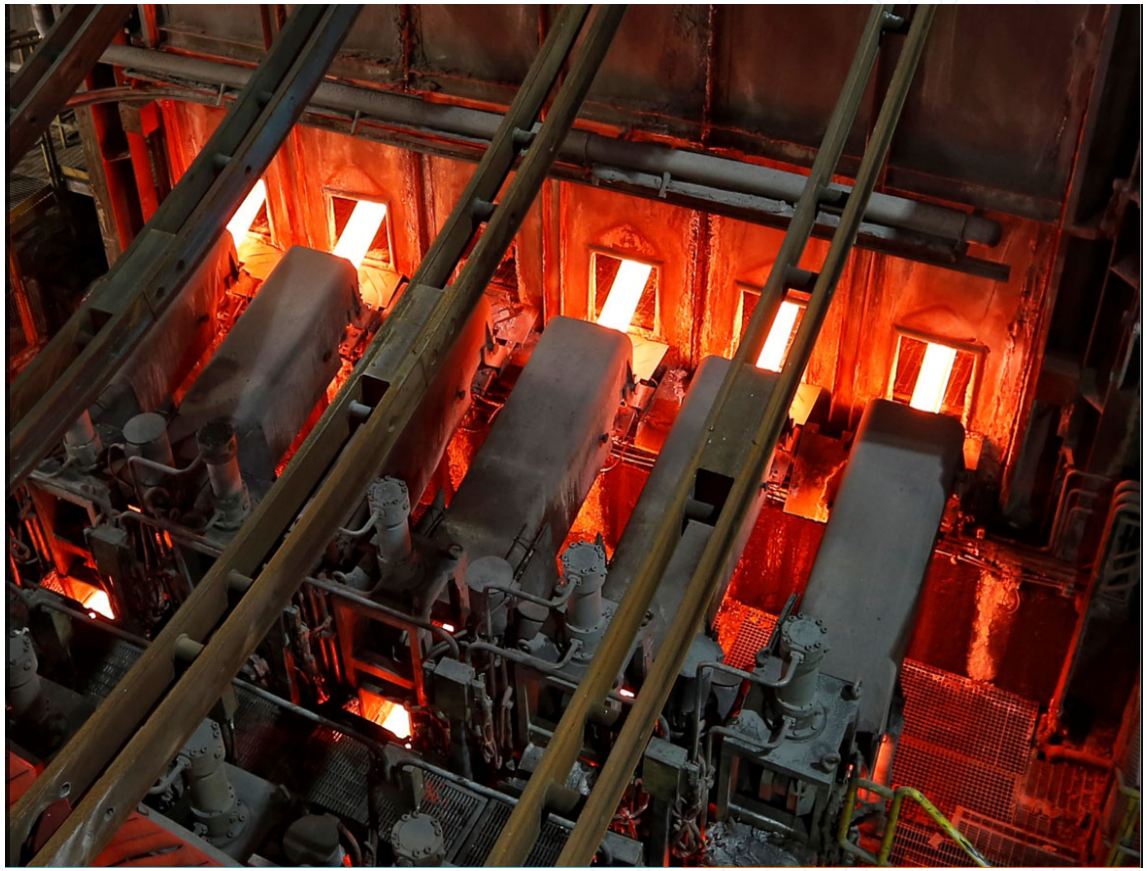
Petronor Innovación
Calcinor
Cluster Energía Basque Energy Cluster
SBS Thermal Technologies
lointek
Bilbao Bizkaia Ur Partzuergoa Consorcio de Aguas Bilbao Bizkaia
nortegas
Smurfit Kappa
sidenor
tecnalia

Basque Hub, Sidenor:

Main objectives:

- Analysis of the synergies with the rest of the partners to identify the possible reduction of raw materials or wastes generation.

- Identify the energy demand and/or heat excess.

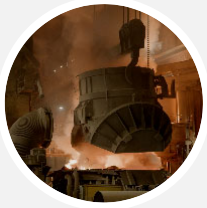


DECARBONIZATION

Reduce NG consumption in the ladle preheating process

CIRULAR ECONOMY

Reduce the amount of stainless steel slag sent to landfill



ELECTRIC ARC FURNACE

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REFINING

OXY-COMBUSTION with HYDROGEN

Current heating: NG + air

Industrial validation of the burner which uses H_2 and O_2 during the preheating of the ladle refractories.

1 $NG + O_2$

Expected savings around 50% in the gas consumption

2 $H_2 +$

Complete avoidance of natural gas consumption

Sla
g

Carbonation process

Valorisation

SBS
Thermal Technologies

Calcinor
QUÍMICA NATURAL

CO_2 Capture

CO_2

5. Preliminary conclusions and next steps

Conclusions:

- Social resistance towards:
  - a) new renewable energy installations
  - b) waste management, and
  - c) CO2 storage
- High investments cost
- Regulatory policies (e.g. as overly complex and restrictive which slow down the implementation of industrial symbiosis)
- Public-private collaboration is essential in this hub

Next steps:

- We are developing indicators for stakeholder engagement
- Governance for continuous stakeholder involvement by hub-specific living labs
- Establishing an expert discussion panel

Thank you for your attention!

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