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RISERS

A Roadmap for Industrial Symbiosis Standardisation for Efficient Resource Sharing

D5.1 KEY POLICY STAKEHOLDERS FOR INDUSTRIAL SYMBIOSIS

DUE DATE: 31.12.2024

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***) R** — Document, report; **DMP** — Data Management Plan; **DATA** — data sets, microdata, etc; **DEC** —Websites, patent filings, videos, etc

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LIST OF ACRONYMS

Abbreviation	Explanation of abbreviation
RISERS consortium	
ENSPIRE	Enspire Science Ltd.
CEN	Comité Européen de Normalisation
DIN e. V.	DIN Deutsches Institut für Normung e.V.
EIT-RM	EIT RawMaterials GmbH
FhG	Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e. V.
UGent	Universiteit Gent
IETU	Instytut Ekologii Terenów Uprzemysłowionych
ISQ	Instituto de Soldadura e Qualidade
ISL	International Synergies Ltd
Other	
AB	Advisory Board
CE	Circular Economy
D	Deliverable
DG	Directorate-General
EC	European Commission
ECoP	European Community of Practice
EoW	End of Waste
GHG	Greenhouse gases
GPP	Green Public Procurement
H4C	Hub(s) for Circularity
IPR	Intellectual Property Rights
IS	Industrial symbiosis
NACE	nomenclature statistique des activités
NGO	Non-Governmental Organisation
R&D	Research and Development
R&I	Research and Innovation
RTO	Research and Technology Organisations
SDO	Standards Development Organizations

(table continues)

(continued table)

Abbreviation	Explanation of abbreviation
SME	Small and medium-sized enterprises
TRL	Technology Readiness Level
VC	Venture Capital
WP	Work Package

1 INTRODUCTION

1.1 INTRODUCION TO THIS DOCUMENT

This report was developed in the RISERS project's Work package (WP) 5, titled "Policy making for industrial symbiosis", specifically in its Task 5.1 "Mapping of key policy stakeholders".

RISERS aims to build a cohesive framework integrating practice, policy and research and innovation (R&I) to promote the standardisation of Industrial Symbiosis (IS) focused on priority synergies and resources for high-impact EU resilience.

The project has five major objectives:

1. Map the landscape of IS-related standardisation to identify specific bottlenecks, gaps and opportunities for standardisation to advance the mainstream adoption of priority synergies.
2. Strengthen the uptake of R&I results to foster an adaptable environment for evidence-based and innovation-driven IS standardisation.
3. Develop new and contribute to the existing directions for IS standardisation promoting circularity of resources and make recommendations for the development of new standards.
4. Identify policy frameworks relevant for IS and engage with policymakers to advocate for policies and regulations fostering IS and their integration into a broader context of sustainability policies.
5. Increase stakeholders' engagement, establishing an active dialogue between the standardisation community and IS practitioners via the Hubs for Circularity Community of Practice and discuss the needs and challenges for bringing innovative technologies and solutions to the market.

This report addresses RISERS' 4th objective and provides the foundation for the project's future contributions to improve the policy framework for IS. Specifically, it lays important foundations for RISERS' Task 5.3, *Policy recommendations*, which aims to specify needs for policy measures by a survey among industry representatives and targeted interviews, also considering the needs of public procurement.

The work on Task 5.1 has also provided specific support for Task 5.2, titled "Standardisation support for policy frameworks promoting IS", especially by contributing suitable stakeholder contacts.[1]

Likewise, the task helped to specify the scope of our communication and dissemination measures in RISERS' WP 8 and WP 9 (Dissemination, communication and exploitation in the first and second project period, respectively).[2] In addition, it provides useful information on broader framework conditions for RISERS' roadmapping activities in WP 7, for example regarding the importance of our key sectors and concerning specific country information.

This report presents the key results of Task 5.1. As a basis for strengthening the community of IS-related policy making, it specifies relevant stakeholders, including their roles, expectations and needs. It particularly identifies national and EU-level government and public bodies involved in policy making for the process industries, organisations from the third sector that focus on policy making, IS practitioners, and relevant associations. Additionally, it identifies organisations from the industry who are interested in taking part in the process of adjusting or creating policies for supporting IS. In these contexts, it also

[1] In Chapter 2, for example, the exchange of information with the CORALIS project is mentioned in Task 5.1 and later in Task 5.2.

[2] An example news piece on the work of Task 5.1 can be found here: https://risers-project.eu/risers-networks-with-coralis-to-advance-industrial-symbiosis/

identifies relevant IS practitioners at Hubs for Circularity (H4C) on different policy making levels and in RISERS' key sectors.

The creation of this report relied on the following interlinked activities:

1. Developing a mapping methodology,
2. Identification of stakeholders based on desk and field research,
3. Specifying stakeholder's importance for RISERS WP 5's following project activities,
4. Stakeholder mapping at least according to their reach and the IS market structure.

According to ISO 59004 (ISO, 2024), section 6.2.6 Industrial, regional or urban symbiosis, the term "symbiosis" describes a system that enables circular flows of resources, by engaging traditionally separate organizations in a collective approach to share inflows and outflows and optimize their value networks.

"Industrial symbiosis" is defined by the CEN Workshop Agreement (CWA) 17354 as 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.

ISO 59004 adds that "this type of geospatial collaboration can create advantages and mutually beneficial value creation and provide resource productivity and innovative solutions, while reducing the overall adverse environmental, social and economic impacts from their activities."

The term "stakeholder" is used synonymously for the term "interested party" defined by ISO standard 14034 Environmental Management: Environmental Technology Verification as a "person or organization being concerned with, affecting, being affected by, or perceiving itself to be affected by the results of environmental technology verification".

ISO 14034 adds the examples "customer; user; community; supplier; developer; manufacturer; investor; regulator; non-governmental organization."

Run4Life (2018) defined stakeholders as "those organisations that can show interest and/or influence in the context of … the project." Their stakeholder analysis also considers several stakeholder attributes defined by the World Bank: the stakeholders' position/power, the level of influence (power) they hold, the level of interest they have in the specific context, and the group/coalition to which they belong or can reasonably be associated with."

RISERS' policy stakeholders are those organisations that can show interest in and/or can influence policy making to support IS. Specifically, they are organisations represented by individuals that can influence, have an interest, knowledge and/or skills related to the further development of the IS policy framework.

Based on Run4Life's (2018) definition, RISERS' Task 5.1 focused on:

- The aware community, i.e., actors directly involved in RISERS' policy making activities, affected by it, or will benefit directly from its results, and
- Unaware community, i.e., the community that lacks awareness of IS and/or about RISERS.

The unaware community will need to be made aware of the project and/or the potential positive impact of policy making to support IS, for example, by communication activities to introduce the future survey of RISERS' Task 5.3.

RISERS' Task 5.1 will also help the project to further develop the aware policy making community through targeted measures.

Besides stakeholders relevant to IS in general, this document's main focus, from an industry point of view, is on the chemicals, steel, food and cement sector, which represents the highest numbers of documented IS cases in the process industry, according to follow-up analyses of RISERS' report D3.1, plus refineries and the bioeconomy, specifically the bio-based economy, as important additional IS segments. Section 2 provides more information on their selection.

Regarding the geographical dimension of the stakeholder identification, our main focus was on the European Union, but also on the United Kingdom, to distribute RISERS' results in this partner country. Based on RISERS' goals to additionally consider international framework conditions appropriately, implement European objectives on the part of its foreign industrial partners, and to further facilitate the IS-related activities of European companies abroad, there is an international focus. Additional geographic specifications within Europe took place according to the importance of European countries for Task 5.1's priority sectors and, specifically, for the priority sectors' IS practitioners.

This document is structured as follows: Chapter 1.2 describes policy documents and instruments relevant for RISERS' WP 5 as a whole. Chapter 2 presents the research methods applied for the creation of this report. Chapters 3 and 4 provide information on sector-independent specifications and stakeholders of RISERS' intended policy support to promote IS. Chapters 5 to 10 are dedicated to RISERS' selected key sectors to propose supporting policy measures: the chemical, steel, food and cement sectors, refineries and the bio-based economy. Chapter 11 provides a summary and outlook on our next steps to support policy making for IS.

To present the information on each priority sector, three sections were specified for each sector chapter: sector profile, important sector-specific stakeholders, and important IS practitioners, supplemented by stakeholder tables in the annex "IS Policy Stakeholders".

The **sector profile** provides, for example, information on the sectors' key countries in Europe, its importance to IS and specific sector segments.

The section on **important sector-specific stakeholders** includes, for example, European industry associations, selected from a database of RISERS' partner CEN, and additional stakeholders who prove to be relevant, e.g. industry associations in the sector's key Member States and key companies (if market data is available).

Important IS practitioners include stakeholders who have expressed an interest in IS and or the circular economy by their H4C registration and additional stakeholders who prove to be relevant, e.g., stakeholders who expressed a specific interest in participating in RISERS' policy making.

1.2 INTRODUCTION TO POLICY DOCUMENTS AND INSTRUMENTS

To implement and stimulate environmentally friendly and resource-efficient measures, policy makers can choose between various options. Table 2 gives an overview and distinguishes between four policy tools: regulatory instruments, economic instruments, information provision and awareness and behavioural instruments.

<table>
<tr><th colspan="2">Tool category</th><th colspan="2">Specific tools</th></tr>
<tr><td rowspan="3">Regulatory instruments</td><td>Mandatory tools</td><td>• Prohibitions
• Targets/limit values</td><td>• Standards (for products and services)
• Polluter pays principle</td></tr>
<tr><td rowspan="2">Tools with a pioneering function</td><td colspan="2">• Green public procurement (GPP)</td></tr>
<tr><td colspan="2">• Socially responsible investments</td></tr>
<tr><td colspan="2">Economic instruments</td><td>• Taxes/duties
• Subsidies/
• Incentives
• Loans</td><td>• Bonus-malus
• Trading systems
• Purchasing programs
• Green payment systems</td></tr>
<tr><td colspan="2">Information provision and awareness</td><td colspan="2">• Awareness raising - education programs
• Advertising and marketing
• (ICT) Information and communication technology
• Employee training/trader communication methods
• Corporate reporting
• Labels with product information</td></tr>
<tr><td colspan="2">Behavioural instruments</td><td colspan="2">• Peer evaluation
• Comparative evaluations
• Recommendations, e.g. by celebrities
• Promises or commitments
• Participation of the public/municipality
• Nudging tools</td></tr>
</table>

Source: based on Songigo et al. (2012)

Table 1: Overview of policy tools

RISERS Task 5.1's work is specifically focused on regulatory instruments, economic instruments and information provision and awareness. According to RISERS' Grant Agreement, its focus on standards is at least on standards specifically used in the regulatory context and for green public procurement.

Broader standardisation policy aspects are specified in the European Standardisation Strategy (see European Commission, 2024a). In this context, the European Commission's communication highlights a number of key areas and urgent standardisation issues. Relevant topics for RISERS include: critical raw materials recycling, the clean hydrogen value chain, low-carbon cement, chips certification and data standards. Specific standardisation aspects of RISERS are considered in WPs 6 and 7, in which the roadmap for IS standardisation is developed.

Table 2 provides an overview of policy documents, of which regulations are the most important mandatory tools. In this context, Blind et al. (2017) provide helpful differentiations from RISERS' other key topic standardisation. Regulations are *"developed and enacted by the government to shape the market environment and influence the behaviour of the concerned actors"*. They *"stem primarily from a top-down approach, while formal standards are typically the result of a market-driven process"*. The exertion of regulations is mandatory, while the adoption of formal standards is, in most cases, voluntary. Nevertheless, there are interdependencies of the two instruments, especially in the course of the "New Approach".

Type of policy document	Policy level	Description
EU regulation	EU	A regulation consisting of legal requirements to be transposed word for word into national legislation, and so are instantly valid in the entire Union
Directive	EU	An EU directive sets legal requirements for the EU. The content of a directive needs to be implemented within the member states within a given period, by national legislation
National regulation, Ordinance	National	Binding legislative document on the national level of the EU member states
Strategy	EU/national	A strategy is a detailed definition and statement of major goals, policies and actions including a description on how to achieve the goals. The achievement refers to an action plan, which can be part of or at least associated with a strategy (Overbeek et al., 2016)
Action plan	EU/national	An action plan is a document which defines actions to be taken in order to achieve a previously defined goal (e.g. in strategy). An action plan might therefore be part of or associated with a strategy.
Roadmap	EU/national	A roadmap focuses on the process to achieve a certain goal, splitting the actions to be taken and setting the development into a temporal context. Furthermore, purpose and scope of new laws and policies are described in roadmaps as well as the monitoring on their impact, if intended (European Commission 2018b).
other	EU/national	Further policy document types, which could not be assigned to one of the above defined categories (report, growth plan, policy, guidance, policy statement, EU Commission Decision)

Source: based on STAR-ProBio (2018), table 2, modified

Table 2: Overview of policy documents

Section 4 to 10 will show the stakeholders of IS-related policy making.

2 METHODS

2.1 METHOD FOR THE IMPORTANCE SPECIFICATION OF IS STAKEHOLDER GROUPS

"Industrial symbiosis has great potential to contribute to European efforts towards CO_2 neutrality and establishment of a circular industry in Europe" (Sommer, 2020). RISERS WP 5's goal of developing policy recommendations efficiently and effectively required further specifications in this context to focus on **sector-independent stakeholders** and the **stakeholders in six priority sectors**. The resulting importance specification of RISERS' policy stakeholders relied on three characteristics, which are described in the following:

- Sector-independent relevance,
- The sector type and
- The organisation type.

Stakeholders of **sector-independent relevance** were identified by the survey described in sections 2.2 and 4.1 and additional analyses and expert input. Besides the identification of **stakeholders working on the EU level**, analyses of the specified priority sectors in chapters 5 to 10 unveiled the leading European countries in these sectors. Relevant sector-independent stakeholders, e.g., **national and regional governments,** were also identified on this basis.

The importance specification according to the sector type aimed to identify six priority sectors for our policy stakeholder mapping. Important foundations for this work were interim results of RISERS' WP 3 titled "Gaps and opportunities analysis for priority synergies", which set out the scope of the RISERS project by analysing the current state of the art in IS practice and standardisation, and identifying priority resources for IS in the project. Its Task 3.1 played a key role in this context, which investigated the type of resources and sectors involved in IS. A specific focus was on IS sinks and sources based on the work of Mendez-Alva et al. (2021).

Mendez-Alva et al. (2021) analysed binary IS synergy models, "in which each sector can have two roles for the other sector: either as a source or a sink for a specific stream" and in which "streams" can refer to energy, by-products, waste, and water. In this context, the "source" role represents "the supply of a stream to the other sector" and a "sink" role "receives a stream from the other sector."

RISERS Task 3.1 started its analysis by generating a long list of IS cases based on former EU projects and additional relevant research results, e.g., from:

- MAESTRI. Symbiosis Space – Library of Case Studies and linked Exchanges Database 2017, https://doi.org/10.17863/CAM.12608
- EPOS. EPOS toolbox and Generic IS cases 2019, https://epos.userecho.com/
- SCALER. SCALing European Resources – with industrial symbiosis 2020. https://www.scalerproject.eu/
- The database "Advancing industrial decarbonisation by assessing the future use of renewable energies in industrial processes" (AIDRES, AIDRES, 2023)
- PhD theses, etc.

As a result, RISERS' deliverable D3.1 "Methodology for Gaps and Opportunities analysis for Industrial Symbiosis in Priority Synergies" showed a high frequency of symbiosis occurrence as a source for the **chemicals**, minerals including **steel,** and the **food** sector in all documented IS cases. It also shows that **cement, chemicals** and minerals, including **stee**l, are most common as sinks sectors in all documented IS cases. Additional analyses of the data unveiled the leading separate role of steel besides the chemical industry, justifying a split of the category of steel and minerals (see Table 3). Accordingly, we specified the first four priority sectors to be chemicals, steel, food and cement.

Regarding our two remaining priority sectors, RISERS' deliverable D3.1 suggests that priority IS sectors in RISERS should cover *"process industries, added with 1-2 industries from the energy and/or bio-based sector and 1 emerging sector."*

Sector	IS source		IS sink	
	(frequency)	(%)	(frequency)	(%)
Chemicals	124	23%	106	20%
Steel	116	22%	59	11%
Food	77	14%	54	10%
Energy	37	7%	53	10%
Pulp and paper	37	7%	21	4%
Refineries	34	6%	20	4%
Cement	33	6%	106	20%
Waste	24	5%	38	7%
Water	19	4%	9	2%
Glass	8	2%	22	4%
Manufacturing	8	2%	9	2%
Minerals	8	2%	7	1%
Textiles	4	1%	3	1%
Services	2	0%	8	2%
Ceramics	1	0%	8	2%
Construction	0	0%	9	2%
Total	532	100%	532	100%

Table 3: Key IS source and sink sectors according to RISERS WP 3's literature review on reported IS cases

The first sectors outside the process industries in Table 3 are energy and refineries, while RISERS deliverable D3.1 suggests an inclusion of the energy and/or the bio-based sector and one emerging sector in RISERS' priority sectors. As energy is also a sector-independent topic on which we expect results within the framework of our already defined sectors, we selected the bio-based economy as an additional priority, which also aligned us with the scope of RISERS' Task 3.2. Our additional choice included refineries as the next most important IS sector outside the process industries.

Chapters 5 to 10 will provide more information on all these sectors. Another activity was the **importance specification according to organisation types**. Details are presented in section 2.3.

2.2 IDENTIFICATION OF STAKEHOLDERS AND MAPPING

A mixed method approach was used to identify relevant stakeholders, consisting of:

- Analyses of EU projects' previous work and other scientific sources.
- Survey and cross-project meeting.
- Statistical, database and web analyses.

The activities are described in the following sections.

Analyses of EU projects' previous work and other scientific sources

These analyses included various projects such as SCALER, EPOS, H4C and CORALIS, and was complemented by analyses of the previous work in RISERS, in particular in WP 3, as described in section 2.1. These measures also helped in specifying fundamental sector-specific needs and expectations.

Survey and cross-project meeting

In addition to a RISERS WP 5 survey, scheduled in the work package's final task (Task 5.3) according to its Grant Agreement, a preliminary short survey was conducted for this report between June and October 2024 and provided many essential insights. It was organised in collaboration with RISERS' Task 6.2 and distributed as part of Task's 6.2 survey. While the results of Task 6.2 are presented in RISERS' report (SEN) D6.2, the WP 5 part presented in this report addressed the following topics to support Task 5.1:

- Governmental organisations that primarily drive IS initiatives.
- Key organisations that could provide policy support for IS in the future.
- Needs for regulatory changes to improve IS.

The survey addressed European experts involved in standardisation, representatives of industry associations and additional stakeholders interested in IS, e.g., at H4C. The established channels of RISERS partner CEN, H4C and the projects and partners' social media channels were mainly used for its distribution. The survey involved 204 experts in total, of which more than sixty also responded to the questions on policy making relevant to WP 5 activities. Figure 1 provides more information on the composition of the participants.

Most respondents were based in EU member states and Europe, with participants from 17 European countries in total and Germany (21%), Italy (11%), and Sweden (10%) providing the highest participation rate. Other contributors included France, Spain, and Ireland. A negligible small number of responses came from non-EU countries.

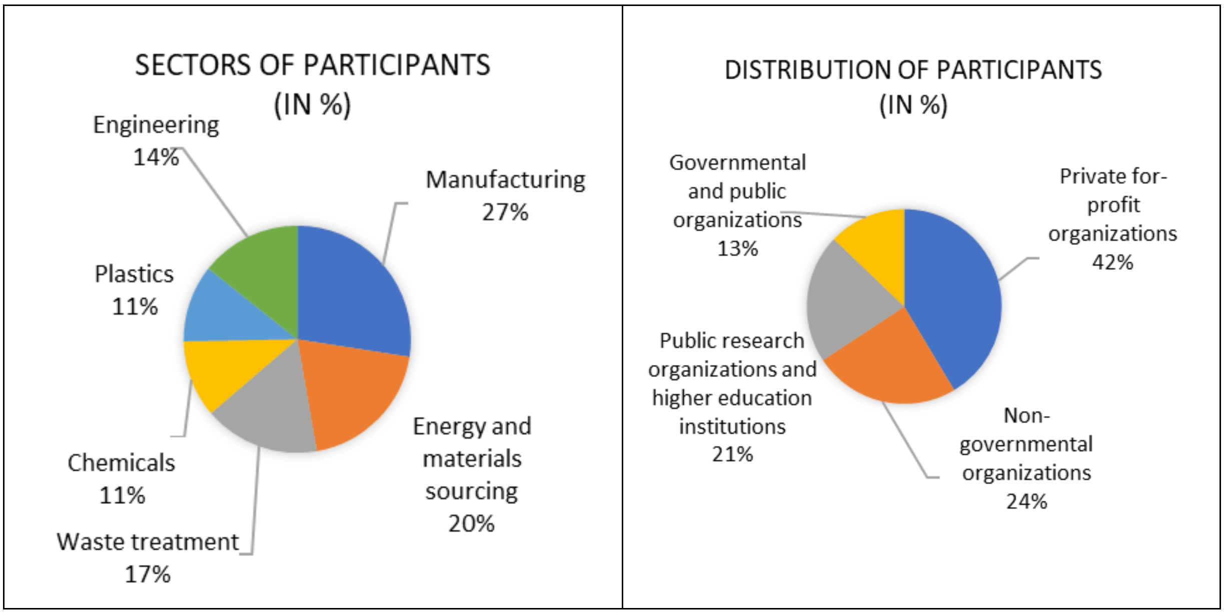


Figure 1: Sectors and organisation types in the RISERS survey conducted in Task 6.2 with specific Task 5.1 parts

Another important activity was the interaction with the almost completed good practice[3] IS project CORALIS (https://www.coralis-h2020.eu/), which aims "to create pathways for the decarbonisation of resource and energy intensive sector value chains through the implementation of viable industrial symbiosis approaches". Our interest in the project relied on two independent sources: a recommendation by our Advisory Board and the scientific article by Branca et al. (2021a). A web-based meeting with five CORALIS experts from Fundación CIRCE (Spain), RINA (Sweden and Italy), Energy Efficiency in Industrial Processes asbl (Belgium) and eight RISERS members on 20 November 2024 and follow-up measures[4] were very helpful in this context. Key topics of the meeting included the assessment of regulatory and standardisation aspects, IS policy stakeholders and needs for policy measures to support IS.

Statistical, database and web analysis

Various additional analyses were conducted for the creation of this report. Statistical analysis, particularly of statista data, played an important role to identify important companies and countries in the context of our priority sectors. In addition, SCALER data (in particular of SCALER Deliverable 3.5, SCALER 2020b) were further used for the work on our key sectors.

Regarding database analyses, section 2.3 will describe our main focus on stakeholders that represent big numbers of individual stakeholders in more detail. Intensive work was therefore dedicated to a database of CEN of industry associations with around 1,630 entries. Several hundred organisations were identified as relevant for our work.

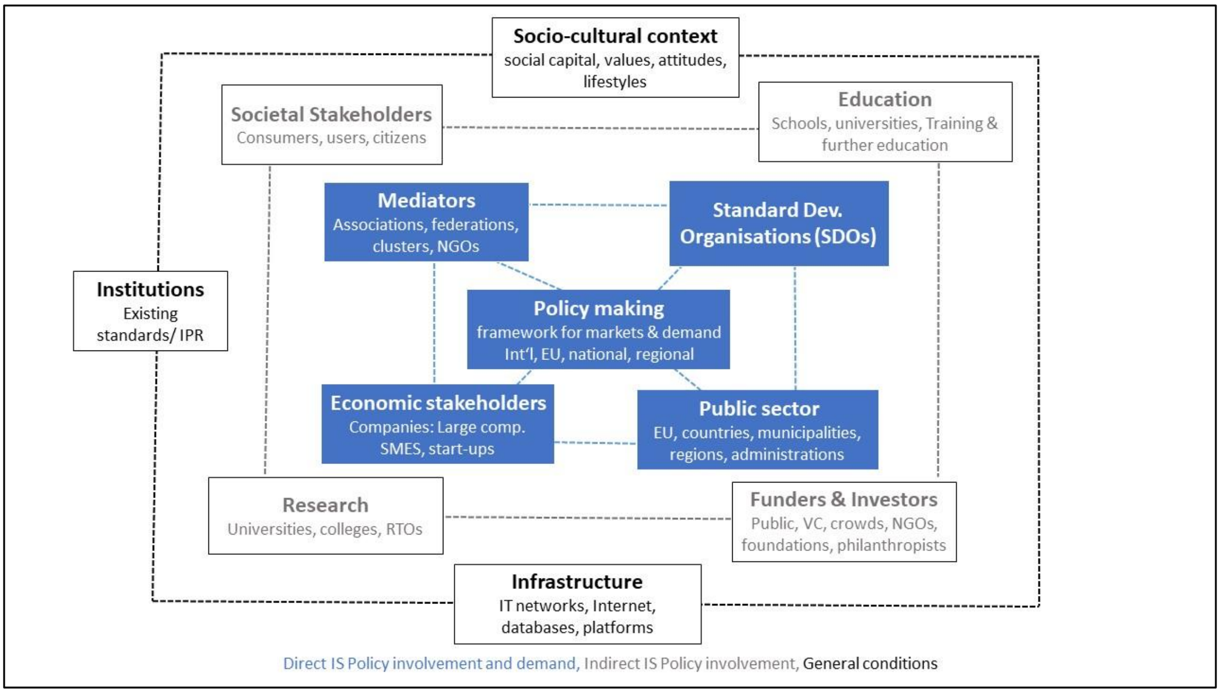
Additional desk research and web analyses were used for searches in the European project database CORDIS (https://cordis.europa.eu/) and to collect more detailed information on existing stakeholders, for example on the scope of the industry associations.

[3] See Branca et al. (2021a)

[4] As an example, the meeting could also provide inspiration for RISERS' Task 5.2 and an additional information exchange has started for that task. Likewise, further collaboration is planned within Task's 5.3 and its development of policy recommendations.

2.3 SECTOR-INDEPENDENT SPECIFICATIONS

This document presents IS stakeholders according to different classifications and from sector-independent and sector-specific perspectives. All these classifications have one thing in common: stakeholders of different organisation types. Their relevance for RISERS is shown in Figure 2.



Source: Inspired by an internal figure of the Fraunhofer institute ISI on innovation systems

Figure 2: Stakeholders of IS-related policy making

Inspired by unpublished Fraunhofer work in another research area, it provides a first classification of RISERS' policy stakeholders according to two levels:

- Stakeholders with (potential) direct involvement in IS policy making.
- Stakeholders with indirect or no involvement in IS policy making.

On this basis, it also represents the **first level of prioritization** for our stakeholder mappings, which will also be relevant for regional and sector-specific mappings.

Regarding stakeholders with (potential) direct involvement in IS Policy making, the figure shows five core groups that will be specifically addressed in our further activities (based on further specifications guided by the results of RISERS' task 3.1):

- Policy makers,
- Mediators (in particular clusters, industry associations and Non-Governmental Organisations (NGOs),
- Economic operators,
- Standards Development Organizations (SDOs) and
- Public sector organisations.

Due to RISERS' work in Task 6.1 "Technical Bodies mapping", SDOs are not analysed in this report. Details on this target group can be found at RISERS (2024b). An important stakeholder group regarding standardisation and policy making in general is the High-Level Forum on standardisation, see European Commission (2024b).

Policy makers, sector-independent mediators, the public sector and IS clusters are considered in section 4 while sector-specific mediators and economic operators are presented in sections 5 to 10.

The consideration of the public sector is specifically focused on public procurement to address specific goals of RISERS' Task 5.3.

In addition, we focus on selected projects based on the specific activities of the organisations involved and/or their already existing interest in collaborating with our policy-making activities. However, RISERS' central collaboration activities with other projects are carried out in its WP4 and Task 8.5.

Individual economic operators shall mainly be addressed via industry associations. While SMEs shall be addressed by the organization Small Business Standards (SBS) according to section 4, our assumption is that the major companies in our key industries are also organised in the relevant industry associations. The biggest German companies in the chemical industry (BASF, Brenntag, Evonik and Covestro), for example, are all members of the German industry association VCI.

2.4 IDENTIFICATION OF STAKEHOLDERS' NEEDS AND EXPECTATIONS

The identification of stakeholder's needs and expectations relied on a three-stage process.

The foundation (1) was a literature review and the formulation of first assumptions.

The following field research (2) identified needs for policy updates by our survey and the expert discussion on 20 November 2024.

Supplementary efforts (3) were undertaken to identify additional, sector specific needs. The cement sector for example, has formulated many needs for policy updates already (see chapter 8).

Table 4 summarizes RISERS' IS policy stakeholder groups and our first working assumption of their **expectations and information needs**, which were further specified by our field study results presented in chapter 4. It also shows the differences compared with RISERS stakeholders in other contexts (e.g., in RISERS WPs with a stronger focus on standardisation stakeholders).

As the table demonstrates, IS stakeholders' needs and expectations have many dimensions. On the "demand side" of IS policy-making, stakeholders' interest is, for example, embedded in a broader interest in IS and/or Circular Economy (CE) activities as part of their business strategy or broader policy making activities to support the own company or sector as a whole.

Regarding the "supply side" of IS policy-making, chapter 4 will show the big variety of policy stakeholders, with various European Directorate-Generals (DGs) involved on the EU level alone, added by various ministries in the member states and policy makers on the regional and city levels.

Target group	Preliminary definition at the beginning of our work		
	Role in RISERS policy making activities	Expectations	Information needs
Policy makers	One of WP 5's key target groups and relations to them are thought in various contexts: as input/feedback givers, receivers of our results and implementers of our recommendations. **Examples** of their various goals in the EU: • To support development and enactment of the Industrial symbiosis concept (see Lybæk et al., 2024), • "To obtain green growth and more efficient business interactions across different value chains, and to disseminate new business models and strengthen the market for re-cycling of by-products, hereunder to deploy more sustainable means of manufacturing within European businesses in general", • "Sustainable consumption and European industrial competitiveness", • "A stronger European industry for growth and economy recovery", • "(Assisting) Europe in deploying a more systematic approach to eco-innovation and to facilitate innovation to develop cross-sectoral arenas" (Lybæk et al., 2024)	As a starting point. the RISERS consortium must convince policy-makers that their project can provide suitable support for their sector. Establishing appropriate relations to policy stakeholders by suitable marketing measures is important. Advantages: established positions of key team members with clients from politics and politics-related organisations	Information on stake-holder's needs
Economic stakeholders in general	Representatives from manufacturing and process industries engaged in the utilization and management of raw materials, energy, and waste. Interest is, for example, embedded in a broader interest in IS and/or Circular Economy (CE) activities as part of their business strategy.	Appropriate framework conditions (incentives, replacement of burdens)	Gaps, barriers, policy initiatives, implications for their individual company
Economic stake-holders –Start-ups and SMEs	See "economic stakeholders in general" above. In addition: potential sources of IS innovations and may benefit from measures to replace growth obstacles and maintaining competitiveness. Their engagement via SME or industry associations is more likely.	See economic stakeholders in general, insurance that their needs are considered appropriately	Implications for their individual company
Mediators, incl. sectorial industrial initiatives	RISERS focuses on industry associations, clusters, networks, and similar entities pertinent to our selected sectors. Their engagement is essential for aligning policies with sector-specific needs. Their interest is, for example. part of broader policy making activities to support their relevant sectors. Mediators will also ensure an appropriate representation of SME's interests in our development of policy recommendations. In addition, RISERS will focus on engaging with several EIT Knowledge and Innovation Communities. According to their website, they bring together partners in the worlds of business, academia, the public and non-profit sectors. Likewise, (EU) projects to support IS are included in this group.	Appropriate framework conditions for the industry	Current policy developments, gaps, barriers, initiatives

(table continues)

Target group	Preliminary definition at the beginning of our work		
	Role in RISERS policy making activities	Expectations	Information needs
Standards Development Organizations (SDOs)	They have links to regulation, especially in the course of the "New Approach". Moreover, around 1/3 of the EU's standardisation activities are developed to directly support the implementation of EU policies and can be key channels to communicate industry's needs to policy makers. Policies also give guidance for standards development. Task 5.2 will address the link between standards and IS policy frameworks specifically.	Support for the development of standards, in particular for standards that support EU policies	Information on stakeholder needs
Public sector	Refers to the public sector in the EU and (EU) countries, municipalities, regions, and administrations. Among others, the public sector must consider policies in public procurement and may provide subsidies based on policy documents, e.g. for priority areas. Regional networks and clusters are a key target group for RISERS. In this context, there is also a link to the stakeholder group "mediators".	Jobs, industrial development, environmental protection, support for regional interests, appropriate integration in current policy frameworks, efficient & effective processes	Guidance
Societal Stakeholders	Refers to consumers, users, citizens. Environmental organisations such as ECOS are also particularly focused.	Information, jobs, save production, reduction of negative environmental effects	Information in general, e. g., regarding regional developments
Funders	In particular, we see them as information receivers, and policies may guide their investment decisions, e.g. influence public funding	Guidance	Information on ongoing developments
Research	Researchers (also in the field of industrial policy) may serve as input givers and provide feedback on project results. In addition, there are links between R&D and standardisation in the development of new markets and between standardisation and policy making. Since many IS areas still have a low TRL level, these links may be very interesting. In addition, trends in IS-related research are regarded as an important indicator for our work and relevant IS topics. Research may also contribute specific values for standards and address policy making indirectly via the link between standards and policy making.	Synergies in various fields, improvement of framework conditions for IS, which may help to exploit previous IS research and encourage more research in that field.	Various information needs were identified. a targeted information exchange seems to be attractive for both sides
Investors	RISERS' outcomes can inform funding authorities for R&I and other funding determinations, enabling the development of new funding initiatives and guiding funding policy formulation. This stakeholder group is also related to the EU taxonomy for sustainable activities[1] and green investment.	Support, and follow-up initiatives	Guidance
Education	May be guided by policies to consider certain issues in education, potential feedback givers on what is needed and feasible.	May not spontaneously see themselves as an interest group	Information on relevant measures

[1] See https://finance.ec.europa.eu/sustainable-finance/tools-and-standards/eu-taxonomy-sustainable-activities_en

Table 4: Overview policy stakeholders on target group level based on literature review and preliminary analyses

3 SECTOR-INDEPENDENT NEEDS REGARDING POLICY MAKING

3.1 FUNDAMENTAL CIRCULAR ECONOMY-RELATED NEEDS

Due to IS's potential to contribute to European efforts towards "the establishment of a circular industry in Europe" (Sommer, 2020), **practitioners' needs and important framework conditions of the circular economy** have to be considered. According to acatech (2021)[5], this means:

- **Financial framework conditions:** Uncertain profitability, high initial investment, fear of cannibalism, costs of reverse logistics.
- **Regulatory framework conditions:** Conflicting objectives of existing regulations on circular approaches (e.g. liability, waste legislation, etc.) - liability law and waste law are seen as hurdles, in some cases there are conflicting objectives.
- **Organisational framework conditions:** Lack of management support & expertise, lack of internal structures/processes.
- **Consumer-related framework conditions:** Lack of customer acceptance, lack of active participation.
- **Value chain-related framework conditions:** Availability of data and information, ability to cooperate, availability of suitable partners, importance to organise information flows to companies, digital topics are very important in the CE context.
- **Technical framework conditions:** Lack of standards, non-circularly designed products, lack of technical infrastructure.
- **Industry specific framework conditions**: worldwide competition, changes in demand and resource supply, energy aspects etc. (see specific sector sections).

The specific needs of **SMEs** in this context, according to Federal Network Agency (2024)[6], are:

- Need for help to turn the big wheel by improved economic policy framework conditions for CE.
- Need for support in finding practical, company-specific answers to complex questions, for example:
    - Which CE regulations will affect the company in the foreseeable future? (compliance),
    - What contribution do standardisation and digitalisation make? (technology)
- Need for guidance on IS implementation, e.g., there are SMEs that inadequately reuse carcinogenic substances such as cobalt and nickel, sometimes as the core of their business model, without being aware of the risks.
- Need for associations which represent them in the development of roadmaps (participation of individual SMEs is not regarded as very useful).

[5] Selection presented by von Hofe, CSCP & Mittelstand-Digital Zentrum WertNetzWerke at Federal Network Agency, online network meeting for multipliers on 28 August "Circular economy"

[6] Federal Network Agency (2024). Online network meeting for multipliers on 28 August "Circular economy". Authors notes on the open discussion at the event.

Likewise, **policy makers** must consider various framework conditions in the establishment of new policies.

While the state of the art in literature does not provide much information in this context, the following topics appear to be relevant based on our initial analyses:

- The importance of consistency with overall circular economy strategies
- The importance of consistency between different policy levels (e.g., European and national policy documents)[7]
- Restrictions to "dictate" actions for industry and society[8]
- Good experience with the public procurement instrument in the context of the circular economy.

3.2 IS-SPECIFIC NEEDS

The identification of IS-specific needs relied on three sources: the state of the art in research, our survey, and our web meeting with external experts on 20 November 2024.

Sources of the state of the art in research included, e.g., SCALER (2020a), Bel et al. (2020), Matti (2021), Neves et al. (2023), Eriksen et al. (2023) and the EPOS project (Van Eetvelde, 2024). The EPOS project, for example, identified three general needs in the field of our scope (see Van Eetvelde, 2024):

- **Waste classification**: dynamic and flexible European waste regulation which allows and promotes the use of waste streams or by-product as raw materials/fuels in other industries, provided that end-of-waste criteria are met, criteria at EU level.
- **Waste heat recovery**: Encourage the recovery of a maximum amount of industrial waste heat.
- **Funding scheme**: Incentivise industrial synergies with tax / penalty reductions when a positive social and environmental impact is reached.

In addition, respondents of our **survey** identified various regulatory challenges and proposed changes to facilitate IS adoption, following the question: **"What regulatory changes do you consider necessary to improve Industrial Symbiosis in your field?".**

60 persons provided (often multiple) suggestions, which refer to six core topics: waste and waste flows, regulatory support (including by-products and wastewater), standardisation, tax policies, financial support and additional topics (see Figure 3). A few examples for each category are given below:

Facilitating the use of waste and waste flows:

- Simplify regulations for defining waste and end-of-waste status.
- Harmonize waste classification across EU member states.
- Develop solutions for by-products (by products were mentioned in one-third of the 15 answers)
- Reduce administrative barriers for using treated wastewater and renewable energy.

[7] See, for example, STAR-ProBio (2018), figure 4 "Considered types of policy documents, classification according to the level and relation to each other"

[8] Source of this and the following item: speech of a representative of the unit "Transformation - Digitalisierung, Circular Economy, Klimaanpassung" in Germany's Bundesministerium für Umwelt, Naturschutz, nukleare Sicherheit und Verbraucherschutz on 22 October 2024 in Berlin: notes of this report's main author

- Create accessible registries for waste flows to improve transparency.
- Remove regulatory barriers for selling different energy carriers.

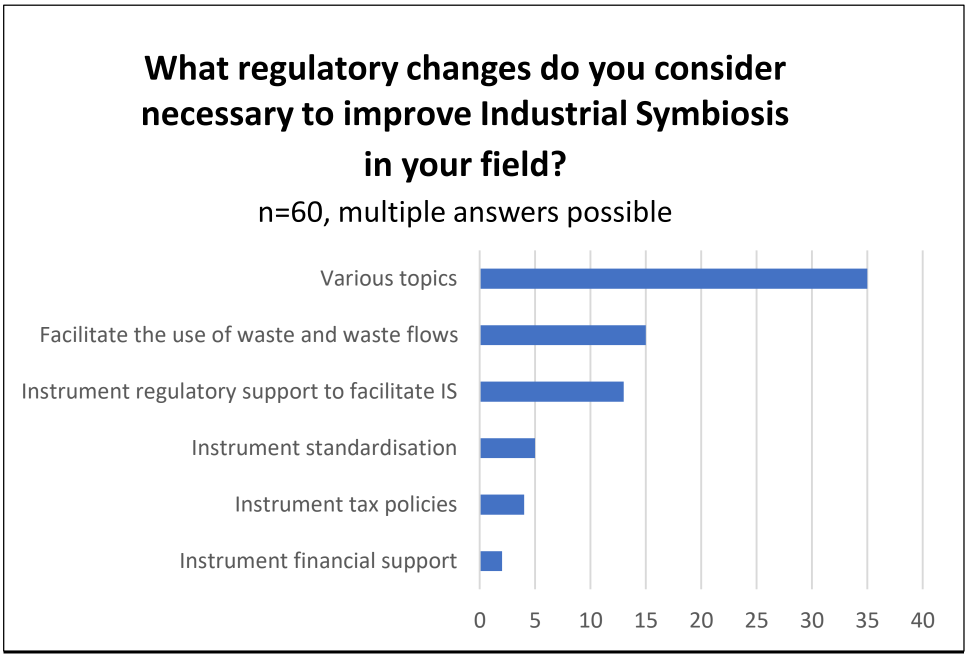


Figure 3: Topics of open answers on the RISERS survey question "What regulatory changes do you consider necessary to improve Industrial Symbiosis in your field?"

Instrument regulatory support to facilitate IS:

- Topics of the previous section ("Facilitate the use of waste and waste flows").
- Simplify permits for IS projects.
- Introduce regulatory sandboxes or living labs to test innovative IS approaches.

Instrument standardisation:

- Develop cross-sector interoperability standards.
- Align efforts across international and regional standardisation bodies.

Instrument tax policies and financial support:

- Adjust tax policies to favor secondary raw materials.
- Introduce financial rewards for recycling and reuse initiatives.

Additional topics:

- Strengthen communication between industries and policy makers.
- Encourage circular construction material recycling.
- Formalize the use of digestate as fertilizer.

The instrument standardisation is further pursued in RISERS' WPs 6 and 7 and is therefore excluded from the following considerations.

The meeting with CORALIS highlighted the following aspects in particular:

Facilitating the use of waste and waste flows:

- Need for waste classification.
- Need for a re-definition of the end of waste.
- Need to support waste valorisation.
- Needs regarding the treatment of by-products.

Instrument regulatory support to facilitate IS:

- **Need to overcome barriers due to different regulatory frameworks** in the member states, showing the importance of Member States' governments in the development of IS, which will be further discussed in section 4.
- **Need to remove barriers of experimental plants**.

Additional topics:

- **Needs for IS facilitators**, referring to "a professional profile, "which can crystallize the set of skills and competences necessary to develop further IS" and "be responsible of different tasks: to conduct analysis in its area of influence, to define and promote synergies between companies from different sectors, to capitalise on the benefits of EC principles implementation, etc."[9]
- **Need for additional awareness raising measures.**
- **Need for baseline education**: while the IS concept itself is known, there is a lack of basic knowledge, e.g., of strengths and weaknesses of IS, what is to avoid, what is to implement and how good practices can be replicated.

Our survey results were compared in detail with the current state of research and the results of the meeting with CORALIS. Table 5 provides a summary. In this context, two aspects raised by CORALIS were added to the topics for our future considerations.

	RISERS survey	CORALIS expert meeting	Other sources	Comment
Facilitating the use of waste and waste flows				
Simplify regulations for defining waste and EoW status	x	x	x	E.g., EPOS (Van Eetvelde, 2024)
Harmonize waste classification in the EU	x	x	x	E.g., EPOS (Van Eetvelde, 2024)
Develop solutions for by-products	x	x	x	E.g., Matti (2021), SCALER (2020a)

(Table continues)

[9] See https://www.insight-erasmus.eu/what-it-is-an-industrial-symbiosis-facilitator/

(continued table)

	RISERS survey	CORALIS expert meeting	Other sources	Comment
Reduce admin. barriers for using treated wastewater	x		(x)	SCALER (2020a) (highlights the need to also consider water in the IS context)
Create accessible registries for waste flows	x		x	e.g., Bel et al. (2020)
Remove regulatory barriers for selling different energy carriers	x		(x)	SCALER (2020a) (highlights the need to also consider energy in the IS context)
Instrument regulatory support to facilitate IS:				
Topics of the previous section	x	(x)	(x)	(x)
Simplify permits for IS projects	x	x		
Introduce regulatory sandboxes or living labs	x	x		E.g., Eriksen et al. (2023)
Instrument tax policies and financial support				
Adjust tax policies to favor secondary raw materials	x		x	E.g., EPOS (Van Eetvelde, 2024), Matti (2021), SCALER (2020a), Eriksen et al. (2023)
Introduce financial rewards for recycling and reuse initiatives	x		x	E.g., EPOS (Van Eetvelde, 2024), Matti (2021), SCALER (2020a), Eriksen et al. (2023)
Additional topics				
Promote education on IS and the establishment of IS facilitators		x	x	E.g., EPOS (Van Eetvelde, 2024), Eriksen et al. (2023)
Intensify awareness raising to support IS		x	x	Was, for example, a topic of the INSIGHT project*
*See e.g., https://circulareconomy.europa.eu/platform/en/good-practices/blueprint-industrial-symbiosis-achieve-circular-and-regenerative-economy				

Table 5: Assessment of RISERS field analysis results

Based on this analysis, twelve fundamental topics were specified as a starting point for further activities in RISERS following Tasks 5.2 and 5.3:

1. Simplify regulations for defining waste and end-of-waste status.
2. Harmonize waste classification across EU member states.
3. Develop solutions for by-products.
4. Reduce administrative barriers for using treated wastewater.
5. Create accessible registries for waste flows to improve transparency.
6. Remove regulatory barriers for selling different energy carriers.
7. Simplify permits for IS projects.
8. Introduce regulatory sandboxes or living labs to test innovative IS approaches.
9. Adjust tax policies to favor secondary raw materials.
10. Introduce financial rewards for recycling and reuse initiatives.
11. Intensify awareness raising to support IS.
12. Promote education on IS and the establishment of IS facilitators.

Regarding the **sector level**, Neves et al. (2023) specified, for example, various needs regarding **refineries**, which are presented in section 9.3. In particular, they emphasize constraints in the legislation regarding the use of **waste** and barriers to consider a waste product as a **by-product,** reflecting items 1-3 above.

Likewise, chapter 11 will show that the **cement sector** has already developed a detailed needs profile towards policymaking to support IS. While various aspects of the list have a broader scope, they require the following actions in line with our items 1, 3 and 9/10:

- **Incentivise** recycling processes, support the use of waste in industries.
- Develop ambitious **waste management policies** to incentivize the recovery and use of materials from industrial waste.
- Acknowledge recovered materials (such **as fly ash) as secondary materials** (i.e., **no longer waste after processing).**

Additional sector-specific needs, of the key IS sectors chemicals and steel, are described in chapters 5 to 10. More detailed information will be provided in RISERS deliverables D5.2 and D5.3.

4 MAPPING OF SECTOR-INDEPENDENT STAKEHOLDERS

4.1 POLICY MAKERS

As described in section 2, RISERS WP 5's short preliminary survey, as part of the project's broader survey in Task 6.2, included two questions on relevant policy makers to support IS. 40 experts provided answers on the question **Which governmental organisations primarily drive Industrial Symbiosis initiatives in your field?"** Participants' verbal answers were clustered by six categories shown in Figure 4. Various answers referred to multiple policy makers, which were considered accordingly. The summary shown in Figure 4 demonstrates the particular roles of national governments, but also of the EU, regional and local institutions. Four participants gave general comments only. Likewise, many answers include the comment "EU" or "national government" without additional specifications.

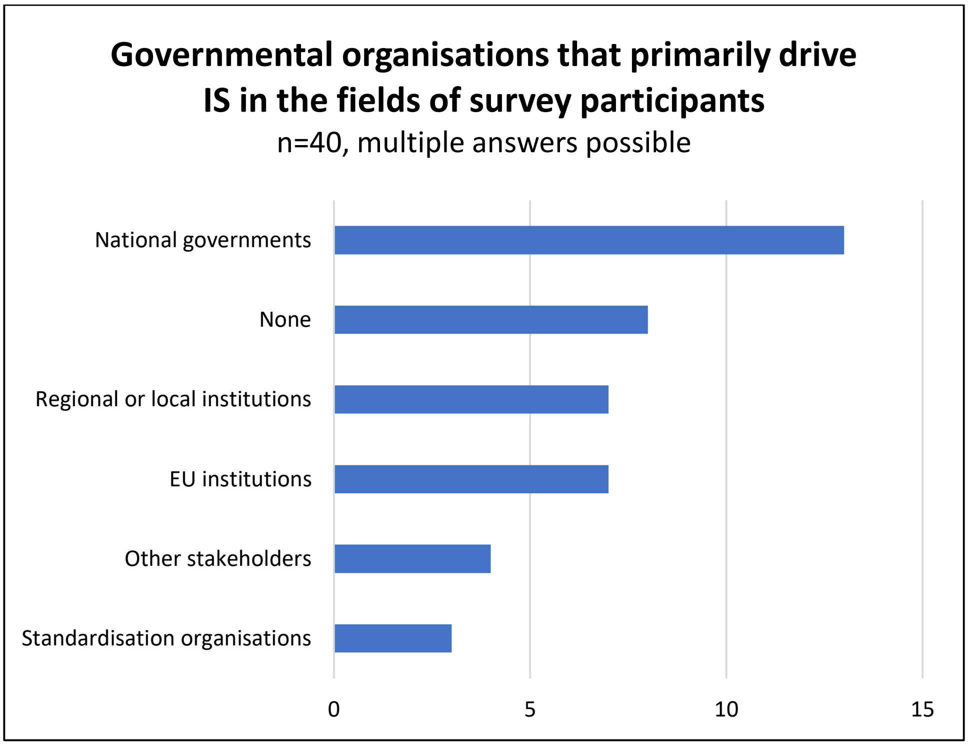


Figure 4: Governmental organisations that primarily drive IS in our stakeholders' fields of activity

The question **"In the future, what could be the most important organisations providing policy support for Industrial Symbiosis?"** was answered by 42 experts, who provided multiple suggestions. Three experts gave general comments only. The verbal answers were clustered by seven categories shown in Figure 5. They highlighted the role of European institutions and national governments, followed by standardisation organisations and regional organisations. On this basis, the answers demonstrated the need for involvement and collaboration on all policy levels from the regional/local level to the EU and international level.

Further analyses regarding **EU institutions** showed besides DG Environment, the particular importance of DG Regions, DG Enterprise, the European Resource Efficiency Platform, DG Innovation and Research and the European Environment Agency in the IS context (see Lombardi, 2024).

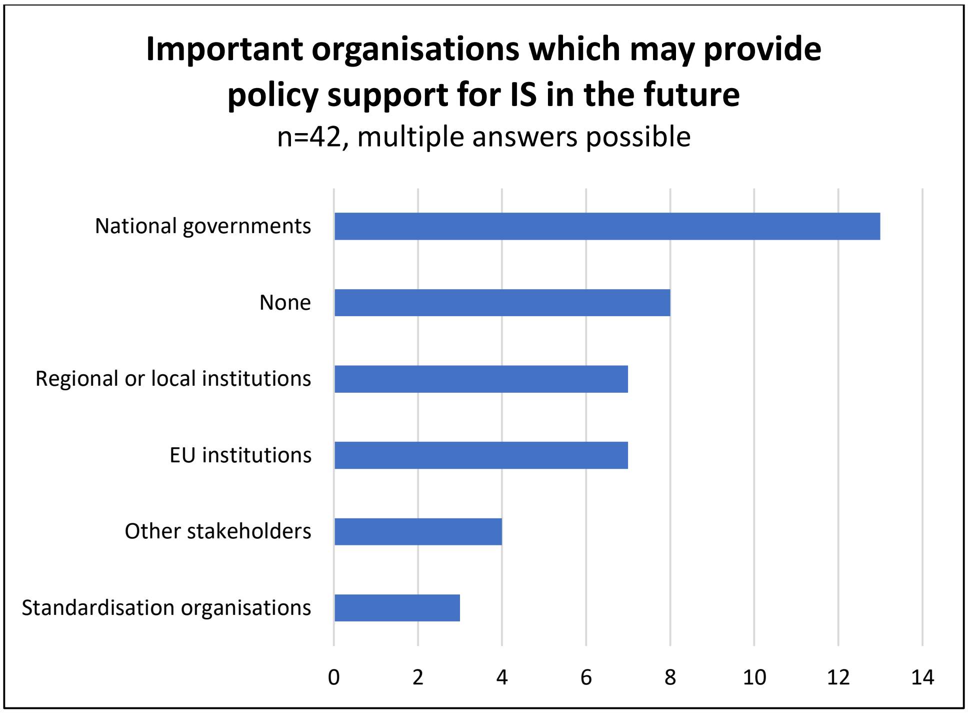


Figure 5: Assessment of key potential organisations that will provide policy support for IS in the future

Regarding governmental organisations currently driving IS, the following specific stakeholders were mentioned besides several general comments:

- **Stakeholders with environmental responsibilities in national governments:** "Ministries for agriculture, climate and environment," "National Environment Ministry," "The minister of Environmental Protection," "Ministry for Ecological Transition and the Demographic Challenge in Spain," "Portuguese Environment Agency, "Minister of Environmental Protection."
- **Stakeholders with economic responsibilities in national governments:** "(German) Federal Ministry for Economic Affairs and Climate Action", "Ministries of Economic Affairs," "Ministry of Industry and Tourism Demographic Challenge in Spain. Councils of Autonomous Communities in Spain related to industry and the environment in Spain."
- **Stakeholders with energy-related responsibilities in national governments:** "Ministries of agriculture or energy."
- **Stakeholders with responsibilities for education and research in national governments:** "Ministry of education and research."

On this basis, the survey results also show the cross-ministry task of supporting IS. It also demonstrates the particular importance of ministries with an environmental focus. The role of specific ministries is further discussed at the end of this sub-chapter.

Additionally, RISERS' need for prioritisation drew our attention to the governments in **key countries** relevant to IS. Chapter 11 will summarize these countries based on the analysis of our priority sectors**.** In this context, chapter 5, for example, describes the engagement of Germany's Federal Ministry for Economic Affairs and Climate Protection (BMWK) to support the circular economy in the country's chemical industry.

In addition, CORALIS' regulatory impact assessment in the EU countries of Austria, Italy, Spain and Sweden (plus Türkiye), showed that Austria and Sweden have very advanced approaches in waste management and district heating, while Italy and Spain face certain barriers (see CORALIS, 2024). However, a participant in our survey also mentioned remaining problems with Swedish regulation without going into details in that stage, which suggests further analyses.

Sector-wise our chapters on the **chemical industry, the steel industry and their IS activities** show the particular importance of eight countries (in varying orders): **Germany, France, the United Kingdom, Poland, Belgium, Spain, Italy and the Netherlands**. Details on the **importance of these eight countries to support IS in general** and all the **other key sectors** can be found in the relevant chapters and in the summary in **chapter 11**.

As far as the individual ministries are concerned, further specifications are required depending on the specific policy measures envisaged. While various measures may be relevant, for example, to the ministries related to climate, economic affairs and energy, needs for education on IS, for example, may also address ministries of education.

The answers on the importance of the **regional and local level** highlighted the role of ICLEI, further described in chapter 4.2. In addition, more than 60 stakeholders from local, regional, national governments and the EU expressed their interest in the circular economy and/or IS by their registration on the H4C platform. They are listed in the annex and include **23 regions and 15 cities.**

Examples (first entries in alphabetic order) are given in Table 6.

Name	Country	Name	Country
Stad Antwerpen	Belgium	**Province east-Flanders**	Belgium
Energibyen Skive -	Denmark	**OVAM**	Belgium
City of Munich	Germany	**POM Limburg**	Belgium
Berlin Partner for Business and Technology	Germany	**Zagreb County**	Croatia
Hansestadt Hamburg	Germany	**Regional Council of Päijät-Häme**	Finland
Municipality of Ravenna	Italy	**Region Nouvelle-Aquitaine**	France
City of Emmen	Netherlands	**Province of Limburg**	Netherlands
Cities of Northern Netherlands	Netherlands	**Møre and Romsdal County**	Norway
Granollers city council*	Spain	**Green Region Vestland**	Norway
Consejeria de Medio	Spain	**IVACE (Valencian Region)**	Spain

Table 6: Examples of cities and regions in the annex

In parallel with the creation of this report, additional stakeholders are currently identified in the specific context of end-of-waste criteria.

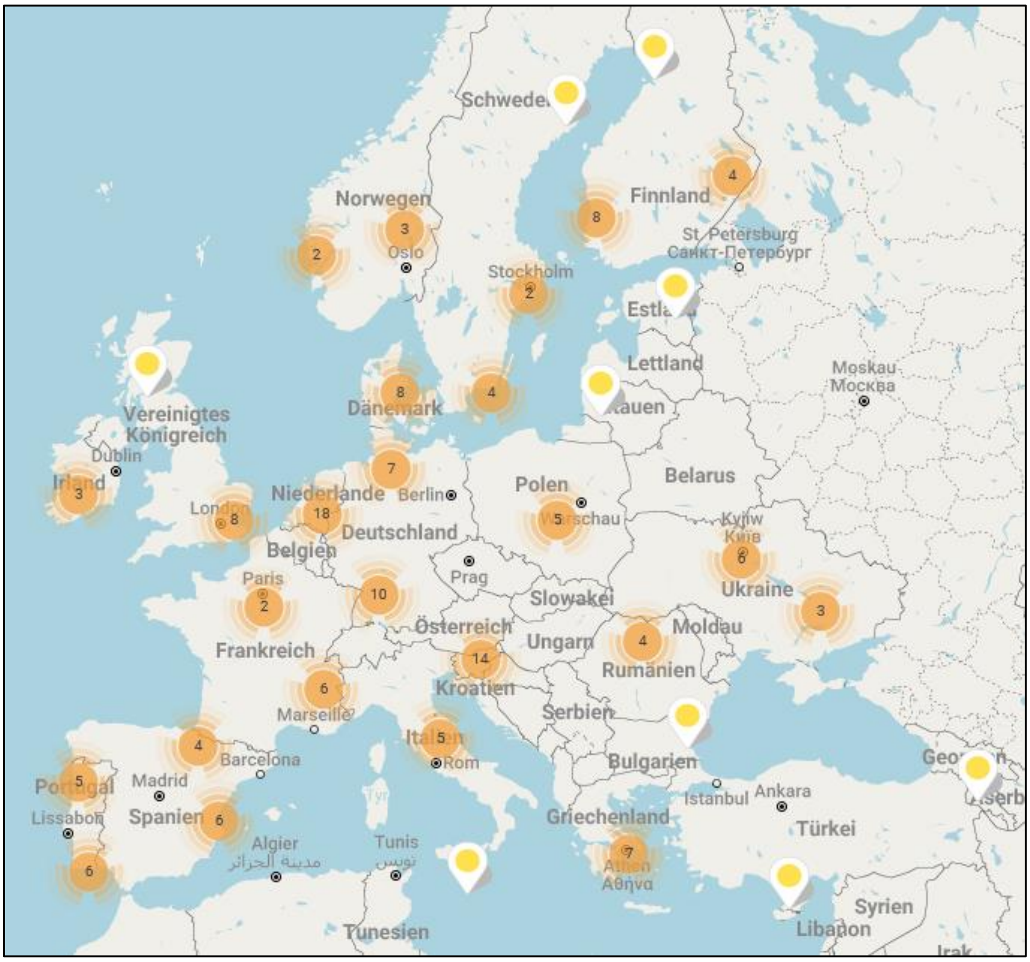
4.2 INDUSTRY-INDEPENDENT ASSOCIATIONS

Besides policy makers presented in chapter 4.1, we focus on five stakeholder groups regarding industry-independent stakeholders, represented by their key associations: **cities and municipalities, public procurement, SMEs, consumers and the environment**. Cities and municipalities play a specific role in these contexts - besides representing IS practitioners in their territory, they are also major players in policy making as described in section 4.1.

The key associations presenting the five stakeholder groups are:

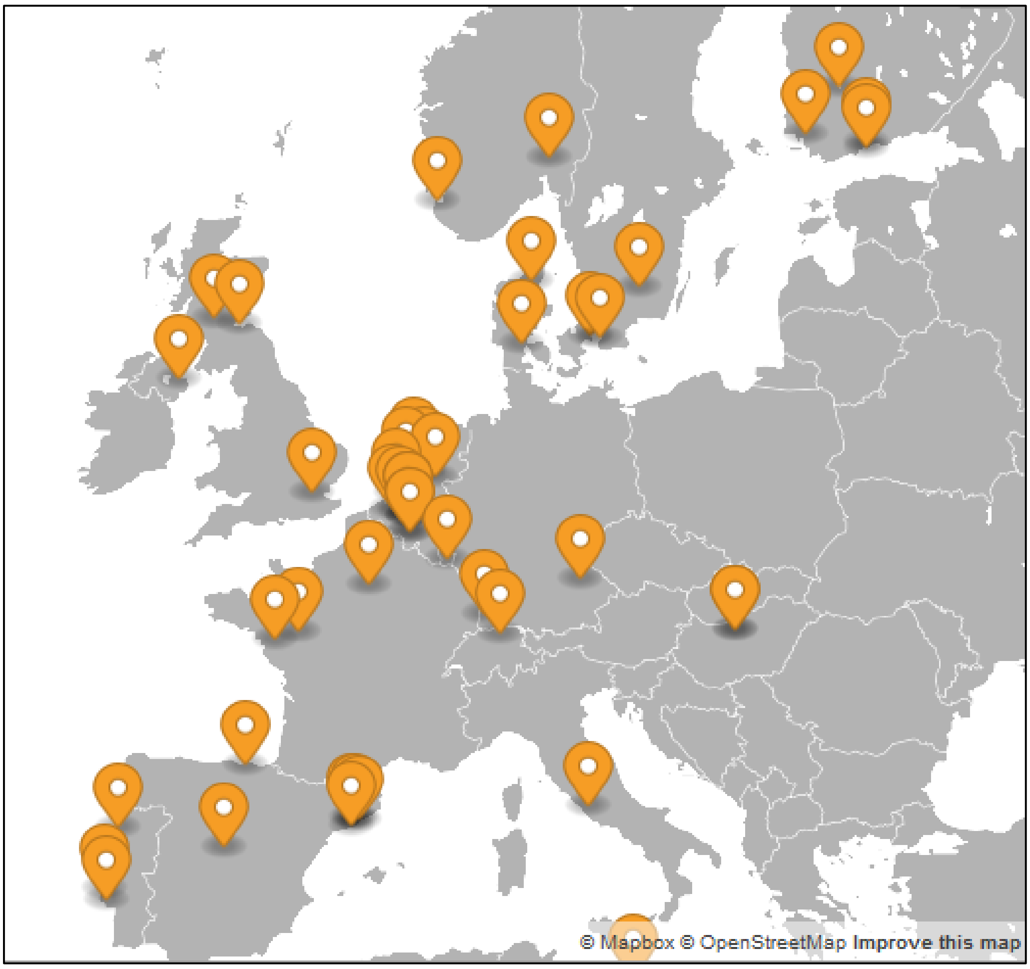
- **Cities and municipalities**, in particular represented by ICLEI, the Local Governments for Sustainability (EU).
- **Public procurement**, represented by GPP (Green Public Procurement) Advisory Group and Procura+ in line with the project's goal to lay important foundations for RISERS' Task 5.3 on policy recommendations by also considering the needs of public procurement.
- **SMEs,** presented by SBS.
- **Consumers**, particularly presented by ANEC (the European consumer voice in standardisation) and the European Environmental Bureau (EEB).
- **The environment and its specific needs**, represented by ECOS, the Environmental Coalition on Standards, and the EEB.

As examples, Figure 6 and Figure 7 show the broad scope of ICLEI and Procura+ in Europe.



Source: https://iclei.org/iclei-members/

Figure 6: Presence of ICLEI in Europe



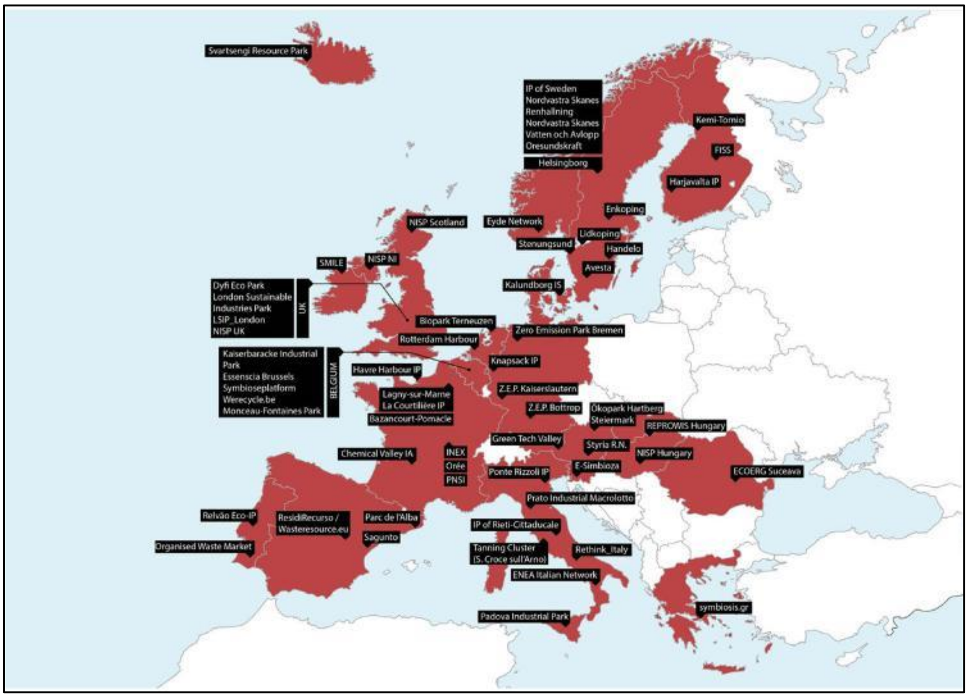
Source: https://procuraplus.org/public-authorities/

Figure 7: Presence of Procura+ in Europe

4.3 IS NETWORKS

Important information on sector-independent IS networks is provided by Domenech et al. (2019). Figure 8 gives an overview. Many more networks are presented in the annex table of that document.

Based on the number of jobs, the twelve biggest IS networks are according to Domenech et al. (2019), Table B1 Mapping of IS networks in Europe: Parc de l'Alba (ES, 40,000 jobs), the Styrian recycling network (AT, 22,943 jobs) and the GreenTech cluster with 200 companies of the "Green Tech Valley" of Styria, which creates more than 1,000 jobs/year; Chemical Valley Industrial area (FR, 6,500 jobs), Zero Emission Park Bremen (DE, 6,200 jobs), Kalundborg (DK, 4,614 jobs), the Industrial Park of Rieti-Cittaducale (IT, estimated 4,300 jobs), the Industrial Park of Sweden with 3,794 jobs, the Eyde Network (NO, 3.794 jobs), Lagny-sur-Marne and La Courtilière Industrial Park (FR, 3,200 jobs), Marcolotto Industriale di Prato (IT, 3,000 jobs), Zero Emission Park Bottrop (DE, 2,500 jobs), Knapsack (DE, 2,200 jobs, in particular of the chemical industry) and Bazancourt-Pomacle (FR, 1,200-2,000 jobs).



Source: Domenech et al. (2019)

Figure 8: IS clusters in Europe

Many other networks are included in that table without information on the number of jobs, which hinders appropriate comparisons. As an example, Domenech et al. (2019) mention a ”Rhein-Neckar” network in Germany without details. In contrast, Heck et al. (2024) describe the **Höchst Industry Park** in the Rhein-Main (Rhine-Main) region, established 1863 with 22,000 employees, which puts that cluster third in the list above. More details will be given in chapter 5.

The importance of various other clusters mentioned by Domenech et al. (2019), e. g., of Kalundborg and the clusters in Italy, was also emphasized by our survey, while Kalundborg is also relevant for our key sector “refineries” (see Neves et al., 2024 and chapter 9).

Due to the various stakeholders involved in these clusters, our approach is to address the regions in general via ICLEI and its local partners and companies of our key sectors by their industry associations as well.

4.4 INDUSTRIAL HOTSPOTS WITH IS POTENTIAL

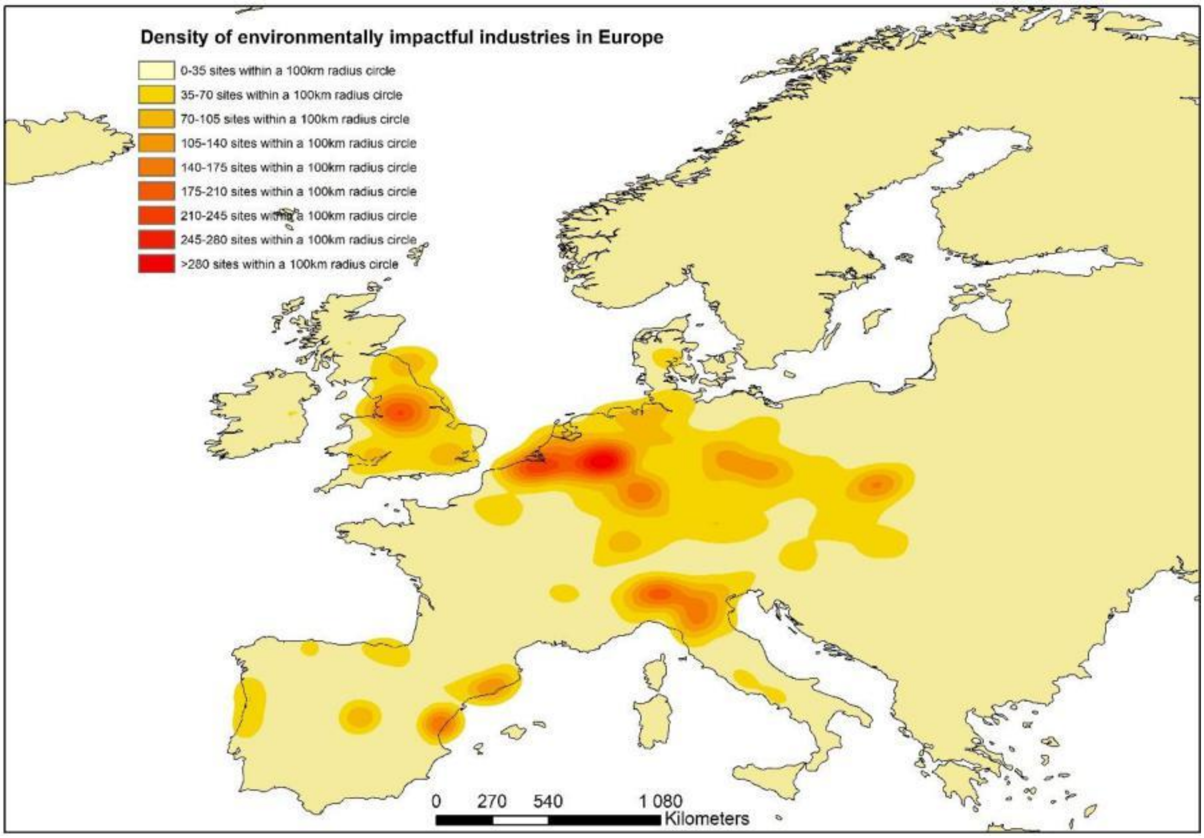
Another sector-independent target group consists of the key industrial clusters in Europe. According to SCALER (2020b), this includes:

- Four key Hotspots: a. Benelux, North of France, Western Germany, Netherlands hotspot, b. Northern Italy, c. Valencia region & the industrial district of Castellon, d. United Kingdom midlands
- Several additional hotspots: Barcelona & Catalonia region, East Germany, Krakow region, Lisbon Region & west coast of Portugal, London region, Lyon Region "Chemical Valley", Madrid region, Paris & Ile de France.

Figure 9 visualizes the location of these clusters in Europe. Various of these clusters are also active in our key sectors, e.g., Benelux and the Chemical Valley in the chemical industry.

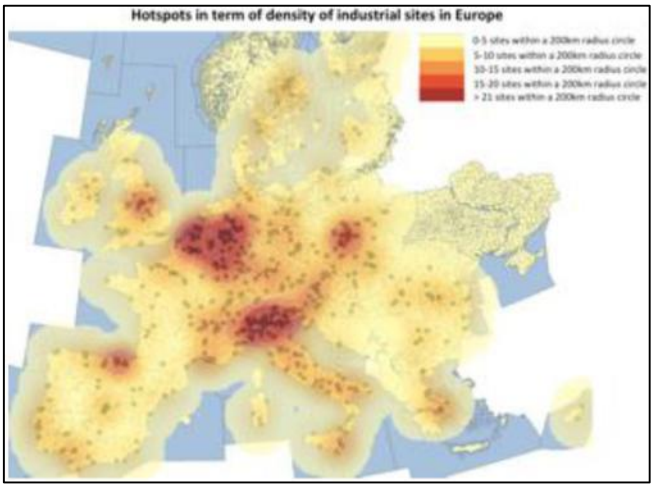
Due to the regional aspect, our approach to reach these stakeholders focuses on ICLEI partners. As an example, Various ICLEI partners are also located in Benelux (e.g., Brussels, Amsterdam), North of France (e.g., Métropole Européenne de Lille), Western Germany (e.g., Bonn, Dortmund, Regionalverband Ruhr), Northern Italy (e.g., Turin) and in the above-mentioned Spanish city of Valencia.

Figure 12 shows the density in four of our key sectors.



Source: SCALER (2020b)

Figure 9: Density of environmentally impactful industries in Europe



Source: STRANE

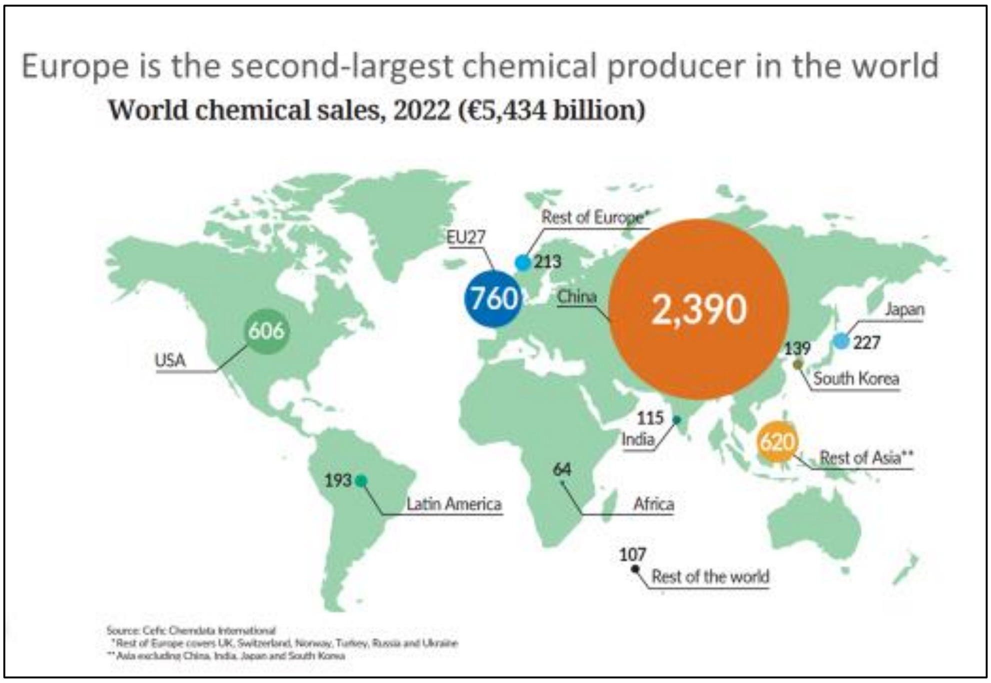
Figure 10: European hotspots in terms of density of industrial sites in four of our core sectors: steel, refining, petrochemicals, and cement

RISERS' policy making aims to consider different needs and expectations in this context by specifying basic and further support for IS policy stakeholders. Its specific goal is the specification of policy measures to provide basic support to stimulate IS in regions with low IS intensity, e.g., together with ICLEI and its regional partners and further support for regions with active IS practitioners to stimulate even more and stronger IS engagement.

5 STAKEHOLDER MAPPING BY PRIORITY SECTORS – CHEMICALS

5.1 SECTOR PROFILE

According to CEFIC (2024), the European chemical industry represents a €760 billion turnover, over 1.2 million workers and €11 billion R&I investments, and is therefore a key sector of the European economy. Figure 11 shows the EU27's international leading, positioned after China and before the U.S. and the rest of Asia. In addition, chemicals are Europe's most important sector regarding IS sources and IS sinks, according to Table 3.



Source: CEFIC

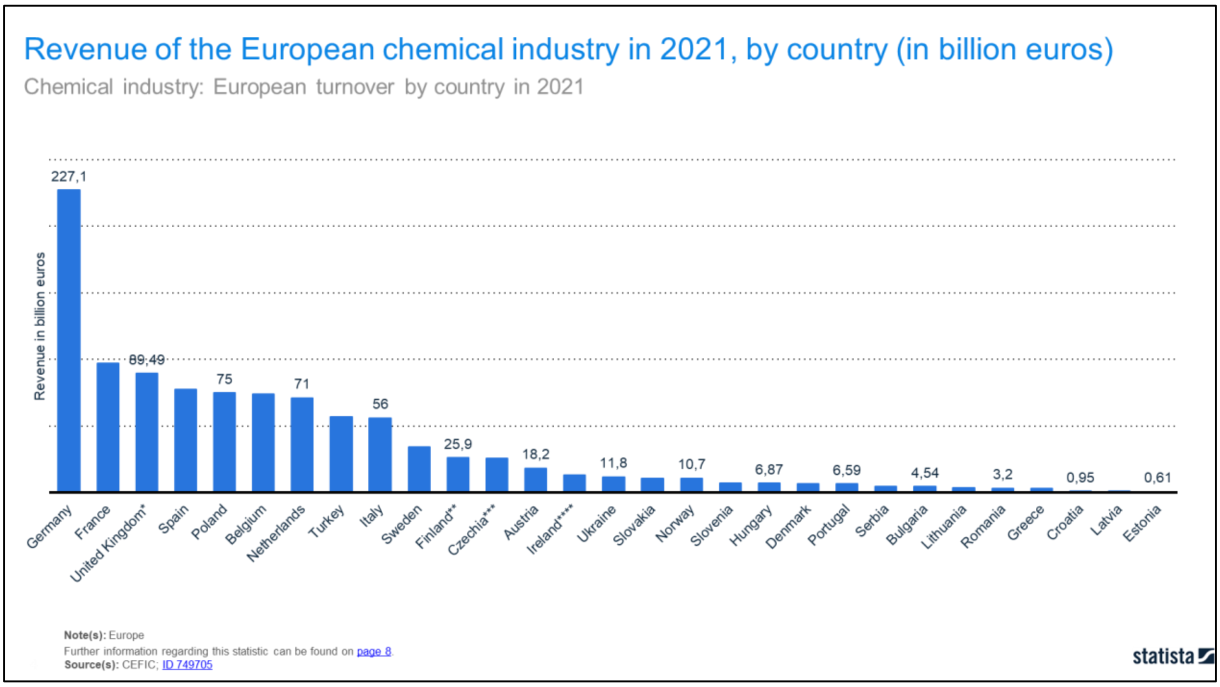
Figure 11: Europe's chemical sector in international comparison

Based on revenue and according to Figure 12, the most important countries of Europe's chemical industry are: Germany, France and the United Kingdom, followed by Spain and Poland, Belgium, the Netherlands and Italy.

According to VCI (2024), Germany's chemical and pharmaceutical industry is not only leading in Europe, it also ranks third worldwide. The German chemical industry forms the basis of many value chains and is an important driver of innovation in numerous other industries.[10]

Information regarding Europe's industrial hotspots with particular suitability for IS is provided by Table 7.

[10] See https://www.vci.de/die-branche/uebersichtsseite.jsp



Source: statista

Figure 12: Key countries of the chemical industry in Europe

Chemicals	Barcelona & Catalonia region	Benelux, North of France & West Germany	Est Germany	Krakow region	Lisbon Region & west coast of Portugal	London region	Lyon Region "Chemical Valley"	Madrid region	Northern Italy	Paris & Ile deFrance	UK Midlands	Valencia region	Total all hotspots	Total 4 Major hotspots	TOTAL Europe	Share of the all hotspots by sector	Share of the 4 Major hotspotsby sector
Organic	6	**30**	8	0	1	1	0	0	7	0	2	1	56	40	126	**44,4%**	31,7%
Inorganic	0	**21**	4	1	2	0	1	0	3	0	3	0	35	27	84	**41,7%** **42,4%**	32,1%
Fertilisers	0	**12**	4	2	3	0	0	0	2	1	1	1	26	16	72	**36,1%**	22,2%
Pharmaceuticals	1	**43**	9	3		4	7	1	6	10	5	0	89	54	249	**35,7%**	21,7%
LCP	1	**61**	30	33	1	17	0	0	7	6	21	1	178	90	563	**31,6%**	16,0%
Total	8	**167**	55	39	7	22	8	1	25	17	32	3	384	227	1094		

Data source: SCALER (2020b), own calculations

Table 7: Number of chemical installations in major and medium density industrial hotspots

According to Table 7, the two leading countries of Europe's chemical industry, Germany and France, are, together with Belgium and the Netherlands, involved in the "Benelux, North of France and West Germany hotspot," Europe's biggest industrial hotspot suitable for IS. All the other leading EU countries of the industry shown in Figure 12 (United Kingdom, Spain, Poland and Italy) are also represented by hotspots with IS potential in the table.

The industries' framework conditions will be an important requirement for the specification of appropriate policy measures to support IS. Besides the topics described in section 3.2, two other important aspects refer to competitiveness and energy-specific needs:

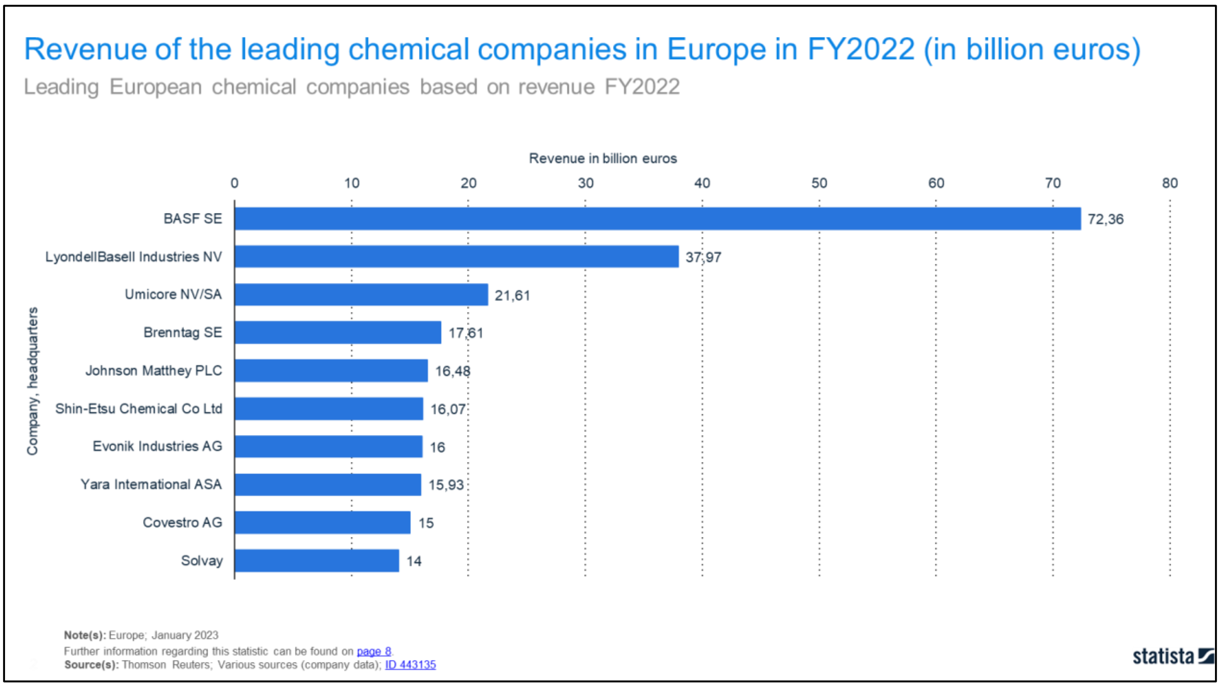
- **The European industry's need to stay competitive:** the EU market share dropped significantly between 2012 and 2022 according to CEFIC (2024). In total, China is by far the most important region, with around three times as much turnover as the EU27 regarding chemical sales (2,350 vs. 760 bn according to CEFIC, 2024, see Figure 11).
- **The industry's challenge of high energy intensity** (see e.g., Branca et al., 2021b) as described below.

Concerning energy intensity, Germany's chemical industry, for example, represents 8% of the country's energy consumption, 22% of its manufacturing industry's energy consumption and 6.5% of Germany's CO_2 emissions according to VCI (2024). The framework condition shows the specific importance of analyzing to what extent energy-related IS can help the chemical industry.

5.2 IMPORTANT SECTOR-SPECIFIC STAKEHOLDERS

Industrial associations play an important role in Europe's chemical industry. Key players of the industry's leading countries - Germany, France, the UK, Spain and Poland - are VCI and DECHEMA (DE), France Chimie (FR), CIA (UK), FEIQUE (ES) and the Polish Chamber of Chemical Industry (PL). The annex "IS policy stakeholders", section "Chemicals", provides more details of the industry associations in the European member states and the United Kingdom. Various IS-related activities can be observed in this context. An important IS activity of VCI in Germany, for example, was the Chemistry4Climate (C4C) platform. Section 5.3 provides more details.

Europe's most important chemical **companies** are according to their revenue shown in Figure 13: BASF (DE) - which is also the world's largest chemical group - LyondellBasell (NL), Umicore (BE), Brenntag (DE), Johnson Matthey (UK), Evonik (DE), Yara (NO), Covestro (DE), Solvay (BE) and the non-European company Shin-Etsu Chemical.



Source: statista

Figure 13: Key companies of the chemical industry in Europe

Accordingly, four of these top 10 companies come from Germany and two from Belgium, followed by one company from each, the Netherlands, Norway, the United Kingdom and outside Europe. Section 5.3 will also refer to Dow, which is among the top 5 chemical companies worldwide, based on revenue.[11]

Following RISERS' further analyses, BASF, Brenntag, Evonik and Covestro are members of VCI while Umicore and Solvay are members of the Belgian association Essenscia. For this reason, all these companies are also represented by these two stakeholders.

5.3 IMPORTANT IS PRACTITIONERS

The chemical industry belongs to the pioneers in contributing to European IS policy making and various organisations participated in the development of the fundamental technical specification CEN Workshop Agreement (CWA) 17354.[12] In particular, these organisations include the German association **DECHEMA** and **Evonik Industries.**

Another important stakeholder group consists of organisations which have expressed an interest in the circular economy and/or IS by their registration on the **H4C** platform. Among other organisations, **the port of Antwerp as Europe's leading chemical cluster,**[13] 26 businesses (12 corporate and 14 SME, of which 11 provide company information) and six industry associations from the chemical industry are currently registered.

Three of the companies come from **Germany**, two each from **Austria, Belgium, France** and **Italy**, four from the **Netherlands**, one from the **United Kingdom** and from several other countries. The businesses include, for example, **Brenntag (Brenntag France)** and **Covestro (Germany)**, the 4th and 9th largest chemical corporations in Europe according to Figure 13.

The chemical cluster of **Antwerp's port** stands also for significant IS investments by market leaders such as **BASF, Evonik** and **Covestro**.[14] More information on BASF's IS activities, in particular regarding the use of waste heat, can also be found at CEFIC (no date 1).

The companies from the Netherlands listed at H4C include, for example, **Dow** and an external partner of that company. As mentioned in section 5.2, Dow belongs to the world's top five chemical companies based on revenue.

Germany's VCI, representing the **leading country** of Europe's chemical industry is also very engaged in IS. In this context, the Chemistry4Climate (C4C) platform organised by **VCI,** and the Association of German Engineers (VDI), is worth mentioning. Its creation was a result of the goal for Germany's chemical and pharmaceutical industry to become greenhouse gas neutral and was launched in May 2021.

In total, over **80 stakeholders** from industry, politics and civil society were represented at C4C. The participating companies came from the chemical, energy, waste disposal, plant construction, building and transport sectors, as well as other energy-intensive industries. The **Federal Ministry for Economic Affairs and Climate Protection (BMWK)** supported the work of the platform, which also aimed to develop concrete recommendations for political decision-makers. In various working groups, experts addressed key topics, such as energy supply and infrastructure, the circular economy and raw materials

[11] See https://www.statista.com/topics/2026/top-chemical-companies/#topicOverview
[12] See https://www.cencenelec.eu/media/CEN-CENELEC/CWAs/RI/cwa17354_2018.pdf
[13] See https://www.chemanager-online.com/en/news/sustainable-industrial-symbiosis-flanders
[14] See https://www.chemanager-online.com/en/news/sustainable-industrial-symbiosis-flanders

supply, as well as the regulatory framework necessary for the success of the transformation. The work ended in early summer 2023.[15]

A specific example of the chemical industry's IS activities in market-leading **Germany** and of the above-mentioned "Benelux, North of France and West Germany hotspot" is **Höchst Industrial Park** (HIP) (Heck et al., 2024). HIP is a chemical and pharmaceutical cluster with around 90 companies in the Rhine-Main region and approximately 22,000 employed individuals (see Heck et al., 2024). The various additional stakeholders engaged for the HIP include, for example, the City of Frankfurt, Energiereferat, the State of Hesse, the Landesenergieagentur, VCI and DECHEMA**.** Germany's Chemical Industrial Park **Knapsack** and the French **Chemical Valley** were already mentioned in chapter 4.

The **industry associations** listed in H4C come from Belgium, Bulgaria, Lithuania, the Netherlands, Lithuania, Spain and Türkiye. In addition, German DECHEMA is listed as a non-profit organisation there.

In summary, 7 out of the 8 key countries of the EU's chemical industry and of the industry's IS practitioners are represented on the H4C platform: by specific industry representatives from Germany, Belgium, the Netherlands and Spain, and by additional stakeholders from these countries, plus France, Italy, and the United Kingdom. Various stakeholders from other regions are also registered on the H4C platform or were already contacted by RISERS, for example from the industry's additional key country Poland.

Another important and engaged IS stakeholder group in general consists of European sector associations working together with **H4C ECoP** to develop **sector guides** for IS, addressing the information needs described in section 3.2. The industries involved in this initiative include: cement, ceramics, chemicals, engineering, minerals, pulp & paper, refining and steel,[16] representing all our key process sectors plus our additional focus sector refineries.

[15] See https://www.vci.de/themen/energie-klima/klimaschutz/ueber-chemistry4climate-klimaschutzplattform.jsp
[16] Source: H4C ECoP experts

6 STAKEHOLDER MAPPING BY PRIORITY SECTORS – STEEL

6.1 SECTOR PROFILE

This section refers to the steel sector. According to Table 3, steel is ranked 2nd after the chemical industry regarding all reported IS cases as a source (22%) and as a sink (11%).

According to Bolddata (2024), Europe has around 417.500 steel companies. Regarding important EU regions of steel production, Figure 14 shows the particular importance of the eight countries Germany, Italy, France, Spain, Austria, Poland, Belgium and the Netherlands, based on metric tonnes.

Crude steel production per country: EU

All qualities ▪ in '000,000 metric tonnes

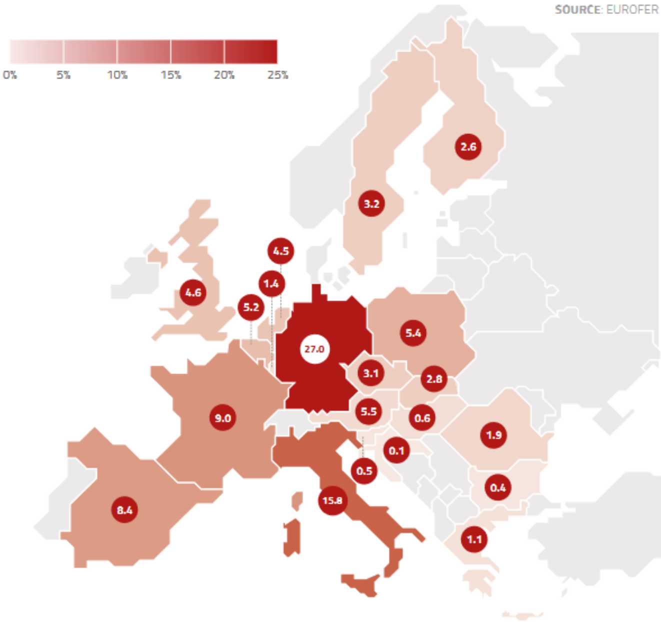
EU COUNTRIES IN DESCENDING ORDER OF CRUDE STEEL PRODUCTION TABLE ▪ 2022

SOURCE: EUROFER

		2022	% shares 2022
1	GERMANY	36,849	27,0%
2	ITALY	21,599	15,8%
3	FRANCE	12,234	9,0%
4	SPAIN	11,464	8,4%
5	AUSTRIA	7,512	5,5%
6	POLAND	7,407	5,4%
7	BELGIUM	7,030	5,2%
8	NETHERLANDS	6,143	4,5%
9	SWEDEN	4,382	3,2%
10	CZECH REPUBLIC	4,262	3,1%
11	SLOVAKIA	3,872	2,8%
12	FINLAND	3,538	2,6%
13	ROMANIA	2,625	1,9%
14	LUXEMBOURG	1,875	1,4%
15	OTHERS	1,855	1,4%
16	GREECE	1,543	1,1%
17	HUNGARY	857	0,6%
18	SLOVENIA	623	0,5%
19	BULGARIA	482	0,4%
20	CROATIA	169	0,1%
	EU 27	136,321	100%

EU COUNTRIES SHOWN BY RELATIVE SIZE OF CRUDE STEEL PRODUCTION MAP ▪ 2022

SOURCE: EUROFER



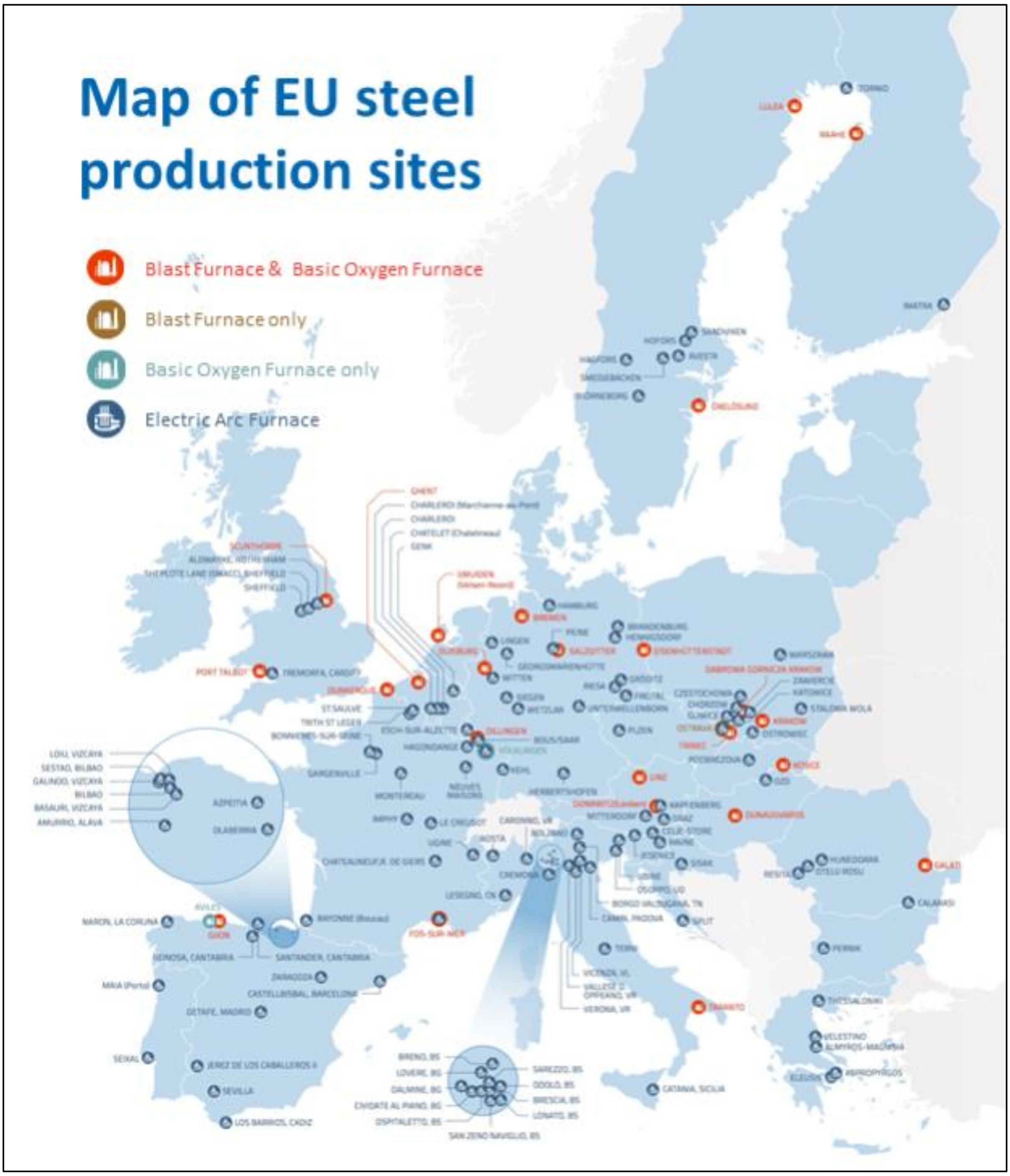
Source: https://www.eurofer.eu/assets/publications/brochures-booklets-and-factsheets/european-steel-in-figures-2023/FINAL_EUROFER_Steel-in-Figures_2023.pdf

Figure 14: Crude steel production in the EU

The United Kingdom was not included in that statistic. It produced 5.96Mt[17] of crude steel in that year, which ranked the country 9th, after the Netherlands.

Regarding the number of steel companies, Italy is leading with a 14.5% market share according to Bolddata (2024), followed by Poland (12.3%) and Germany (12.1%). Figure 15 and Table 8 provide more details on regional hotspots.

[17] See https://mepsinternational.com/gb/en/news/steelmakers-in-the-dark-over-uk-decarbonisation-plan



Source: https://www.eurofer.eu/assets/Uploads/Slide1.PNG

Figure 15: Map of European steel production

Blast Furnace & Basic Oxygen Furnace

Location	Hot Metal Capacity ('000 tonnes/ year)	Finished Steel Capacity ('000 tonnes/ year)	No. of furnaces
AUSTRIA			
DONAWITZ (Leoben)	1370	1570	2
LINZ	4340	6000	3
BELGIUM			
GHENT	4430	5000	2
CZECH REPUBLIC			
OSTRAVA	3200		3 – BF only
TRINEC	2100	2400	2
FINLAND			
RAAHE	2400	2600	2
FRANCE			
DUNKERQUE	6800	6750	3
FOS SUR MER	5160	5100	2
GERMANY			
BREMEN	3960	3800	2
DILLINGEN	4790	2760	2
DUISBURG	11600	11560	4
EISENHÜTTENSTADT	2340	2400	2
SALZGITTER	4800	5200	3
VÖLKLINGEN		3240	BOF only
HUNGARY			
DUNAUJVAROS	1310	1650	2
ITALY			
TARANTO	9590	11500	4
NETHERLANDS			
IJMUIDEN (Velsen-Noord)	6310	7500	2
POLAND			
DABROWA GORNICZA	4500	5000	2
KRAKOW	1310	2600	1
ROMANIA			
GALATI	3250	3200	2
SLOVAKIA			
KOSICE	2850	4500	2
SPAIN			
AVILES		4200	BOF only
GIJON	4480	1200	2
SWEDEN			
LULEA	2200	2200	1
OXELÖSUND	1800	1700	2
UNITED KINGDOM			
PORT TALBOT	4770	4900	2
SCUNTHORPE	3590	3200	3

Electric Arc Furnace

Location	Capacity ('000 tonnes/ year)	No. of furnaces
AUSTRIA		
GRAZ	365	1
KAPFENBERG	180	1
MITTERDORF	300	1
BELGIUM		
CHARLEROI	850	1
CHARLEROI (Marchienne au Pont)	350	1
CHATELET (Chatelineau)	1000	1
GENK	1200	2
BULGARIA		
PERNIK	1000	2
CROATIA		
SISAK	350	1
SPLIT	185	1
CZECH REPUBLIC		
OSTRAVA	120	1
PLZEN	150	2
FINLAND		
IMATRA	360	1
TORNIO	1300	2
FRANCE		
BAYONNE (Boucau)	1200	1
BONNIERES SUR SEINE	550	1
CHATEAUNEUF,R. DE GIERS	100	1
FOS SUR MER	480	1
GARGENVILLE	700	1
HAGONDANGE	460	1
IMPHY	90	1
LE CREUSOT	150	1
MONTEREAU	720	1
NEUVES MAISONS	800	1
ST.SAULVE	730	1
TRITH ST LEGER	800	1
UGINE	250	2
GERMANY		
BOUS/SAAR	350	1
BRANDENBURG	1800	2
FREITAL	90	1
GEORGSMARIENHÜTTE	1100	1
GRÖDITZ	100	1
HAMBURG	1100	1
HENNIGSDORF	1000	2
HERBERTSHOFEN	1180	2
KEHL	2500	2
LINGEN	620	1
PEINE	1000	1
RIESA	900	1
SIEGEN	600	1
SIEGEN	150	1
UNTERWELLENBORN	1100	1
VÖLKLINGEN	300	1
WETZLAR	400	1
WITTEN	480	1
GREECE		
ALMYROS MAGNISIA	1200	1
ASPROPYRGOS	400	1
ELEUSIS	800	1
THESSALONIKI	600	1
VELESTINO	450	1
HUNGARY		
OZD	400	1
ITALY		
AOSTA	260	1
BOLZANO	200	2
BORGO VALSUGANA, TN	600	1
BRENO, BS	100	1
BRESCIA, BS	1200	2
BRESCIA, BS	650	1
CAMIN, PADOVA	600	1
CARONNO, VA	780	1
CATANIA, SICILIA	500	1
CIVIDATE AL PIANO, BG	250	1
CREMONA	3850	2
DALMINE, BG	700	1
LESEGNO, CN	600	1
LONATO, BS	1100	1
LONATO, BS	600	1
LOVERE, BG	150	1
ODOLO, BS	900	1
OSOPPO, UD	2200	1
OSPITALETTO, BS	150	1
SAN ZENO NAVIGLIO, BS	800	1
SAREZZO, BS	540	1
TERNI	1450	2
UDINE	500	1
UDINE	770	1
VALLESE D. OPPEANO, VR	450	1
VERONA, VR	1250	2
VICENZA	170	1
VICENZA, VL	1200	1
LUXEMBOURG		
ESCH SUR ALZETTE	2250	2
POLAND		
CHORZOW	145	1
CZESTOCHOWA	800	1
GLIWICE	250	1
KATOWICE	65	1
OSTROWIEC	900	1
STALOWA WOLA	240	1
WARSZAWA	750	1
ZAWIERCIE	1340	2
PORTUGAL		
MAIA (Porto)	600	1
SEIXAL	1100	1
ROMANIA		
CALARASI	470	1
HUNEDOARA	550	1
OTELU ROSU	830	1
RESITA	450	1
SLOVAKIA		
PODBREZOVA	350	1
SLOVENIA		
CELJE STORE	150	1
JESENICE	500	1
RAVNE	140	1
SPAIN		
AMURRIO, ALAVA	150	1
AMURRIO, ALAVA	360	1
AZPEITIA	800	1
BASAURI, VIZCAYA	740	1
BILBAO	1100	1
CASTELLBISBAL, BARCELONA	2400	2
GALINDO, VIZCAYA	400	1
GETAFE, MADRID	600	1
JEREZ DE LOS CABALLEROS II	1300	1
LOIU, VIZCAYA	130	1
LOS BARRIOS, CADIZ	1200	3
NARON, LA CORUNA	700	1
OLABERRIA	2450	1
REINOSA, CANTABRIA	240	1
SANTANDER, CANTABRIA	750	1
SESTAO, BILBAO	2000	2
SEVILLA	1300	2
ZARAGOZA	500	1
SWEDEN		
AVESTA	500	1
BJÖRNEBORG	95	1
HAGFORS	120	1
HOFORS	500	1
SANDVIKEN	200	1
SMEDJEBACKEN	480	1
UNITED KINGDOM		
ALDWARKE, ROTHERHAM	1220	2
SHEFFIELD	150	1
SHEPCOTE LANE (SMACC), SHEFFIELD	500	1
TREMORFA, CARDIFF	1200	1

Source: https://www.eurofer.eu/assets/Uploads/Slide1.PNG

Table 8: List of European steel production regions in detail

Information regarding industrial hotspots with particular suitability for IS is provided by SCALER (2020b) and Table 9.

According to Figure 14 and Table 9, of the eight leading European steel countries, Germany, France, Belgium and the Netherlands belong to the biggest hotspot “Benelux, North of France & West Germany”. Various additional parts of Germany, France and Spain as well as three hotspots in Italy, the United Kingdom and Poland, also belong to the regions with specific industrial density suitable for steel-related IS.

Sub-sector of & steel & metals	Barcelona & Catalonia region	Benelux, North of France & West Germany	Est Germany	Krakow region	Lisbon Region & west coast of Portugal	London region	Lyon Region "Chemical Valley"	Madrid region	Northern Italy	Paris & Ile deFrance	UK Midlands	Valencia region	Total all hotspots	Total 4 Major hotspots	TOTAL Europe	Share of the all hotspots by sector	Share of the 4 Major hotspotsby sector
Steel	1	**39**	7	19	3	1	1	2	29	3	10	0	115	78	263	**43,7%**	29,7%
Non-ferrous metals	3	**68**	18	6	3	4	2	6	9	11	23	1	154	101	341	**45,2%**	29,6%
Total	4	**107**	25	25	6	5	3	8	38	14	33	1	269	179	604		

Data source: SCALER (2020b), own calculations

Table 9: Number of steel and metal installations in major and medium density industrial hotspots

The industries' framework conditions will be an important requirement for the specification of appropriate policy measures to support IS. Besides the topics described in section 3.2, an important framework condition is also that the industry faces many challenges in general. This means, in particular,

- High energy intensity (see e. g, Branca et al., 2021b).
- Very high energy prices and uncertainties regarding future energy prices (see e.g., EUROFER, 2024).
- Tough competition from China.
- Extremely CO_2-intensive production processes.
- Weak manufacturing sectors' conditions, inflation above target levels, severe geopolitical tensions and economic challenges driven by high interest rates (see e.g., EUROFER, 2024).
- Concern regarding the future development of the industry in Europe (see EUROFER, 2024).

Regarding the competition from China, overcapacities from China are also forcing their way into Europe. As a result, prices are falling, and domestic companies are suffering. Many plants and factories are not being utilised to capacity. These challenges also influence the prospects of the future development of Europe's steel industry (see WDR, 2024).

According to EUROFER (2024), "the overall evolution of steel demand remains subject to high uncertainty." Following that source, a "modest recovery is foreseen in 2025" with expected growth of +1.6% (revised downwards from +2.3%) in 2025.

In this context, Germany's economics Minister Habeck argues, for example, that the transition to climate-friendly steel production must continue. He proposes that green steel companies should be guaranteed orders. The remaining problem is financial coverage - without money from the state, a switch to green steel production is hardly possible (WDR, 2024).

Regarding IS, the energy aspect plays an important role. This framework condition shows the specific importance of analyzing to what extent energy-related IS can help the chemical industry.

6.2 IMPORTANT SECTOR-SPECIFIC STAKEHOLDERS

This section refers to important industry associations and companies of the steel sector.

Key industry associations representing European steel companies are included in the annex, for example, EUROFER AISBL (presented below), ECCS, APEAL and EWRIS.

EUROFER AISBL (https://www.eurofer.eu/) is the European Association for steelmakers. Its aim is to provide information, services and guidance to its members related to European and international policy affairs and political, economic and market analysis. It also aims to provide guidance for the implementation of EU legislation.

Another important organization is ESTEP, which aims to engage in collaborative EU actions and projects on technology, addressing European challenges to create a sustainable EU steel industry. The association is composed of steelmakers, R&D institution, universities and equipment suppliers. https://www.estep.eu/

Regarding national industry associations, our focus is on the eight most important European steel production countries according to Figure 14, which are Germany, Italy, France, Spain, Austria, Poland, Belgium and the Netherlands:

In Germany, Düsseldorf-based WV Stahl (https://www.stahl-online.de/english/) is the political-economic association of the country's steel industry. It represents the sector's political interests in when in contact with politicians, business and the public.

Italy's Federaccia (https://federacciai.it/english/steel/) is an Italian Confindustria association and the representative entity of all about 150 iron and steel companies in the country. The association's primary goal is to promote Italian iron and steel companies to make them work better and to have better revenues in the international market.

The French A3M (https://www.a3ms.fr/fiches-matieres/cobalt/) is positioned as an interface between companies in the metallurgical sector, French and European public authorities, downstream industries, the academic and scientific world, R&D actors and French, European and international professional federations.

UNESID (https://unesid.org/en/sample-page-en/) is the Spanish association of steelmakers, founded in 1968. The organization belongs to EUROFER and has been helping the Steel industry in Spain and Europe since its creation.

Austria's Association of the Metal Industry, Fachverband der Maschinen- und Metallwarenindustrie (FMMI, https://www.metalltechnischeindustrie.at/en/), is one of the largest business and employers' associations in Austria. It is committed to the design of the relevant legal and economic framework conditions to ensure the successful continuation of companies in international competition. The steel sector is one of the industries within the organisation's scope.

In Poland, the Polish Steel Association (HIPH, https://www.hiph.org/GLOWNA/aktual_eng.php) is an organization of economic self-government associating metallurgical enterprises, cooperating industries and institutions related to metallurgy, conducting activities in the association's area of operation. Such activities may include manufacturing, trade, and services.

In Belgium, the Groupement de la Sidérurgie (GSV, https://www.steelbel.be/en/) is a professional federation of the steel sector which defends the interests of the country's steel industry in various areas (market, climate, energy, social affairs). With more than 10,000 workers, the steel industry remains a leading sector in Belgian industrial fabric.

Metaal Netherlands https://www.metaalnederland.com/ represents the industry in the Netherlands. The members of this industry association include more than 80% of the Dutch metal industry (companies with their own legal personality and 20 or more employees) and the largest foundries in the country.

As the United Kingdom belong to RISERS' target regions, our focus is also on the representative of the country's steel industry. UK Steel https://www.uksteel.org/ is the trade association of the UK's steel industry and proudly champions the country's steel manufacturers.

The Top 50 largest European steel companies according to Bolddata are listed in detail in the Annex "IS policy stakeholders", section "Steel" – "Companies". This list includes, for example, various ArcelorMittal companies, the ThyssenKrupp AG, Tata Steel IJmuiden B.V. and Outokumpu Stainless Oy.

6.3 IMPORTANT IS PRACTITIONERS

As mentioned in chapter 2, the H4C platform was used as the main source to identify IS practitioners for this report. Since H4C includes almost no representatives from the steel industry, additional methods needed to be applied to identify these stakeholders. An analysis of relevant research literature was used for this purpose. Branca et al. (2021a) fitted best with our goal as it described specific good practice. In addition, it summarizes the different wastes/by-products that could be used for IS. In general, most of the identified IS cases involve the steel and the construction sector. Regarding good practice examples, Branca et al. (2021a) refers to the EU project **CORALIS** (Creation of new value chain relations through novel approaches facilitating long-term industrial symbiosis), which aims to implement different demo cases of IS systems in different European regions. The steel and metal sectors are represented by an IS system in the **north of Italy (Brescia district)** that includes two steel factories, an aluminium producer, and a foundry cooperate, which practise a mutual materials exchange.

Due to the importance of Italy as one of the leading steel countries in Europe according to Figure 14 and the importance of Northern Italy among dense industrial hotspots according to Table 9, these stakeholders are of particular importance to us.

Based on RISERS partners' sectoral knowledge, six additional examples were selected to represent five of the six key European steel countries.

- Example **France 1**: ArcelorMittal in Dunkerque has been involved in initiatives to sell excess energy to the city. One notable project is their collaboration with the local authorities to utilize waste heat from their steel production processes.[18]
- Example **France 2**: Together with other stakeholders, Eramet, ArcelorMittal, and Comet joined forces in the Go-4-0 project (EIT RM funding, mid-2016 - mid-2019). Within Go-4-0, the waste streams from carbothermic production of silicon & ferro-manganese alloys and from metal & carbon-containing waste streams from steel and metal recycling activities were valorized to produce FerroManganese, see ERAMET (2016).
- Example **Germany**: ThyssenKrupp and the chemical company Covestro, which is also mentioned in the chapter on the chemicals sector, are involved in the Carbon2Polymers "lighthouse project"[19]

[18] See https://jdlgroupe.com/en/2024/01/15/18-mrd-pour-decarboner-le-site-arcelormittal-de-dunkerque/
[19] See https://www.chemie.de/news/1171908/kreislauf-fuer-nachhaltige-kunststoffe.html for "lighthouse project"

(sub-project of the Carbon2Chem project), which aims to utilise carbon-containing gases from steel production as a source of raw materials.[20]

- Example **Belgium**: by the project Steelanol, ArcelorMittal Ghent implemented an industrial installation capable of transforming the CO_2 produced by the plant into ethanol.
- Example **Netherlands**: together with other stakeholders, Tata Steel conducted the HIsama project developed the HIsarna process, which facilitates the reduction of CO_2 emissions in steel production. The starting point was the European project 'ulcos' in 2004, followed by installations and tests in 2010-2014, 2016-2018 and 2020 to date, see Tata Steel (2020) for more information. The HIsarna process allows for the direct use of iron ore and coal, eliminating the need for coking and sintering. The by-products of this process can be used in other industries, promoting industrial symbiosis. The company aims to have a HIsarna factory on an industrial scale by 2030.
- Example **Italy**: In 2022 the Stillmetal (Sustainable sLag process to obtain a valuable METAL, EIT RM funding, mid-2022 – end 2024) project started with the involvement of various partners, such as OPIGEO (SME specialized in slag valorisation), ITALGHISA (SME ferrolloys leading supplier) and the ZEROCENTO Group as the 1st customer building an industrial plant (TRL 9[21]). The key objective was converting foundry slag into ferroalloys (see ZAG, 2022).

Stillmetal's ZEROCENTRO is also relevant for other priority sectors of RISERS. Since 2010, the Group has specialised in the production of an artificial basalt obtained from steel industry waste and intended to produce bitumen and cement mixes, see https://zerocento.eu/chi-siamo/.

[20] See https://www.umsicht.fraunhofer.de/en/carbonmanagement/carbon-cycle.html for more details on Carbon2Chem

[21] TRL level 9 means "Actual system proven in an operational environment", see https://horizoneuropencpportal.eu/sites/default/files/2022-12/trl-assessment-tool-guide-final.pdf for more details

7 STAKEHOLDER MAPPING BY PRIORITY SECTORS – FOOD

7.1 GENERAL INFORMATION ON THE SECTOR

This section describes our policy stakeholders in the food sector, which represents 13% of all reported IS cases as a source and 9% of all cases as a sink. As we will show in the next section, there is a specific focus on the sugar industry.

The food and drink industry has an annual turnover of €1,112 billion and is the leading manufacturing sector in the EU. It employs 4.6 million people, making it the leading employer in the EU and contains 291,000 companies. The sector accounts for €182 billion in exports, €110 billion in imports, giving a positive trade balance of €72 billion.[22]

The supply chain for the sector equates to €3,700 billion turnover, with 28.7 million workers employed across agriculture and the input industry to food and drink services.

The industry emits 85 Mt CO_2 eq. per year, mostly associated with energy due to heat and power. Food loss and wastage equates to 10% or 58 million tonnes (2021 figures), accounting for 16% of the total GHG impact from the sector. Packaging plays a large role in the sector, and efforts are made to decrease the impact. In 2021, 40% of plastic packaging was recycled.

With regards to R&D, the EU sector lags behind many areas of the world as Eurostat indicates.[23]

Additional analyses based on RISERS' WP 3 data showed that sugar is the industry's most important sub-sector as an IS source (see Figure 16). Regarding IS sinks, our analysis showed the importance of "crop & animal production, hunting and related services" (20 cases), followed by mixed farming[24] (5 cases) and freshwater aquaculture (4 cases).

[22] FoodDrinkEurope (2023) Data and trends EU Food and Drink Industry
[23] Eurostat figures quoted in FoodDrinkEurope (2023) Data and trends EU Food and Drink Industry
[24] Mixed farming (NACE class 1.5) means the combined production of crops and animals without a specialized production of crops or animals). This class includes the combined production of crops and animals without a specialized production of crops or animals. The size of the overall farming operation is not a determining factor. If either production of crops or animals in a given unit exceeds 66 per cent or more of standard gross margins, the combined activity should not be included here, but allocated to crop or animal farming, see https://ec.europa.eu/competition/mergers/cases/index/by_nace_a_.html#a1_5 and https://unstats.un.org/unsd/classifications/Econ/Detail/EN/27/0150

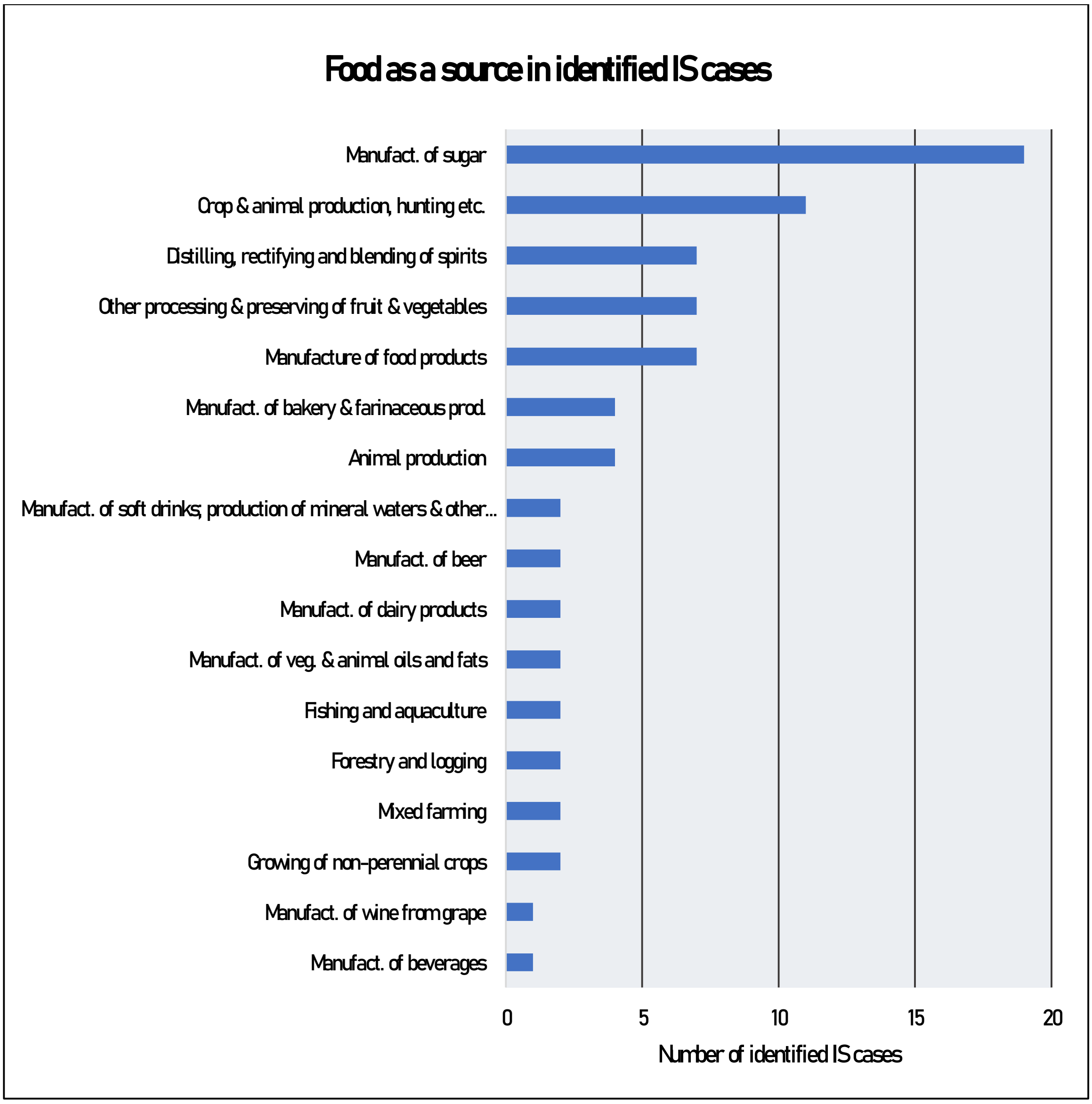
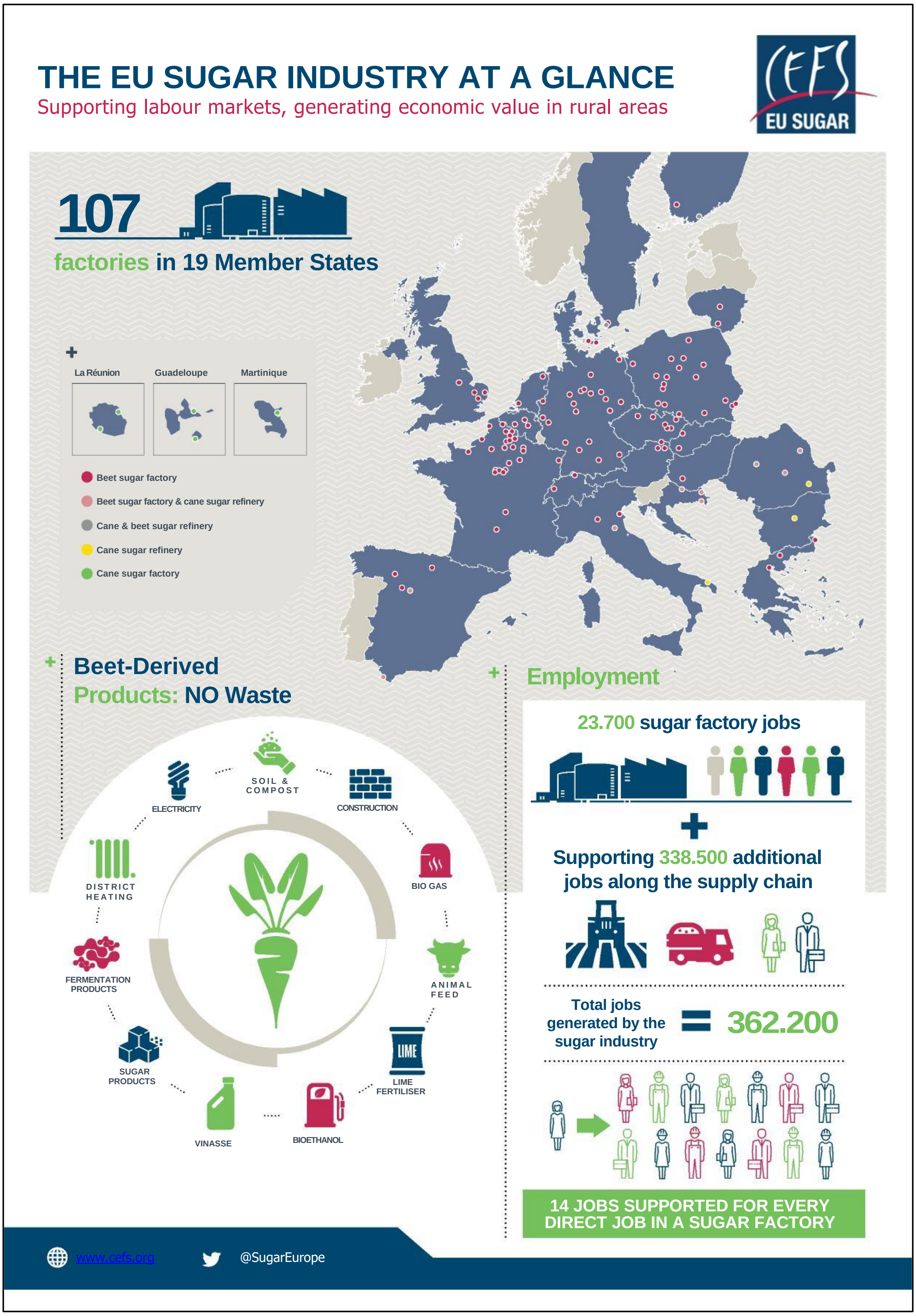


Figure 16: Key sub-sectors in the field of food regarding IS sources[25]

Figure 17 provides an overview on the sugar industry in Europe and its various circular economy activities in general.

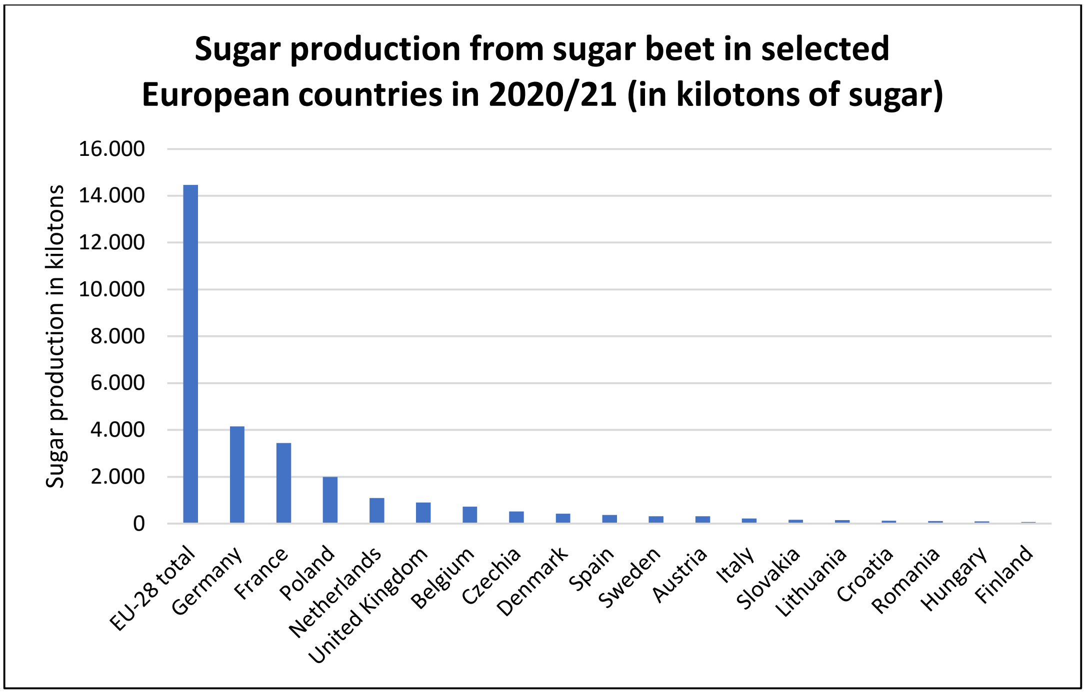
Key European sugar production regions are, according to Figure 18, Germany, France and Poland, followed by the Netherlands, the United Kingdom and Belgium.

[25] Source: own calculations, data source: RISERS WP 3 repository - source of raw data of D3.1, table 6



Source: CEFS

Figure 17: Overview of the European sugar industry



Source: own figure based on statista data

Figure 18: Key countries of the sugar industry in Europe

SCALER (2020b) shows key EU regions with IS potential according to the density of industry installations, indicating many similarities with the sub-sector's leading countries, see Table 10.

Food	Barcelona & Catalonia region	Benelux, North of France & West Germany	Est Germany	Krakow region	Lisbon Region & west coast of Portugal	London region	Lyon Region "Chemical Valley"	Madrid region	Northern Italy	Paris & Ile deFrance	UK Midlands	Valencia region	Total all hotspots	Total 4 Major hotspots	TOTAL Europe	Share of the all hotspots by sector	Share of the 4 Major hotspotsby sector
Agro-industries (Sugar)	0	**24**	4	1	2	1	0	0	7	5	0	0	44	31	111	39,6%	27,9%

Data source: SCALER (2020b), own calculations

Table 10: Number of installations of the food industry in major and medium density industrial hotspots

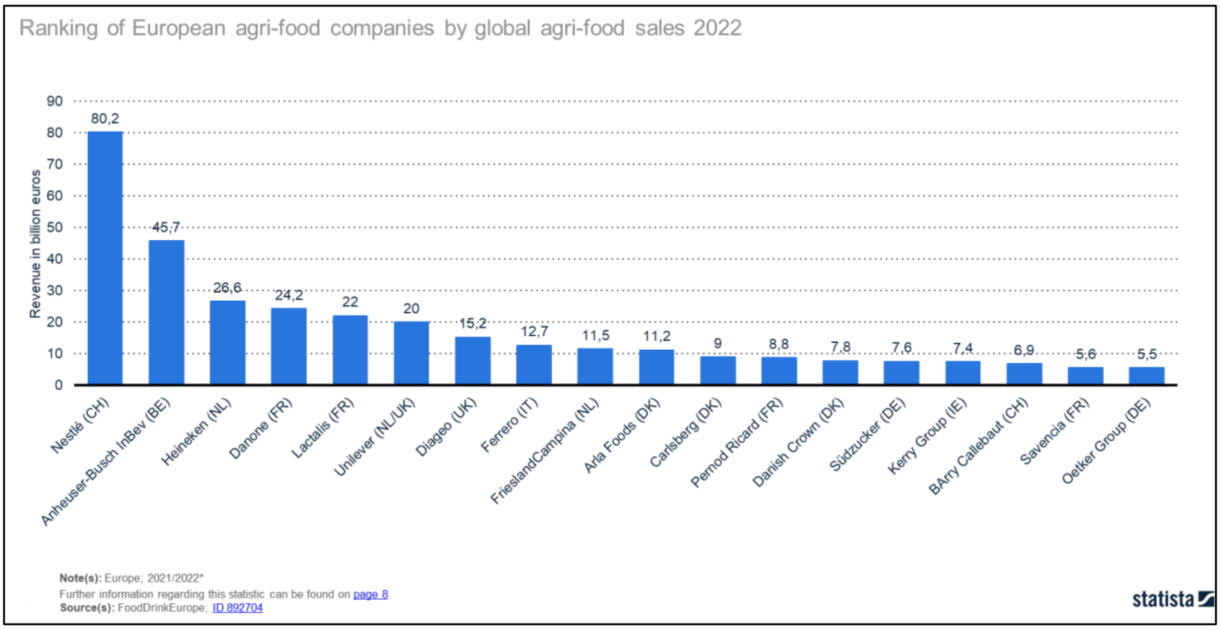
In the next section, we will discuss important stakeholders in Europe and, in particular, in these regions.

7.2 IMPORTANT SECTOR-SPECIFIC STAKEHOLDERS

Food sector associations and companies are listed in the Annex "IS policy stakeholders", section "Food".

From Figure 19 below, the most important European and UK-based agri-food companies are, according to their global agri-food sales in 2022, led by Nestlé with € 80.2 bn:

- Nestlé (CH)
- Anheuser-Busch InBev (BE)
- Heineken (NL)
- Danone (FR)
- Lactalis (FR)
- Unilever (NL/UK)
- Diageo (UK)
- Ferrero (IT)
- Friesland/Campina (NL)
- Arla Foods (DK).



Source: Statista (2023), https://www.statista.com/statistics/892704/ranking-of-europe-s-leading-food-companies-by-sales/

Figure 19: Key companies of the food industry in Europe

Of these top 10 companies, three (Heineken, Unilever and Friesland/Campina) come from the Netherlands, two (Danone and Lactalis) from France and two from the United Kingdom (Unilever and Diageo).

Their main products and brands are as follows:

1. Nestlé (CH)

- Food: Baby food, breakfast cereals, coffee, confectionery, frozen food, dairy products, pet food, and ice cream.
- Notable brands: Nescafé, KitKat, Maggi, Purina, Häagen-Dazs, Gerber, and Perrier.

2. Anheuser-Busch InBev (BE)

- Beverages: Beer, hard seltzers, malt beverages, and energy drinks.
- Notable brands: Budweiser, Stella Artois, Corona, Beck's, Hoegaarden, and Michelob Ultra.

3. Heineken (NL)
- Beverages: Beer and cider.
- Notable brands: Heineken, Amstel, Tiger Beer, Strongbow Cider, and Sol.

4. Danone (FR)
- Food: Dairy products, plant-based alternatives, baby food, and medical nutrition.
- Beverages: Bottled water and specialty beverages.
- Notable brands: Activia, Actimel, Alpro, Evian, Volvic, and Nutricia.

5. Lactalis (FR)
- Food: Dairy products including milk, cheese, butter, cream, and yogurt.
- Notable brands: Président, Galbani, Parmalat, and Société.

6. Unilever (NL/UK)
- Food: Spreads, dressings, sauces, soups, ice cream, and tea.
- Notable brands: Hellmann's, Knorr, Lipton, Ben & Jerry's, Magnum, and Walls.

7. Diageo (UK)
- Beverages: Alcoholic drinks including spirits, beer, and wine.
- Notable brands: Johnnie Walker, Smirnoff, Guinness, Tanqueray, and Baileys.

8. Ferrero (IT)
- Food: Confectionery, chocolate products, and spreads.
- Notable brands: Nutella, Ferrero Rocher, Kinder, and Tic Tac.

9. FrieslandCampina (NL)
- Food: Dairy products including milk, cheese, butter, cream, yogurt, and ingredients for food production.
- Notable brands: Friso, Campina, Chocomel, and Dutch Lady.

10. Arla Foods (DK)
- Food: Dairy products including milk, butter, cheese, yogurt, and whey-based ingredients.
- Notable brands: Arla, Lurpak, Castello, and Puck.

Südzucker (Germany), ranked 14th among the biggest European food companies, is the world market leader of the sugar industry.[26] Likewise, **Nordzucker** does not only have a leading European, but also a leading worldwide position, in the sugar industry.[27]

The most important European **sugar companies**, led by Südzucker and Nordzucker, are also listed in the annex "IS policy stakeholders", section "Food" – "Companies". In this context, Südzucker includes 29 sugar factories and two refineries, "extending from France in the west via Belgium, Germany and Austria, through to Poland, the Czech Republic, Slovakia, Romania, Hungary, Bosnia and Moldova in the east."[28]

SCALER's (2020b) statistics in Table 10 above shows interesting links between the sugar industry's key countries and key hotspots with IS potential, e.g. regarding the biggest hotspot **"BENELUX, North**

[26] https://biconsortium.eu/member/sudzucker
[27] https://www.nordzucker.com/de/
[28] https://biconsortium.eu/member/sudzucker

of France and West Germany" and the sugar industry's leading European countries **(1. Germany, 2. France,** 3. Poland, **4. Netherlands,** 5. United Kingdom, and **6. Belgium).**

Based on these findings, we also have a specific focus on the industry associations in these countries. Their details are listed in the annex "IS policy stakeholders", section "Food" – "Associations". Likewise, important sugar companies of these regions are listed there, for example, **Nordzucker Germany, Nordzucker Poland, Südzucker Germany and Südzucker Poland.**

7.3 IMPORTANT IS PRACTITIONERS

Looking at the main food sector companies listed above, examples of their involvement with industrial symbiosis include:

1. Nestlé (CH)

- By-product Utilization: Using coffee grounds and cocoa shells from production as biomass for renewable energy in manufacturing plants.[29]
- Packaging Collaboration: Partnering with packaging suppliers to develop recyclable and compostable materials, reducing waste.[30]
- Resource Sharing: Co-locating with other food producers to share utilities like water treatment facilities[31].

2. Unilever (NL/UK)

- Waste-to-Feed: Redirecting food production waste, such as tea leaves and vegetable peels, to animal feed or composting facilities.[32]
- Energy Recovery: Using factory by-products as inputs for energy production in nearby facilities.[33]
- Shared Logistics: Partnering with other companies to optimize transport networks and reduce carbon emissions.[34]

3. Danone (FR)

- Biogas Projects: Collaborating with dairy farms to convert manure into biogas, providing energy to production plants.[35]
- Packaging Recycling: Working with regional partners to establish circular recycling systems for plastic bottles.[36]
- Nutrient Recovery: Using whey, a by-product of cheese production, as an input for other food products or livestock feed.[37]

[29] https://www.beveragedaily.com/Article/2015/04/02/Coffee-power-Nestle-Waters-announces-Swiss-biogas-plant-with-a-little-help-from-Nespresso
[30] https://www.nestle.com/media/news/low-carbon-fertilizer-pilot
[31] https://www.nestle-caribbean.com/stories/cow-poo-biogas-farmers-coffee-henniez
[32] https://facilityexecutive.com/unilever-reaches-zero-waste-to-landfill/
[33] https://www.unilever.com/sustainability/responsible-business/tackling-manufacturing-waste/
[34] https://www.coursesidekick.com/business/1580236
[35] https://www.danone.com/content/dam/corp/global/danonecom/about-us-impact/policies-and-commitments/en/2023/methane-matters.pdf
[36] https://www.danone.com/sustainability/nature/circular-and-low-carbon-packaging-system.html
[37] https://www.ft.com/content/9da0429b-ab3d-42b0-81de-80659c393f03

4. Ferrero (IT)

- Circular Sourcing: Using nut shells and cocoa husks for energy production or as raw materials in biodegradable packaging.[38]
- Local Synergies: Collaborating with neighbouring industries to exchange resources like heat, water, or bio-waste.[39]
- By-product Valorisation: Turning hazelnut shells into biochar or soil amendments.

5. Anheuser-Busch InBev (BE)

- Spent Grain Reuse: Partnering with agricultural companies to use spent grains as livestock feed or inputs for biogas plants.[40]
- CO_2 Capture: Sharing captured CO_2 from fermentation processes with other industries, such as beverage carbonation or greenhouses.[41]
- Water Reuse: Treating and redistributing wastewater to local communities or industries.[42]

6. FrieslandCampina (NL)

- Manure Utilization: Converting cow manure into biogas or fertilizers through partnerships with energy companies.
- Shared Energy Systems: Using waste heat from dairy production to supply neighbouring industries.
- By-product Exchange: Supplying whey proteins and lactose to the pharmaceutical and food industries.

7. Lactalis (FR)

- Whey Valorisation: Converting whey into high-protein powders or as an input for other food producers.
- Circular Energy: Partnering with bioenergy plants to use production waste for renewable energy.
- Shared Infrastructure: Collaborating on wastewater treatment with nearby facilities.

8. Heineken (NL)

- Spent Grain Repurposing: Diverting brewing by-products, like spent grain, for use in livestock feed or bioenergy production.
- Heat Recovery: Sharing excess heat from breweries with local heating networks or nearby industries.
- Packaging Collaboration: Working with packaging manufacturers to recycle and reuse glass and aluminum.

9. Arla Foods (DK)

- Biogas Collaboration: Partnering with local farms to convert agricultural waste into biogas for energy.

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[38] https://www.theguardian.com/sustainable-business/2015/apr/21/ferrero-packaging-nutella-nutshell-biomass-biofuel

[39] https://www.ferrerosustainability.com/int/sites/ferrerosustainability_int/files/2023-06/ferrero-sr22_230621_1.pdf

[40] https://www.brewbound.com/news/anheuser-busch-backed-evergrain-gives-spent-grain-a-second-life/

[41] https://ab-inbev.eu/life-projects/beverage/#:~:text=Project%20objectives,carbon%20and%20climate%2Dresilient%20economy.

[42] https://www.ab-inbev.com/news-media/news-stories/5-ways-ab-inbev-is-helping-address-global-water-challenges

- Nutrient Exchange: Using by-products like whey for animal feed or fertilizer.
- Wastewater Sharing: Treating and reusing wastewater in collaboration with local municipalities.

10. Diageo (UK)

- Circular by-products: Utilizing by-products from whiskey production (e.g., spent grains) in renewable energy projects or as animal feed.
- CO_2 Partnerships: Capturing and sharing CO_2 emissions from distillation processes with local industries.
- Water Symbiosis: Sharing water treatment systems with neighbouring companies.

Südzucker, the leader of the sugar market, also participated in Germany's[43] Biorefineries Roadmap as part of the German Federal Government action plan for the material and energetic utilisation of renewable raw materials. It is also a member of the Bio-based Industries Consortium[44] and therefore also relevant to us in the context of the bioeconomy.

Although Europe's leading food and sugar companies are not (yet) part of the H4C platform, they include 15 businesses from the sector (13 SMEs and two bigger companies listed in the annex), highlighting the additional relevance for RISERS to collaborate with SME associations specifically.

Based on the European food and sugar industries' structure, their clusters and the IS activities of their market leaders, our specific regional focus is on Belgium, France, Germany, Italy, Netherlands, Poland and the United Kingdom regarding these industries.

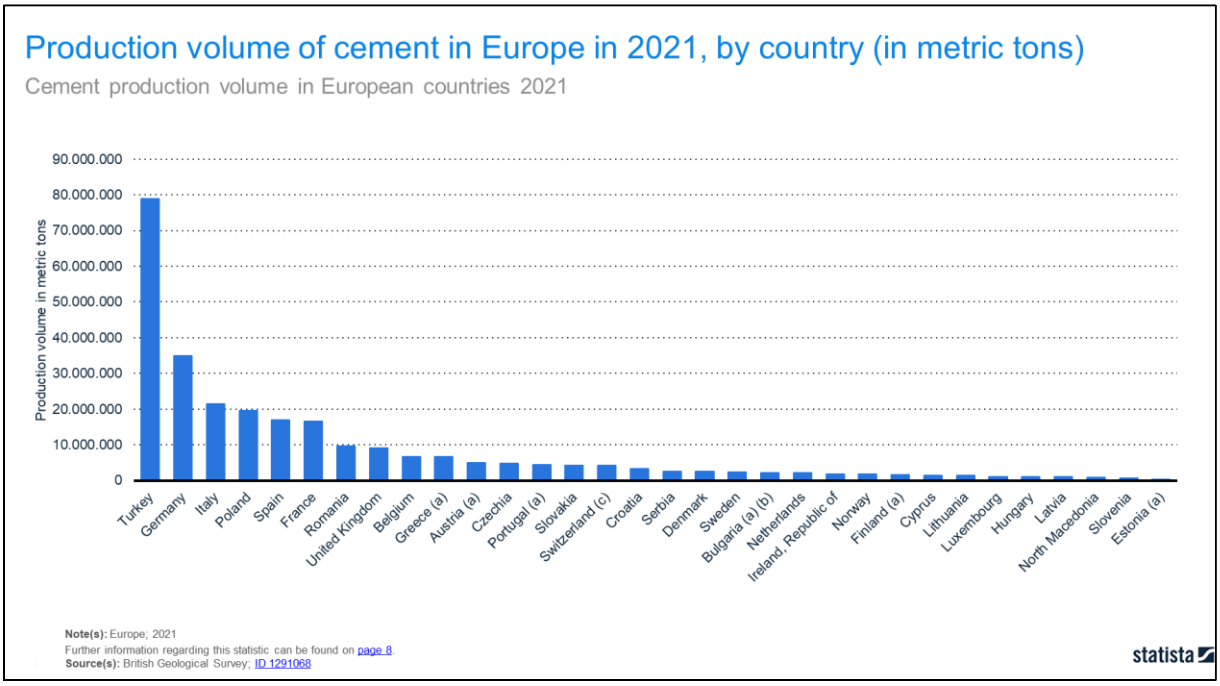
Neither the food sector nor the sugar industry is involved in H4C's development of sector guides for IS. However, three industry associations expressed their interest in the circular economy and IS in the field of food in general by their registration on the H4C platform, which are of additional interest to us: Circular Friesland in the Netherlands, Business Region Gällivare Industry Association in Sweden, and the Bulgarian-Romanian Chamber of Commerce and Industry.

[43] https://www.bmbf.de/SharedDocs/Publikationen/de/bmbf/FS/30759_Biorefineries_Roadmap_en.pdf?__blob=publicationFile&v=3
[44] See https://biconsortium.eu/member/sudzucker

8 STAKEHOLDER MAPPING BY PRIORITY SECTORS - CEMENT

8.1 SECTOR PROFILE

The European cement industry represents 17% of all documented European IS cases as a sink (rank 1 together with the chemical industry) and 5% as a source, which brings the industry to the top 7 industries in this context (see Table 3). According to CEMBUREAU (2022), the EU-27 produced 175.8 Million tonnes of cement in 2022. As Figure 20 shows, **Germany, Italy, Poland, Spain and France** are the most important EU countries of the European cement industry based on the production volume in metric tons.



Source: statista

Figure 20: Key countries of the European cement industry

As chemicals and steel, cement belongs to the energy-intensive sectors (see Branca et al., 2021b), which has specific implications regarding appropriate policy measures to support IS. In total, it generates more than 5% of global emissions of CO_2, but also of SO_2, NO_x and other pollutants (see Branca et al., 2021b).

Detailed analysis in RISERS’ deliverable D3.2 (RISERS, 2024c) have shown the particular importance of cement related IS cases with steel as a source to recover BOF slag and provide silicium, aluminium, iron and calcium for clinker raw materials and plastic packaging as a source to use plastic waste from the process industries as raw material in the cement industry.

In this context, CEMBUREAU (2024a) highlighted that the adoption of low clinker cements has gained momentum over the past decades. On average, 23% of clinker was replaced with supplementary materials like granulated slag from steel blast furnaces and fly ash from coal-fired power plants.

Information regarding industrial hotspots with suitability for IS is provided by SCALER (2020b) and Table 11.

Sector	Barcelona & Catalonia region	Benelux, North of France & West Germany	Est Germany	Krakow region	Lisbon Region & west coast of Portugal	London region	Lyon Region "Chemical Valley"	Madrid region	Northern Italy	Paris & Ile deFrance	UK Midlands	Valencia region	Total all hotspots	Total 4 Major hotspots	TOTAL Europe	Share of the all hotspots by sector	Share of the 4 Major hotspotsby sector
Cement	0	**36**	5	2	1	1	2	1	26	2	0	0	76	62	245	**31,0%**	25,3%

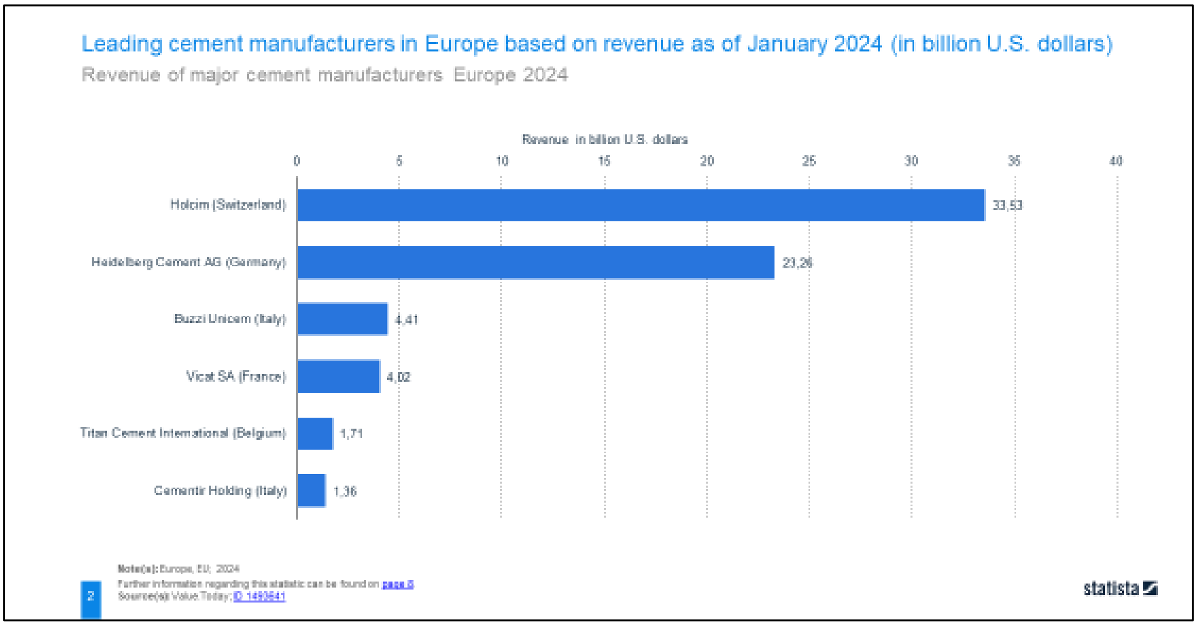
Data source: SCALER (2020b), own calculations

Table 11: Number of cement installations in major and medium density industrial hotspots

According to Figure 20 and Table 11, the leading countries of the EU's cement industry, Germany, Italy, Poland, France and Spain, are also represented by regions with specific hotspots suitable for IS. Germany and France belong to the most important hotspot in this context, the "Benelux, North of France and West Germany hotspot." Likewise, the importance of the Northern Italy hotspot of the EU's second most important country of the cement industry, is visualised.

8.2 IMPORTANT SECTOR-SPECIFIC STAKEHOLDERS

Figure 21 shows Europe's leading cement manufacturers Holcim, Heidelberg Cement AG, Buzzi Unicem, Vicat SA, Titan Cement International, and Cementir Holding. According to the figure, four of these six companies are located in Germany, Italy, and France, which belong to the top 5 countries of the EU's cement industry. Likewise, most of these companies are located in important hotspots according to Table 11.



Source: statista (2024)

Figure 21: Leading cement manufacturers in Europe

The industry is represented by CEMBUREAU, the European Cement Association and its national partner organisations (see the annex "IS policy stakeholders", section "Cement" – "Associations" for details). Other important organisations listed in the annex include ECOBA and EUROSLAG. ECOBA (European Coal Combustion Products Association e. V.) stands mainly for fly ash, which is, like slag, intensively used in cement production.

8.3 IMPORTANT IS PRACTITIONERS

Like the chemical industry, the cement industry belongs to the pioneers of IS policy making and various organisations which participated in the development of the fundamental specification CWA 17354. These organisations include **CEMBUREAU**, the European Cement Association, and **ACCIONA Construcción**. **CEMBUREAU** also published a Net Zero Roadmap (CEMBUREAU, 2024a,b), which is presented in more detail at the end of this sub-chapter. **ACCIONA Construcción** (ES) also led the IS project FISSAC (Fostering Industrial Symbiosis for a Sustainable Resource Intensive Industry across the extended Construction Value Chain, https://fissacproject.eu) with many demonstrators.

Among the market leaders, the Swiss company **Holcim** is not only the biggest European (and international) cement manufacturer, but also active in various EU countries and dedicated to IS. On its website, it represents itself as a company that "sets industry-leading standards, fosters industrial symbiosis and supports its customers to achieve their sustainability targets."[45] As an example, the French Holcim Innovation Center SAS leads the EU project ReActiv (Industrial Residue Activation for sustainable cement production, https://cordis.europa.eu/project/id/958208/results).

Cementir is not only the 6th largest European cement company, but it also represents an IS case in the MAESTRI[46] database.

H4C comprises 16 businesses, industry associations and non-profit organisations in the field of cement.

It also includes **Cemex**, a global operating company which belongs to the ten biggest cement producers worldwide. Cemex has participated in various European IS projects, also including the EPOS project. Cemex and the **Polish Runiki cluster** also participated in an EPOS SWOT analysis to replicate IS practices (EPOS, 2019). The foundation of the analysis was the **Hull cluster** in the United Kingdom (Maqbool, 2020).

Another interesting example of H4C-registered organisations is the **Norwegian region Vestland,** listed in the Annex. According to Green region Vestland and EY, Green Region Vestland developed a portfolio of 16 green hubs with an estimated investment demand of NOK 225 billion. Focused on the goal that the hubs work together to achieve IS, the region aims to create more than 17,000 green jobs.[47]

CEMBUREAU's Net Zero Roadmap CEMBUREAU (2024a) mentioned above describes the following objectives according to CEMBUREAU (2024b):

- By 2030, a 37% reduction in CO_2 emissions related to cement production, and 50% down the value chain.
- By 2040, a 78% reduction on cement, and 93% down the value chain.
- By 2050, carbon neutral cement production in Europe.

[45] https://www.holcim.com/what-we-do/applications/sustainable-waste-management
[46] https://doi.org/10.17863/CAM.12608, see also section 2 of this document
[47] https://www.ey.com/en_no/insights/consulting/how-the-vestland-region-can-realize-its-potential-for-green-growth, https://www.gronregionvestland.no/english

The roadmap also highlights key policy needs to meet these goals, including, for example, the creation of lead markets for low-carbon, circular products. It also describes the following needs regarding cement, clinker (the backbone of cement production), concrete, and construction in general:

- Review **public procurement** rules and standards to create lead markets for low CO_2 products.
- Encourage demand incentives through progressive, predictable and material-neutral building regulations.
- Make a step change on the circular economy: ban the landfilling of waste, **incentivise** recycling processes, support the use of waste in industries and encourage circularity and life cycle thinking throughout the construction value chain.

Adopting cements with reduced clinker content can lead to substantial emission reductions. Specific needs regarding such "low clinker cements" for policy support include:

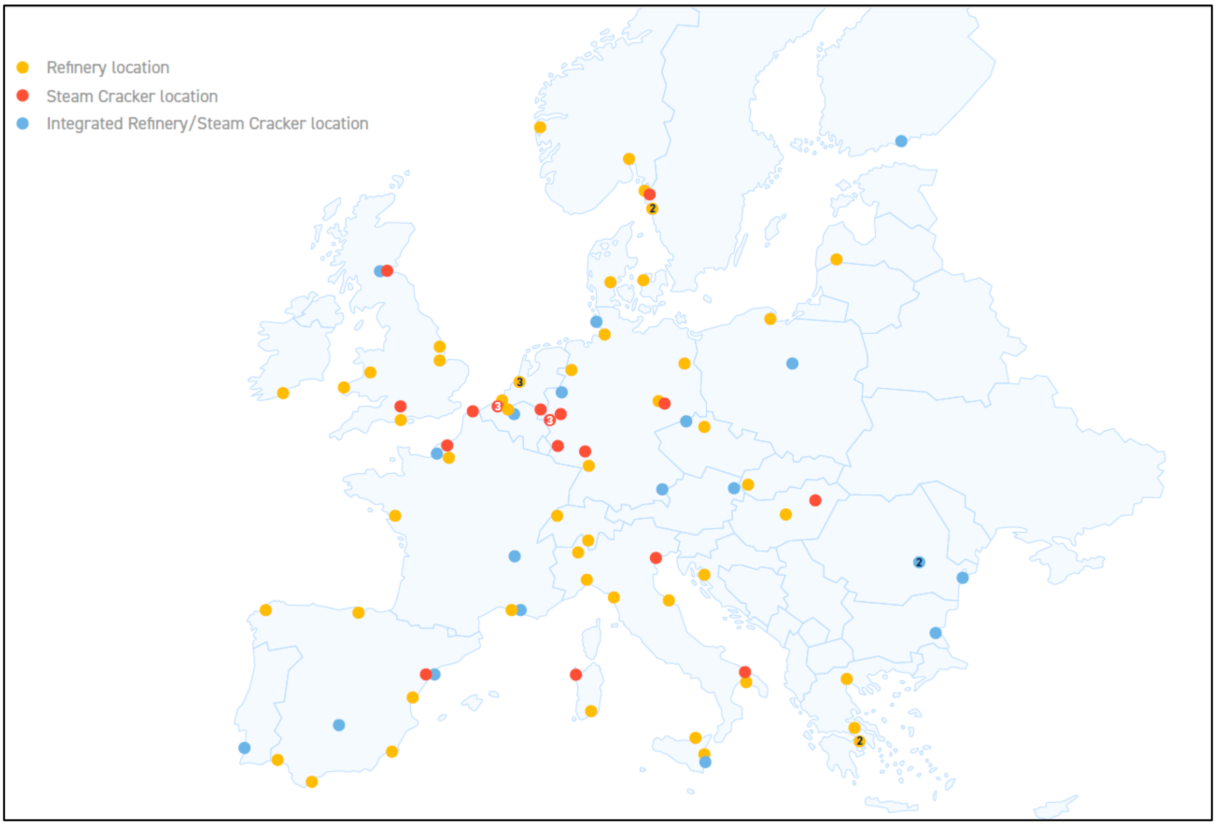
- Develop ambitious **waste management policies** to incentivize the recovery and use of materials from industrial waste as SCMs, facilitate waste shipment between EU countries, discourage landfill, and minimise exports of waste outside the EU.
- Acknowledge recovered materials (such as **fly ash**) **as secondary materials** (i.e. no longer waste after processing).

Partnering with **CEMBUREAU,** the **CO2 Valorize** project investigates the potential of waste materials such as mine tailings and recycled concrete to be used as supplementary cementitious materials (SCMs). Recycled concrete fines is another promising option, with numerous plants already implementing this technology across the EU (see https://cordis.europa.eu/project/id/101073547 and CEMBUREAU, 2024a).

9 STAKEHOLDER MAPPING BY PRIORITY SECTORS – REFINERIES

9.1 SECTOR PROFILE

According to statista (2024b), there were almost 90 oil refineries operating in Europe as of early 2024. Significant share of crude oil refineration is located in **Germany -** which has the most refineries in Europe **- Italy, Netherlands** and **Belgium,** but also in **France, Spain** and **the United Kingdom** (see Figure 22 and FuelsEurope, Statistical Report, 2022, which is also the main source of the following descriptions).



Source: Concawe and Petrochemical Europe (data 2019) from FuelsEurope, Statistical Report (2022)

Figure 22: Refinery/steam cracker sites in Europe

An interactive map with detailed information on all European refineries is provided by Concawe here: https://www.concawe.eu/refineries-map/.

Europe's petrochemical and energy infrastructure plays a crucial role in ensuring the continent's energy security and industrial output. Its refineries process crude oil into essential fuels such as gasoline, diesel, and heating oil.

Around 1/3 of the industry's installations are located in major and medium density industrial hotspots (see SCALER, 2020b). **Western and Central Europe,** particularly countries like **Germany, France, and the Netherlands, serve as key players** in this network. The highest density of the installation is in **Benelux, North of France** and **West Germany**. Examples of integrated hubs identified by RISERS partner IETU include sites in **Germany's Ludwigshafen and France's Fos-sur-Mer**, where both re-fining and petrochemical processing activities take place, strengthening their role as key centres for industrial operations. Certain locations across Europe house both refineries and steam crackers, further boosting their capacity to meet the continent's energy and industrial needs.

An additional notable site identified by IETU located in **Gonfreville, France,** serves as an important hub for producing not only fuels but also a wide range of petrochemical products essential for multiple industries. Major hubs for refining activities are also located in **Rotterdam, Antwerp**, and several key locations in the **United Kingdom**, including **Stanlow and Fawley**. These sites contribute significantly to the production and distribution of energy products, underpinning various sectors of the European economy, for example, transportation, logistics and municipal heating. In addition to refineries, steam crackers are pivotal to the petrochemical industry. These facilities break down hydrocarbons into fundamental components used to produce plastics and other vital chemicals. Many of these crackers are co-located with refineries, creating industrial clusters that enhance efficiency and production capabilities.

Currently, the industry faces various economic challenges. FuelsEurope (2022) details the closing and transformation of 26 mainstream refineries since 2009. Moving away from oil and converting into bio-refineries is a main element of this transformation process. This is another important framework condition that policy making to support IS has to consider ensuring an appropriate link with this transformation process.

According to observations by IETU, the current infrastructure will need to evolve as the EU transitions towards more sustainable energy sources and seeks to reduce its dependence on fossil fuels. In this context, the shift towards renewable energy and eco-friendlier chemical production is likely to continue to shape the future landscape of Europe's industrial centres. It is the most important that the key symbiotic relations of refineries are related to the energy generated based on refinery wastes serving not only refineries themselves and the interlinked petrochemical sector, but also power plants and heating facilities.

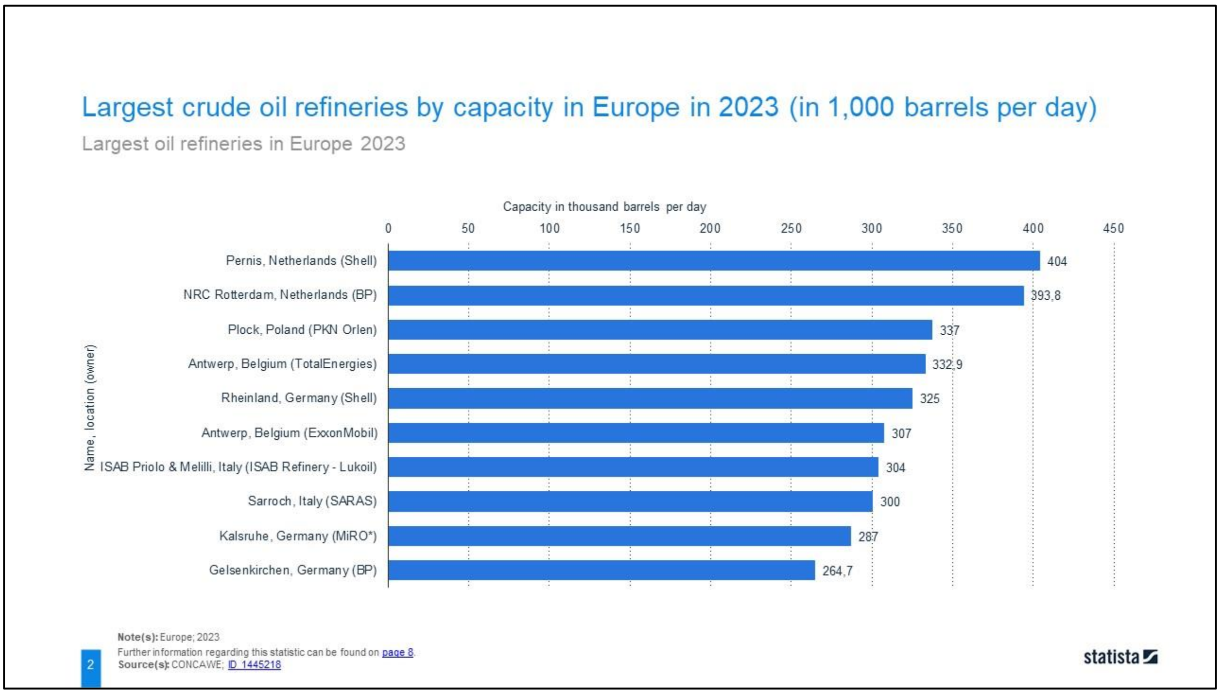
Another essential relation observed by IETU is related to waste management and the reuse of mineral resources. IS in refineries goes beyond waste management to include advanced applications of waste heat and carbon dioxide. In Rotterdam in particular, collaboration between refineries and greenhouse operators has led to a significant reduction in CO_2 emissions, with diverted emissions meeting the needs of agriculture. Investment in infrastructure for the use of waste heat and legislative improvements for the reclassification of waste as secondary raw materials remain crucial for the expansion of such initiatives.

At the same time, the interconnectedness of refineries and petrochemical plants across Europe reflects their significant role in supporting various industries such as transport, automotive, aviation, and manufacturing. Case studies illustrate the ecological and economic benefits of IS. In Guayama, Puerto Rico, for example, the exchange of steam between a refinery and a power plant reduced sulphur dioxide emissions by 99.5%, particulate matter emissions by 95%, and nitrogen oxides by 84% (see Chertow et al, 2008). These examples underline the transformative potential of the refinery symbiosis to achieve sustainability goals.

As the geopolitical and environmental landscapes continue to shift, Europe’s energy infrastructure can play an increasingly vital role in securing long-term energy stability and meeting environmental targets.

9.2 IMPORTANT SECTOR-SPECIFIC STAKEHOLDERS

In Europe, a significant share is represented by large crude oil refineries located in different countries. Key European refinery companies are shown in Figure 23.



Source: statista, * Joint venture between Phillips66, ExxonMobil, Shell, and the Bundesnetzagentur

Figure 23: Key European refinery companies

According to the figure, they include Shell and BP (NL), PKN Orlen (PL), TotalEnergies (BE), Shell (DE), ExxonMobil (BE), ISAB Refinery and SARAS (IT) as well as MiRO and BP (DE). As the overview shows, BP and Shell each have more than one refinery listed among the top 10 largest companies.

The refineries and the petrochemicals sector are represented by several associations, national and European ones included in the Annex. Associations in the member states include, e.g.:

- Concawe (originally standing for “ CONservation of Clean Air and Water in Europe”), Europe
- DVGW (Deutscher Verein des Gas- und Wasserfaches e.V.), Germany
- Assorisorse (Associazione Italiana per l'Industria Mineraria e Petrolifera), Italy
- NOGEPA (Netherlands Oil and Gas Exploration and Production Association), Netherlands
- BRAFCO (Belgian Federation of Fuel Traders), Belgium
- VEMOBIN (De Vereniging Energie voor Mobiliteit en Industrie), Netherlands
- DWV (German Hydrogen Association e. V.), Germany
- en2x (en2x - Business Association Fuels and Energy e. V.), Germany

The introduction of hydrogen-based technologies is becoming increasingly crucial for the future of refinery symbiosis. Organizations such as Hydrogen Europe and the Clean Hydrogen Partnership are actively promoting innovative solutions that improve energy efficiency and reduce CO_2 emissions. This consolidates the role of hydrogen as a cornerstone of sustainable development in the refining industry.

9.3 IMPORTANT IS PRACTITIONERS

In the context of IS within refineries, organizations like **Hydrogen Europe** and the **Hydrogen Council** play a significant role in advancing innovative technologies, including the use of hydrogen. Collaboration in the refining sector can enhance effective waste management through recycling and processing, thereby minimizing environmental impacts. Apart from indicated organisations, some of the units are participating in international networks dedicated to networking and knowledge exchange. One of them is **World Refining Association**, which is an international platform for networking and knowledge sharing focused on traditional refining techniques and future developed technologies.

The H4C platform only includes one entry from the EU in the section on refineries: the **Port of Antwerp-Bruges.**[48] Therefore, additional analyses of this sector took place by RISERS partner IETU.

In this context, programs such as the **Rotterdam Port Initiative** are an example of how government support can promote IS. This program not only facilitated the use of waste heat, but also fostered trust between participants by transparently communicating the environmental and economic benefits.

Similarly, the **Kalundborg** symbiosis in **Denmark** highlights the importance of shared infrastructure and community involvement in adopting long-term sustainable practices. In European scale similar unit is **Chemical, Petrochemical and Refining Cluster**[49] in Portugal, which includes industry & research units interested in such activity.

Other important examples include **Humber (United Kingdom), and Lysekil, Sweden** (see Neves et al. 2023 and, in addition, Neves et al. 2020 regarding Humber and Rotterdam).

In **Poland**, the **Cluster of Hydrogen Technologies** and the **Polish Chamber of Chemical Industry (PIPC)** are focusing on solutions that can convert waste into secondary raw materials for refining processes. The symbiosis between refineries and emerging technologies, including hydrogen, is essential for improving energy efficiency, reducing CO_2 emissions, and fostering sustainable development.

Concawe, whose members include **most oil companies operating in Europe (e.g. Shell, BP, Orlen, and Total Energies**[50]**)** and its Concawe Refinery Waste Special Task Force have carried out various analyses on the sector's sustainability and its waste management options. In this context, the Concawe (2020) report "Exploring possible pathways for the EU refining system to contribute to a low-CO_2 economy in the 2030-2050 time frame" also addresses, for example, the use of waste heat and wood waste from industry. Concawe's (2024) report "Sustainability Assessment of Waste Sludge Management Options" also includes various IS options, e.g. co-processing in cement plants. Based on these considerations, Concawe appears to be a very interesting stakeholder for RISERS WP 5's future policy-related activities to promote IS in this sector.

Regarding stakeholders' needs and expectations related to IS, Neves et al. (2023) describe the "major challenge (of) constraints in the legislation regarding the use of waste." "Often there are barriers to consider a waste product as a by-product, which prevents it from being used as a raw material by another entity. " These findings stress our sector-independent findings in section 3.2.

[48] Another organisation from outside the EU that is registered there is the Istanbul Mineral and Metals Exporters' Association. Two additional organisations do not provide appropriate contact data there.
[49] See https://profile.clustercollaboration.eu/profile/cluster-organisation/38e16f36-be35-48e2-ab5a-94aeada-bcbd1 for details
[50] See https://www.concawe.eu/who-are-we/membership/

10 STAKEHOLDER MAPPING BY PRIORITY SECTORS – BIOECONOMY

10.1 SECTOR PROFILE

The bioeconomy gains increasing importance in the strategic focus of the European Union and has been identified as a key sector to achieve the Union's sustainability and climate targets. Strategically, the bioeconomy is integral to the European Green Deal, which aims to make Europe the first climate-neutral continent by 2050. The EU's dedicated Bioeconomy Strategy focuses on developing a sustainable and circular bioeconomy to address societal challenges and enhance the competitiveness of bio-based industries. Significant funding for bioeconomy-related projects is also allocated through the EU's research and innovation framework program, Horizon Europe (Bio-based Industries Consortium, 2024).

The terms bioeconomy (BE) and bio-based economy (BBE) are sometimes used interchangeably. However, it is worth it to distinguish them: The "**biobased" (also "bio-based") economy** is a subset of the bioeconomy that focuses specifically on replacing fossil-based resources with biological ones in the production of materials, chemicals, and energy; and excludes primary biomass production. It aims to use biomass (plant- and algae-derived resources) as a substitute for petroleum-based materials in products such as plastics, chemicals, and fuels.

Bio-based products are wholly or partly derived from materials of biological origin (such as plants, animals, enzymes), and microorganisms, including bacteria, fungi and yeast) (European Commission, n.d.). The *Bio-based Industries Consortium* developed a methodology to derive the share of bio-based production in the basic economic indicators of the sectors that are active in the bioeconomy. They assessed a € 2,35 trillion turnover for the bioeconomy according to Figure 23, and € 725 billion turnover for the bio-based sector in the EU in 2021, see Figure 24, taken from Bio-based Industries Consortium, 2024.

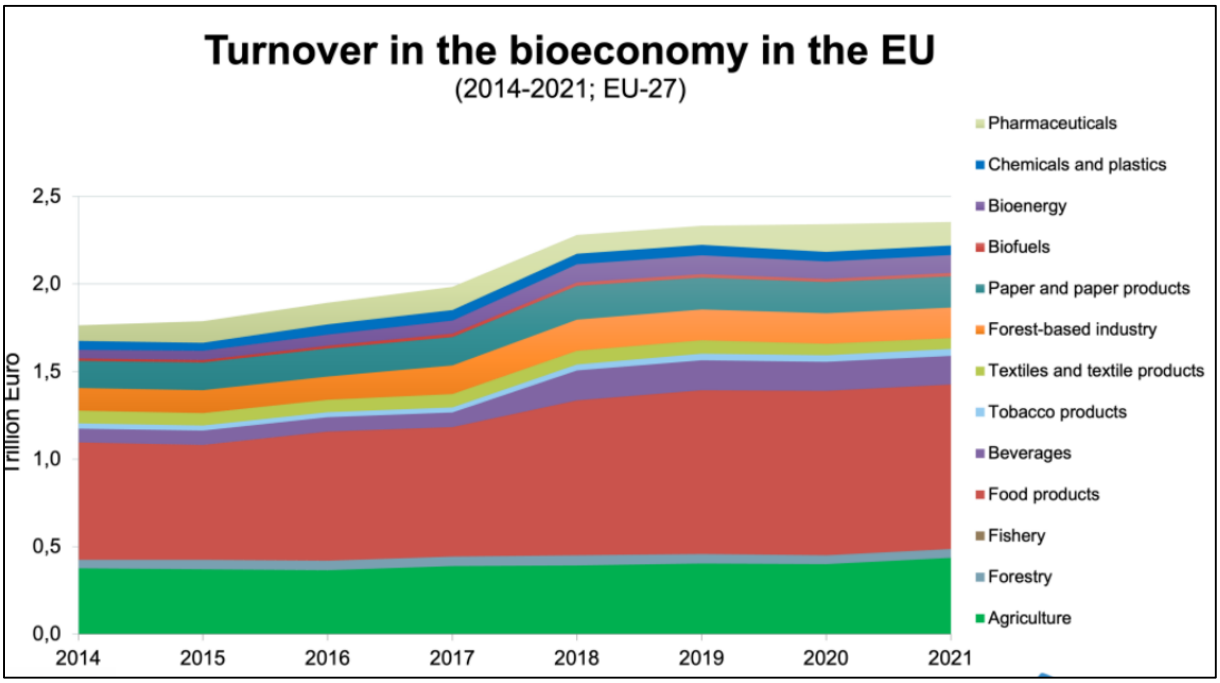


Figure 24: Turnover in the bioeconomy in the EU (2014–2021; EU-27)

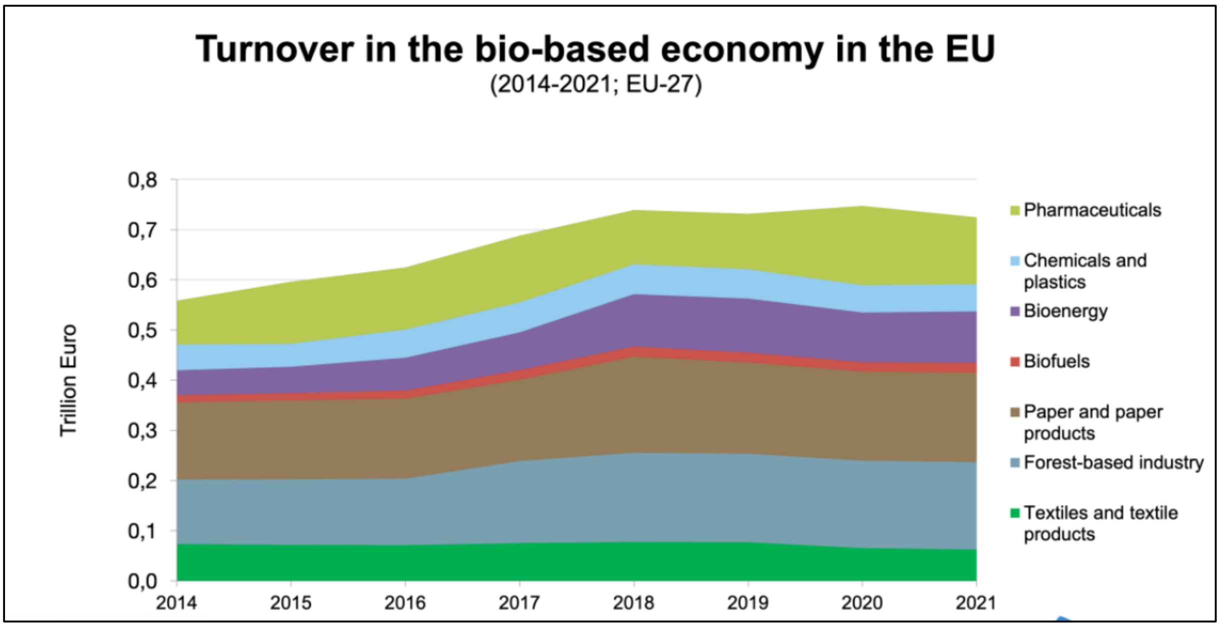


Figure 25: Turnover in the bio-based economy (2021; EU-27)

Employment in the bioeconomy generated about 16 million jobs in the EU, of which 3,3 million are in the bio-based economy. Looking towards the specific share of the bio-based industries in the production of chemicals and chemical products (see Figure 24), some substantial geographical differences can be observed.

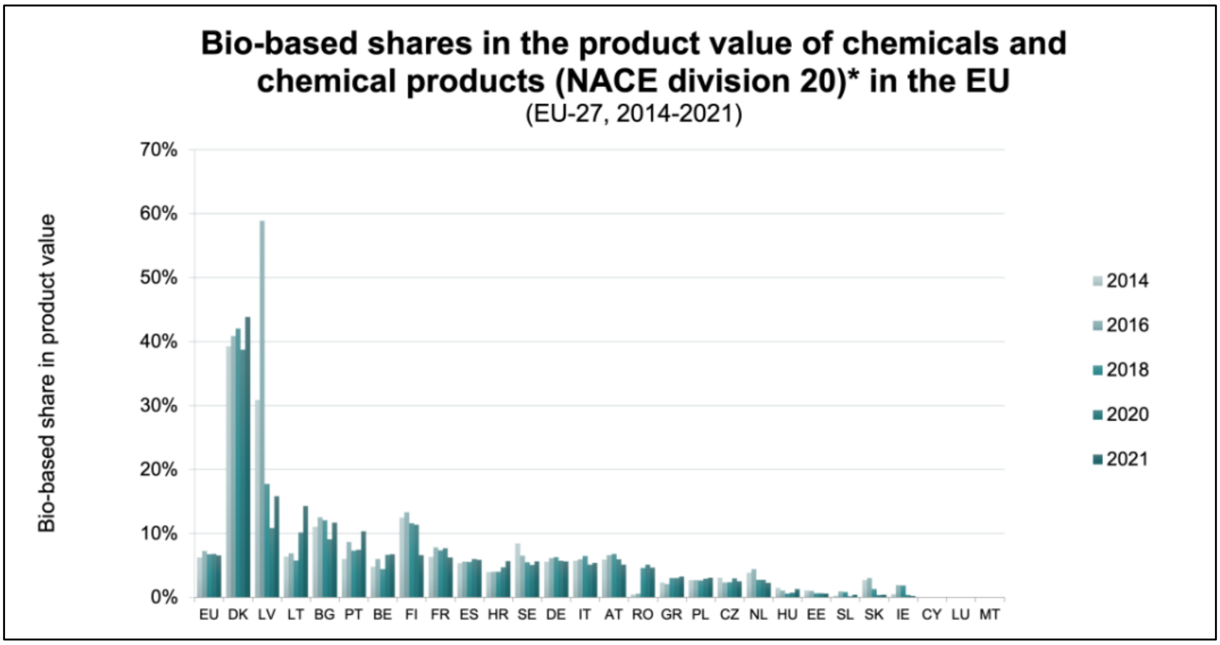


Figure 26: Bio-based shares in the product value of chemicals and chemical products (NACE division 20), EU27, 2014-2021

Figure 27 shows the contribution of the different NACE classes to the total product value of bio-based chemicals in bn. € within the EU-27.

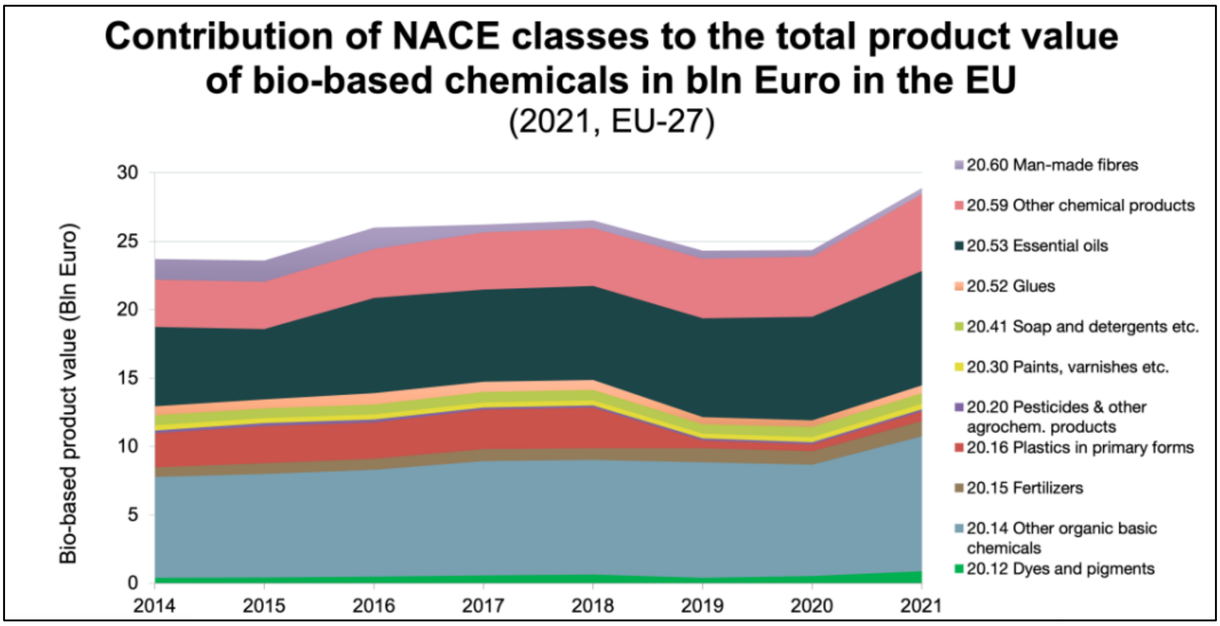


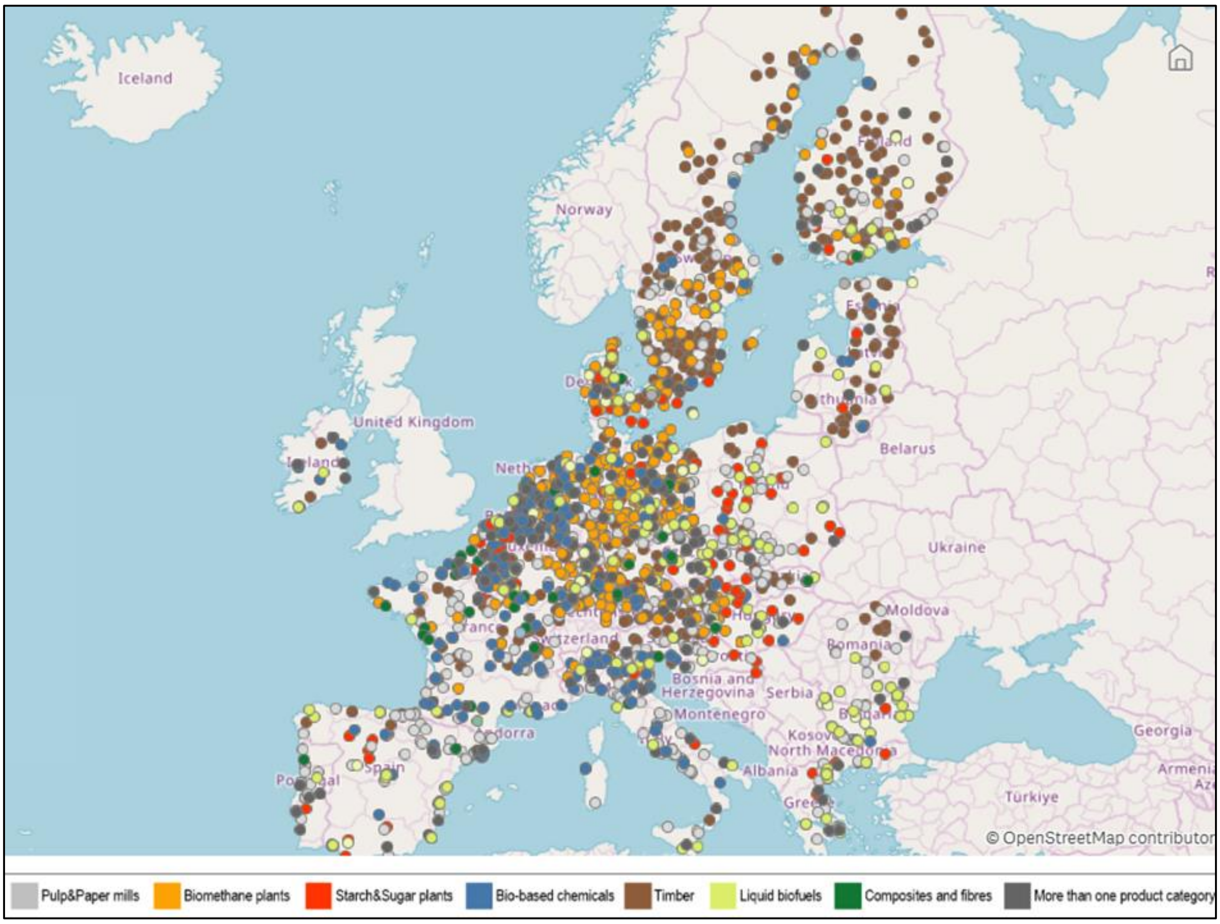
Figure 27: Contribution of NACE classes to the total product value of bio-based chemicals

Looking into clustering, the European commission has indicated the importance of biorefineries for the advancement of the bio-based economy within the EU (Knowledge for policy, n.d.). An initial study identified 224 biorefineries operating in the EU at the end of 2017. The raw materials and main end-products differ according to location and market focus. On the other hand, work by the Joint Research Centre mapped more than 800 facilities producing bio-based products, of which more than 500 are dedicated to the production of bio-based chemicals. The distribution of these biorefineries can be found in Figure 28.

The European Commission also includes a live dashboard, showing 2,362 facilities related to bio-based activities within EU27 (European Commission, 2018b). Based on updated data from 2022, Knowledge for policy presents the same figure on its website[51].

Multi-product biorefineries are important, because they improve the efficiency of biomass utilisation by increasingly parallel exploitation of sideflows, reducing and/or recovering waste and residues, thereby boosting resource efficiency and waste prevention as well as recycling and circularity. The transformation of waste and residues into higher added value products will further link various sources of biomass with the production of an array of products such as food, feed, biotextiles, biopolymers, chemicals, bioplastics and eventually bioenergy/biofuels, thereby increasing the value creation, jobs and competitiveness as well as sustainability of biomass production and use as well as the value creation (Knowledge for policy, n.d.).

[51] https://knowledge4policy.ec.europa.eu/visualisation/bio-based-industry-biorefineries-eu_en



Source: European Commission (2018b), an updated interactive map with data from 2022 can be found at: https://knowledge4policy.ec.europa.eu/visualisation/bio-based-industry-biorefineries-eu_en
Figure 28: Map of the distribution of bio-based industrial plants, including biorefineries

While various EU regions are active in the bio-economy, Mubareka et al. (2023) specifically highlights the joint initiative of the leading bioeconomy clusters in the Netherlands, France, the UK and Germany via the 3BI (Brokering Bio-Based Innovation Cluster) intercluster activity.

Regarding policy making, twelve EU-27 countries have national bioeconomy strategies dedicated to the bioeconomy as of December 2024: Austria, Estonia, Finland, France, Germany, Ireland, Italy, Latvia, the Netherlands, Norway, Portugal and Spain. Seven other member states have such strategies under development (Croatia, Czechia, Hungary, Lithuania, Poland, Slovakia and Sweden). Six other member states have other policy initiatives dedicated to the bioeconomy (e.g., a sub-national bioeconomy strategies in Belgium), see FAO (2024).

10.2 IMPORTANT SECTOR-SPECIFIC STAKEHOLDERS

A key representative of bio-based companies is **Bio-based Industries Consortium** https://biconsortium.eu/ with more than 300 industry members and 250 associate members. 145 key stakeholders are also presented by nova-Institute's Renewable Carbon Initiative https://renewable-carbon.eu/companies/, see more details in the annex "IS policy stakeholders", section "Bioeconomy" – "Associations". Due to the bio-based economy's link to the chemical sector, the list includes also various chemical companies.

Apart from this, the EU also supports the development of the bio-based economy by the Bio-based Industries Joint Undertaking, a €3.7 billion Public-Private Partnership between the European Union and the Bio-based Industries Consortium (BIC)[52]. Until today, BBI JU has funded 142 bio-based innovation projects involving 1,055 beneficiaries from 39 EU Member States and Associated Countries. Pilots4U maps all existing open access pilot and demo-infrastructures across Europe, creating a very visible and easily accessible network for the European bio-economy. The crucial role of the EU in financing pilot facilities to enforce the growth of the bio-based economy does not go unnoticed. The Smidt Futures task force (USA) defined innovative hubs like **BioBase Europe** as the gold standard for biomanufacturing pilot facilities.[53] As described in the next section, BioBase Europe is also involved in IS activities via the project Symba.

10.3 IMPORTANT IS PRACTITIONERS

As examples of IS practice, many practitioners can be listed in a wide range of long existing but also highly innovative applications in bio-based technology. The following examples of bio-based chemicals, surfactants, ethanol, and proteins, as well as IS with the food, steel and wood industry, demonstrate the wide range of applications.

As one of the first movers, **Citribel (Belgium)** has been producing citric acid chemical by fungal fermentation of sugar molasses, which are a side product of sugar factories[54], since 1919.

Celtic Renewables (Ireland) is using similar conversion of residues from whiskey distilleries to produce chemical products. It was the first company to produce biofuel from the by-products of the scotch whisky industry.[55]

Bio-based surfactants are also being produced from **organic waste**, for example by the Belgium startup **Amphistar**, which produces specialized chemicals for use in detergents, emulsifiers etc.[56]

The **Steelanol** process in Ghent (Belgium) is using cokes oven gas from **steel production** to produce ethanol in Ghent (Belgium), see also chapter 6.3.[57]

Another industrial application is **Arbiom** (France), which is producing single **cell proteins** from **wood-waste** by fermentation, to produce animal feed.[58] Human food can also be made from industrial waste products as has been demonstrated by **Enough,** which is producing vegan protein food products from soy industry sidestreams (Netherlands).[59]

Seven businesses and three non-profit organisations from the field of bio-based chemicals are engaged on the **H4C platform**. The companies are located in Austria, Germany, Greece, Italy, Portugal and

[52] See https:/www.bbi.europa.eu/
[53] See https://www.schmidtfutures.org/wp-content/uploads/2023/05/Bioeconomy-Task-Force-Strategy-4.14.22-4.pdf
[54] See www.citribel.com
[55] See https://www.bbeu.org/what-we-can-achieve-together/testimonials-and-collaboration-results/
[56] See https://amphistar.com/
[57] See http://www.steelanol.eu/en
[58] See https://arbiom.com/arbiom-receives-e12-million-to-build-its-first-commercial-plant/
[59] See https://www.enough-food.com/our-factory

Romania, and the other organisations in Germany, the Netherlands and the United Kingdon/Northern Ireland.

In addition, the EU launched a specific funding programme to support IS in bio-based industries, called "**Symbiosis in the bio-based industrial ecosystems"** (see CORDIS, 2023). Two projects were funded by that programme: SYMBA und SYMBIO.

SYMBA stands for "Securing local supplY chains via the development of new Methods to assess the circularity and symbiosis of the Bio-bAsed industrial ecosystem enhancing the EU competitiveness and resource independence". The project has a particular focus on the chemical industry, textiles, packaging and biofertilizers.

Besides its leader, the Italian SME ENCO SRL, the SYMBA consortium also comprises the Fundación CIRCE Centro de Investigacion de Recursos y Consumos Energeticos, Spain, the Centre Scientifique & Technique del'Industrie Textile Belge ASBL, Belgium, the Climate-KIC Holding BV, Netherlands, the Bio Base Europe Pilot Plant VZW, Belgium, AIMPLAS, Spain, Novamont SPA, Italy, Fundacion Centro Gallego Investigaciones Del Agua, Spain and the ICLEI GmbH, Germany.

SYMBIO refers to "Shaping symbiosis in bio-based industrial ecosystems based on circular by-design supply chains". Led by the Lombardy Green Chemistry Association, the project's work includes 12 European pilot regions: Lombardy, Piedmont, Veneto, Friuli-Venezia Giulia, Emilia-Romagna, Carinthia, Slovenia, Croatia, Andalusia, Brussels Capital, Wallonia, Flanders.

Other partners are ANTEJA ECG D.O.O., Slovenia, the Fundación Corporación Tecnológica de Andalucía (CTA), Spain, alchemia-nova GmbH, Austria, Kärntner Betriebsansiedlungs- und Beteiligungsgesellschaft M.B.H., Austria, Hrvatski Drvni Klaster, Croatia, Startup Europe Regions Network, Belgium, Tajana Radic, Croatia.

The **programme "Symbiosis in the bio-based industrial ecosystems"** shows the EU's specific interest in IS in this area. RISERS aims to provide further support by contributing to appropriate policy measures to promote IS among these stakeholders.

As mentioned above, Mubareka et al. (2023) documented the specific initiative of the leading bioeconomy clusters in the Netherlands, France, the UK and Germany via the 3BI initiative. In addition, our description of IS-stakeholders presented various Belgian bio-based companies, also including, for example, Steelanol, which was already mentioned in the chapter on the steel sector, referring to its IS partners in Ghent. The SYMBIO project's 12 pilot regions include 5 clusters in Italy, 3 in Belgium, 1 in Spain and 3 others. For these reasons, or key countries of bio-based IS are not only Netherlands, France, the United Kingdom and Germany, but also Italy, Belgium and Spain.

11 SUMMARY AND OUTLOOK

This report aimed to specify and map relevant stakeholders for RISERS' activities to support policy making to promote IS and to identify first policy needs and expectations. A mix of methods, including literature and statistical analyses, a survey, a cross-project meeting, and various other measures were used for this purpose.

On this basis, **sector-independent** and **sector-specific policy stakeholders** were identified. Task 5.1 part of the Task 6.2 survey demonstrated the need for involvement and collaboration on all policy levels from the regional/local level to the EU and international level. Sector-independently, the importance of different European DGs and institutions, national governments, cities and regions was emphasized. On the national level, the survey also showed the cross-ministry task of supporting IS. IS clusters and hotspots with IS potential were also presented.

The importance of the **governments** refers in particular to the need of overcoming the barrier of different IS framework conditions in the member states. In addition, GPP is regarded as a helpful tool to support IS on member state level.

Sector-specifically, the chemicals, steel, food, cement, refineries, and bio-based sectors were selected as priorities of RISERS' policy making. Major countries and IS practitioners in these areas also unveiled key national governments for these six priority sectors and the national industry associations to be engaged to support IS.

Country-wise, our analysis unveiled the specific importance of **eight countries** for our work according to Table 12: Belgium, France, Germany, Italy, Netherlands, Poland, Spain and the United Kingdom.

Sector & country	Chemicals	Steel	Food, in particular sugar	Cement	Refineries	Bio-based	Big sector-independent networks[1]	Total
Belgium	x	x	x	x	x	x		6
France	x	x	x	x	x	x	x	7
Germany	x	x	x	x	x	x	x	7
Italy	x	x	x	x	x	x	x	7
Netherlands	x	x	x		x	x		5
Poland	x	x	x	x	x			5
Spain	x	x		x	x	x	x	6
United Kingdom	x	x	x	x	x	x		7
Other		x[2]		x[3]	x[4]	x[5]	x[6]	

[1] According to number of employees in Domenech et al. (2019), [2] Austria (industry only)
[3] Norway, [4] Denmark, Sweden, [5] Croatia, Slovenia, [6] Austria, Denmark (same example as refineries), Norway, Sweden

Table 12: Key countries for RISERS' policy making based on its priority sectors, the industries' national and IS activities

Stakeholder's **needs and expectations** were analysed through literature-based, survey-based methods, and by specific analyses in our priority sectors. Regarding further steps for policy making to support IS, twelve general topics were specified.

1. Simplify regulations for defining waste and end-of-waste status.

2. Harmonize waste classification across EU member states.
3. Develop solutions for by-products.
4. Reduce administrative barriers for using treated wastewater.
5. Create accessible registries for waste flows to improve transparency.
6. Remove regulatory barriers for selling different energy carriers.
7. Simplify permits for IS projects.
8. Introduce regulatory sandboxes or living labs to test innovative IS approaches.
9. Adjust tax policies to favor secondary raw materials.
10. Introduce financial rewards for recycling and reuse initiatives.
11. Intensify awareness raising to support IS.
12. Promote education on IS and the establishment of IS facilitators.

In addition, considering **industry-specific framework conditions** will be an important requirement for the specification of appropriate policy measures.

Cement, chemicals and **steel** also belong to the Sustainable Process Industry through Resource and energy Efficiency (**SPIRE**) sectors. These sectors are characterized by a high dependence on resources (energy, raw materials and water) in their production and strive for long-term sustainability, supported by appropriate European policies (see Tello and Weerdmeester, no date). Their characteristics also show the importance of analysing to what extent support for energy- and water related IS can help these industries.

The **cement** industry has already developed a sector-specific roadmap with various measures to support IS, which make future collaborations very attractive for RISERS. The European **steel** industry faces many challenges at the moment, which requires specific considerations as to what extent its stakeholders can currently dedicate resources to our proposed activities.

Our analyses also highlighted differences of sectors' engagement related to their involvement in H4C and/or H4C ECoP. For example, the sector associations engaged by H4C ECoP to create sector guides for IS do not specifically represent **food and bio-based companies**. Likewise, **refineries** are missing in the special "Refineries" section of the H4C stakeholder platform, showing opportunities for additional engagement of these sectors.

Regarding bio-based companies, the programme ”Symbiosis in the bio-based industrial ecosystems” shows the EU's specific interest in IS in this area. RISERS aims to provide further support by contributing to appropriate policy measures to promote IS among these stakeholders.

RISERS' next steps in the development of policy recommendations will consider all these framework conditions specifically.

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RISERS

A Roadmap for Industrial Symbiosis Standardisation
for Efficient Resource Sharing

ANNEX: IS POLICY STAKEHOLDERS

SECTOR-INDEPENDENT STAKEHOLDERS

Note: * represents already existing contact data

POLICY MAKERS

Name (each organization stands for specific experts relevant to RISERS included in a RISERS database)	Kind of stakeholder	Country	Justification
European Commission*	EU institution	BE	RISERS analysis in H4C
DG Environment*	EU institution	BE	RISERS analysis in H4C
DG Regions	EU institution	BE	Policy analysis
DG Enterprise	EU institution	BE	Policy analysis
DG Innovation and Research	EU institution	BE	Policy analysis
CINEA - European Commission*	EU institution	BE	RISERS analysis in H4C
CARDET*	EU institution	CY	RISERS analysis in H4C
European Investment Bank (EIB)*	EU institution	LU	RISERS analysis in H4C
EIT Climate-KIC*	EU institution	UK, XI	RISERS analysis in H4C
Federal Ministry for Economic Affairs and Climate Protection (BMWK)	National institution	DE	Experience of RISERS partner
Komptenzstelle für nachhaltige Beschaffung Beschaffungsamt des BMI*	National institution	DE	Experience of RISERS partner
IDEA Consult*	Regional administration	BE	RISERS analysis in H4C
Province East-Flanders*	Regional administration	BE	RISERS analysis in H4C
OVAM*	Regional administration	BE	RISERS analysis in H4C
POM Limburg*	Regional administration	BE	RISERS analysis in H4C
Zagreb County*	Regional administration	HR	RISERS analysis in H4C

Name	Kind of stakeholder	Country	Justification
Regional Council of Päijät-Häme*	Regional administration	FI	RISERS analysis in H4C
Region Nouvelle-Aquitaine*	Regional administration	FR	RISERS analysis in H4C
Province of Limburg*	Regional administration	NL	RISERS analysis in H4C
Møre and Romsdal County*	Regional administration	NO	RISERS analysis in H4C
Green Region Vestland*	Regional administration	NO	RISERS analysis in H4C
IVACE (REGIONAL DEVELOPMENT AGENCY OF VALENCIAN REGION)*	Regional administration	ES	RISERS analysis in H4C
Fundación Patrimonio Natural de Castilla y León*	Regional administration	ES	RISERS analysis in H4C
Agencia de Ciencia, Competitividad Empresarial e Innovación de Asturias*	Regional administration	ES	RISERS analysis in H4C
ITAINNOVA*	Regional administration	ES	RISERS analysis in H4C
FUNDACION PATRIMONIO NATURAL DE CASTILLA Y LEON*	Regional administration	ES	RISERS analysis in H4C
Fundacion Progreso y Salud*	Regional administration	ES	RISERS analysis in H4C
Deputy Directorate General fostering Circular Economy (Madrid)*	Regional administration	ES	RISERS analysis in H4C
CATALAN WASTE AGENCY*	Regional administration	ES	RISERS analysis in H4C
West Midlands Combined Authority*	Regional administration	UK, XI	RISERS analysis in H4C
CHEMELOT CIRCULAR HUB*	Regional administration	NL	RISERS analysis in H4C
Umwelttechnik BW*	Regions Association	DE	RISERS analysis in H4C
ICLEI*	Regions Association	DE	RISERS analysis in H4C
CHEMELOT CIRCULAR HUB*	Regions Association	ES	RISERS analysis in H4C
Stad Antwerpen*	City administration	BE	RISERS analysis in H4C
Energibyen Skive - Industrial Recycling for Construction*	City administration	DK	RISERS analysis in H4C
City of Munich*	City administration	DE	RISERS analysis in H4C
City of Munich, department of climate and environment*	City administration	DE	RISERS analysis in H4C
Berlin Partner for Business and Technology*	City administration	DE	RISERS analysis in H4C

Name	Kind of stakeholder	Country	Justification
Hansestadt Hamburg*	City administration	DE	RISERS analysis in H4C
Municipality of Ravenna*	City administration	IT	RISERS analysis in H4C
City of Emmen*	City administration	NL	RISERS analysis in H4C
Cities of Northern Netherlands*	City administration	NL	RISERS analysis in H4C
Granollers city council*	City administration	ES	RISERS analysis in H4C
Consejeria de Medio*	City administration	ES	RISERS analysis in H4C
Ajuntament*	City administration	ES	RISERS analysis in H4C
City of Umeå, Umeå Eco Industrial Park*	City administration	SE	RISERS analysis in H4C
City of Malmö*	City administration	SE	RISERS analysis in H4C
London Borough of Hounslow*	City administration	UK, XI	RISERS analysis in H4C
ACR+*	City association	BE	RISERS analysis in H4C
Grenoble Alpes Métropole*	City association	FR	RISERS analysis in H4C
ICLEI (in Italy)*	City association	IT	RISERS analysis in H4C
Circular Hub Tirol (Standortagentur Tirol)*	National institution	AT	RISERS analysis in H4C
Bundesstiftung Bauakademie*	National Institution	DE	RISERS analysis in H4C
GREEN FUND*	National institution	GR	RISERS analysis in H4C
NEDO*	National institution	JP	RISERS analysis in H4C
ChemistryNL*	National institution	NL	RISERS analysis in H4C
Innovation Norway*	National institution	NO	RISERS analysis in H4C
Portuguese Environment Agency (APA)*	National institution	PL	RISERS analysis in H4C
CDTI*	National institution	ES	RISERS analysis in H4C
RISE RESEARCH INSTITUTES OF SWEDEN AB*	National institution	SE	RISERS analysis in H4C
Net Zero*	National institution	UK, XI	RISERS analysis in H4C
Circular Economy for Innovate UK*	National institution	UK, XI	RISERS analysis in H4C
NRW.Energy4Climate GmbH*	Regional institution	DE	Experience of RISERS partner

ASSOCIATIONS

Name	Country	Link	Justification
ICLEI* - Local Governments for Sustainability	DE/EU	https://iclei.org/	Global network working with more than 2500 local and regional governments committed to sustainable urban development. Active in 125+ countries.
(EU) GPP (Green Public Procurement) Advisory Group	BE	https://green-business.ec.europa.eu/green-public-procurement/advisory-group-national-action-plans_en	Expert group composed of representatives of the EU Member States and the following stakeholders: Business Europe, UEAPME (small and medium enterprises association), European Environment Bureau/BEUC (European Consumer Organisation), ICLEI. The role of the Group is to provide advice to the European Commission on the development and implementation of GPP policies.
Procura+	DE	https://procuraplus.org/public-authorities/	The Procura+ Network has been developed by and for procurers and staff dealing with sustainability and innovation issues in public authorities. It is active in 17 European countries.
ECOS* - Environmental Coalition on Standards	BE	https://ecostandard.org	ECOS is an international network of NGOs who support the mission to defend environmental interests in the development of standards and product regulations.
SBS* - Small Business Standards	BE	https://sbs-sme.eu/	The voice of European SMEs in standardisation. Its goal is to represent and defend SMEs' interests in the standardisation process at European and international levels, has twenty-two member organisations
ANEC*	BE	https://www.anec.eu	The European consumer voice in standardization.
EEB	BE	https://eeb.org/	Europe's largest network of environmental citizens' organisations, stands for sustainable development, environmental justice & participatory democracy. 180 members in 40 countries.

ADDITIONAL ASSOCIATIONS

Name	Country	Link	Justification
EWA* - European Water Association	EU	www.ewaonline.de	Experience of RISERS partner
EuRIC* - European Recycling Industries Confederation	EU	https://euric-aisbl.eu/	Experience of RISERS partner
FEAD* - European Federation of Waste Management and Environmental Services	EU	www.fead.be	Experience of RISERS partner
HE* - Hydrogen Europe	EU	https://hydrogeneurope.eu/	Experience of RISERS partner
Hydrogen TCP* Hydrogen Technology Collaboration Programme	EU	https://www.ieahydrogen.org/	Experience of RISERS partner
NetworkNature* - ICLEI European Secretariat GmbH for NetworkNature+	DE	https://iclei.org/activity/networknature-advancing-nature-based-solutions-together/	Experience of RISERS partner

Other industry associations and stakeholders interested in our work not yet included in our lists are welcome to contact us via our website.

ADDITIONAL NGOS

Name (each organization stands for specific experts relevant to RISERS included in a RISERS database)	Kind of stakeholder	Country	Justification
ZWE*	NGO	BE	RISERS analysis in H4C
CENER 21*	NGO	BA	RISERS analysis in H4C
Business Agency*	NGO	BG	RISERS analysis in H4C
akobstad Region Development Company Concordia Ltd.*	NGO	FI	RISERS analysis in H4C
Strane Innovation*	NGO	FR	RISERS analysis in H4C
CEO Project*	NGO	DE	RISERS analysis in H4C
Association of local authorities in Iceland*	NGO	IS	RISERS analysis in H4C
Hringrásarsetur Íslands*	NGO	IS	RISERS analysis in H4C
A Sud*	NGO	IT	RISERS analysis in H4C
BCSD Malaysia Berhad*	NGO	M	RISERS analysis in H4C
Circle Economy*	NGO	NL	RISERS analysis in H4C
EIT Climate-KIC*	NGO	NL	RISERS analysis in H4C
Foodscale Hub*	NGO	RS	RISERS analysis in H4C
Green DigitalFinance Alliance*	NGO	CH	RISERS analysis in H4C
Turkey Design Council*	NGO	TR	RISERS analysis in H4C
Zero Waste Scotland*	NGO	UK, XI	RISERS analysis in H4C

CHEMICALS

ASSOCIATIONS

Name	Country	Website	Justification
CEFIC* - European Chemical Industry Council	EU	https://cefic.org/	CEFIC (no date 1), has partners in all EU countries
DECHEMA* -Gesellschaft für Chemische Technik und Biotechnologie e.V.	DE	https://dechema.de/en/	already involved in the CWA and various IS projects, > 5,500 members - individuals, institutions and companies
VCI* - Verband der Chemischen Industrie e. V.	DE	https://vci.de	CEFIC partner in big EU country, CEFIC (no date 2), 1,900 members
France Chimie*	FR	https://www.francechimie.fr/	CEFIC partner in big EU country, CEFIC (no date 2), 3,500 members
FEIQUE* - Federación Empresarial de la Industria Química Española	ES	https://www.feique.org	CEFIC partner in big EU country, CEFIC (no date 2), 3,120 members
IKEM* -Innovations- och kemiindustrierna	SE	https://www.ikem.se/	CEFIC partner in big EU country, CEFIC (no date 2), 2,547 members
Kemianteollisuus*	FI	https://www.kemiante-ollisuus.fi/en/	CEFIC partner in big EU country, CEFIC (no date 2), 880 members
FCIO* - Fachverband der Chemischen Industrie Österreichs	AT	https://www.fcio.at/	CEFIC partner, 236 members
ESSENSCIA* - Belgische federatie van de chemische industrie en life sciences	BE	essenscia.be	CEFIC partner, >720 members
BCCI* - Bulgarian Chamberof Chemical Industry	BGR	https://bcci2001.com/en/	CEFIC partner, 634 members
HGK* - Hrvatska gospodarska komora (Croatian Chamber of Commerce)	HR	https://hgk.hr/	CEFIC partner, 397 members
SCHP CR* - Svaz Chemického Průmyslu ČR	CZ	https://www.schp.cz/	CEFIC partner, 1.830 members
Conferation of Danish Industry*	DK	https://www.danskindustri.dk/	CEFIC partner, 303 members
ECIA* -Estonian Chemical Industry Association / Eesti Keemiatööstuse Liit	EE	https://keemia.ee/	CEFIC partner, 119 members
HACI* - Hellenic Association of Chemical Industries	GR	https://haci.gr/profile/	CEFIC partner, 939 members
MAVESZ* - Hungarian Chemical Industry Association	HU	https://mavesz.hu/frontpage/	CEFIC partner, 16,279 direct employees

Name	Country	Link	Justification
BioPharma - Chem Ireland* (within IBEC)	IE	https://ibec.ie/	CEFIC partner, >42,000 direct employees
FEDER-CHIMICA*	IT	https://federchimica.it/	CEFIC partner, 2,800 members
LAKIFA* - Association of the Latvian Chemical and Pharmaceutical Industry	LV	https://www.lifescience.lv/	CEFIC partner, 9,700 direct and indirect employees
VNCI* - Koninklijke Vereniging van de Nederlandse Chemische Industrie	NL	https://www.chemija.lt	CEFIC partner, 380 members
Polish Chamber of Chemical Industry*	PL	https://www.vnci.nl/english	CEFIC partner, 13,000 members
APQuimica* - Associação Portuguesa da Química, Petroquímica e Refinação	PT	https://pipc.org.pl/	CEFIC partner, 958 members
APDCR* - Romanian Chemicals Producers and Distributors Association	RO	https://www.apquimica.pt/	CEFIC partner, 1,259 producers, 1,609 distributors
ZCHFP* - Association of Chemical and Pharma-ceutical Industry of the Slovak Republic	SK	https://romchimica.ro/	CEFIC partner, 291 (with ≥ 20 employees)
GZS* -Association of Chemical Industries of Slo-venia (at Chamber of Commerce and Industry of Slovenia	SI	https://zchfp.sk/	CEFIC partner, 810 members
PlasticsEurope	EU	https://plasticseurope.org/de/	Important player in the field of bioplastics
CEPE* - European Confederation of Paint, Printing Ink and Artists' Colours Industry	EU	www.cepe.org	Experience of RISERS partner
ECOFI* - European Consortium of the Organic Fertilizer Industry	EU	https://ecofi.info/	Experience of RISERS partner
EFBA* - European Fertiliser Blenders Associa-tion	EU	www.european-blenders.org	Experience of RISERS partner
EFCC* -European Federation for Construction Chemicals	EU	www.efcc.eu	Experience of RISERS partner
EFfCI* - The European Federation for Cosmetic Ingredients	EU	www.effci.com	Experience of RISERS partner
EUMEPS* - European Manufacturers of Ex-panded Polystyrene	EU	www.eumeps.org	Experience of RISERS partner
EUROBITUME* - European Bitumen Associa-tion	EU	www.eurobitume.eu	Experience of RISERS partner
EuPC* - European Plastics Converters	EU	www.plasticsconverters.eu	Experience of RISERS partner

Name	Country	Link	Justification
MI* - Methanol Institute	EU	www.methanol.org	Experience of RISERS partner
PU Europe* - Federation of EuropeanPolyurethane Rigid Foam Associations	EU	www.pu-europe.eu	Experience of RISERS partner
PlasticsEurope AISBL	EU	wwww.plasticseurope.org	Experience of RISERS partner
TEPPFA* - The European Plastic Pipes and Fittings Association	EU	www.teppfa.eu	Experience of RISERS partner

Note: RISERS' contact list of industry associations in its priority sectors is longer than presented here. For reasons of simplification, slightly abbreviated lists are shown in each case.

Industry associations and stakeholders interested in our work not yet included in our lists are welcome to contact us via our website.

NETWORKS

Name	Country	Justification
BENELUX Hotspot	BENELUX	SCALER (2020b)
Antwerp Chemical Cluster	BE	SCALER (2020b)
Höchst Industry Park*	DE	Heck et al. (2024)
Knapsack	DE	Domenech et al. (2019)
Prague	CZ	SCALER (2020b)
East Germany	DE	SCALER (2020b)
Le Havre Chemical Cluster	FR	North of France interesting according to SCALER (2020b)
Lyon region "Chemical Valley"	FR	SCALER (2020b)
Barcelona & Catalonia region	ES	SCALER (2020b)
Krakow	PL	SCALER (2020b)
Stenungsund IS Network	SE	Domenech et al. (2018) for EU
Industry Park of Sweden (IPOS)	SE	http://www.circulary.eu/project/kemira-industrial-symbiosis/

COMPANIES

Name	Country	Justification
Umicore	BE	Statista
Solvay	BE	Statista
Brenntag	DE	Statista
BASF	DE	Statista
Evonik*	DE	Statista
Covestro	DE	Statista
LyondellBasell	NL	Statista

Name	Country	Justification
Yara	NO	Statista
Johnson Matthey	UK	Statista
Evolveable	AT	RISERS analysis in H4C
RTDS Group	AT	RISERS analysis in H4C
PNO Consultants	BE	RISERS analysis in H4C
EEIP	BE	RISERS analysis in H4C
Covestro	BR	RISERS analysis in H4C
Brenntag	FR	RISERS analysis in H4C
Seitiss	FR	RISERS analysis in H4C
VCG.AI	DE	RISERS analysis in H4C
Avient Colorants Germany GmbH	DE	RISERS analysis in H4C
Covestro Deutschland AG	DE	RISERS analysis in H4C
Greener than Green Technologies	GR	RISERS analysis in H4C
PNO Consultants	IT	RISERS analysis in H4C
ENCO SRL	IT	RISERS analysis in H4C
Dow	NL	RISERS analysis in H4C
Dow partner company	NL	RISERS analysis in H4C
KWA bedrijfsadviseurs	NL	RISERS analysis in H4C
TechPilot Innovation Consultancy	NL	RISERS analysis in H4C
Leira næringspark AS. Industrial park	NO	RISERS analysis in H4C
Centrum Transferu Technologii – INNOVA-TIONS Sp. z o.o.	PL	RISERS analysis in H4C
A4F-Algae for Future	PT	RISERS analysis in H4C
Tremend	RO	RISERS analysis in H4C
Lezak Emil	ES	RISERS analysis in H4C
Kingspan	UK, XI	RISERS analysis in H4C

FOOD

ASSOCIATIONS

Name	Country	Website	Justification
Agri-Food Chain Coalition	BE	agrifoodchaincoalition.eu	Experience of RISERS partner
European Association of Sugar Manufacturers	BE	https://cefs.org/	Sugar is the most important source sector of the food industry, goal: a sustainable European beet sugar industry, working together with the EU Institutions. Website shows sugar companies.
European Sugar Refineries Association	BE	https://sugarrefineries.eu	ESRA is the leading voice of Europe's sugar refining industry. Based in Brussels, the association represents the majority of the full-time cane sugar refineries in the EU.
In addition:			
European Association of Poultry Processors and Poultry Trade	BE	avec-poultry.eu	Experience of RISERS partner
Brewers of Europe	BE	brewersofeurope.org	Experience of RISERS partner
Association of Chocolate, Biscuit and Confectionery Industries of Europe	BE	caobisco.eu	Experience of RISERS partner
European Liaison Committee for Agricultural and Agri-Food Trade	BE	celcaa.eu	Experience of RISERS partner
Liaison Centre for the Meat Processing Industry in the EU	BE	clitravi.eu	Experience of RISERS partner
European association for cereals, rice, feedstuffs, oilseeds, olive oil, oils, and fats	BE	coceral.com	Experience of RISERS partner
European Farmers and Agri-Cooperatives	BE	copa-cogeca.eu	Experience of RISERS partner
Association of Crop Protection Industry in Europe	BE	croplifeeurope.eu	Experience of RISERS partner
Culinaria Europe e.V.	DE	culinaria-europe.eu	Experience of RISERS partner

Name	Country	Website	Justification
European Dairy Association	BE	https://eda.euro-milk.org/home.html	Is the acknowledged voice of the European milk processing industry in Brussels and the benchmark for all sector specific organisations in the field of agriculture in creating a European forum for both, high level debates on the future of the European ”lactosphere” and in depth analysis of today's dairy related topics on the European agenda.
European Flavour Association	BE	effa.eu	Experience of project partner
European Forum of Farm Animal Breeders	NL	effab.info	Experience of project partner
European Federation of Food, Agriculture, and Tourism Trade Unions	BE	effat.org	Experience of project partner
European Food Safety Authority	IT	https://www.efsa.europa.eu/en	Is an EU agency set up in 2002 to serve as an impartial source of scientific advice to risk managers and to communicate on risks associated with the food chain. It provides the scientific basis for laws and regulations to protect European consumers from food-related risks.
European Federation of Associations of Health Product Manufacturers	BE	ehpm.org	Experience of RISERS partner
European Plant-Based Foods Association	BE	https://ensa-eu.org/	ENSA was established in January 2003 as the voice of natural soy foods producers in Europe. In 2012, it became the European Plant-based Foods Association to reflect the evolution of the market.
European Snacks Association	BE	esasnacks.eu	Experience of RISERS partner
European Association of Dairy Trade	BE	eucolait.eu	Experience of RISERS partner
Fruit Vegetables Europe	BE	https://www.eucofel.eu/	Its mission is to represent, defend and promote the Fruit and Vegetables produced in the EU.
European potato processors' association	BE	https://euppa.eu/	Represents the industry of potato processors in Europe. Its members are six national associations based in Belgium, Germany, France, Italy, the Netherlands and the United Kingdom as well as 16 individual companies, accounting for more than 90% of processed potato production in Europe.
European Association for Bioindustries	BE	europabio.org	Experience of RISERS partner
European Seed Association	BE	euroseeds.eu	Experience of RISERS partner

Name	Country	Website	Justification
Food and Drink federation	UK	https://www.fdf.org.uk/	The FDF is a powerful voice for the UK's food and drink manufacturing industry. For over 100 years, it has contributed to policy making and legislative development. Has more than 1,000 members.
European Food Banks Association	BE	https://www.eurofoodbank.org/	To contribute to reducing food insecurity mainly through the prevention of food loss and the support and development of Food Banks in countries where they are most needed.
European Pet Food Federation	BE	fediaf.org	Experience of RISERS partner
European feed manufacturers federation	BE	https://fefac.eu/	Represents, defends and promotes the interests of the European compound feed and premix industry with the European Institutions, international bodies and stakeholders platforms
FoodDrinkEurope	BE	fooddrinkeurope.eu	Promotes the ideas and policies that enable the European food and drink industry to make products that are not only safe but also contribute to a greener planet, healthier living and a thriving economy.
European fresh produce association	BE	https://freshfel.org/	Is in contact with its members on a daily basis to respond to their needs and interests and to provide the latest information on policy developments. Is in close regular contact with the European Commission, Members of the European Parliament and the European Council.
European Association of Fruit and Vegetable Processors	BE	profel-europe.eu	Experience of RISERS partner
Committee of the National Food Industries of the EU	BE	prodcom.eu	Experience of RISERS partner
EU Platform on food losses and food waste	BE	https://food.ec.europa.eu/safety/food-waste/eu-actions-against-food-waste/eu-platform-food-losses-and-food-waste_en	Brings together public entities (Member States/EFTA countries, EU bodies and international organisations) and actors in the food value chain including consumer and other non-governmental organisations.
Alliance for Beverages Cartons and Environment*	EU	www.beveragecarton.eu	Experience of RISERS partner
Union of European Beverages Associations*	EU	www.unesda.org	Experience of RISERS partner

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COMPANIES

Name	Country	Justification		Name	Country	Justification
In general				**Sugar**		
Nestlé	CH	STATISTA, own analyses		Acor	See CEFS	CEFS
Anheuser-Busch InBev	BE	STATISTA, own analyses		Agrana Austria	AT	CEFS
Heineken	NL	STATISTA, own analyses		Agrana Czech Republic	CZ	CEFS
Danone	FR	STATISTA, own analyses		Agrana Hungary	HU	CEFS
Lactalis	FR	STATISTA, own analyses		Agrana Romania	RO	CEFS
Unilever	NL/UK	STATISTA, own analyses		Agrana Slovakia	See CEFS	CEFS
Diageo	UK	STATISTA, own analyses		Azucarera	See CEFS	CEFS
Ferrero	IT	STATISTA, own analyses		Coprob	See CEFS	CEFS
Friesland/Campina	NL	STATISTA, own analyses		Cosun Beet Company	See CEFS	CEFS
Arla Foods	DK	STATISTA, own analyses		Cristal Union	See CEFS	CEFS
Carlsberg	DK	STATISTA		Cukrovar Prosenice	See CEFS	CEFS
Pernod Ricard	FR	STATISTA		Cukrovar Vrbátky	See CEFS	CEFS
Danish Crown	DK	STATISTA		Iscal	See CEFS	CEFS
Südzucker	DE	STATISTA, own analyses		Lesaffre Frères	See CEFS	CEFS
Kerry Group	IE	STATISTA		Magyar Cukor	See CEFS	CEFS
Barry Callebaut	CH	STATISTA		Nordic Sugar Denmark	DK	CEFS
Savencia	FR	STATISTA		Nordic Sugar Finland	FI	CEFS
Oetker Group	DE	STATISTA		Nordic Sugar Kedainiai	See CEFS	CEFS
IS				Nordic Sugar Sweden	See CEFS	CEFS
Barilla S.p.A.	IT	MAESTRI		Nordzucker Germany	DE	CEFS, company website
IRCI S.p.A.	IT	MAESTRI		Nordzucker Poland	PL	CEFS
Schmack Biogas S.r.l.	IT	MAESTRI		Nordzucker Slovakia	See CEFS	CEFS
Opoe Cons. Coop. Agr. PA	IT	MAESTRI		Ouvré Fils	See CEFS	CEFS

Name	Country	Justification		Name	Country	Justification
				Pfeifer & Langen Germany	DE	CEFS
				Pfeifer & Langen Poland	PL	CEFS
				Polish Sugar (KGS)	See CEFS	CEFS
				Raffinerie Tirlemontoise	See CEFS	CEFS
				Sant Louis Sucre	See CEFS	CEFS
				Sucre Suisse	CH	CEFS
				Südzucker Germany	DE	CEFS, statista
				Südzucker Poland	PL	CEFS
				Tereos Czech Republic	See CEFS	CEFS
				Tereos France	FR	CEFS
				Viro	See CEFS	CEFS

STEEL

ASSOCIATIONS

Name	Country	Website	Justification
EUROFER AISBL - European Steel Association*	EU	https://www.eurofer.eu/	Steel association, RISERS D3.1
ECCS - European Convention for Constructional Steelwork	BE	https://www.steelconstruct.com/	Steel association, RISERS D3.1
ESTEP - Euroepan Steel Technology Platform	BE	https://www.estep.eu/	Its membership encompasses all the major European steel producers and EUROFER; academic centers and research organisations; industrial stakeholders (e.g., car manufacturing); and other stakeholders such as trade union representatives. The European Commission and the Member States are also represented in ESTEP management committees.
ACEA* - European Automobile Manufacturers' Association	EU	www.acea.be	Experience of RISERS partner
APEAL* - Association of European Producers of Steel for Packaging	EU	www.apeal.org	Experience of RISERS partner
ECCS* - European Convention of Constructional Steelwork Associations	EU	www.steelconstruct.com	Experience of RISERS partner
EWRIS* - European Federation of Steel Wire Rope Industries	EU	www.ewris.com	Experience of RISERS partner
National industry associations	div.	See main document, section 6.2	Experience of RISERS partner

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NETWORKS

Name	Country	Justification
Brescia	IT	CORALIS
Basauri	ES	CORALIS

COMPANIES

Name	Country	Justification
INA-Holding Schaeffler GmbH & Co. KG	DE	Top 50 largest Steel Companies in Europe according to https://bolddata.nl/en/companies/europe/steel-companies-europe/
Fischer Connectors Holding SA	CH	See INA-Holding
thyssenkrupp AG	DE	See INA-Holding
Norsk Hydro ASA	NO	See INA-Holding
IHO Verwaltungs GmbH	DE	See INA-Holding
Marquard & Bahls AG	DE	See INA-Holding
Wurth Norge AS	NO	See INA-Holding
thyssenkrupp Materials Services GmbH	DE	See INA-Holding
LIEBHERR-WERK TELFS GMBH	AT	See INA-Holding
ArcelorMittal	DE	See INA-Holding
ArcelorMittal Sourcing	L	See INA-Holding
SSAB AB	SE	See INA-Holding
Outokumpu Oyj	FI	See INA-Holding
Klockner & Co SE	DE	See INA-Holding

Name	Country	Justification
MICHAN IP	?	See INA-Holding
ARCELORMITTAL FRANCE	FR	See INA-Holding
Imerys Talc Austria GmbH	AT	See INA-Holding
Boliden AB	SE	See INA-Holding
Hydro Aluminium AS	NO	See INA-Holding
Outokumpu Stainless Oy	FI	See INA-Holding
Boliden Commercial AB	SE	See INA-Holding
Volvo Construction Equipment AB	SE	See INA-Holding
Tata Steel IJmuiden B.V.	UK	See INA-Holding
Netze BW GmbH	DE	See INA-Holding
BMW Motoren GmbH	FE	See INA-Holding
Fujitsu Technology Solutions (Holding) B.V.	NL	See INA-Holding
ARCELORMITTAL ESPAÑA, SA	ES	See INA-Holding
GOODYEAR DUNLOP TIRES OPERA-TIONS S.A.	LU	See INA-Holding
Eramet Norway AS	NO	See INA-Holding
De Heus Animal Nutrition B.V.	NL	See INA-Holding
NUOVO PIGNONE INTERNATIONAL SRL	IT	See INA-Holding
ThyssenKrupp Industrial Solutions AG	DE (part of Decarbon Tech. Now)	See INA-Holding
SMS GmbH	DE	See INA-Holding
Salzgitter Mannesmann Handel Gesell-schaft mit beschrankter Haftung	DE	See INA-Holding
MARCEGAGLIA CARBON STEEL SPA	IT	See INA-Holding
ITALPREZIOSI SPA	IT	See INA-Holding

Name	Country	Justification
Hunter Douglas Industries B.V.	NL	See INA-Holding
ALUMINIO ESPAÑOL SL	ES	See INA-Holding
Outokumpu Europe Oy	FI	See INA-Holding
Salzgitter Mannesmann International GmbH	DE	See INA-Holding
TRAXYS EUROPE S.A.	LU	See INA-Holding
Aurubis Belgium	BE	See INA-Holding
INVENSYS LIMITED	LU	See INA-Holding
Luminus	BE	See INA-Holding
Hüttenwerke Krupp Mannesmann Gesell-schaft mit beschrankter Haftung	DE	See INA-Holding
Texas Instruments EMEA Sales GmbH	DE	See INA-Holding
Oranjewoud N.V.	NL	See INA-Holding
Aperam Stainless Belgium	BE	See INA-Holding

CEMENT

ASSOCIATIONS

Name	Country	Website	Justification
CEMBUREAU - European Cement Association*	EU	https://cembureau.eu/	The European Cement Association is the representative organisation of the cement industry in Europe.
BIBM	EU	https://bibm.eu/	BIBM is the Federation of the European Precast Concrete industry and provides the major platform of the sector in Europe, also promoting SME friendly **legislation and stable standards**. BIBM endorses the importance of sustainability and its three pillars and represents **fifteen national associations of precast concrete**.
EFCA	EU	https://www.efca.info/	Partnership of 12 National Admixture Associations to represent the interests of the industry regarding European **legislation and standardisation** in the field of construction products. EFCA's total membership provides in excess of 80% of admixture sales within Europe and represents all the major admixture manufacturers. Locally, EFCA partners represent more than eighty producers in total.
ERMCO*	EU	https://ermco.eu/	ERMCO is the federation of national associations for the ready-mixed concrete industry in Europe and represents this industry in the fields of **standardisation**, certification and the environment, e. g., at CEN. ERMCO currently comprises twenty-seven members. It is estimated that its full members represent almost 8.000 plants spread all over Europe.
UEPG	EU	https://www.aggregates-europe.eu/	Represents the largest non-energy extractive industry with 26,000 extraction sites across Europe operated by 15,000 companies (mostly SMEs) and delivering about 3 billion tons a year of natural, recycled, and manufactured aggregates.
CE*- Concrete Europe*	EU	www.europeanconcrete.eu	Experience of RISERS partner
CPE*-Construction Products Europe*	EU	www.construction-products.eu	Experience of RISERS partner
EAACA*-European Autoclaved Aerated Concrete Association*	EU	www.eaaca.org	Experience of RISERS partner

Name	Country	Website	Justification
EFCA*-European Federation of Concrete Admixtures Associations Limited*	EU	www.efca.info	Experience of RISERS partner
Bulgarian Construction and Building Chamber	BG	https://ksb.bg/	CEMBUREAU partner
Croatia Cement	HR	http://www.croatiacement.hr/hr/index.php	CEMBUREAU partner
Czech Cement Association	CZ	http://www.svcement.cz/	CEMBUREAU partner
Syndicat Français de l'Industrie Cimentière	FR	https://www.franceindustrie.org/le-syndicat-francais-de-lindustrie-cimentiere-devient-france-ciment/	CEMBUREAU partner
Verein Deutsche Zmentwerke	DE	https://www.vdz-online.de/	CEMBUREAU partner
Hellenic Cement Industry Association	GR	https://www.hcia.gr/	CEMBUREAU partner
Hungarian Cement Association	HU	https://www.cembeton.hu/	CEMBUREAU partner
OFICEM-APCAC (Oficemen – Agrupación de Fabricantes de Cemento de España)	ES	https://www.oficemen.com/en/	CEMBUREAU partner
Cement Manufacturers Ireland	IE	https://www.ibec.ie	CEMBUREAU partner
Associazione Italiana Tecnico Economica Cemento	IT	https://www.aitecweb.com/	CEMBUREAU partner
Polish Cement Association	PL	https://www.polskicement.pl/	CEMBUREAU partner
Associação Técnica da Indústria do Çimento	PT	https://www.atic.pt/	CEMBUREAU partner
Cemsuisse / Verband der Schweizerischen Cementindustrie	CH	https://www.cemsuisse.ch/	CEMBUREAU partner
MPA Cement / Mineral Products Association Cement	UK	https://cement.mineralproducts.org/	CEMBUREAU partner

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NETWORKS

Name	Country	Justification
Northern Italy Cluster	IT	SCALER (2020b)
Sagunto	ES	Domenech et al. (2019)

(to contact via regional multipliers as described in the main document)

COMPANIES

Name	Country	Justification
ACCIONA Construcción*	ES	Led FISSAC project
AEIFOROS S.A.	GR	http://www.circulary.eu/project/ladle-furnace-slag-aeiforos/
Holcim	CH	STATISTA (2024)
Heidelberg Cement AG	DE	STATISTA (2024)
Buzzi Unicem	IT	STATISTA (2024)
Vicat SA	FR	STATISTA (2024)
Titan Cement International	BE	STATISTA (2024)
Cementir Holding	IT	STATISTA (2024)

REFINERIES

ASSOCIATIONS

Name	Country	Website	Justification
Hydrogen Europe	EU and beyond	https://hydrogeneurope.eu	European association representing the interest of the hydrogen industry, > 600 members
Clean Hydrogen Partnership	EU	https://www.clean-hydrogen.europa.eu/	Member of Hydrogen Europe association. PPP for research and innovation activities in hydrogen technologies. The three members include: EU represented by EC, the fuel cell and hydrogen industries represented by Hydrogen Europe and the research community represented by Hydrogen Europe Research.
Hydrogen Europe Research	EU and beyond	https://www.clean-hydrogen.europa.eu	Member of Hydrogen Europe association. Research for safe and clean hydrogen technologies. Members consists of one representative of each Member State and of each country associated with the Horizon Europe program.
Hydrogen Council	Multinational	https://hydrogencouncil.com	Collaboration between industry, governments, investors, and civil society, supports the development of international safety and sustainability standards. 140 multinational companies participate, representing the entire hydrogen value chain.
Concawe - Oil Companies' European Association for Environment, Health and Safety in Refining and Distribution	EU and beyond	https://www.concawe.eu	The division of the European Fuel Manufacturers. Engaged in partnerships and maintains contacts with other industry sector associations, as well as international organisations. Together with Fuels Europe it forms the European Fuel Manufacturers Association. Members include most oil companies operating in Europe.

Name	Country	Website	Justification
Petrochemicals Europe	Europe	https://www.petrochemistry.eu	Association of companies manufacturing ethylene, propylene, and other olefins/aromatics for chemical use. 70 member companies.
EPCA - European Petrochemical Association	Europe	https://epca.eu	Leading petrochemical business network for knowledge exchange. Over 600 companies from 48 countries around the world.
DVGW - Deutscher Verein des Gas- und Wasserfaches e.V.	DE	https://www.dvgw.de	German technical and scientific association for gas and water, setting standards and conducting research in the gas sector. Over 14,000 individual and corporate members.
Assorisorse- Associazione Italiana per l'Industria Mineraria e Petrolifera	IT	https://www.assorisorse.org	Italian association representing the oil and gas industry, promoting sustainable development and innovation. Over 100 member companies.
NOGEPA - Netherlands Oil and Gas Exploration and Production Association	NL	https://www.nogepa.nl	Dutch association representing oil and gas exploration and production companies, promoting safe and sustainable operations. 13 member companies.
BRAFCO - Belgian Federation of Fuel Traders	BE	https://www.brafco.be	Belgian association representing fuel distributors, advocating for the sector’s interests and promoting sustainable practices. Over 200 member companies.
VEMOBIN - De Vereniging Energie voor Mobiliteit en Industrie	NL	https://vemobin.nl	VEMOBIN’s members supply energy for transport and raw materials for industry, promoting pro-environmental policies in the Netherlands.
DWV - German Hydrogen Association e.V.	DE	https://dwv	Focused on implementation and optimization of frameworks for hydrogen economy development, including plant construction and infrastructure.

Name	Country	Website	Justification
en2x - Business Association Fuels and Energy e.V.	DE	https://en2x.de	Members include companies manufacturing, processing, distributing, or transporting liquid/gaseous hydrocarbons and hydrogen-based products.
Energia	BE	https://www.energiafed.be/nl	Industry organization in Belgium, representing companies offering energy solutions in transport, heating, and raw materials for the petrochemical sector.
UNEM Unione Energie per la Mobilata	IT	https://www.unem.it	Represents main companies operating in Italy in processing, logistics, and distribution of petroleum and low-emission energy products.
DrivkraftDanmark - Danish Oil Industry Association	DK	https://www.drivkraftdanmark.dk/	Represents Denmark's fuel suppliers and charging operators, bringing together refineries, petrol stations, and charging facilities.
SEEPE Hellenic Petroleum Marketing Companies Association	GR	-	Represents 13 petroleum marketing companies distributing 90% of liquid fuels and other oil products in Greece.
Cluster of Hydrogen Technologies, Poland	PL	https://profile.clustercollaboration.eu	Member of Hydrogen Europe association, focusing on industrial applications, including refinery industry. 34 members, 4 supporting members.
PIPC - Polish Chamber of Chemical Industry	PL	https://pipc.org.pl	Represents Polish chemical industry before public administration and international organizations. 150 member organisations.
SITPNIG - Scientific and Technical Association of Engineers and Technicians of the Oil and Gas Industry	PL	https://www.sitpnig.pl/	Promotes professional qualifications in the oil, gas, and refining industries through dissemination of knowledge and technical achievements. Branches in 13 Polish cities.

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NETWORKS

Name	Country	Justification
World Refining Association	Multinational	Platform for networking and knowledge sharing focused on traditional refining techniques and future technologies.
Chemical, Petro-chemical and Refining Cluster	Europe	Network of all associate entities, supporting cooperation between companies, as well as between these companies and universities and R&TD centres. Carrying out joint projects and studies, promoting new CE technologies.
Kalundborg	DK	Includes coal-fired power plant, oil refinery, biotech and pharmaceutical company, liquid fertilizer company, plaster-board manufacturer, soil remediation and recovery company, public wastewater treatment, waste treatment company, the municipality, freshwater provider, district heating distribution, fish farms, neighbouring farms, pig farms, and cement and road aggregate producers, and some material recycling (Neves et al., 2024).
Forth Valley	UK	Includes energy company, refinery, chemical industry, paper mill, oil and gas company, cement manufacturer, and waste processor.
Humber	UK	Includes biodiesel production, plaster board manufacturer, chemical industry, refineries, water treatment chemicals, food and fish processing, wastewater treatment, local farms, pet food, and furniture production (see Neves et al., 2023, 2024).
Rotterdam	NL	Includes refinery, greenhouse companies, residential area, port, chemical company, truck cleaning company, power plant, and shrimp farm (see Neves et al., 2023, 2024).
Lysekil	SE	Includes land-based seaweed cultivation plant, and oil refinery (see Neves et al., 2024).

COMPANIES

Name	Country	Website	Justification
Shell	NL	LinkedIn of contact person	statista – large crude oil refinery
BP	NL	https://www.bp.com/nl_nl/netherlands/home/wie-wij-zijn/bp-in-nederland.html	statista – large crude oil refinery
PKN Orlen	PL	https://www.orlen.pl/en	statista – large crude oil refinery
TotalEnergies	BE	https://totalenergies.com/belgium	statista – large crude oil refinery
Shell	DE	LinkedIn of contact person	statista – large crude oil refinery
Exxon Mobile, Antwerp refinery	BE	LinkedIn of contact person	statista – large crude oil refinery
ExxonMobil Product Solutions	BE	https://www.exxonmobilchemical.com/en/products	Experience of RISERS partner
ISAB Refinery	IT	https://goi.energy/	statista – large crude oil refinery
SARAS	IT	See Sarlux	statista – large crude oil refinery
Sarlux a SARAS company	IT	LinkedIn of contact person	Experience of RISERS partner
MiRO	DE	LinkedIn of contact person	statista – large crude oil refinery
BP	DE	https://www.bp.com/de_de/germany/home.html	statista – large crude oil refinery
REPSOL	ES	https://www.repsol.com/en	Experience of RISERS partner
Kalundborg Refinery	DK	https://www.klesch.com/our-businesess/	Experience of RISERS partner
Shell Energy and Chemicals Park Rotterdam	NL	LinkedIn of contact person	Experience of RISERS partner
Port of Rotterdam	NL	LinkedIn of contact person	Experience of RISERS partner
Esso Nederland B.V. Rotterdam Refinery	NL	https://www.exxonmobil.be/company/locations/netherlands/rotterdam-refinery	Experience of RISERS partner
Lejeune Association Management in The Hague	NL	www.lejeune.nl	Experience of RISERS partner
InfraLeuna GmbH	DE	www.infraleuna.de	Experience of RISERS partner

Name	Country	Justification	Name
Chempark Leverkusen Currenta	DE	www.chempark.de/index.php?p...	Experience of RISERS partner
Port of Antwerp	BE	www.portofantwerp.com	Experience of RISERS partner, RISERS analysis in H4C regarding IS
Płock Refinery	PL	LinkedIn of contact person	Experience of RISERS partner
Gdańsk Refinery	PL	LinkedIn of contact person	Experience of RISERS partner

BIOECONOMY

ASSOCIATIONS

Name	Country	Website	Justification
Bio-based industries consortium*	EU	https://biconsortium.eu/	More than 300 industry members and 250 associate members
Renewable Carbon Initiative*	EU	https://renewable-carbon.eu/companies/	145 key stakeholders
EBA*European Biogas Association	EU	www.european-biogas.eu	Experience of RISERS partner
EBB* - European Biodiesel Board	EU	www.ebb-eu.org	Experience of RISERS partner
European Bioplastics*	EU	www.european-bioplastics.org	Experience of RISERS partner
Star-Probio Project* Sustainability Transition Assessment and Research of Bio-based Products (finished, but the relevant organisations are interesting, e.g. Novamont, see companies)	div.	www.star-probio.eu	Experience of RISERS partner
ePURE*- European Producers Union of Renewable Ethanol	EU	www.epure.org	Experience of RISERS partner

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NETWORKS

Name	Kind of stakeholder	Country	Justification
SYMBIO	Project	div.	Specific IS project, 12 EU pilot regions**
SYMBA	Project	div.	Specific IS project
CLIMATE-KIC HOLDING BV	Agency	NL	Project SYMBA
BIO BASE EUROPE PILOT PLANT VZW	Research	BE	Project SYMBA
LOMBARDY GREEN CHEMISTRY ASSOCIATION	Association	IT	Project SYMBIO
ANTEJA FUNDACION CORPORACION TECNOLOGICA DE ANDALUCIA	Represents a regional cluster	ES	Project SYMBIO
HRVATSKI DRVNI KLASTER	Regional cluster	HR	Project SYMBIO
STARTUP EUROPE REGIONS NETWORK	Region	BE	Project SYMBIO
CHEMELOT CIRCULAR HUB*	Non-profit organisation	NL	RISERS analysis in H4C
**** Lombardy, Piedmont, Veneto, Friuli-Venezia Giulia, Emilia-Romagna, Carinthia, Slovenia, Croatia, Andalusia, Brussels Capital, Wallonia, Flanders			

COMPANIES

Name	Kind of stakeholder	Country	Justification
CITRIBEL	Business	BE	See main text
Celtic Renewables	Business	IE	See main text
AMPHISTAR	Business	BE	See main text
STEELANOL	Business	BE	See main text
ARBIOM	Business	FR	See main text
NOVAMONT SPA	Business	IT	Project SYMBA
KARNTNER BETRIEBSANSIEDLUNGS- UND BETEILIGUNGSGESELLSCHAFT M.B.H.	Business	AT	Project SYMBIO

Name	Kind of stakeholder	Country	Justification
ECG D.O.O.	Business	SI	Project SYMBIO
Avient Colorants Germany GmbH*	Business (corporate)	DE	RISERS analysis in H4C
VCG.AI*	Business (corporate)	DE	RISERS analysis in H4C
Tremend*	Business (corporate)	RO	RISERS analysis in H4C
RTDS Group*	Business (SME)	AT	RISERS analysis in H4C
Greener than Green Technologie*	Business (SME)	GR	RISERS analysis in H4C
ENCO SRL*	Business (SME)	IT	RISERS analysis in H4C
A4f-Algae for Future*	Business (SME)	PL	RISERS analysis in H4C
Materiom*	Non-profit organisation	UK, XI	RISERS analysis in H4C
Additional >100 companies and organisations from the bio economy presented by nova-institute (2024) whose contacts we have (to keep the report manageable, only their names are listed here): 3R-BIOPHOSPHATE LTD.*, ACIB GMBH*, ADDIPLAST*, ADVANCE NONWOVEN A/S*, ADVANCED BIOCHEMICAL*, AGRANA STARCH GMBH*, AGRODOME*, AGROTECH*, AIMPLAS*, ALBRECHT DINKELAKER, POLYMER- UND PRODUKTENWICKLUNG*, ASSOBIOTEC*, AVK*, BEG GROUP LLC*, BELGIAN BIOPACKAGING*, BEOLOGIC NV*, BETA ANALYTIC*, BIO*, BIO BASE EUROPE PILOT PLANT*, BIO-FED BRANCH OF AKRO-PLASTIC GMBH*, BIOFIBRE GMBH*, BIOPOLYNOV / NATUREPLAST*, BIOPOWDER.COM / SCHILLING LTD*, BIORESET*, BIOTEC*, BIOVOX GMBH*, BIOWERT INDUSTRIE GMBH*, BMG & DPC*, CABAMIX*, CARDOLITE*, CAVAC BIOMATERIAUX*, CELABOR*, CELANESE CLARIFOIL*, CELIGNIS BIOMASS ANALYSIS LAB.*, CENER BIO2C*, CKADE BV*, CKT*, CLIB2021*, CLUB BIO-PLASTIQUES*, CM FLUIDS AG*, CONENOR*, COPERION*, CORBION PURAC*, CORDENKA GMBH & CO. KG*, CRODA GMBH*, CSIRO MATERIALS SCIENCE AND ENGINEERING*, AGROTECH*, DUPONT*, ELMIRA INDUSTRIAL SUPPLIES UG*, ENVIPLAST*, ENZYMICALS AG*, EPNOE*, EVONIK INDUSTRIES*, FIBENOL*, FIBRES RECHERCHE DEVELOPPEMENT*, FKUR KUNSTSTOFF GMBH*, FUTERRO*, GFBIOCHEMICALS*, GIANECO S.R.L.*, GREEN SERENDIPITY*, H. HIENDL GMBH & CO. KG*, HANS WEBER MASCHINENFABRIK GMBH*, HEXPOL TPE*, HF MIXING GROUP*, HSB - HOCHSCHULE BREMEN*, IAR*, IBB NETZWERK GMBH*, INGEVITY*, INTEXIVE*, IOWA ECON. DEVELOPMENT AUTHORITY*, ISOWOOD GMBH*, JELU-WERK*, K.I.M.W. NRW GMBH*, KANEKA CORPORATION*, KELHEIM FIBRES GMBH*, LACTIPS*, LANZATECH*, LEARTIKER S.COOP.*, LENZING AG*, LEVACO CHEMICALS GMBH*, LUBRIZOL ADVANCED MATERIALS SPAIN*, MASCHINENFABRIK REINARTZ*, METABOLIC EXPLORER*, MIFSUD*, MKV GMBH KUNSTSTOFFGRANULATE*, MMATWO PROJECT*, MOSCA GMBH*, NAFIGATE CORPORATION A.S.*, NATUREWORKS LLC*, NNFCC*, NOOSA S.A.*, NOVASEP PROCESS SAS*, OMNI TECH INTERNATIONAL, LTD.*, OWS NV*, PETER GREVEN GMBH & CO. KG*, PLASTRANS TECHNOLOGIES GMBH*, POLYLABS*, POLYVLIES FRANZ BEYER GMBH*, PTT MCC BIOCHEM*, RECARBN*, RECELL®*, REESE-SOLUTIONS GMBH*, REIFENHÄUSER*, REVERDIA*, RHENOFLEX GMBH*, ROQUETTE*, RSB*, SENBIS POLYMER INNOVATIONS B.V.*, SKZ - DAS KUNSTSTOFF-ZENTRUM*, SONAE INDUSTRIA WOODFORCE*, TECNARO*, TECNON ORBICHEM*, ULUU*, UPM*, VAN AROMA*, VHI*, WACKER CHEMIE AG*, WILL & CO. BV*, WOOD K PLUS*			