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SIDE EVENT

Identification of priority synergies and gap assessment

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UGent-ECM: Energy & cluster management

~INDUSTRIAL SYMBIOSIS (since 1998)

- energy & resource management in
  - industrials parks & sites
  - urban-industrial & cross-sectoral clusters
  - regions, ports, hubs & districts
- interdisciplinary research
  - engineering models
  - legal, economic, spatial, technical and social aspects
- projects eg
  - industrial clustering/management
  - climate/energy symbiosis and circular economy
  - hubs for circularity

MATERIALS
resources, waste, emissions, critical materials, by/side-products, ...

ENERGIES
heat/steam, electricity, nuclear, hydrogen, renewables, ...

SERVICES
facilitation, infrastructure, logistics, transport, engineering, platforms, ...

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RISERS synergy database

Description of a synergy:
bilateral exchange of MES (Material/Energy/Service) between sink/source sectors



A.SPIRE Process industries

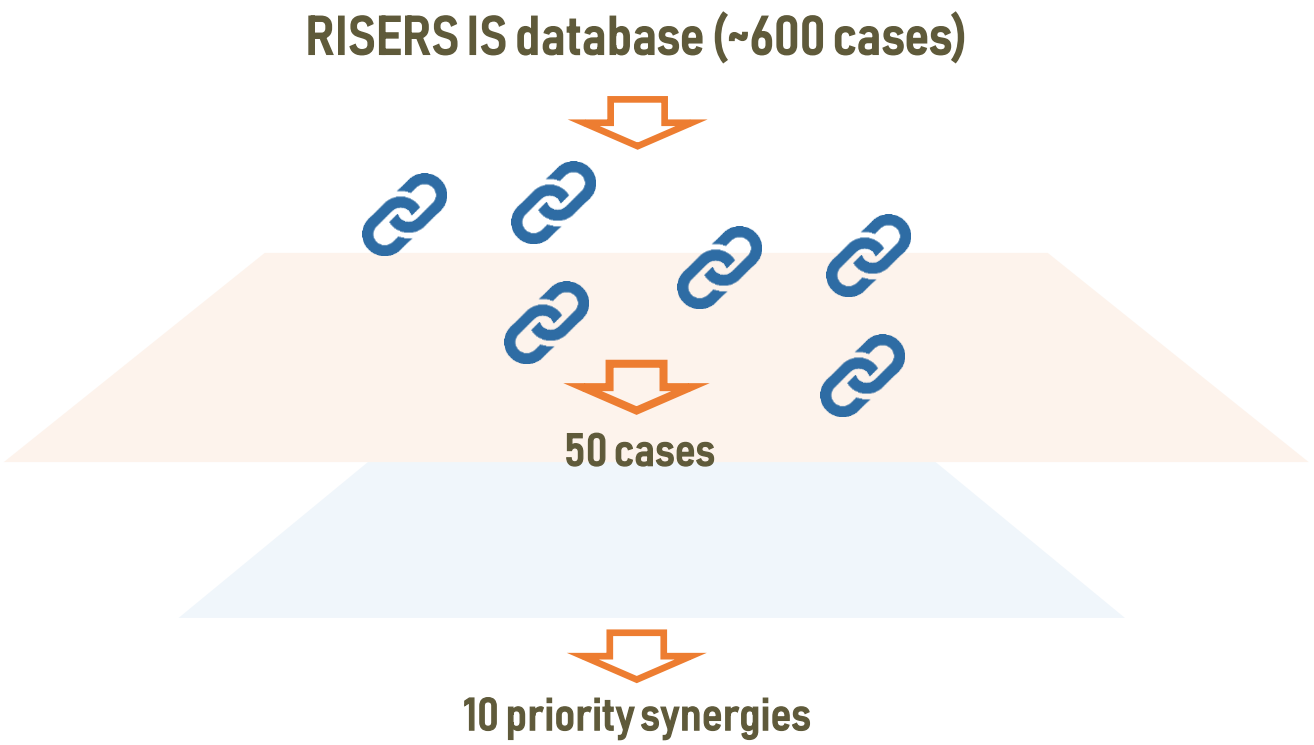
+ Food, Pulp & paper, Glass

+ Urban & others sectors (services, minerals, etc.)

SCALER (100 cases in the A.SPIRE sectors)
MAESTRI (>400 cases in various sectors)

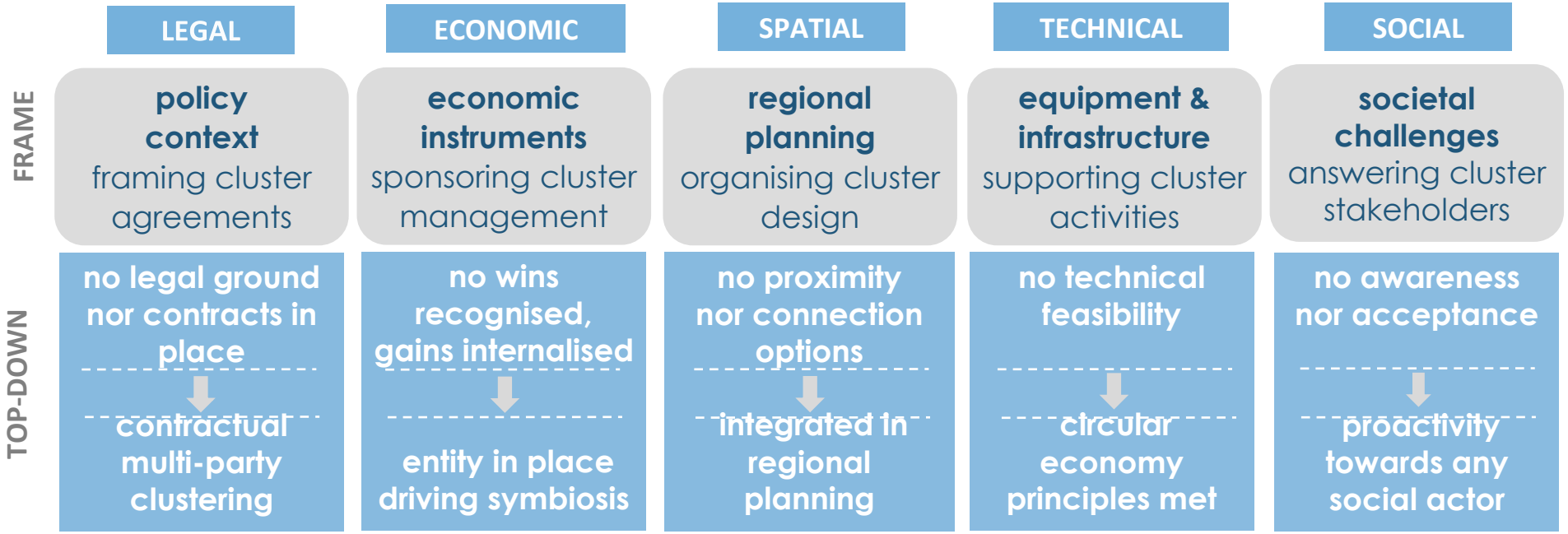
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RISERS synergy screening



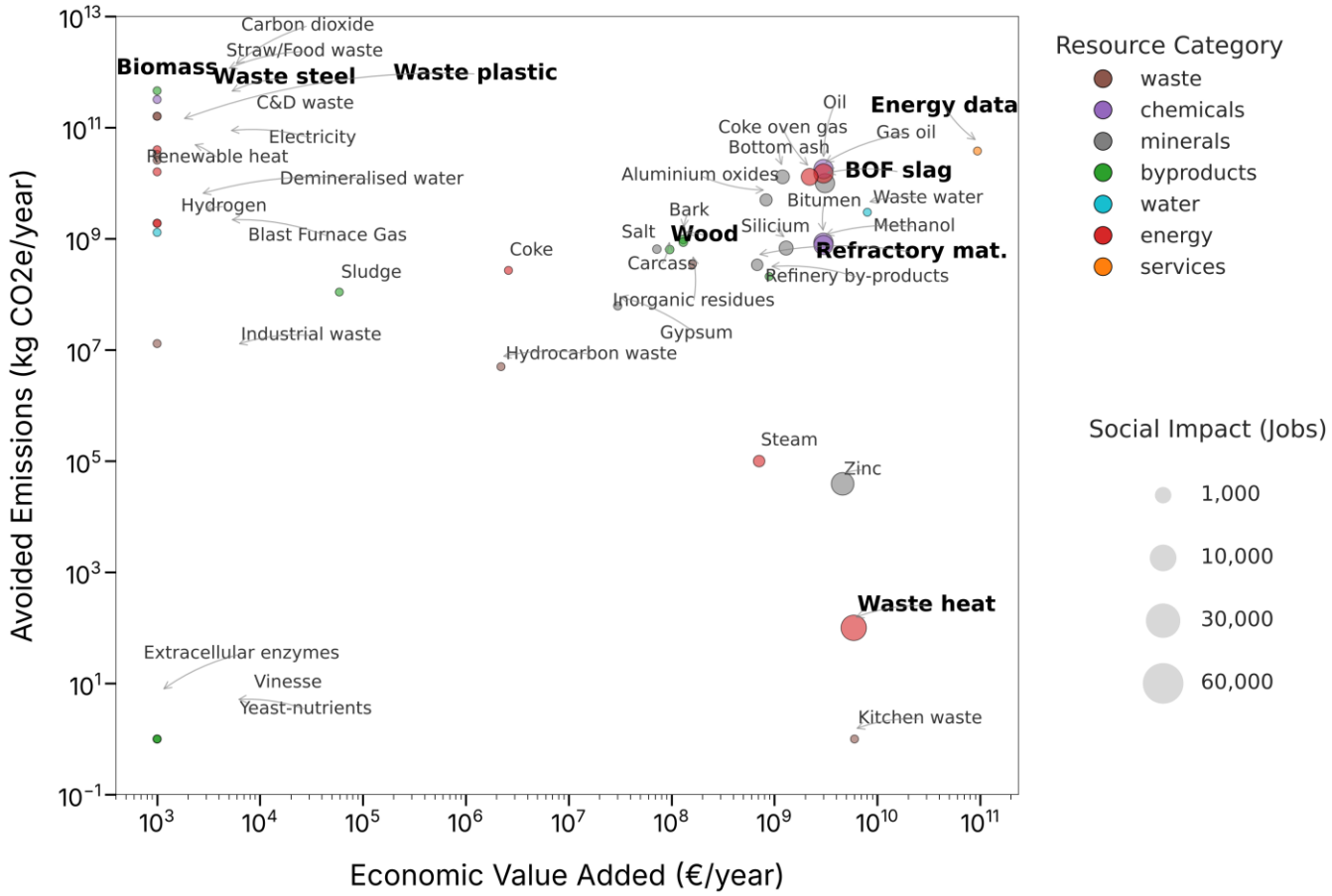
RISERS synergy screening

LESTS methodology (Maqbool et al., 2016)



- Engineering suitability (eg need for infrastructure)
- Organisational suitability (eg in line with company goals and strategies)

RISERS synergy screening



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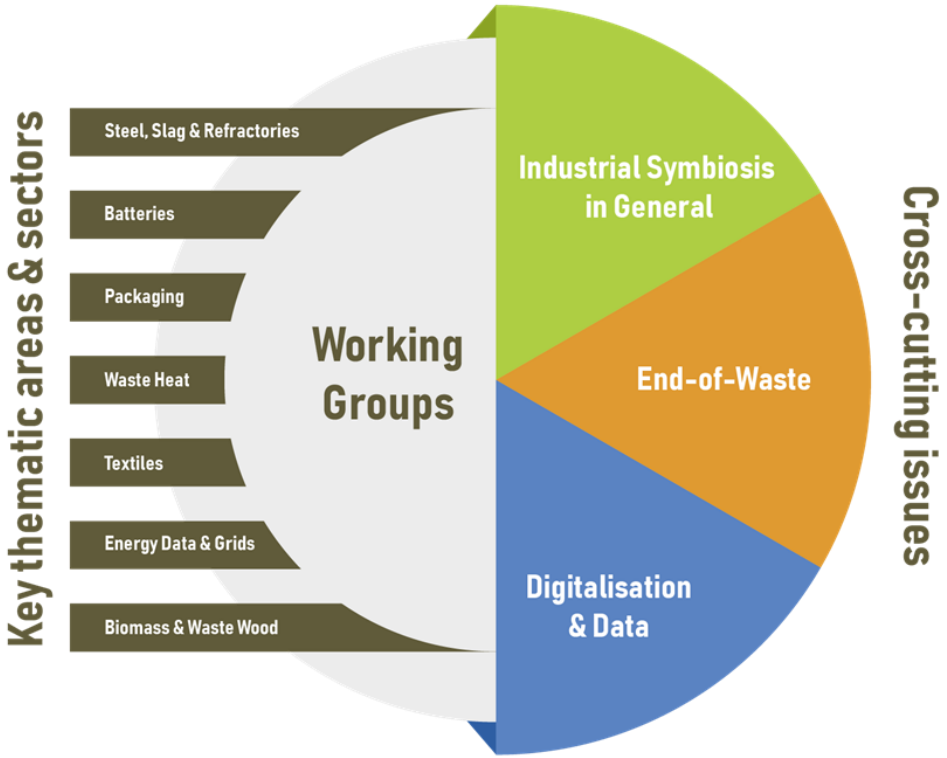
- Impact assessments of 50 highest scoring synergies (based on EU project data or literature (e.g. SCALER, EPOS)
- Selection of key synergies (based on highest impact, relevance to priority sectors and key EU policies)

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Industrial symbiosis standardisation roadmap

RISERS selection of 10 priority synergies

MES		Source sector	Sink sector	Synergy	PPP impact very high on
BOF/EAF slag	M	Steel	Cement, various	Recover BOF slag and provide Si, Fe, Ca and Al for clinker raw materials	planet
Waste heat	E	Various	Urban	Recover heat from process industry and use for urban heating	people
Plastic packaging	M	Various	Cement, various	Use plastic waste from process industry as raw material in cement industry	planet
Waste steel	M	Urban, Various	Steel	Recover waste steel for recycling (secondary steel manufacturing)	planet
Energy data	S	Various	Energy	Optimise electricity sourcing and provide flexibility via demand-response	planet
Biomass	ME	Urban, Various	Refineries, Various	Produce alternate fuels using Fischer-Tropsch process	planet
Waste wood	ME	Pulp & paper	Energy	Recover waste wood from pulp & paper sector to fuel combustion plants	planet
Refractory materials	M	Steel	Glass, construction	Recover fly ash and extract mineral products for brick and roof tiles manufacturing	people
Textiles	M	Textiles	Various	Produce secondary raw materials from unwearable textile waste.	planet
EV batteries	ME	Transport	Energy/Minerals	Recover lithium and other rare earth elements, reuse for energy storage	planet



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Methodology

SCREENING PHASES

1. IS library
Aggregation of ~600 unique IS cases based on prior EU projects (EPOS, SCALER, MAESTRI, AIDRES).

2. Priority sectors
Mapping resources across sink and source sectors (e.g., chemicals, cement, energy).

3. LESTS screening
Qualitative filter reducing cases to **50 high-potential synergies.**

4. Impact assessment
Quantitative PPP impact analysis isolating **10 priority synergies.**

GAP ASSESSMENT

Literature review
Reviewing deliverables of prior EU projects and standardisation bodies.

SWOT analysis
Assessing barriers and enablers via desk research and IS practitioner interviews.

Standards screening
Screening of 92 CEN Technical Committees and over 4,000 standards.

Geographic synergy mapping
Geospatial mapping of synergy potential and cluster analysis (RES2Go).

Policy analysis
Evaluating regulatory gaps based on literature and expert surveys (n=207).

RESEARCH OUTPUT

Standardisation recommendations
Targeted guidance for sectoral and cross-cutting topics, including End-of-Waste frameworks, digitalisation, and standardisation governance for IS implementation.

Policy recommendations
Actionable insights for policymakers to remove regulatory barriers, simplify permitting, adjust tax policies, and offer financial incentives for secondary raw materials.

Input for the RISERS working groups
Providing structured insights and analytical data to support the standardisation and policy recommendations of the topic working groups.

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Overview

THE CHALLENGE

Fragmented industrial symbiosis uptake

More than 600 potential material, energy and service exchanges sit across Europe without a common way to screen, compare or standardise them.

Screening of IS cases: chemicals (20%), minerals (20%) and food (13%) lead as sources; chemicals (17%), cement (17%) and minerals (11%) as sinks

THE APPROACH

Qualitative and quantitative screening

The LESTS multi-criteria framework and a PPP impact assessment narrow the case library from 607 to 50, then to 10 priority synergies. Energy-intensive manufacturing shows the highest potential, alongside emerging biobased and battery recycling exchanges.

- BOF/EAF SLAG
- WASTE HEAT
- PLASTIC PACKAGING
- WASTE STEEL
- ENERGY DATA
- BIOMASS
- WASTE WOOD
- REFRACTORIES
- TEXTILES
- BATTERY RECYCLING

KEY FINDINGS

Gap assessment

Literature review, SWOT analysis and geospatial analysis (RES2Go) demonstrate where sectoral clusters coexist or can develop across Europe. Analysis of standardisation TCs and a policy survey identified primary regulatory barriers.

Non-technical barriers dominate: fragmented regulation, permitting, end-of-waste criteria, and a lack of funding and support.

THE IMPACT

A roadmap for IS standardisation

Recommendations and sector guidance contributed to industrial stakeholder consultations and feed the RISERS roadmap for competitive, climate-ready industrial clusters.

Future work: validate and extend the proposed methodology while mitigating heterogeneous data sources.

607 Industrial symbiosis cases screened across European project databases

10 Priority synergies selected for standardisation follow-up

90+ Relevant CEN technical committees mapped, governing more than 4,000 active standards

204 Stakeholders surveyed across 17 European countries

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RISERS MES & synergies database: https://zenodo.org/records/17767696

RISERS D3.2 PRIORITY SYNERGIES: https://zenodo.org/records/19887028

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Thank you

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