

From Industrial Symbiosis Challenges to a Standardisation Roadmap

Insights from the RISERS Project on Industrial Symbiosis Standardisation

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October 20th, 2026



Objective of today's webinar

To present how the RISERS project identified key challenges, gaps and opportunities for industrial symbiosis standardisation (IS), and how these findings informed the development of a IS Standardisation Roadmap to support wider industrial symbiosis uptake and guide future standardisation activities.

Agenda



- 1. The RISERS project and why industrial symbiosis needs common approaches**
Andrea Motola, Enspire Science Ltd.
- 2. From evidence to standardisation needs: the foundations of the RISERS Roadmap**
Christian Grunewald, DIN
- 3. The RISERS Industrial Symbiosis Standardisation Roadmap**
Sebastian Vogel, CEN and CENELEC
- 4. From Roadmap to action: what comes next?**
Andrea Motola



Industrial Symbiosis

Industrial symbiosis is the use by one company or sector of underutilised resources broadly defined (including waste, by-products, residues, energy, water, logistics, capacity, expertise, equipment and materials) from another, with the result of keeping resources in productive use for longer.

Definition from CEN Workshop Agreement 17354



Map the landscape of IS-related standardisation to identify specific bottlenecks, gaps, and opportunities for standardisation and advance the mainstream adoption of priority synergies

Strengthen the uptake of R&I results in IS standardisation

Develop new and contribute to existing directions for IS standardisation promoting circularity of resources and make recommendations for the development of new standards (standardisation roadmap)



RISERS Objectives

Strengthen the engagement of policy making community and the identification of policy frameworks to support IS

Increase stakeholders' engagement, establishing an active dialogue between the standardisation community and IS practitioners via Hubs for Circularity Community of Practice and discuss the needs and challenges for bringing new technologies and innovative solutions to the market

Why RISERS? The need for common approaches

RISERS

Industrial symbiosis can keep resources in productive use — but promising exchanges do not automatically scale.

THE CHALLENGE

Industrial symbiosis connects sectors with different practices, requirements and standards.

Gaps in compatibility, data sharing and stakeholder coordination hinder uptake.

WHY COMMON APPROACHES MATTER

Shared terminology, compatible processes and a stronger link between R&I and standardisation can facilitate cross-sector resource sharing and market uptake.

RISERS RESPONSE

RISERS maps gaps and priority synergies, mobilises industry, research, standards and policy actors, and **develops a roadmap** for new or revised standardisation directions.

From fragmented practices to a shared Industrial Symbiosis Standardisation Roadmap



From evidence to standardisation needs: the foundations of the RISERS Roadmap

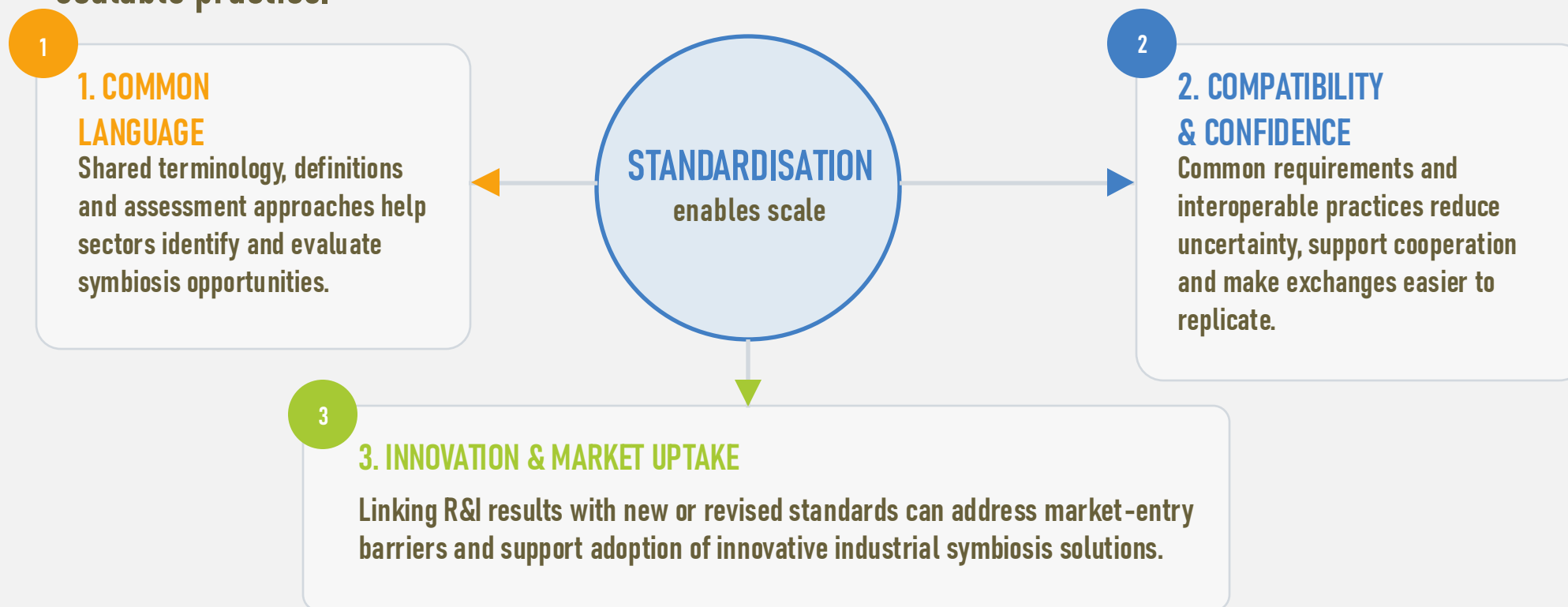
Christian Grunewald, DIN



About Standards

How standardisation supports wider uptake of industrial symbiosis

Standardisation helps move industrial symbiosis from promising exchanges to repeatable, scalable practice.



What do we mean by Standard?

EUROPEAN STANDARD	EN 397:2012+A1
NORME EUROPÉENNE	
EUROPÄISCHE NORM	October 2012
ICS 13.340.20	Supersedes EN 397:2012
English Version	
Industrial safety helmets	
Casques de protection pour l'industrie	Industrieschutzhelme
This European Standard was approved by CEN on 17 December 2011 and includes Amendment 1 approved by CEN on 19 July 2012. CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member. This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions. CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.	

technical specification

for *voluntary* application

adopted by a *recognised standardisation body*

used as a *rule, guideline* or *definition*

for a repeatable way of doing something

Making standards for Europe

International



Regional (European)



National



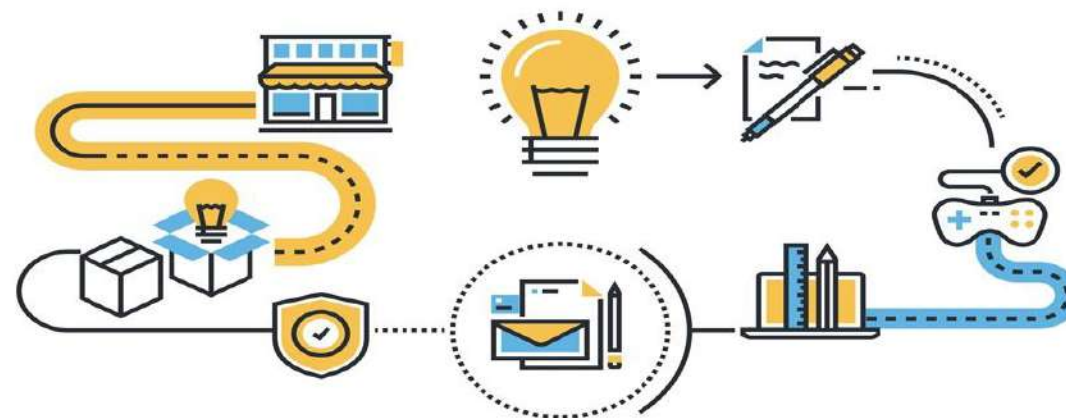
How are standards made?

Voluntary stakeholders
(**experts**) agree by
consensus on the need for
new standards and their
contents.



- Companies
- SMEs
- RTOs
- Universities
- Public Authorities
- Associations, NGOs, etc.

SDOs provide a common
framework and conditions for
the transparency and
reliability of this agreement.



Types of standards



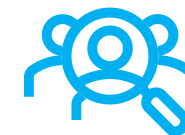
- Test and measurement standards
 - Measure content or parameter



- Product standard
 - Specify product performance



- Management standards
 - Models for managing activities



- Services standard
 - Quality and safety during the provision of services



Benefits of standards



The Role of Standards Bodies in RISERS

- § Support development of the Standardization Roadmap on Industrial Symbiosis
- § **Ensure alignment** with European and international standardization frameworks
- § Facilitate **uptake of recommendations** in Technical Committees
- § Provide **platforms and governance** for future standardization activities



How we started

What were our initial objectives?

§ Main goal:

Lay the foundation for a European Standardisation Roadmap for Industrial Symbiosis (IS)

§ Key Outputs:

- Mapping relevant Technical Bodies
- Consultation with standardisation experts
- Drafting the Roadmap outline

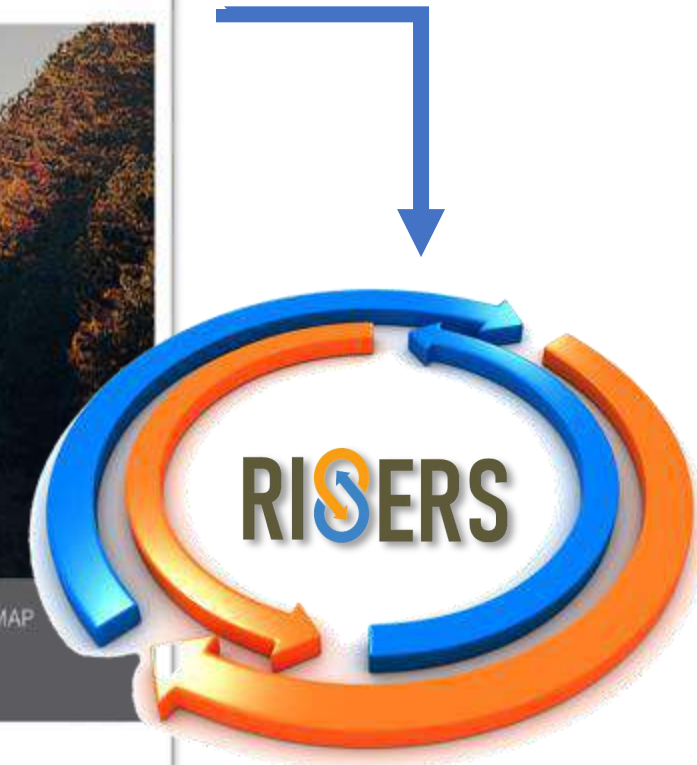
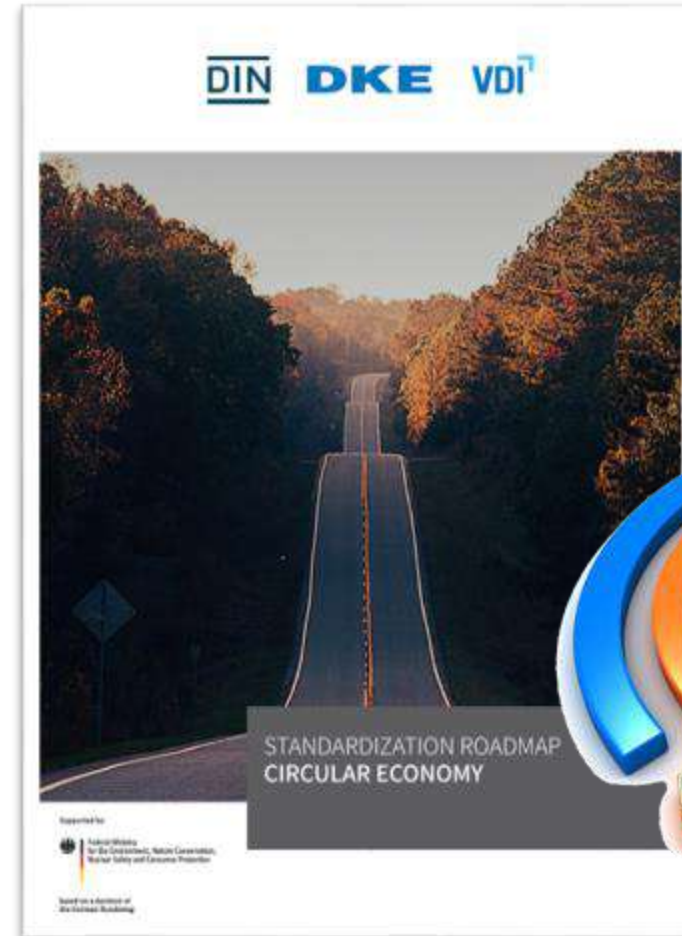
Roadmap Methodology

§ Designed to align with **DIN Circular Economy Roadmap**

§ Initial steps:

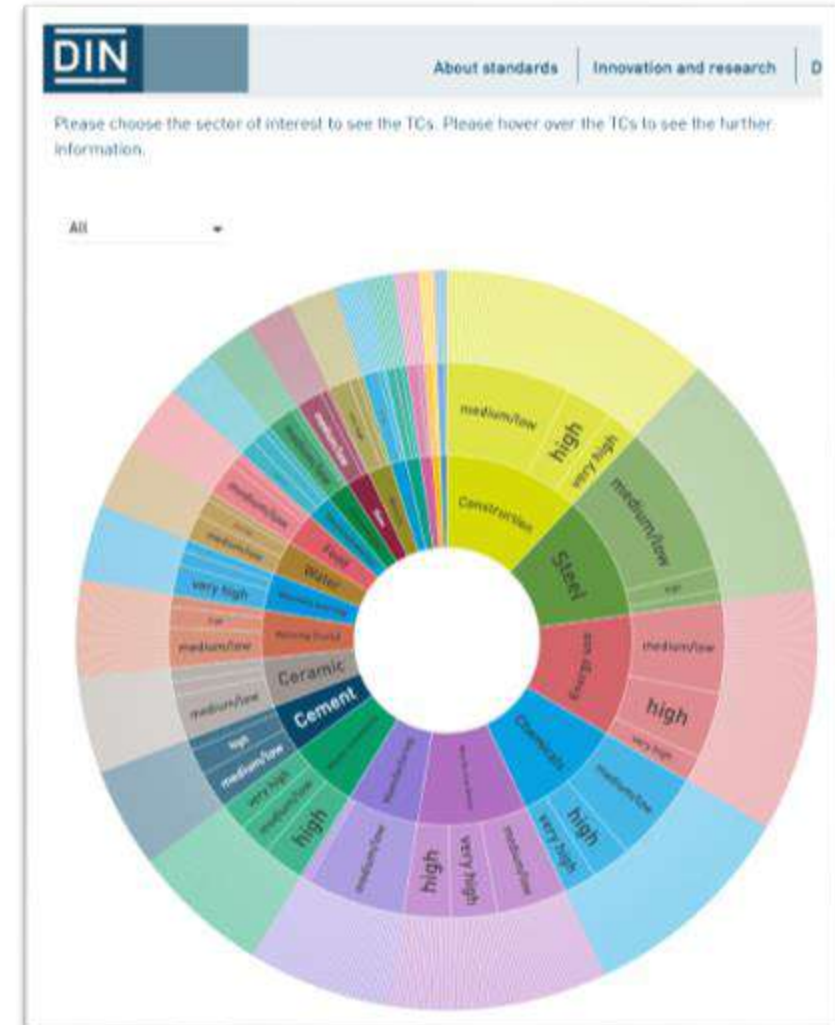
1. Map existing standards
2. Stakeholder consultation via survey
3. Identify gaps and overlaps
4. Formulate preliminary recommendations
5. Draft modular structure
6. Define working groups

§ Iterative feedback loops with a Coordination Committee.



Technical Bodies Mapping

- § **Purpose:** Identify standardisation structures relevant to IS
- § **Methodology:**
 - Keyword screening of ~800 TCs (CEN, CENELEC, ISO, IEC)
 - 350 potentially relevant TCs
 - Manual validation of ~131 most relevant TCs
- § **Result:**
 - Interactive map published on RISERS & DIN websites
 - Used for targeting consultations and planning roadmap topics



Scan QR to
access the
Map



Consultation of Technical Bodies

§ Survey Goals:

- Understand how TCs (and practitioners) address IS
- Identify standardisation needs and practitioner barriers

§ Execution:

- Online survey – Aug–Oct 2024
- 350+ TBs contacted, disseminated via CEN-CLC and RISERS websites
- Webinar with over 100 participants
- 93 responses (67 complete)

§ Outputs:

- Academic paper presented at EURAS 2025

The image shows a screenshot of a survey form. At the top, the CEN-CENELEC logo is displayed. The title of the survey is "Industrial Symbiosis Standardisation". Below the title, there is an "Introduction" section that defines Industrial Symbiosis (IS) as a system enabling circular flows of resources by engaging traditionally separate organisations. It mentions the ISO 59004:2024 standard. The survey aims to investigate current approaches, collaboration, and bottlenecks, and should take about 15 minutes to complete. It states that the survey was created within the EU-funded RISERS project. At the bottom, there is a consent statement: "I consent to share anonymized inputs to this survey with project partners for the analysis." and two radio button options: "Yes" and "No".

cen CENELEC

Industrial Symbiosis Standardisation

Introduction

Industrial Symbiosis (IS) is a system that enables **circular flows of resources by engaging traditionally separate organisations** to share inflows and outflows, thereby optimizing their value networks (see [ISO 59004:2024](#)). This collaborative approach involves the exchange of resources like energy, water, or by-products, leveraging geographical proximity to create mutually beneficial value.

This survey aims to **investigate current approaches, collaboration, and bottlenecks and should take about 15 minutes to complete**. Your personal insights as an individual expert will help identify and address these challenges via the standardization system.

Your information will be handled securely, ensuring privacy and compliance with applicable regulations ([privacy policy](#)).

* I consent to share anonymized inputs to this survey with [project partners](#) for the analysis.

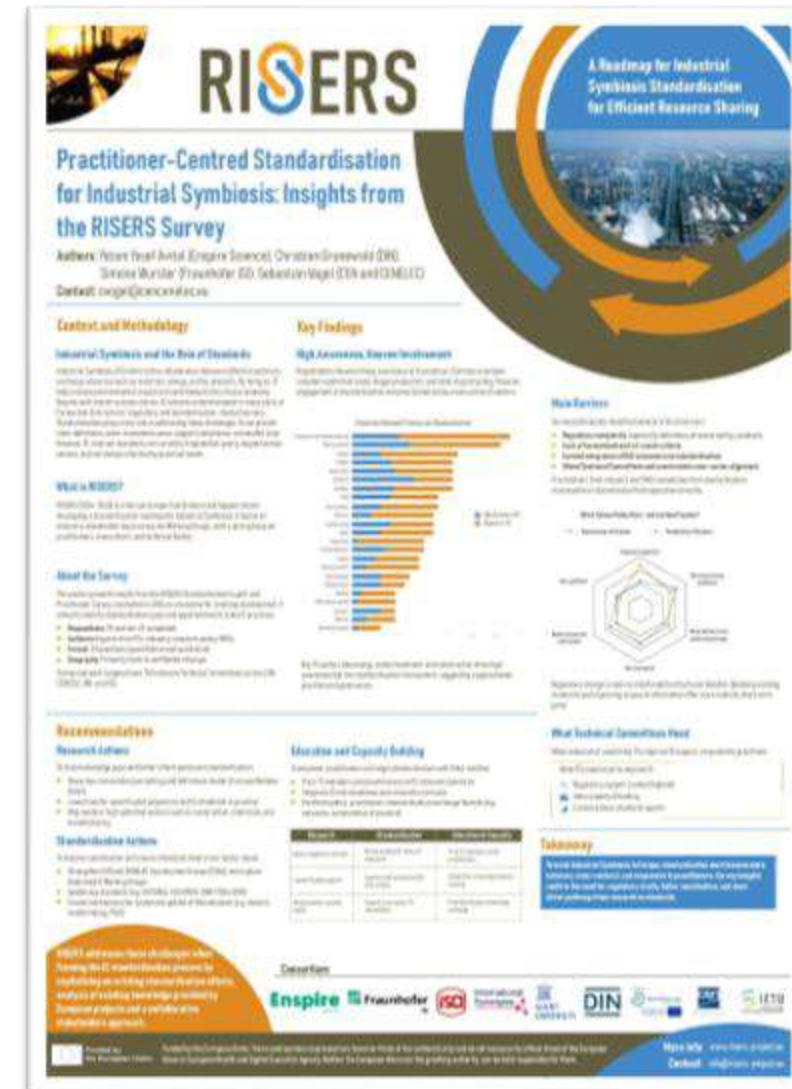
This survey was created within the EU-funded RISERS project.

☐ Yes

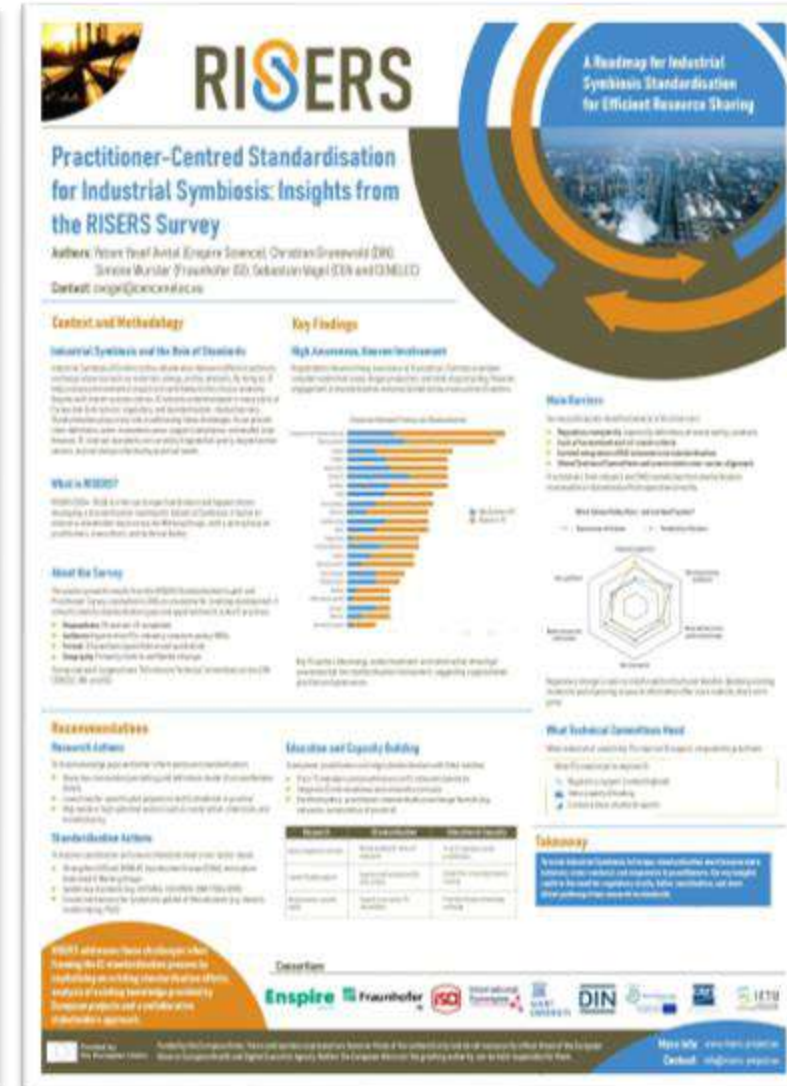
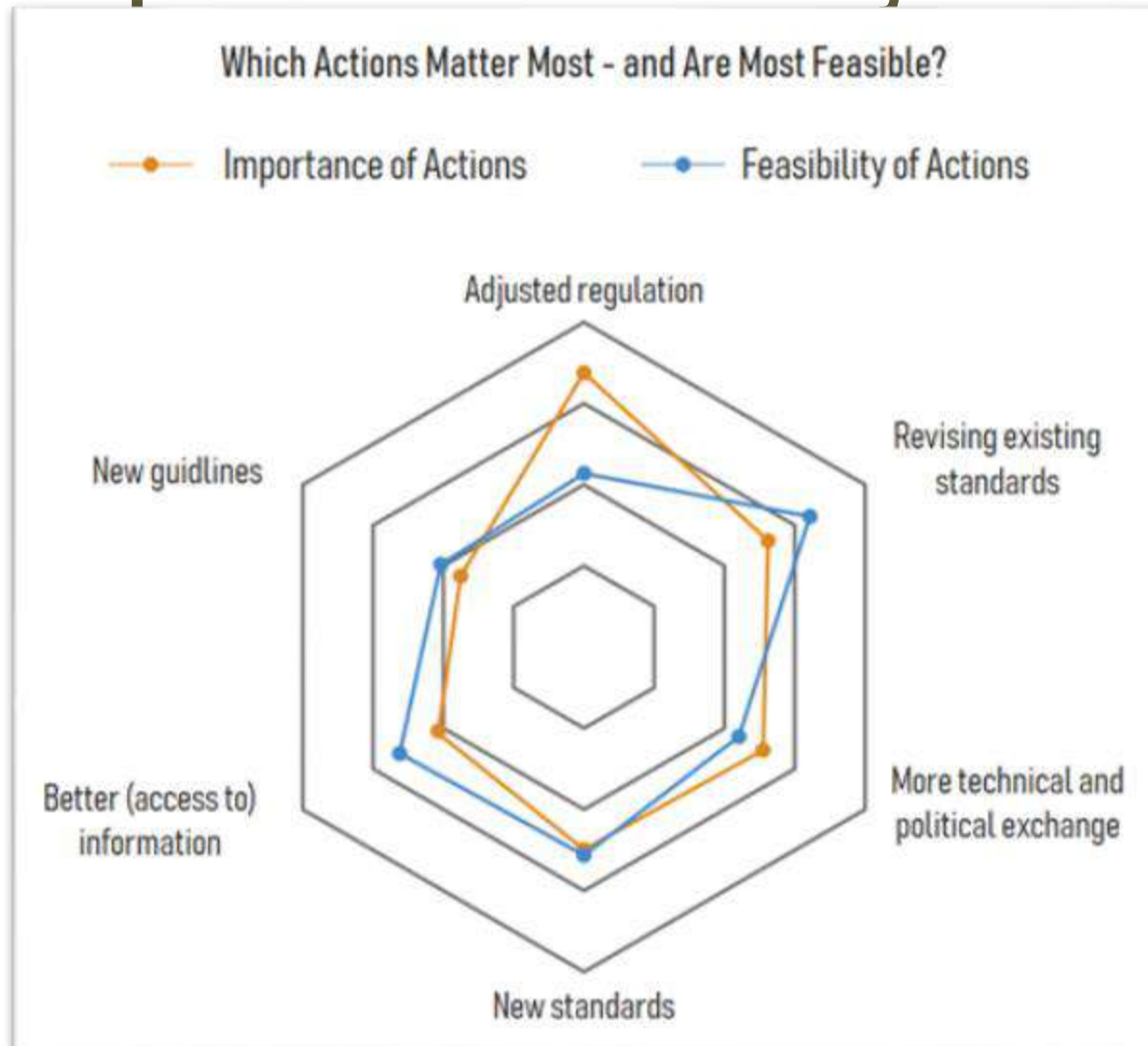
☐ No

Key Survey Findings

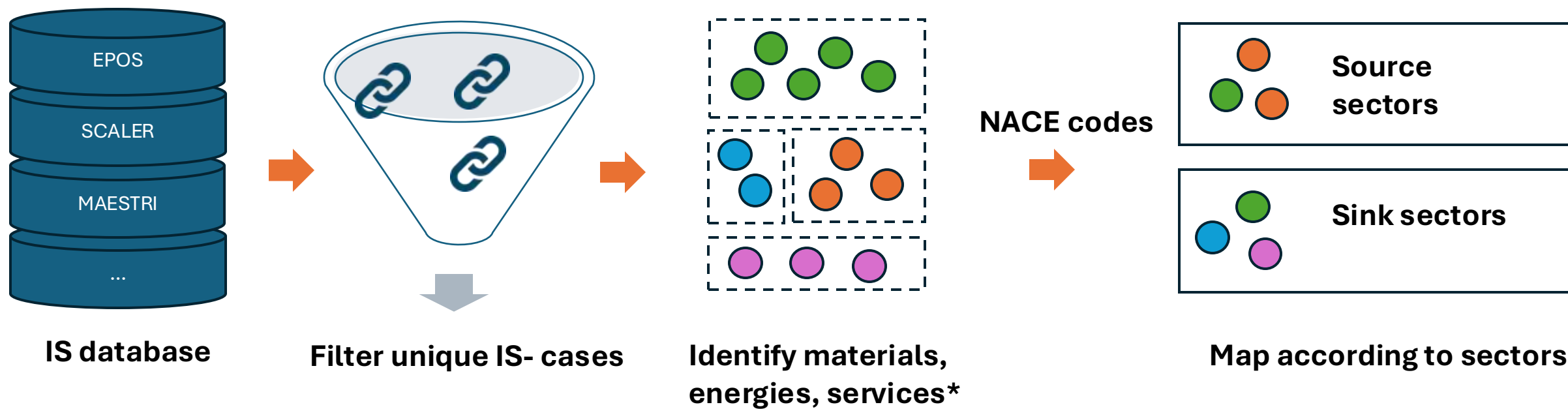
- § **84% see standardisation as important or very important for IS**
- **Challenges Identified:**
 - Fragmented regulations (e.g. End-of-Waste)
 - Limited cross-sector coordination
 - Insufficient linkages between R&I and standards
- **Needs Expressed:**
 - More inclusive standard-setting processes
 - Integration of R&I outcomes into standards
 - Better data frameworks for IS tracking
- § **Recommendations**
 - Revise key horizontal standards (e.g. EN 15804, EN 50625)
 - Strengthen practitioner roles in TC work
 - Create pathways from EU projects to CEN/CENELEC deliverables



Prioritising Standardisation Actions: Importance vs. Feasibility



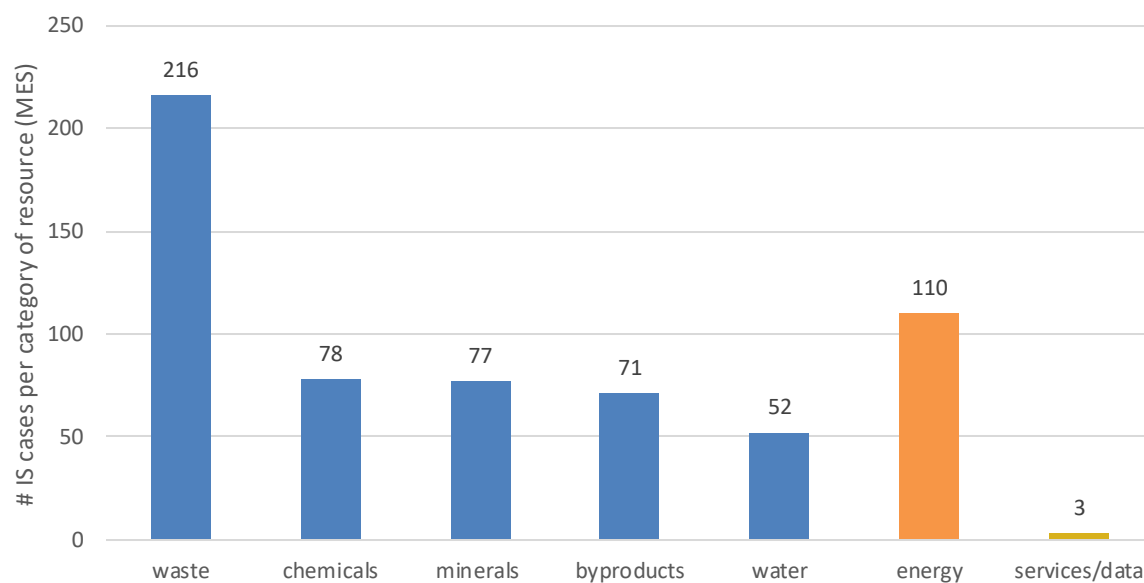
Understand IS areas



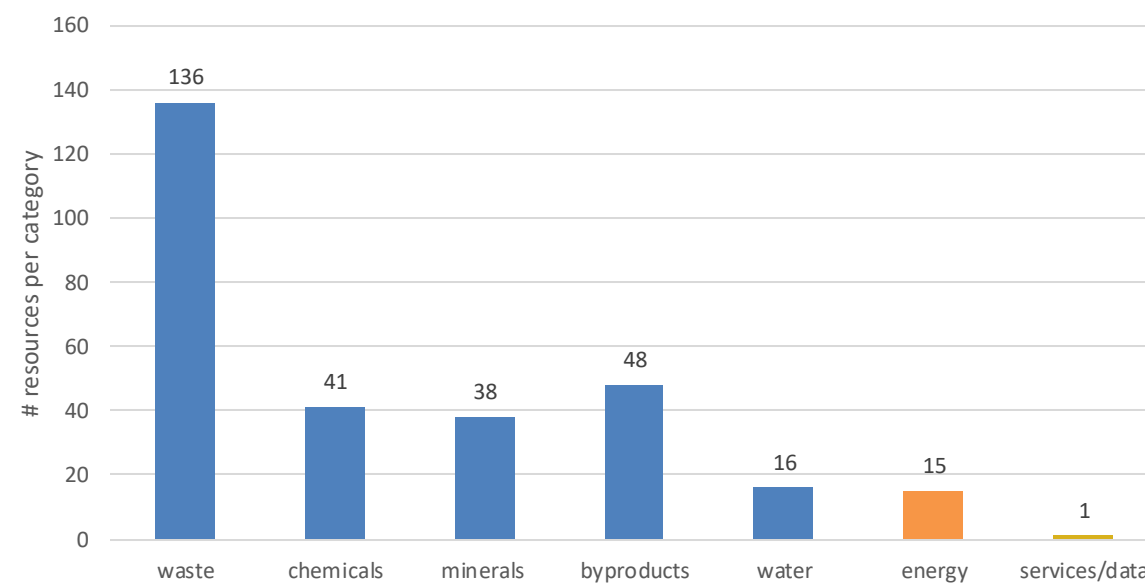
RISERS list of MES streams

RISERS list ~600 cases ~300 resources

categorisation per Materials - Energies - Services (MES) stream



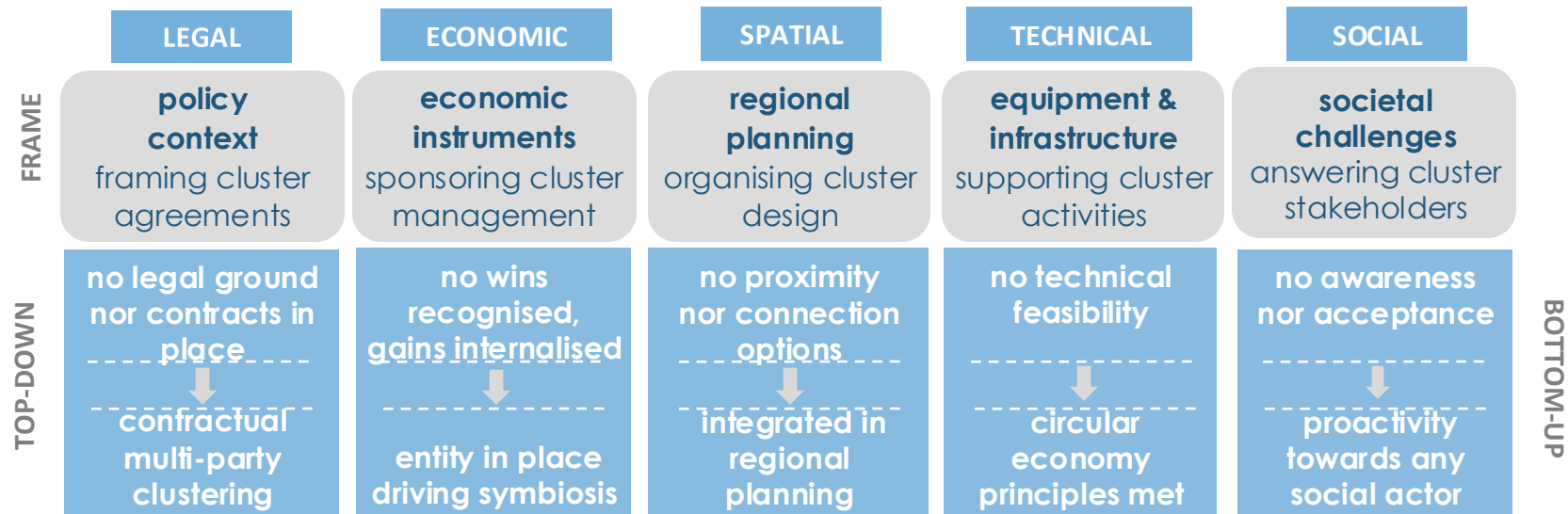
IS longlist cases categorised per MES stream



IS resources categorised per MES stream

Identify IS potential

> LESTS methodology (Maqbool et al., 2016)



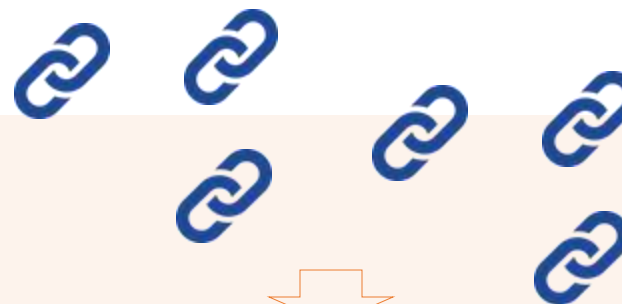
Identify IS IMPACT

Quantitative Assessment

3P Framework (People, Planet, Profit)

1. Environmental, economic, and social impact
2. Aligned with e.g., EU Green Deal, CE Action Plan

RISERS IS database (~600 cases)

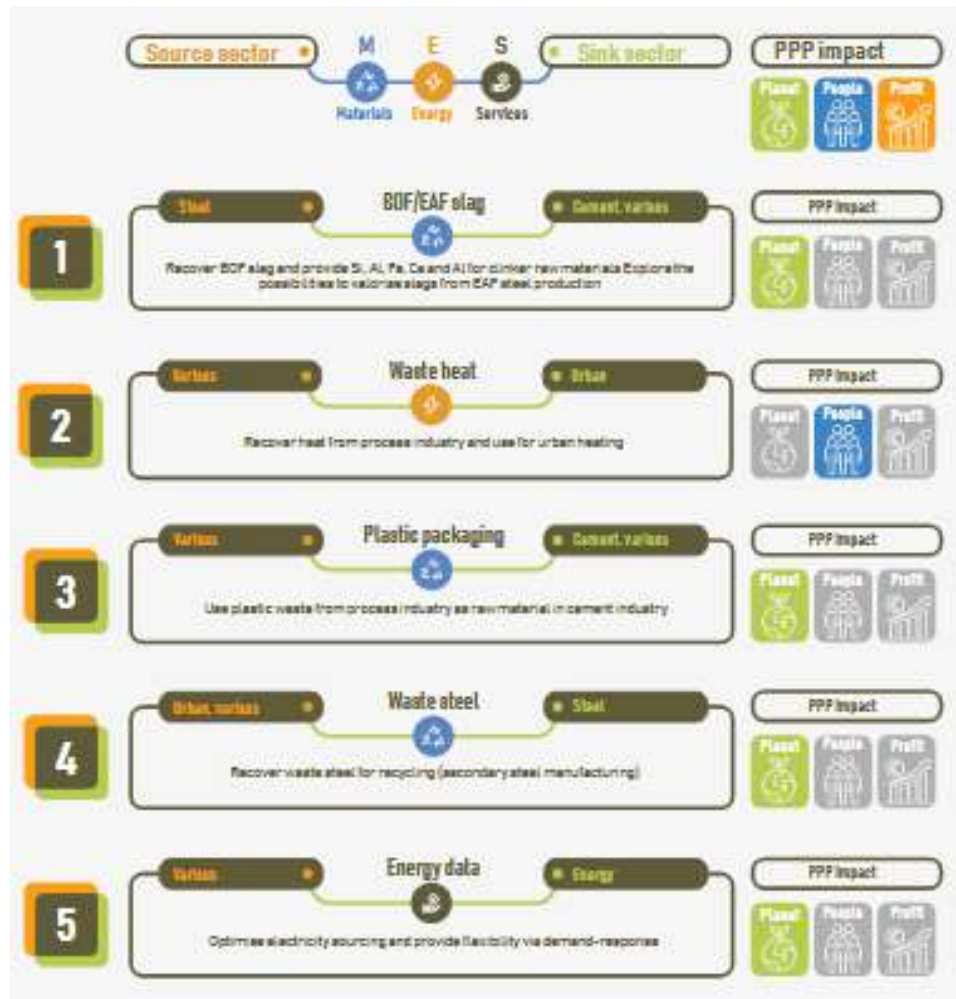


~50 cases



10 priority synergies

Which were the priority synergies?



Main Outcomes of the Roadmap Foundation

- § Mapping of 800+ TCs → 67 priority bodies
- § Survey analysis → validated objectives for IS standardisation
- § Roadmap Outline → core structure for IS roadmap

3. The RISERS Industrial Symbiosis Standardisation Roadmap

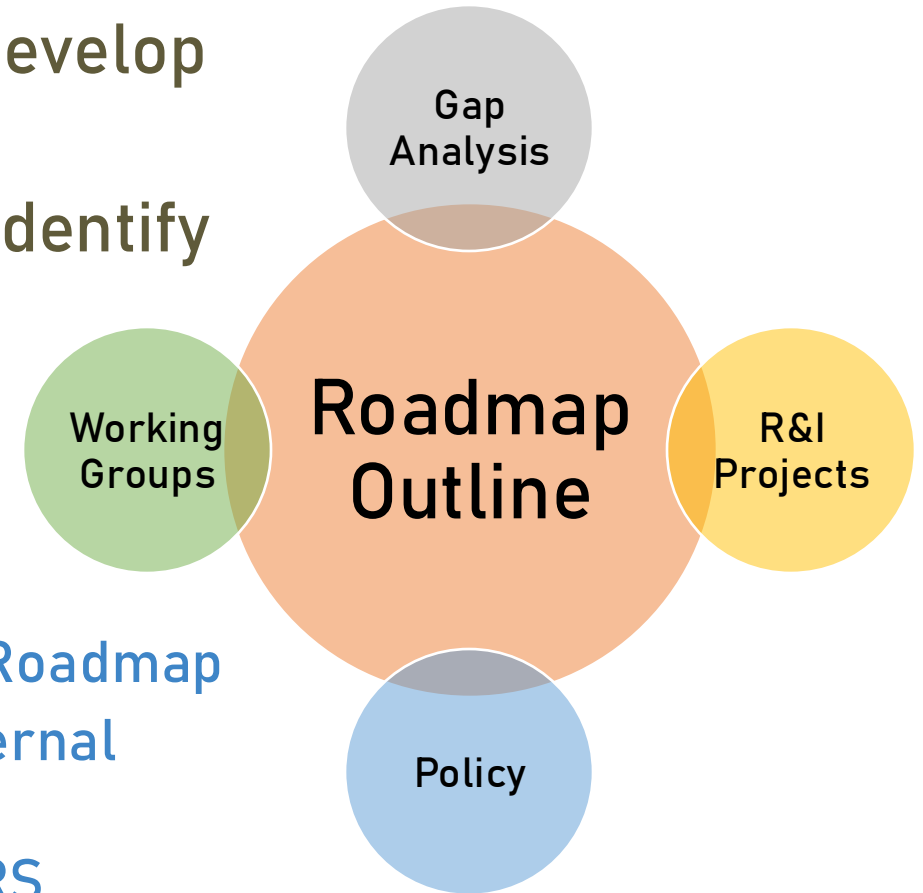
Sebastian Vogel, CEN and CENELEC



What was missing?

How to get actionable recommendations?

- § **Working Groups** needed to be created to develop them for policymakers and standardizers.
- § We had to specify standardisation needs, identify barriers, and explore standardisation opportunities.
- § **But why Working Groups?**
 - Main external input to the IS Standardisation Roadmap
 - Create link between internal analysis and external expertise
 - Build stakeholder engagement base for RISERS



Goals of the Standardization Roadmap

Identify challenges for IS implementation concerning standardization and regulation

Facilitate and harmonize resource sharing practices to scale

Create a common understanding of IS and define practical examples across sectors

6 goals

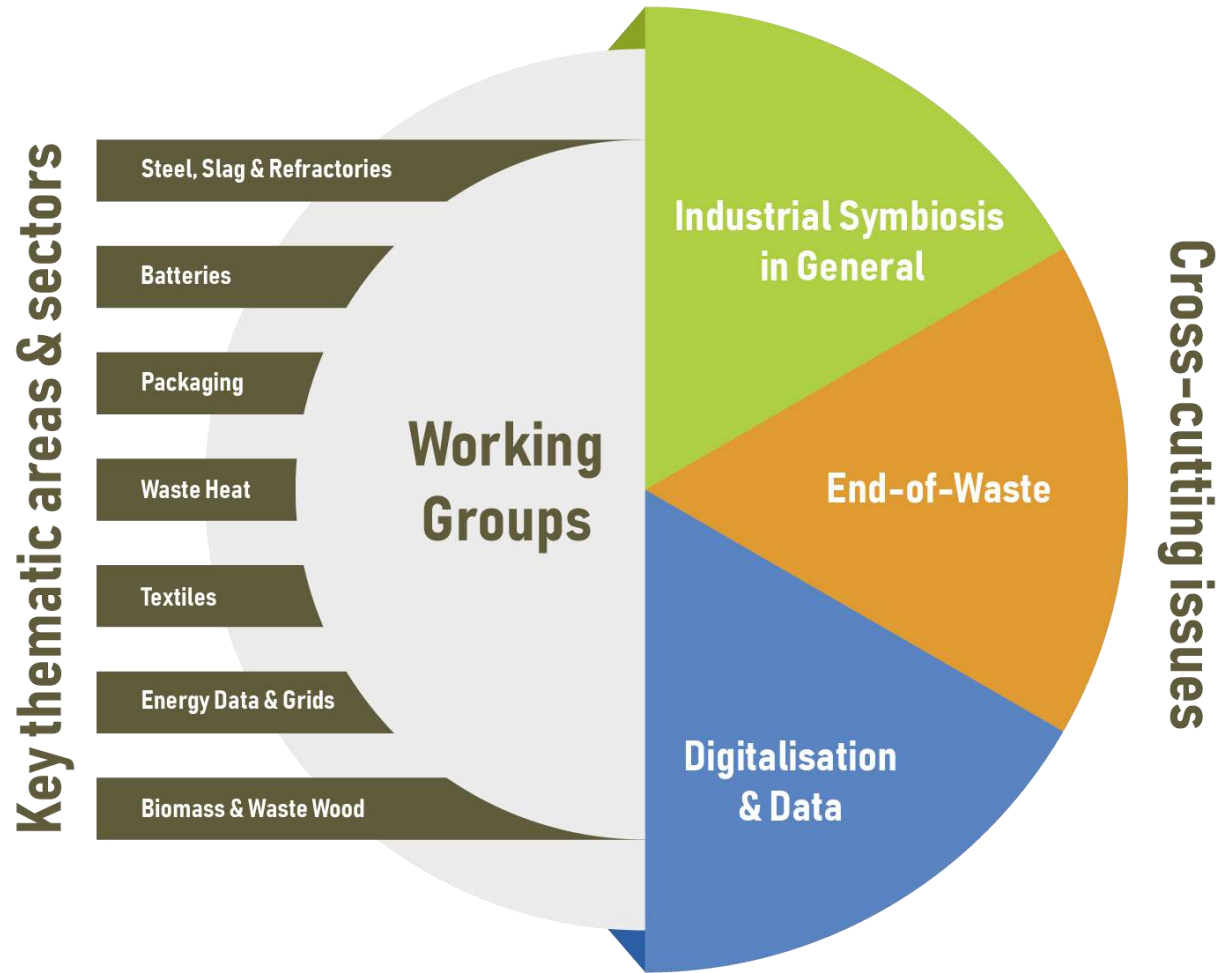
Discuss and formulate recommendations with and for policymakers

Use opportunities of standardization to provide clear guidance and frameworks for IS application

Networking

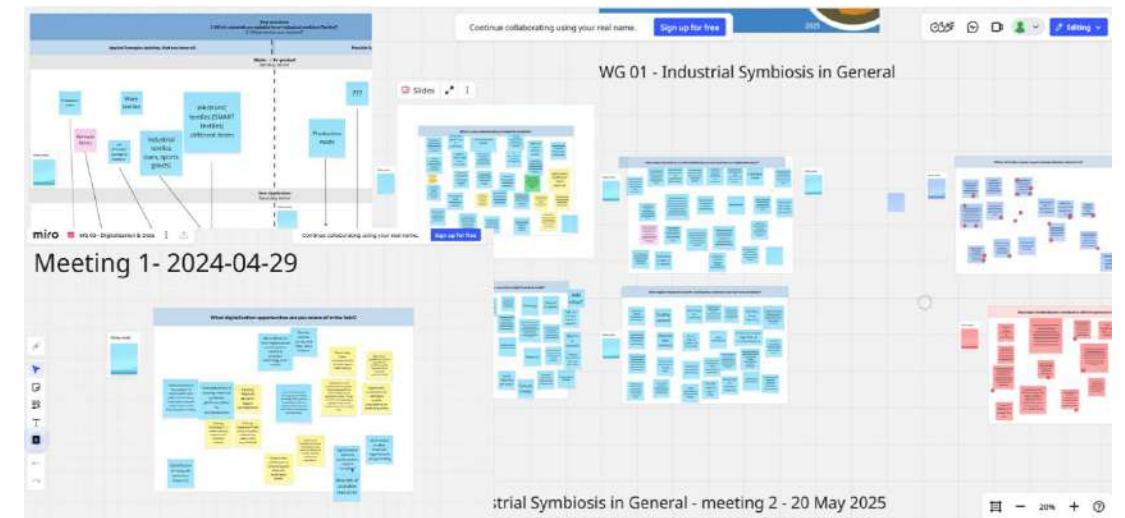
From Evidence to Recommendations

- **10 Working Groups (WGs)** covering horizontal and sector-specific topics
- Led by partners and volunteers, steered by a Coordination Committee
- Invitations shared with CEN-CLC TC Secretaries, Technical Boards, and RISERS website
- **93 unique stakeholders** from:
 - Industry (37%)
 - Academia (21%)
 - R&I Support (15%)
 - Standardisation Bodies & Authorities (27%)



WG Meeting Formats

- Moderated online roundtables during 2025
- All meetings held online for accessibility and diversity
- Sessions tailored by topic complexity and demand (some met twice)
- Plenary sessions to consolidate outputs



Impact and use of results

- § Build on findings from gap analysis, R&I and policy workstreams
- § Develop **Roadmap Outline** into an elaborated document
- § Inform development accompanying TC Toolbox
- § Set stage for additional meetings and TC-specific consultations

Two Working Group Examples:

WG 01 – Industrial Symbiosis in General

From the WG Plenary Meeting in November 2025

Scope & Focus

- § Cross-sectoral industrial symbiosis systems,
- § focusing on governance models,
- § business frameworks, and
- § enabling conditions.



Key findings, barriers or opportunities

§ Findings

- § Inconsistent use of language, terminology etc
- § Lack of clarity might hinder mainstreaming of IS
- § Need to address Waste Framework Directive

§ Barriers

- § Existing terminologies are embedded in certain groups

§ Opportunities

- § Refer to existing standards for terminologies, definitions where fit for purpose
- § A new IS standard becomes the definitive standard
- § Opens markets, including across borders
- § Incentivises companies to take part
- § Can be used to create qualification standards such as facilitation requirements

Initial recommendations

- § What needs to be addressed
 - § IS definition
 - § Terminology – including alignment with/between other standards
 - § Challenge accepted ‘facts’ such as the need for proximity
 - § Governance models – should ICT be a governance model? Are there models not yet accepted?
 - § Have regard for blurred edges – do the governance models have strict boundaries or do you get amalgamations/blending of the models?
 - § A new paradigm for by-products, wastes and resources – based on standards

WG 02 – End-of-Waste (EOW)

From the WG Plenary Meeting in November 2025

Scope & Focus

- Understanding how current EOW process affects uptake of industrial symbiosis.
- Gaining an overview of relevant standards and standardization activities related to waste



WG 02 – Key findings, barriers or opportunities

§ Findings

- § EOW is more of a hindrance than an enabler of IS (national fragmentation, legal uncertainty)
- § Innovation moves faster than regulation, and many streams are not covered by regulation

§ Barriers

- § Over-harmonisation may not suit all waste types or national contexts
- § Flexibility required to support rapidly evolving innovation
- § Slow pace of standardisation vs. urgent need for IS solutions

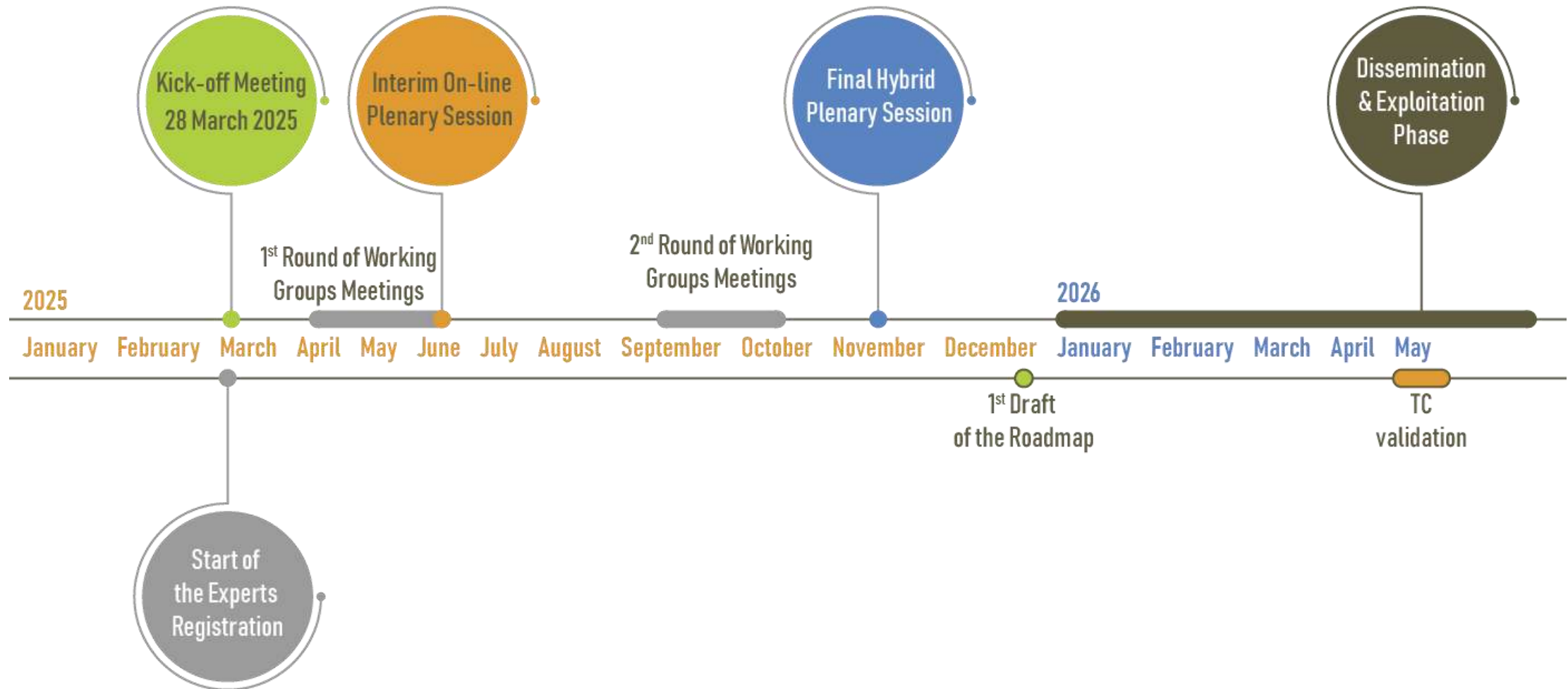
§ Opportunities

- § Improvement in transparency and predictability
- § Facilitation of cross-border recognition and reduction of bureaucracy
- § Build on existing standards (e.g., products, inputs, environmental)
- § Address the by-product/waste process while ensuring safety for human health and the environment

WG 02 - Initial recommendations

- § Proposal for a high-level *horizontal* standard
- § *Vertical* standards could then define acceptability of specific materials as inputs (building on existing product standards)
- § Could IS-related standards remove the need for EOW?

Development timeline



Engagement with the community



Call for Experts sent to TC Chairs and Secretaries outlining RISERS scope and themes.



About 100 experts from the public contributed to roadmap development through 10 thematic **Working Groups** throughout 2025. Additional interviews and workshops were held.



CEN-CLC were formally informed on publication of the first draft version, with the draft being published for **consultation** in January 2026.



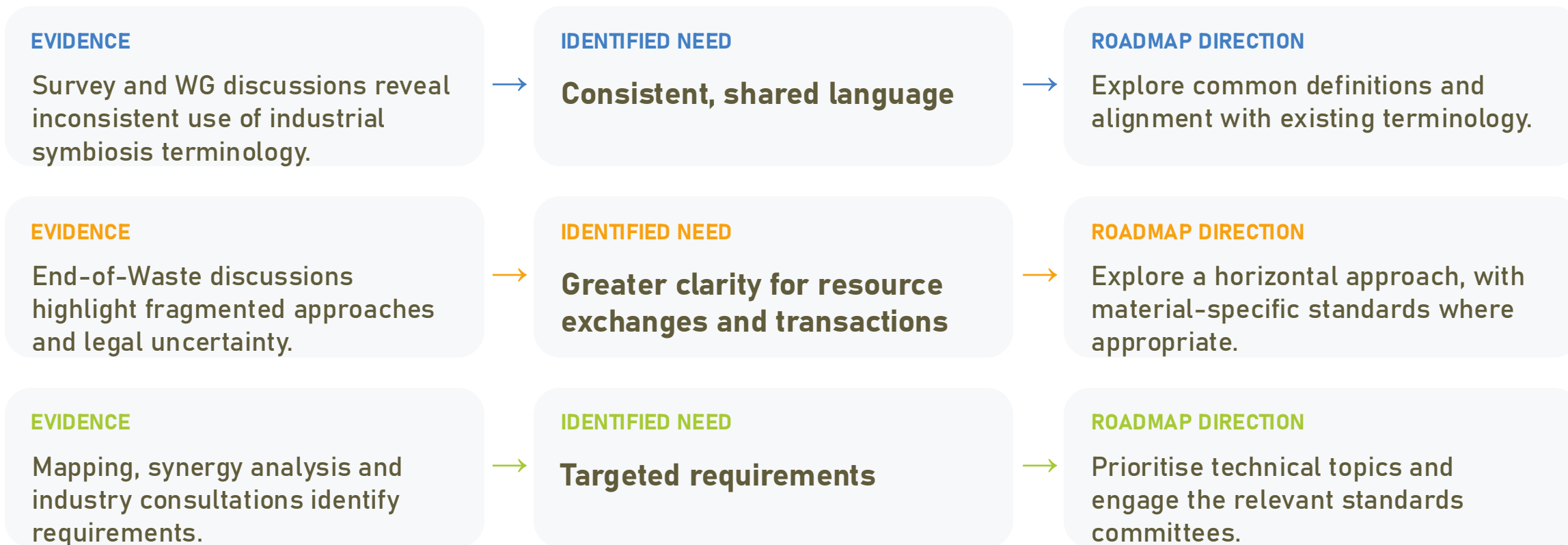
TC-specific meetings were held to **validate recommendations**.



The final roadmap with its recommendations will be published in December 2026.

From RISERS evidence to Roadmap priorities

The Roadmap builds on mapped standards, stakeholder needs and insights from priority industrial symbiosis synergies.



From Roadmap to action: what comes next?

Andrea Motola, Enspire Science



From Roadmap to standards and practice

Turning the RISERS roadmap into action requires complementary roles across the industrial symbiosis ecosystem.

S

STANDARDS ORGANISATIONS TURN PRIORITIES INTO STANDARDISATION WORK

- Examine common IS terminology and alignment with existing standards.
- Supply concrete exchange cases and operational requirements.
- Develop common terminology, data and quality approaches.

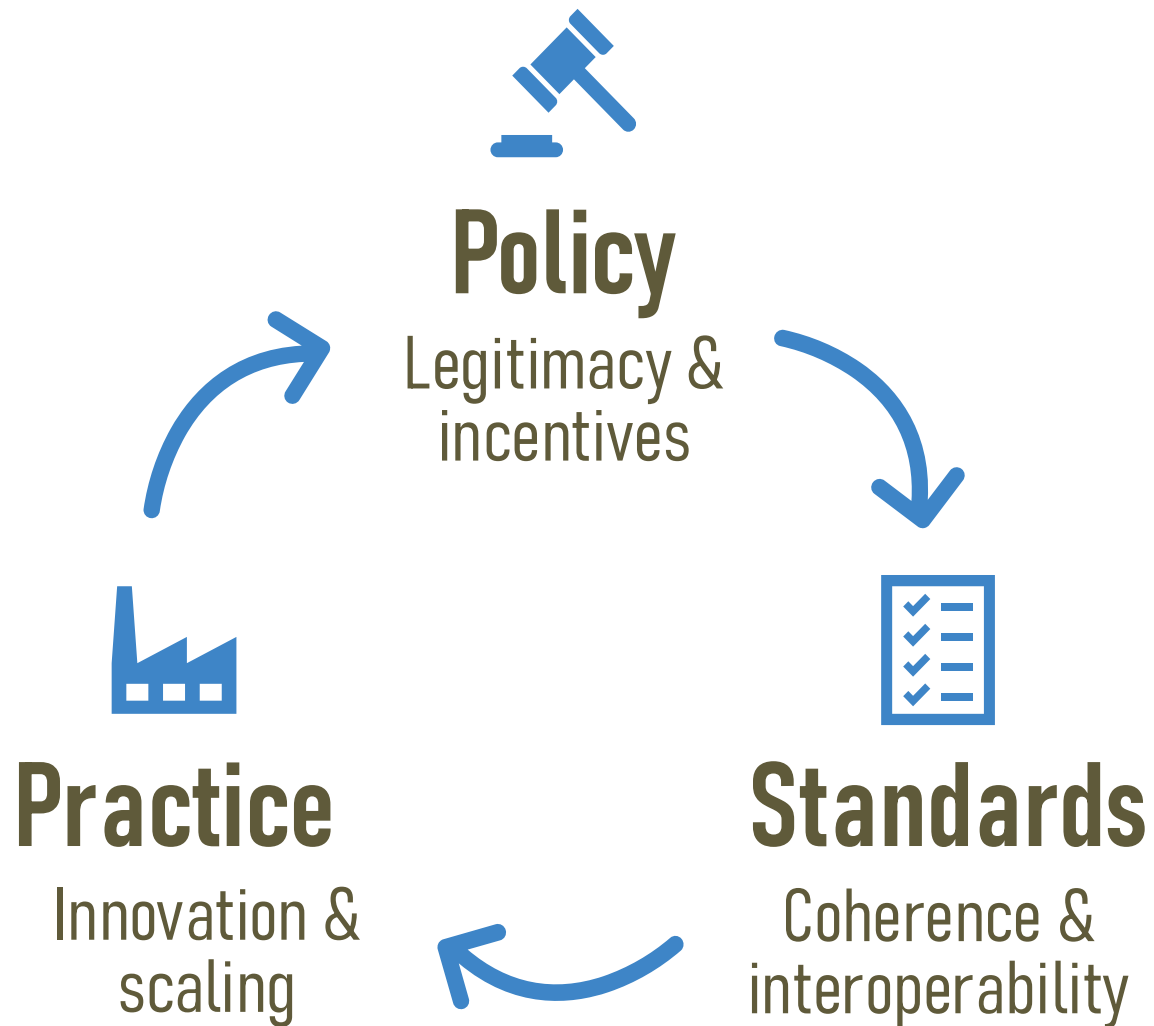
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POLICY MAKERS TURN PRIORITIES INTO FRAMEWORKS

- Examine existing policies on European and national levels.
- Identify implementation barriers and evidence needed for wider uptake.
- Assess opportunities to use standards as enablers for harmonisation, i.e. regarding EOW.

R&I organisations and industry stakeholders need to be involved and stay engaged!

The next step: collective action



RISERS Final Conference in Brussels and online

When: November 3rd

How Europe Can Drive Cross-Sector Resource Efficiency: Upscaling Industrial Symbiosis through Standardisation

Register here:



An official World Circular Economy Forum 2026 Side Event.

Our Consortium



RISERS

Want to learn more about bridging research and
standardisation?
See our past joint webinar with Edu4Standards!

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.science

