



DRIVING MANUFACTURING SME TRANSFORMATION TOWARDS  
GREEN, DIGITAL AND SOCIAL SUSTAINABILITY

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## Deliverable 1.1

### Mapping the European sustainable manufacturing ecosystem – an overview



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## Executive Summary

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This report summarises research results on the current status of a (potential) European Sustainable Manufacturing Ecosystem (EUSME). It describes its elements, functionalities and networks and identifies gaps. This ecosystem should support small and medium-sized enterprises of the manufacturing ecosystem to become (more) sustainable. As it is understood as a Europe-wide ecosystem, it is conceptualised to provide second-level support to organisations such as clusters, regional ecosystems and sector organisations on an overarching level. This report provides insights into what is already there and what is already done on the European level to support the sustainable development of manufacturing SMEs and what is still missing in order to have a well-working EUSME in Europe.

The European manufacturing industry is an integral part of the European economy, contributing 29% of the value added and 23% of jobs of European non-financial business in 2020 (Eurostat, 2020). Accordingly, it also contributes its share to energy and material consumption and the production of waste and greenhouse gases (e.g. manufacturing SMEs are estimated to have produced over 400 million tons CO<sub>2</sub> in 2018, more than the construction sector and wholesale and retail trade sector all together (European Commission, 2022)). Its contribution to the European Green Deal and the overall goal of net zero carbon production until 2050 of the European Union is an important part of reaching those goals. The manufacturing SMEs are an essential part of the green transition in the European Union. The effects of the COVID19 crisis, the rising prices of raw materials and the disruption of supply chains due to the war in Ukraine since 2022 do take their toll on the capacity of manufacturing SMEs to focus on the green transition. Supporting ecosystems and clusters provide direct support to SMEs. As they also benefit from experience, research results, and good practices from other regions, clusters and projects, overarching networks, initiatives, platforms and organisations strengthen the pan-European exchange and collaboration. **But, is there already a European Sustainable Manufacturing Ecosystem (EUSME)?**

The research conducted in WP1 of the greenSME initiative has been guided by the following questions:

- What elements and functionalities of an EUSME are there already?
- Which meta-clusters (e.g. European networks, organisations, initiatives) are active in supporting manufacturing SMEs' sustainability on a European level?
- What kind of connections and networks between different actors are already there? Which are missing?
- What are the requirements for a well-functioning EUSME?
- Where do meta-clusters<sup>1</sup> see gaps and potential for development?

For this mapping, sustainability is understood as environmental, social and economic sustainability. The understanding is closely aligned with the one of the European Green Deal (EGD) as presented by the European Commission (European Commission, n. y.). As the focus of the project and this deliverable lies on the manufacturing sector, certain aspects are of particular interest: emissions that foster climate change are reduced, material and water management are oriented towards the minimisation of material use and the implementation of the principles of waste reduction such as reduction of material and energy use, recycling, reusing, repurposing are to be implemented. In terms of social sustainability, workplaces should be adaptive, collaborative and reliable. Mechanisms of

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<sup>1</sup> Meta-clusters are understood as networks, platforms, associations, projects or similar cooperation that act on an overarching level above clusters or regional ecosystems and bring together clusters, networks, and other stakeholders to act on a European, national or inter-regional level.

worker skilling, good human-technology interaction, worker well-being, security and inclusiveness need to be implemented. Economic sustainability includes the capacity of manufacturing companies to stay prosperous and competitive, resilient to economic risks, and consider social and environmental requirements and changes. Manufacturing enterprises need to be prepared for the compliance with environmental and social legislation (high standards of environmental protection, circular economy social protection and inclusiveness) and have long-term sustainable business models and strategies. In order to achieve these goals, the EUSME aims at fostering the implementation of Advanced Technologies and/or Social Innovation in SMEs in the manufacturing sector and raising awareness for sustainability and available opportunities and solutions.

The EUSME is understood as a mission-oriented innovation ecosystem (Jütting, 2020) as it addresses the particular societal challenge of climate change and the need for a green transition. The mission is to foster sustainability of manufacturing SMEs by promoting the use, implementation and diffusion of technological and non-technological innovations and solutions.

In the WP1 of the greenSME project, desk-research and 13 expert interviews have been conducted to gain a thorough understanding of the current status of the EUSME and identify gaps. The starting point for this research has been to identify and analyse meta-clusters, such as European networks, initiatives, platforms and associations, that work on the topic of manufacturing sustainability and provide useful output for SMEs. The following results can be summarised from the interviews with meta-cluster representatives and desk research:

The meta-clusters already bring together a variety of stakeholders that are relevant actors within a potential EUSME and who are collaborating towards the goal of fostering sustainability in manufacturing. While companies, public administrations and policy makers and research institutions as well as business development agencies are already well represented, education providers and civil society stakeholders are the least represented, although they are depicted as important stakeholders by the meta-cluster representatives.

One important aspect is that there is already (European, national and some regional) funding for research and development and meta-clusters in the area of sustainability in manufacturing which provides a continuity to the activities of most meta-clusters.

Many topics, that are highly relevant to manufacturing SMEs for increasing sustainability, are addressed by different meta-clusters. Examples are how Circular Economy is addressed by the ECESP and how several technologies for greening products, production processes and machine use (Cleantech Network, Silicon Europe, MANUFUTURE, MANU-KET, EACN, EACP) are monitored, developed and promoted by meta-clusters.

More topics were mentioned as important ones to address but were not taken up in the meta-clusters' activities in a sufficient manner. Those were especially non-technological measures to increase efficiency of material use, energy use and decreasing waste production and the topic of skills needed for sustainable change and the role of education.

The meta-clusters that have both, a large Europe-wide scope and a clear focus on sustainability topics are the MANUFUTURE platform and the European Circular Economy Stakeholder Platform.

Meta-clusters with less scope but important activities that contribute clearly to the sustainability of manufacturing SMEs are TIPPS, MANU-KET, Greater Green, and the SuperEcosystem in Finland.

Important promoters and disseminators are Enterprise Europe Network, EIT Manufacturing, ECCP, ECA, and EACN as they are meta-clusters with a large scope and reach into clusters and they address sustainability at least as one topic among others. Further relevant meta-clusters are the German Circular Economy Initiative acatech, IRISS, EuMaT and the EACP. Also, there are meta-clusters that could not be analysed in great detail, but are part of a potential EUSME, such as other national CE

initiatives, the Ellen McArthur Foundation, ERMA, further EIT organisations, such as the EIT Climate KIC, and further European initiatives (e.g. in ERASMUS+ or Horizon programmes).

The objective of the meta-cluster defines the objectives of the collaborations supported and their scope. While larger meta-clusters have the strength to bring together companies and other stakeholders from various regions, thematic meta-clusters allow for more a more focused joining of forces and expertise on a particular topic. This can enable a quicker development of solutions and innovation. In the case of sustainability-related topics, meta-clusters in our analysis worked on Circular Economy solutions, Clean Technologies, advanced materials and safe and sustainable by design processes and products.

The European Commission plays an important role for almost all of the analysed meta-clusters, as source for funding and as legislator. These functions lead to somewhat a coordinating role of the European Commission, guiding the understanding of sustainability and supporting some areas of R&D over others, for example.

There are few collaborations between meta-clusters on the topic of sustainability on the European level, as members rather enter collaboration on sustainability topics on the regional level. Also, there is a lack of an adequate governance structure that brings all actors together.

In the interviews, a number of requirements for an EUSME and current gaps that prevent the EUSME from functioning well and being self-sufficient have been made explicit:

### Requirements

- A governance structure that allows for the need of regional manufacturing sectors to take centre-stage and a coordinated development of a more concrete common strategy towards a sustainable manufacturing sector
- Continuous interaction with the SMEs, for example through clusters and business and sector associations
- Further engagement of education providers
- Further engagement of civil society stakeholders, at least with regards to the implementation of Circular Economy
- Well-elaborated, up-to-date and continuous communication with members and mutual learning and knowledge sharing
- Alignment with European policies relevant for sustainability in the manufacturing sector
- Continuous and sustainable funding of the EUSME structures where needed.
- Fostering inter-regional and international collaboration between clusters

### Current Gaps in the EUSME

- To provide information on the legislative activity at European and national levels, as well as on financial support programmes information to implement coming legislation.
- Support with change management of implementing sustainability measures for SMEs
- Support of companies for the provision of green skills through Continuous Vocational Education and Training (CVET) and other upskilling pathways
- Support with implementing co-creation processes that allow for all stakeholders to provide their expertise and perspective with helping sustainability-raising processes
- Awareness raising and education for social innovation in companies that allow for better efficiency of energy and material use and decreased waste production
- A repository of best practices and examples for the implementation of useful sustainability measures
- Standardisation of processes and solutions required for sustainable production to promote fair competition and help companies adapt to upcoming environmental regulations

- Support for more collaboration between clusters and meta-clusters from the different European regions.
- An adequate governance structure is still to be established that brings together the needs and insights from the regions and a coordinated strategy development.

The findings of the mapping represent a first step towards a roadmap for a Sustainable Manufacturing Ecosystem. The roadmap, in turn, aims to identify the gaps of the existing ecosystem or, if necessary, indications to what is missing to develop such an ecosystem and will suggest overall steps of development and actions of stakeholders to improve and complete the ecosystem. The roadmap will be developed in another dedicated deliverable. The development of an ecosystem itself, however, is not implemented in greenSME.

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## List of acronyms

AI	Artificial intelligence
AT	Advanced technology
ATI	Advanced technology for industry
CE	Circular Economy
CVET	Continuous Vocational Education and Training
EACN	European Automotive Cluster Network
EACP	European Aerospace Cluster Partnership
EC	European Commission
ECA	European Clusters Alliance
ECCP	European Cluster Collaboration Platform
ECESP	European Circular Economy Stakeholder Platform
EFFRA	European Factories of the Future Research Association
EGD	European Green Deal
EIT	European Institute of Innovation and Technology
ERMA	European Raw Materials Alliance
EU	European Union
EuMaT	European Advanced Engineering Materials and Technologies Platform
EUSME	European Sustainable Manufacturing Ecosystem
IoT	Internet of things
IRISS	International ecosystem for accelerating the transition to safe-and-sustainable-by-design materials, products and processes
MANU-KET	Manufacturing key enabling technologies [a meta-cluster]
MANUFUTURE	A European technology platform for the manufacturing sector
R&D	Research and Development
SME	Small or medium-sized enterprise
SSbD	Safe-and-Sustainable-by-design
TIPPS	Transition and Innovation with the Piedmont Clusters System [meta-cluster]
VET	Vocational Education and Training

## List of greenSME partners

Consortium partner	Expertise and role in greenSME
AFM	Cluster organisation for advanced manufacturing & machine tool industry in Basque Country
CIM4.0	Competence centre & innovation HUB for digital (4.0) and technological development of manufacturing industry in Piemonte
Danish Board of Technology (DBT)	Social innovation and participation in the technological & sustainable development of society. HUB strategy and concept development, community building
F6S	Communication and digital solutions
MESAP	Cluster organisation for smart manufacturing in Piemonte
SA&AM	Cluster organisation for the automotive sector in Silesia
TEKNIKER	Research and technology centre specialised in Advanced Manufacturing, Surface Engineering, Product Engineering and ICTs technologies
Technical University of Braunschweig (TUBS)	University, section of sustainable business model development
TU Dortmund (TUDO)	University, section of social innovation SMEs in regional and sectoral ecosystems and sustainability roadmap

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## 1. Introduction

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This Deliverable 1.1 of the greenSME project summarises the research results of the work package 1 on what is already done and by which actors on a European level to promote and support sustainability of small and medium-sized enterprises (SME) of the manufacturing sector in Europe. It maps the current status of a potential EU Sustainable Manufacturing Ecosystem (EUSME) with its elements, functionalities and networks and identifies gaps within the ecosystem. It also presents requirements for a EUSME from the perspective of meta-cluster representatives.

The European manufacturing industry is an integral part of the European economy, contributing 29% of the value added and 23% of jobs of European non-financial business in 2020 (Eurostat, 2020). Accordingly, it also contributes its share to energy and material consumption and the production of waste and greenhouse gases (e.g. manufacturing SMEs are estimated to have produced over 400 million tons CO<sub>2</sub> in 2018, more than the construction sector and the wholesale and retail trade sector (European Commission, 2020)). Its contribution to the European Green Deal and the overall goal of net zero carbon production until 2050 of the European Union is an important part of reaching those goals. The sector is made up of 52% SMEs playing a vital role in the sector.

The manufacturing SMEs are an essential part of the green transition in the European Union. The effects of the COVID19 crisis, the rising prices of raw materials and the disruption of supply chains due to the war in Ukraine since 2022 do take their toll on the capacity of manufacturing SMEs to focus on the green transition. Supporting ecosystems and clusters provide direct support to SMEs. But they also benefit from experience, research results, and good practices from other regions, clusters and projects. Overarching networks, initiatives, platforms and organisations strengthen the pan-European exchange and collaboration. **But, is there already a European Sustainable Manufacturing Ecosystem (EUSME)?**

This report provides insights into what is already there and what is already done on the European level to support the sustainable development of manufacturing SMEs and what is still missing in order to have a well-working EUSME in Europe. In the WP1 of the greenSME project, desk-research and 13 expert interviews have been conducted to gain a thorough understanding of the current status of the EUSME and to identify gaps. The starting point for this research has been to identify and analyse meta-clusters, such as European networks, initiatives, platforms and associations, that work on the topic of manufacturing sustainability and provide useful output for SMEs. Meta-clusters operate on an over-arching level above clusters and regional ecosystems. They already bring together a broad spectrum of stakeholders and provide second-level support and valuable knowledge to clusters and regional ecosystems and bundle insights into needs and the status of manufacturing SMEs to the European level.

The findings of the research of WP1 of the greenSME initiative will be presented, answering the following guiding questions:

- **What elements and functionalities of an EUSME are there already?**
- **Which meta-clusters (e.g. European networks, organisations, initiatives) are active in supporting manufacturing SMEs' sustainability on a European level?**
- **What kind of connections and networks between different actors are already there? Which are missing?**
- **What are the requirements for a well-functioning EUSME?**
- **Where do meta-clusters see gaps and potential for development?**

The report summarises the insights gained through the research and then identifies gaps and unsolved challenges of the EUSME. It provides starting points for the development of a complete and well-functioning European ecosystem that supports sustainability of the manufacturing sector and its SMEs.

The scope of the mapping allows to understand what is already done on a European level to achieve this EUSME. There is also a lot of support and activity for manufacturing SMEs happening within single regions, regional clusters, smaller projects, national projects and similar. These activities were not mapped individually as they are not accessible for all manufacturing SMEs across Europe and because there is so much, that it is out of scope to present it all. Rather, it will be clarified, how the EUSME as a second-level support ecosystem works.

The report starts with the clarification of terms, such as sustainability and ecosystem and provides context for the mapping in the background chapter, presents the research approach applied and then goes on to present the findings of the mapping in a structured way. The findings of the research are then assessed in the context of a European Sustainable Manufacturing Ecosystem. In the conclusions, the main findings are summarised and a short outlook is given to a planned roadmap towards a well-functioning EUSME. In the annex, profiles of the analysed meta-clusters are provided for further information.

## 2. Background

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### 2.1. The approach to mapping the European Sustainable Manufacturing Ecosystem (EUSME)

While ecosystem approaches are often used at the regional level, the study of an ecosystem at the European level seems to be more challenging. Consequently, the working methods and interdependencies with regard to sustainability issues remain largely unexplored. The extent to which interdependencies and collaborations already exist between actors from different backgrounds in manufacturing on the topic of sustainability and to what extent one can speak of a European ecosystem here is accordingly the object of investigation in the mapping of Task 1.1. It is also to be investigated which stakeholders are needed to speak of a functioning ecosystem. Possible success factors and elements as well as the necessary actors and sectors of such an ecosystem will be investigated in the course of interviews. Particular emphasis will be placed on the question of how well-connected clusters and meta-clusters already are and to what extent networks already exist – as well as to the questions what gaps remain and what else is needed for a green transition in manufacturing.

In greenSME, the EU Sustainable Manufacturing Ecosystem is understood as an ecosystem which provides second-level support to clusters. As we are looking at the European level, we understand this ecosystem neither as regionally or nationally delimited, nor consisting mainly of individual organisations, but rather focus on the connecting overarching organisations, platforms and initiatives. We coined these organisations “meta-clusters”, which are the main unit of analysis of the ecosystem mapping. Despite some differences between these individual forms of organisation, the term meta-cluster best sums up these overarching organisations, also because the majority of them have clusters as partners and members, and thus operate at a higher level.

The meta-clusters serve well as a starting point to map the EUSME, as they already connect stakeholders from different backgrounds, they go beyond single clusters and give insights into overarching topics and challenges, needed support and services, aggregated interest and the experience of fostering interaction and exchange between companies and between stakeholders. They also give insight into experience of how such exchange can be organised best. As the leading question of this mapping is, what is already done in terms of action and cooperation towards sustainable manufacturing SMEs on the European level, the overarching meta-clusters are the closest to an ecosystem-like structure on this level. Within meta-clusters, different stakeholder groups cooperate towards a common goal beyond cluster boundaries.

There are three important criteria for the selection of meta-cluster organisations as relevant stakeholders in the EUSME:

- They should be active for or in the manufacturing sector and offer manufacturing-specific services or solutions.
- They need to address the topic of sustainability in manufacturing.
- And, they should consider SMEs and their specific position in the value chain and their needs or have solutions that are also useful for SMEs and not only large companies.

These criteria are derived from the mission of the greenSME project to foster and support sustainability of SMEs in the manufacturing sector.

The findings of the mapping represent a first step towards a roadmap for a Sustainable Manufacturing Ecosystem. The roadmap, in turn, aims to identify the gaps of the existing ecosystem or, if necessary, indications to what is missing to develop such an ecosystem and will suggest overall steps of

development and actions of stakeholders to improve and complete the ecosystem. The roadmap will be developed in another dedicated deliverable. The development of an ecosystem itself, however, is not implemented in greenSME.

## 2.2. The understanding of sustainability

In the greenSME project, the understanding of sustainability is closely related to the EU policies on the green transition and the target of climate neutrality of European countries until 2050, summarised under the European Green Deal (EGD) (European Commission, n. y.). The understanding of sustainability of the EGD builds on the Brundtland report's understanding, that sustainable development is a "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development, 1987).

Three dimensions of sustainability are differentiated: environmental, social and economic sustainability.

The EGD defines **environmental sustainability** as the ability to use natural resources in a way that does not deplete them and does not harm the environment. The EGD aims to reduce greenhouse gas emissions, protect biodiversity, prevent pollution, and promote circularity, all while ensuring that natural resources are used in a responsible and sustainable way. It means that emissions that foster climate change are reduced, material and water management are oriented towards the minimisation of material use and the implementation of the principles of waste reduction such as reduction of material and energy use, recycling, reusing, repurposing (European Commission, n. y.). It also means that energy consumption changes in two ways: the change from fossil-based energy towards renewable energy (1) and an increase of efficiency and the overall reduction of energy consumption (2).

**Social sustainability** is defined as the ability to create a society that is inclusive, equitable, and cohesive. The EGD aims to promote social sustainability by ensuring that the transition to a climate-neutral and circular economy is fair and just. This means ensuring that all members of society can benefit from the opportunities created by the transition, and that disadvantaged groups are not left behind (European Commission, n. y.). Social sustainability in the context of the manufacturing industry is mainly defined by "adaptive, collaborative and reliable workplaces", including worker skilling, human-technology interaction, worker well-being, security and inclusiveness (Schmiedel & Martinez, 2022).

The EGD defines **economic sustainability** as the ability to create a prosperous and competitive economy that is resilient to economic, environmental and social risks. The EGD promotes the development of low-carbon and circular industries, supporting innovation and research, and ensuring that the financial system supports sustainable investments (European Commission, n. y.). Accordingly, economic sustainability in the context of greenSME and the EUSME is understood as the capacity of manufacturing companies to stay prosperous and competitive, that they are resilient to economic risks, but also take into account social and environmental requirements and changes. They are prepared for the compliance with environmental and social legislation that requires high standards of environmental protection, circular economy and sustainability as well as social protection and inclusiveness and have long-term sustainable business models and strategies.

When looking at sustainability as part of the goal of the EUSME, some further specifications should be noted. This ecosystem aims at fostering the use of advanced technologies and/or social innovation in SMEs in the manufacturing sector to achieve more sustainable ways of production. Thus, a focus lies on the implementations of technological and social innovation solutions specific to the manufacturing sector and its particular production processes and organisational characteristics. Rather than looking for ground-breaking inventions, the ecosystem aims at raising awareness about available opportunities

and technological solutions for increased sustainability, fostering actual implementation of these solutions in more small or medium sized companies in the sector, share good practices, matching service and technology providers with manufacturing companies, and working together for a better and quicker increase of sustainable ways of production and according business models.

To some extent regulations and laws requiring an increase in sustainability are also a part of the green transition and can be understood as important external influence on the ecosystem, as they often trigger the companies to seek better sustainability outcomes. This relation has two functions: on the one hand, regulations that set a framework that requires compliance by the companies which can threaten the existing business model of a company and creates a need for business model adaptation (1); on the other hand, funding and support schemes for companies that allow for easier transition towards more sustainability and help companies (2). Public entities are considered part of innovation ecosystem at the same time.

### 2.3. Sustainability ecosystems as mission-oriented ecosystems

The metaphor of the biological ecosystem has been taken up in various economic and sociological approaches. The link to biological ecosystems and its metaphorical use in an economic and organisational context refers to the complex interactions and interdependencies of different actors (Brown & Mason, 2017; Moore, 1993). At the same time, ecosystems, as in nature, are able to **sustain** themselves. Accordingly, all the "elements" (or in the economic and social context: actors and sectors) that are essential for survival are found in such an ecosystem, while no external interventions are needed (European Commission, 2012).

With regard to sustainability innovations in an industrial context, the ecosystem approach is also relevant. The implementation of the green transformation in the manufacturing sector (Halme & Korpela, 2014; Janahi, Durugbo, & Al-Jayyousi, 2021) is difficult and complex. In accordance with the ecosystem approach, the cooperation of several stakeholders is needed to tackle the necessary changes, as they are better able to achieve goals together than individual actors on their own. One approach to find a working combination of stakeholders is the quadruple helix consisting of the stakeholder groups business, policy, research/education and civil society (Howaldt, Kaletka, Schröder, & Zirngiebl, 2018). An ecosystem thereby typically describes the complex collaborations and interdependencies between actors from different backgrounds, often including all or most members of a value chain (Moore, 1993). They all work together towards a common goal.

In the economic literature on ecosystems, three main types of ecosystems dominate the debate: business ecosystems, entrepreneurial ecosystems and innovation ecosystems. The three ecosystem approaches business, entrepreneurial and innovation ecosystems overlap in many ways and are closely interrelated. Yet, they can be differentiated by their goals, foci and application areas. Understanding the differences can help identify relevant actors and resources for a particular ecosystem and develop appropriate strategies and actions to address the specific goals and challenges.

**Business Ecosystems** refer to the network of companies, organisations and other stakeholders that interact with each other to create, distribute and capture value in one particular industry or market. Often, business ecosystems are defined with a region or a certain territory. The goal of Business Ecosystems is to create value for all participants in the ecosystem and to promote the growth and development of the industry or market as a whole. It aims at bringing forward a prosperous regional economy. Business Ecosystems often revolve around a central actor - in most cases a focal firm, whose ability to create value depends on different stakeholder groups and actors who produce complementary services and products (Acs, Stam, Audretsch, & O'Connor, 2017; König, 2012; Moore, 1993).

**Entrepreneurship Ecosystems** focus on the conditions and factors that support the creation and growth of new businesses. The focus of entrepreneurial ecosystems is on the external environment of



such businesses, explaining the dynamics between entrepreneurs and actors who are in close geographical, institutional and relational proximity (Brown & Mason, 2017; Stam, 2015). Entrepreneurship Ecosystems include a variety of actors, such as founders, investors, mentors, incubators, accelerators and support organisations, working together to foster innovation, build capabilities and strengthen entrepreneurial culture. Entrepreneurial Ecosystems are in some cases defined by further elements, going beyond an actor-based understanding. These elements include, for example, infrastructure, entrepreneurial culture and knowledge (Stam, 2015). The goal of Entrepreneurship Ecosystems is to create an environment that facilitates the creation of new businesses and promotes the survival and growth of start-ups.

The approach of ***Innovation Ecosystems*** is most fitting to the purposes of the EUSME. Innovation Ecosystems focus on the role of innovation in promoting sustainability, economic growth, or competitiveness. They encompass a wide range of actors from different stakeholder groups, including universities, research institutes, government agencies, companies and civil society organisations. The goal of Innovation Ecosystems is to create a dynamic and open environment that fosters knowledge sharing and collaboration to create new products, services and technologies. In a broader approach, innovation is understood in a variety of ways, referring not only to technological but also to social innovations. All institutions and practices with defining effects on the introduction, implementation and diffusion of innovations are included in the innovation ecosystem approach (Granstrand & Holgersson, 2020; Thomas & Autio, 2019).

While innovation ecosystems in general can have broader goals and, as mentioned above, can also refer to objectives such as economic growth or competitiveness, the EUSME addresses a clear societal challenge: namely, to achieve environmental, social and economic sustainability in the manufacturing sector. Legal requirements and regulations as well as customer demands are important drivers for actors in manufacturing to pursue more sustainable processes, products and business models. Against this background, the European Sustainable Manufacturing Ecosystem is understood as a **mission-oriented innovation ecosystem**, for which not only actors from economy, but also policy, education and research as well as civil society are necessary elements. Mission-oriented ecosystems focus on achieving specific societal goals – often linked to green transformation and sustainability challenges (Jütting, 2020). In the case of the European Sustainable Manufacturing Ecosystem and in accordance with the greenSME project, the mission is to promote sustainability of SMEs in the manufacturing sector, thereby fostering the use, implementation and diffusion of advanced technologies and non-technological solutions, such as social innovation, in SMEs as enablers of greener solutions. In line with other conceptual directions such as social innovation ecosystems (Howaldt et al., 2018), the literature on mission-oriented innovation ecosystems also identifies the four stakeholder groups as particularly important: Industry, science, politics and civil society (Jütting, 2020; Mazzucato, 2018). The question of which stakeholders play an important role in current overarching efforts on sustainability in SMEs at the European level (in the studied meta-clusters) is a central object of the mapping.

### 3. Methodology and Objectives

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The goal of this deliverable is to map current European initiatives on sustainable manufacturing SMEs and the current status of an EU sustainable manufacturing ecosystem. Thereby, a number of research questions have guided the research process and the development of this report.

After defining necessary elements of an ecosystem, these **research questions** are:

- What elements and functionalities of an EUSME are there already?
- Which networks, organisations, initiatives and other meta-clusters are active in supporting manufacturing SMEs' sustainability?
- What kind of connections and networks between different actors are already there? Which are missing?
- What are the requirements for a well-functioning EUSME?
  - What elements and functionalities would a EUSME need in order to sustain itself and work towards its own goal?
  - Which requirements do stakeholders have for the EUSME?
- Where do meta-clusters see gaps and potential for development?

As the perspective is to look at the European level and describe a Europe-wide ecosystem, the starting point taken to map current relevant elements of such an ecosystem was to look for organisations, initiatives and networks that work towards the goal of sustainable manufacturing SMEs on an overarching European level (either as the main focus or as one goal among others), as explained in the last chapter.

The research strategy was to look at meta-clusters first, as they have the largest scope, already bring together different groups of stakeholders that are necessary to form an ecosystem and are the first building parts of a Europe-wide ecosystem. This understanding of meta-clusters means different types of organisations and networks that work on an overarching level above the level of clusters. They can call themselves networks, platforms, initiatives or projects and might have other types of members than just clusters. Despite some differences between these individual forms of organisation, the term meta-cluster best sums up these overarching organisations, also because the majority of organisations have clusters as partners and members, and thus operate at a higher level.

Based on desk research, relevant meta-clusters were identified. The selection criteria were, as described in the background chapter:

- They should be active for or in the manufacturing sector or offer manufacturing-specific services or solutions.
- They need to address the topic of sustainability in manufacturing.
- And, they should consider SMEs and their specific position in the value chain and their needs or have solutions that are also useful for SMEs and not only large companies.

In line with the research interest, a qualitative approach was chosen to analyse and map the meta-clusters. In this context, 13 semi-standardised interviews were then conducted with experts working in the meta-clusters by the partners of the greenSME consortium. Not all mapped meta-clusters could be interviewed and analysed in detail. We present all mapped meta-clusters in section "4.1 Stakeholders and organisations" in the overview figure of the EUSME.

The sample of the interviewed meta-clusters represents a spectrum of different types of meta-clusters. We included the following.

- European meta-clusters that are mostly focused on specific manufacturing sub-sectors (such as the the European Aerospace Cluster Partnership (EACP) for the aviation sector or the European Automotive Cluster Network (EACN)) were considered. Important criteria for the selection were the proximity to the manufacturing sector and the high importance of SMEs for these meta-clusters or their cluster members. The aim of the qualitative research in these cases was to find out how the topic of sustainability is addressed in such organisations.
- At the same time, higher-level cluster networks such as the European Clusters Alliance (ECA) and the Enterprise Europe Network, were taken into account. More than 1000 different European clusters are organised in the ECA. The high importance of the ECA for European clusters and the special role of SMEs as members of the organised clusters were important criteria for the mapping. In this case, too, it was important to find out what significance services on the topic of sustainability have for the ECA in the course of the interviews.
- Meta-clusters with smaller scope, such as the Piemontese TIPPS, the Spanish MANU-KET or the inter-regional Greater Green, were also considered, even though the meta-clusters do not focus on the entire European area, but only on regions or member states. Important criteria for consideration were the specific fit of the topics addressed. In the case of Greater Green, its topics match very well with the focus area of greenSME: Greater Green sees itself as a meta-cluster for environmental sustainability and focuses specifically on SMEs. It thereby brings together clusters, science and administration players on an interregional level

Table 1: Interviewed meta-clusters. Selection based on four criteria: scope (1), sustainability (2), SME focus (3), stakeholder involvement (4) and availability. Information based on web-desk research.

Meta-cluster	Scope	Sustainability	SME focus	Stakeholder involvement
<b>Circular Economy Initiative acatech (CE Initiative)</b>	National scope, focusing on Germany	Focus on Circular Economy → Environmental sustainability clearly targeted	Targeted activities for SMEs	Consortium of 130 experts from 50 institutions (ministries, companies, research institutions & civil society organisations)
<b>European Automotive Cluster Network (EACN)</b>	European scope	Green transformation is addressed as an important driver for the automotive industry	More than half of the companies represented by the partner clusters are SMEs → targeted services for SMEs by EACN's partner clusters	EACN comprises 26 clusters from 13 European countries → among these are companies, R&D institutions & public authorities
<b>European Aerospace Cluster Platform (EACP)</b>	European scope	Sustainability does not seem to be in the foreground of EACP's activities, but nonetheless a topic of interest for the meta-cluster	Majority of companies represented by the member clusters are SMEs	Companies, research institutions, universities and public authorities
<b>European Clusters Alliance (ECA)</b>	European scope	Sustainability is among the main pillars of the covered topics	Among the represented clusters/cluster associations of the network are thousands of SMEs	Aggregating 22 associations of clusters and more than 1000 clusters with a variety of different stakeholder groups
<b>European Enterprise Network</b>	European scope	Sustainable innovation and Circular Economy as a main focus	SMEs are considered as customers of Enterprise Europe Network → are in the focus of services	A variety of different stakeholder groups are integrated: Companies, research institutions & universities, public agencies
<b>EIT (European Institute of Innovation and Technology) Manufacturing</b>	European scope	Sustainability, or more specifically sustainable manufacturing, is among the key areas of EIT Manufacturing	SMEs are an important target group for the activities of EIT Manufacturing	Partners are single organisations, including leading industry partners, universities and research institutes

<b>European Technology Platform for Advanced Engineering Materials and Technologies (EuMaT)</b>	European scope	Safe and sustainable materials are in the focus of EuMaT; environmental and social sustainability are included	Further activities for SMEs are planned	Members are mainly from the industry and R&D institutions
<b>Greater Green</b>	Regional scope, focusing on the Greater region (Germany, France, Luxembourg, Belgium)	Sustainability is clearly in the focus → Greater Green aims at promoting inter-regional collaboration in this area, with a focus on environmental technologies	Greater Green is in direct contact with about 50 SMEs	Companies, public administration, research institutions and business development agencies are among the members
<b>International Cleantech Network (ICN)</b>	International scope	The focus is on environmental and climate sustainability	Among the member's members of ICN are many SMEs	Groups represented are mainly technology providing companies (among which are many start-ups and SMEs) as well as public authorities and research institutions
<b>IRISS – the international ecosystem for accelerating the transition to Safe-and-Sustainable-by-design materials, products and processes</b>	International scope	Sustainability is in the focus of IRISS' activities	Some of the activities of IRISS also target SMEs; e.g. training services for SMEs	The IRISS consortium consists of European research institutes, trade associations, companies, authorities and universities, as well as technology platforms
<b>MANU-KET</b>	National scope, focusing on Spain	Many aspects of the research agenda focus on sustainability; mainly connected to sustainable manufacturing	No targeted measures for SMEs	MANU-KET has 256 member-organizations: Companies, research institutions, associations, universities as well as governmental organizations and agencies.
<b>Silicon Europe Alliance (SEA)</b>	European scope	Sustainability as one of the main topics in SEA	More than 2000 of SEA's members are SMEs	Alliance members are individual organisations, including research institutes and companies

<b>TIPPS</b>	Regional scope, focusing on Piemonte (Italy)	The ecological transformation is among the core topics of TIPPS	Over 85% of the members of TIPPS are SMEs	Different stakeholder groups are represented by TIPPS: Companies, universities and research institutions
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Table 2: Meta-clusters considered in the desk-research as important actors for the EUSME, but not interviewed.

Meta-cluster	Scope	Sustainability	SME focus	Stakeholder involvement
<b>MANUFUTURE</b>	European scope	Sustainability and sustainable manufacturing (e.g. in the form of eco-efficient products and manufacturing) as one of the main objectives of MANUFUTURE	Targeted measures and activities for SMEs	Companies, research institutions, universities, public authorities, associations and technology platforms
<b>European Association on Smart Systems Integration (EPoSS)</b>	International scope	Sustainability as a key target of EPoSS → special focus on the integration of green Smart Systems technologies	SMEs are among the members and the target groups of EPoSS	EPoSS members mainly consist of industrial companies and research organisations; but universities and public authorities are also integrated
<b>European Circular Economy Stakeholder Platform (ECESP)</b>	European scope	Clear focus on Circular Economy with economic, social, environmental and technological aspects considered	No particular focus on SMEs	24 participating stakeholders from different stakeholder groups, including think tanks, NGOs, business associations, European administration and research institutions

<b>Efficient Sustainable Manufacturing (ESM)</b>	Regional scope	Sustainability is a core topic of ESM, more specifically: contribution to a reduction of pollution and energy consumption and facilitation of smart usage of resources	SMEs are also targeted within ESM	The main target groups are companies; The initiative is mainly driven by regional authorities within the framework of Smart Specialisation strategies
<b>Ellen McArthur Foundation</b>	International scope	Circular Economy is the main topic of the Ellen McArthur Foundation	Targeted measures for SMEs	Different stakeholders from business, academia, policymakers, civil society and institutions are collaborating in the network
<b>EIT Climate KIC</b>	European scope	The transition to a zero-carbon, climate-resilient society stands as the main objective of EIT Climate KIC	Targeted activities, like events and competitions, for SMEs	EIT Climate KIC brings together stakeholders from business, academia, the public and non-profit sectors
<b>European Cluster Collaboration Platform (ECCP)</b>	European scope	The main focus of the ECCP is the digital and green transformation	The ECCP particularly aims at strengthening the competitiveness and sustainability of SMEs	Overarching platform on which the majority of European clusters and meta-cluster and their members are represented
<b>Finnish SuperEcosystem (SupEco)</b>	Regional scope, focusing on Pohjois-Savo (Finland)	Sustainability is embedded in most of the activities of SupEco	Targeted measures for SMEs	SupEco brings together regional stakeholders from industry, regional public bodies, intermediary actors such as the business development agency, as well as education providers and civil society actors

Despite pre-formulated guiding questions, a relatively open design was used, in which respondents were to be given the opportunity to present contexts in a detailed, thorough and in-depth manner. The interviews served to gain deeper insights into the meta-clusters and be able to learn from the experience of meta-clusters with bringing together different stakeholders, working on support for SMEs and the topic of sustainability in the manufacturing sector. Finally, the various interviews were analysed using an analysis scheme to obtain deeper insights into what the meta-clusters already offer to manufacturing SMEs in terms of sustainability. The meta-cluster specific results are summarised in the profiles of meta-clusters in the annex. A more open approach of analysing the results for the interviews was used to answer the research questions about the status of the EUSME and requirements and chances that meta-cluster representatives see for the EUSME. The results of the analysis are presented in the next chapter. In order to achieve the required anonymisation, here, the arguments, assessments and opinions taken from the interviews are not referenced to single interview partners or meta-clusters. They are nonetheless clearly presented as or marked as based on the interviews.

The mapping of the EUSME is based on the understanding of mission-oriented innovation ecosystems as explained in the chapter “Background” with the specific pan-European scope and the understanding that this level of organisation would entail rather a second-level support structure for the organisations (such as the mapped meta-clusters) that are already in place.



## 4. Mapping the EU Sustainable Manufacturing Ecosystem (EUSME)

### 4.1. Stakeholders and organisations

The decision to analyse meta-clusters for mapping the current state of a sustainable European ecosystem stems (among other reasons) from the fact that such organisations already unite different stakeholder groups among their members. While the literature on (mission-oriented) innovation ecosystems suggests that companies, public authorities or policy makers, research and education and civil society actors are usually needed to achieve the common goal of the ecosystem, we also looked for these four types of stakeholders from the quadruple helix. The answer to the question of which stakeholders are specifically considered already part of meta-clusters specifically was not clear before conducting the qualitative research. In addition to extensive desk research, the interviews and results of the desk research provide information about the stakeholder groups that are already part of European sustainability efforts in the manufacturing sector. The results are shown within this section.

The first observation is that there is a certain **diversity among the organisations** studied. Due to our somewhat broader understanding of the term meta-cluster, networks, partnerships, platforms, cluster-collaborations and projects were included in the mapping. Although they are all meta-clusters as we define the term, subtle differences could be found. These differences are often related to the members and the target groups of the meta-clusters. The types of members and target groups influence the service offer and scope of activities. One important shaping factor is whether meta-clusters stay in contact with individual companies themselves, either because they allow for individual companies to become members or because they offer services for them. For example, meta-clusters usually stand in contact with their member clusters and associations, so that services are rather not developed directly with companies. The individual clusters, on the other hand, are rather in direct contact with companies. Those meta-clusters that are networks and platforms may differ in their target groups, depending on their goal and type of structure. In general, most of the services of the meta-clusters analysed serve to promote sustainability among SMEs, but it differs whether SMEs are the direct target group or whether they are reached indirectly via the member organisations – which will be further elaborated in the next subchapter.

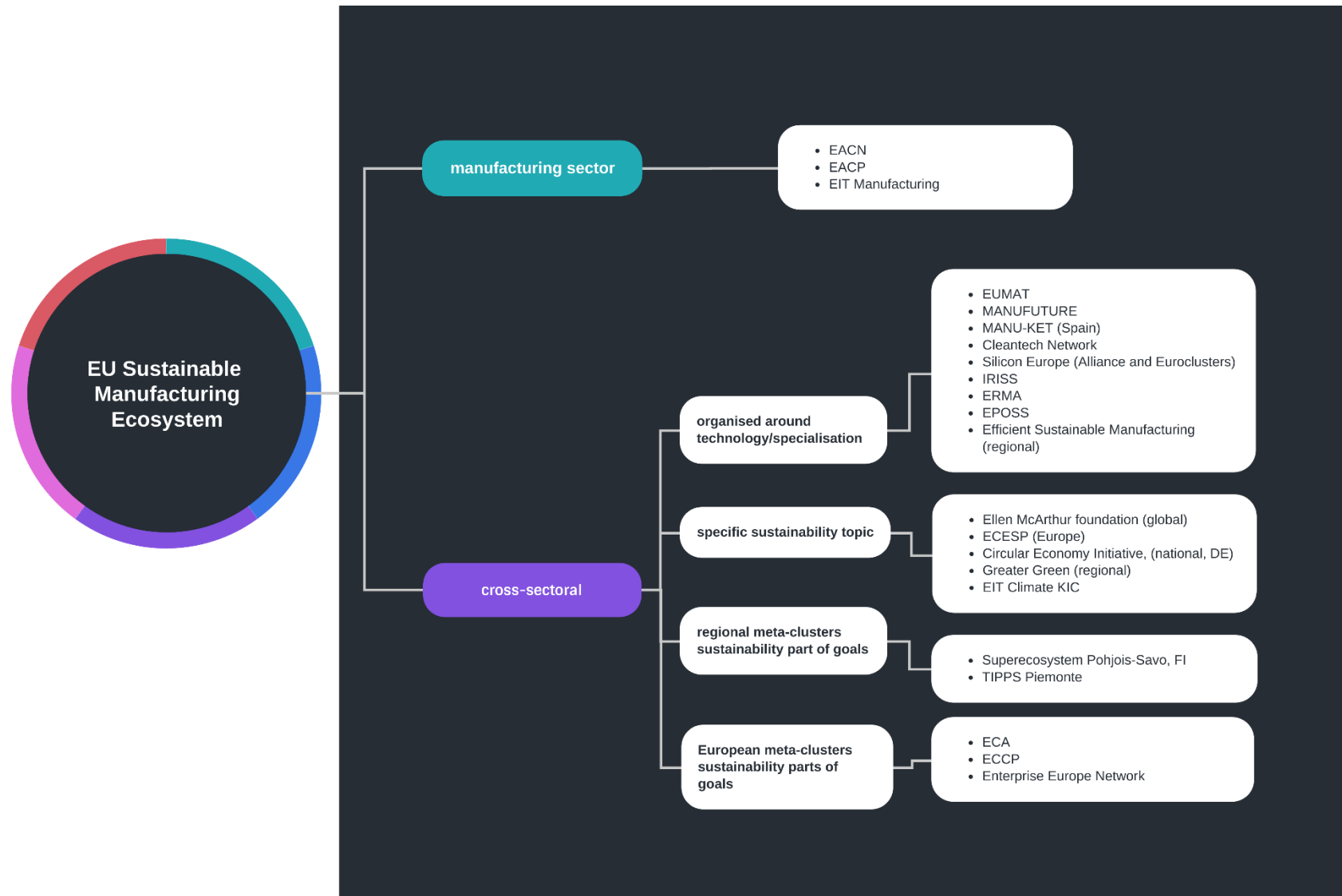


Figure 1: Mapping of meta-clusters in the EUSME

As suspected, the various meta-clusters studied unite a range of different stakeholder groups from different backgrounds among their members. In most meta-clusters, a triple helix of actors is found, consisting of stakeholders from the economy, research and the public sector. In some cases, not only companies but also sector associations are included. In the area of research, there are both research institutes, who conduct research on sector-specific technological solutions, and universities. The public sector includes governmental organisations, including public administration bodies, as well as chambers and agencies. Civil society seems to be rather underrepresented as the fourth stakeholder group. Nevertheless, some of the organisations studied also integrate start-ups with a social mission, in the sense of social entrepreneurship, as well as NGOs or labour unions. While research from the stakeholder group “research and education” is represented in most meta-clusters, education providers, such as Vocational Education schools and training institutes for both, initial VET programmes and continuous vocational education are almost never represented. In this respect, one only can partly speak of a quadruple helix of actors within some meta-clusters, which would include actors from all four backgrounds, economy, policy, research & education as well as civil society.

In the vast majority of the meta-clusters studied, SMEs are one of the most important target groups of services of either the met-clusters or their members. This is mostly due to the fact that the majority of the member clusters in turn have SMEs among their members - in line with our research interest. The number of members varies depending on the type of meta-cluster.

In order to illustrate the spectrum from smaller to larger meta-clusters and their members, a few examples shall be presented in the following.

- smaller meta-clusters
  - **IRISS**, as a three-year project, involves research institutes (e.g. IVL Swedish Environmental Research Institute, Fundación TEKNIKER in Spain, BioNanoNet (BNN) Austria, EMPA in Switzerland), trade associations (like CLEPA, the European Association of Automotive Suppliers, CEFIC representing chemical industries), companies, public authorities and universities (e.g. University of Birmingham, Leuphana University of Lüneburg), as well as technology platforms (e.g. ETP, EU Technology Platform for the Future of Textiles & Clothing) and EMIRI (Materials industrial initiative) in a consortium which consists of 20 partners. The project also takes up the ecosystem idea and aims at building an ecosystem for SSbD (safe and sustainable by design materials and chemicals, products and processes along the lifecycle).
  - **MANU-KET**, a technology platform for advanced manufacturing, comprises around 150 companies, 52 research institutions, 24 associations, 20 universities and 11 governmental organisations and agencies, combining about 256 members altogether. The majority of the members, aside from the associations, are therefore individual organisations.
- large meta-clusters
  - **EACN** involves 5000 companies, of which around 2700 are SMEs – as EACN involves 26 clusters from 13 European countries. Yet, not only companies but also R&D institutions and public authorities are among the members of the individual clusters in EACN.
  - **EACP** is a meta-cluster that consists of 45 aviation clusters from 18 European countries, covering around (among others) 4300 companies in the aerospace sector, of which the majority are SMEs. In order to become a member of the EACP, partner clusters have to represent all relevant stakeholder groups of the regional aerospace sector, including industry, research and development (R&D) and administrative bodies.
  - The **Enterprise Europe Network** comprises partner organisations from 40 countries and understands itself as a global, international network. Individual organisations from

different areas of society are united here: among them Chambers of Industry and Commerce, Regional Development Organisations, universities and research institutes and innovation agencies - the thematic focus is thereby on business support, whereby concrete solutions are also designed together with and for companies. Regional branches in the individual partner countries are a tried and tested means of granting access to companies – as will be explained in more detail in the next subchapter.

- Another example, is the **European Cluster Alliance (ECA)**, which comprises around 1000 different clusters, which in turn have completely different thematic focuses. This includes 22 national cluster associations, public agencies or country ambassadors and around 1000 cluster organisations. Among them are 150,000 innovative businesses, of which approximately 60% are SMEs. ECA also includes over 11,000 universities, research centres and public institutions.

The selected meta-clusters have different focal points and focus sectors, all of which are more or less related to manufacturing. The spectrum ranges from meta-clusters with a clear focus on one manufacturing sub-sector to meta-clusters that encompass several sectors to meta-clusters that are dedicated to certain key topics, being open to all relevant sectors to this topic. We grouped the interviewed meta-clusters in the following way:

- Examples of sector-specific clusters:
  - The EACN, the European Automotive Cluster Network, has a clear focus on the automotive sector.
  - The EACP, the European Aerospace Cluster Partnership, brings together different aviation clusters and focuses on the aerospace sector.
  - EIT Manufacturing brings together members from different stakeholder groups of the manufacturing sector. It focuses on a variety of current manufacturing challenges, especially on innovations for digital and green transformation.
- Examples of meta-clusters that cover several sectors and are organised around certain technologies or specialisations that are relevant for sustainability in the manufacturing sector:
  - EuMaT, the European Technology Platform for Advanced Engineering Materials and Technologies, can be mentioned here as an example. Since engineering materials are important in many different sectors, the platform has a broad focus. However, the 9 sectors health, sustainable construction, new energies, sustainable transport, home and personal care, sustainable packaging, sustainable agriculture, sustainable textiles, and electronics are in the foreground. Now EUMAT is involved in the creation of **AMI2030 initiative**.
  - MANU-KET is the Spanish Technology Platform for Advanced Manufacturing (national level).
  - Cleantech Network as an international network of clusters, companies and public bodies that foster the dissemination and marketisation of technologies that increase sustainability in different sectors and are needed for Circular Economy set-ups.
  - The Silicon Europe Alliance consists of (at the moment) 11 European clusters active in digital technologies and Internet-of-things areas such as micro and nanoelectronics, photonics, ICT and software. The Silicon Eurocluster project aims (among other goals) at using these technologies in the green transformation.
  - IRISS (description above) covering safe and sustainable by design materials and chemicals, along the value chain.

- Examples of meta-clusters that have a specific focus sustainability topics and encompass several sectors:
  - The Circular Economy Initiative acatech works on the topic of the circular economy from a national perspective in Germany. The initiative works in three interdisciplinary and cross-sectoral working groups. The topics are circular business models, traction batteries and packaging. In total, about 130 experts from over 50 institutions from science, business, politics and civil society discussed how circular economy systems can be enabled and implemented.
  - Greater Green is an inter-regional meta-cluster aiming at inter-regional collaboration on sustainability. It brings together stakeholders from different areas, such as regional administration, companies, industrial clusters and research institutes. Greater Green is open to all sectors.
- Examples of meta-clusters that cover several sectors and are also broadly positioned in terms of topics, with relevance to sustainability and manufacturing
  - The European Clusters Alliance (ECA)<sup>2</sup> is described as a cluster network and can also be considered a meta-cluster or an umbrella organisation of European clusters, as it is aggregating 22 associations of clusters, nearly 1000 clusters and tens of thousands of European SMEs. Different topics are covered by the ECA. Most of these topics are connected to the pillars of sustainability, digitalisation and resilience. Thereby, a variety of sectors is covered, as the partner clusters all have different sectoral foci.
  - The Enterprise Europe Network is the world's largest support network for SMEs. The network's member organisations thereby include chambers of commerce and industry, regional development organisations, universities and research institutes and innovation agencies. Sustainability is an important topic at the Enterprise Europe Network. Thereby, a distinction is made between the dimensions of social, environmental and economic sustainability. Enterprise Europe Network is directly tasked with supporting companies in sustainability across Europe.
- Regional meta-cluster that has a strong focus on sustainability but ultimately aims at a prosperous economy of a region.
  - TIPPS in Piemonte

## 4.2. Offers and services of current meta-clusters

The focus of this sub-chapter is on services and resources offered by meta-clusters that are fostering sustainability of small and medium enterprises. Two external drivers of sustainability measures in SMEs have been mentioned in the interviews. One is regulations of the European Commission and in turn national governments on the one hand and – often due to these regulations – customer requirements on the other hand. When these reach SMEs they can lead to a need for action by SMEs with regard to the implementation of sustainable solutions (for a fairly current analysis of the situation compare also see European Commission, 2022). The meta-clusters report that the topic of sustainability is of great importance, but that many SMEs are not aware yet, that regulations and customer needs will affect them. Meta-clusters are developing support for clusters for their services and, in some cases, their own services on the topic of sustainability in manufacturing SMEs: In line with the understanding of sustainability in greenSME and as described in chapter 2 from a theoretical standpoint, many of the

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<sup>2</sup> <https://clustersalliance.eu/>

organisations direct their services for sustainability in three ways: fostering environmental, social and economic sustainability.

The nature and focus of the services related to sustainability also allow conclusions to be drawn about **how sustainability is understood and approached**. The individual clusters, which form the majority of the members of the meta-clusters studied, already have various offers for their own members to support them in their green and sustainable development: For example, some the meta-clusters' members focus on renewable energies, while others concentrate on green technology aspects. The services of the meta-clusters accordingly complement the sustainability activities of their member clusters and networks. Meta-clusters thereby generally offer services to promote environmental as well as social sustainability to support their member clusters and member organisations in their efforts, both also fostering economic sustainability in an indirect or direct manner. Sustainability itself is not necessarily the main focus of all analysed meta-clusters – yet, the importance of sustainability is clear in all the clusters studied, whether as a core topic or one of the addressed topics.

Particularly with regard to environmental sustainability, this results in numerous implications with regard to products, processes and business models: for example, representatives from the raw materials sector describe that companies are **required by law** to use recycled materials in their products. This leads to new requirements with regard to the manufacturing process and the equipment used or the product design phase. At the same time, many equipment and component providers are required to provide information on the carbon footprint of their components and processes, also in order to be able to better assess the footprint of the entire final product. Above that, knowledge about the behaviour of components and parts along their life cycle are also required, e.g. in order to make better decisions with regard to re-manufacturing, re-cycling, or re-using. According to the experts interviewed, such sustainability-related requirements have a major impact on companies, whereby *information and knowledge about methodologies and strategies of how to gather and provide the required information are often lacking* - not only with regard to the described example of measuring the carbon footprint, but also in other respects. How such a green transformation can be economically feasible for SMEs and which implications arise with regard to social aspects (e.g. skills in the workforce) are central questions of the meta-clusters investigated.

In some of the analysed cases, the services of the meta-clusters connected to sustainability in the broadest sense revolve around the **use of technology to increase environmental sustainability**. In this context, and in order to achieve environmental sustainability, Advanced Technologies (AT) are of great significance, according to the several interviewees. In general, AT are mentioned in some interviews to be an important enabler with regard to circular economy, energy and materials efficiency and the reduction of waste production, although technology alone is not sufficient. The interviewees also mention Artificial Intelligence (AI) as a key technology, especially with regard to energy reduction and the optimisation of energy use. AI together with the Internet of Things (IoT) could make an important contribution to using the available resources in companies and industries in the best and most economical way, thus also to reduce the amount of energy consumed.

From a social point of view, challenges revolve around a lack of skilled workforce, especially in areas related to digitalisation, manufacturing and sustainability – or more specifically, circularity. Against the background of the digital and green transformation, topics like **training** as well as **image and recruiting, talent retention and workforce satisfaction** are important issues. Aside from that, the optimisation of workflow and work organisation is also a significant factor. Thereby, it is important “to introduce circular flows for everything” (interview 1), also connected to organisational structures. This seems to be deeply connected to a change of cultural approach and a change of the way of working, according to some of the interviewees. Some examples mentioned here, were a project-based way of working on better solutions with an inclusive and error-friendly culture as well as restructuring work organisation where needed to adapt to the principles of circular material flows.

Additionally, many of the activities offered by meta-clusters at a higher level are about **networking** and **promoting cooperation and exchange of knowledge**. This also includes providing an overview of which cluster and which organisation (sometimes also which company) is working on which sustainability projects, initiatives and solutions, to their members – information events serve this purpose, so that both, the meta-clusters themselves and the member organisations have an overview. In some cases, initiatives work on the same topics without knowing of each other - this is where the services of meta-clusters aim at **making connections**. In the broadest sense, many of the services of meta-clusters in the area of sustainability are therefore about promoting cooperation and communication between individual cluster organisations on a higher level with regard to sustainability activities.

As suggested above, a majority of the services of the studied meta-clusters aim at the **provision of information and knowledge** as well as **knowledge exchange** and the goal of **creating awareness for sustainability among companies**. The focus is on trying to give small and medium-sized enterprises in particular a sense of what the green transformation means - and what challenges and opportunities the companies are facing. Such **awareness raising** could e.g. be related to funding opportunities, or to the use of digital technologies, which are seen as enablers for the green transformation, but could also be related to social issues, such as training or better inclusion of potential workforce. Awareness raising in most studied cases takes place in the course of events such as workshops: "Then we put in place a series of activities and events, like webinars or fairs, to increase the awareness on [the] topic [of sustainability]" (interview 11).

Another way to exchange and provide knowledge, is through the presentation of **best practice examples** and **impact assessments**. According to several of the stakeholders interviewed, it is helpful if such examples come from other sectors and other regions, so that the benefits and value of certain solutions and processes can be considered more objectively. In the case of meta-clusters, whose members mostly consist of different individual clusters, it is also a matter of **identifying certain useful services implemented by clusters**, which in turn could also be used by other clusters. At the same time, such an exchange can also lead to the development of **joint services of clusters** (mostly in one sector).

Especially with regard to small and medium-sized enterprises and start-ups, **Open Calls** for funding opportunities also play an important role in promoting sustainability. In some cases, overarching organisations are themselves in a position to fund and launch such open calls. In other cases, the service offered is to monitor and assess funding opportunities for the meta-cluster's members. This activity, in turn, is more related to awareness raising and knowledge provision. The activities of meta-clusters in some analysed cases also encompass **consortium building**, thereby aiming at enabling different clusters to cooperate within projects and open calls in order to receive funding for sustainability measures.

Another service that plays a role in almost all of the overarching meta-clusters studied and is also mainly organised in the form of events is so called **matchmaking**. In broad terms, this is about facilitating and promoting cooperation and contacts. In some of the studied meta-clusters, it revolves around the mediation or putting in contact between technology providers on the one hand, for example in the form of start-ups or scale-ups, and larger corporate customers with corresponding needs on the other hand. It can also involve collaborations with regard to R&D and therefore matchmaking in the field of research; e.g. with regard to cross-sector or cross-country testing of solutions.

However, the services of meta-clusters can also take on concrete and **individually tailored** forms to the needs of companies. This is due to the access meta-clusters have to companies: While some meta-clusters and overarching organisations are only in contact with their partner clusters and member organisations and do not maintain direct and regular communication with the companies, this is



different for other meta-clusters, depending among other things on their organisational structure. Some meta-clusters analysed have regional branches – e.g. referred to as co-location centres (EIT Manufacturing) or local contact points (Enterprise Europe Network). These regional contact points can facilitate access to companies also for the overarching part of the meta-cluster. Respondents have stressed that precisely the regional proximity is an important way of understanding current topics and needs of SMEs and to understanding the context they act in. Spatial proximity can also lead to collaboration with stakeholders otherwise hard to connect to, as the one meta-cluster stressed in the interview.

Some of the meta-cluster organisations design **concrete services for companies**, especially SMEs, e.g. in the form of **counselling or consulting** that are directly related to sustainability. Among these tailor-made services for companies are, e.g. support with regard to more **sustainable business models** or support in **adapting marketing strategies**. Representatives of the meta-clusters are thereby in direct contact with the companies and identify challenges and problems in order to develop individual solutions in cooperation and communication with the companies.

Such direct contact with the companies, which seems to be rather untypical for meta-clusters, can also come about for a limited time period when needed: For example, one of the interviewed meta-clusters which normally only has contact with the member clusters, has developed services that were aimed directly at companies - due to the Covid-19 pandemic and the war in Ukraine and the rapid disruptions associated with it. The services were not individual solutions for specific business needs, but rather broader information for open calls and funding as well as public events. However, the meta-cluster found it difficult to provide information in a timely manner, so they have since returned to the original model - and the meta-cluster is once again in contact exclusively with the member clusters. This experience shows how meta-clusters are not always the right level to directly deliver services to companies, but that a close collaboration with the regional clusters and the meta-clusters is of high importance.

Many of the topics dealt with by meta-clusters in the context of sustainability are dealt with in **working groups**. Such working groups are set up to work on particular sustainability issues, such as bio-diversity or bio-economy at the ECESP<sup>3</sup>. Other examples are Working Groups, in which the Meta-cluster specialises in supporting its members in developing concrete measures, e.g. for the advanced measurement of carbon footprint or with regard to the topic of Circular Economy. Events are also organised in the course of such working groups. For example, ECESP leadership groups organise annual circular talks on various sustainability-related topics<sup>4</sup>.

It can be summarised that services of the analysed meta-clusters can take different forms and range from broader offers, such as awareness raising and information provision, to very specific, individually tailored recommendations and assistance for companies. In some cases, meta-clusters provide a whole range of these services for different stakeholder groups (such as member clusters, companies, policy makers) (e.g. the Enterprise Europe Network), depending on the meta-cluster members and goals. Most analysed meta-clusters are primarily in contact with their first level members (networks and clusters) and less with the members of their members. They, accordingly, tend to offer services for the clusters and other partner networks and associations. But, the ultimate goal is to help them support their members, which are companies, mainly SMEs, technological centres, universities, and public agencies.

Naturally, the services of meta-clusters are not limited exclusively to topics related to sustainability. A number of other services are also offered, for example in connection with the internationalisation of

<sup>3</sup> <https://circulareconomy.europa.eu/platform/en/coordination-group>

<sup>4</sup> <https://circulareconomy.europa.eu/platform/en/coordination-group>



clusters, other technological innovation areas, the marketing of business strategies, the promotion of competitiveness etc. However, the topic of sustainability, which in some cases also overlaps with the examples mentioned, seems to be important in one way or another in all of the meta-clusters examined - either as a core topic or as a cross-cutting topic.

### 4.3. Existing networks and collaborations

#### 4.3.1. Formats of collaboration within the meta-clusters

The analysed meta-clusters all organise on-site and online activities for collaboration. The scope differs from international (e.g. the IRISS Network) and Europe-wide (e.g. the ECCP, EIT Manufacturing, Enterprise Europe Network, Silicon Europe, EUMAT) to regional (e.g. The Super Ecosystem in the Savonia region in Finland). Most meta-clusters explicitly have a European reach. This does not necessarily mean that all member states are involved. Often, as regional clusters and actors are their members, the meta-clusters have an inter-regional approach. So, they act Europe-wide, but connecting regions, rather than involving the national level actors. Only a few do also include national-level stakeholders, while none of them have mainly national-level stakeholders as members. Nonetheless, most meta-clusters do interact with European Commission agencies or maintain a European level office or coordination.

Some activities happen in most meta-clusters with the intent to bring members into exchange of ideas and the creation of collaborations as described above (reference sub-chapter).

Member assemblies on-site or online happen in some of the meta-clusters, e.g. the European Circular Economy Stakeholder Platform or the European Aviation Cluster Partnership, allowing for agenda setting and discussion of common topics among all members.

The described thematic working groups of some of the meta-clusters allow for the exchange of knowledge and development of project ideas about the respective topic. Sustainability-related topics can thereby be found in different studied cases in these working groups and are then discussed between member organisations. Examples for this are the working group on circular economy of the Enterprise Europe Network, or the leadership groups of the ECESP.

Overall, there is a strong role of the European Commission on the European level for meta-clusters as many of the meta-clusters are either continuously partially funded by the EC or receive funding for parts of their activities temporarily. The extensive programmes funded by the European commission or by public-private-partnerships with the European Commission as one of the funders do give a strong incentive to the clusters, meta-clusters and many companies to get into action in the areas of strategic importance to the EC, such as a competitive, resilient, sustainable and human-centric industry, or the Green Deal. In some of the interviews, these policies and measures have directly been mentioned as an important reference point. A great deal of collaboration by the EC, representing the public sector, with meta-clusters must be acknowledged as one important element of the EUSME.

Two of the analysed meta-clusters are projects that are directly financed by European programmes (Greater Green and IRISS). The EIT Manufacturing, the Enterprise Europe Network and the European Circular Economy Stakeholder Platform were established by European Union public bodies and are financed continuously by EU funds. In that way they are part of the European Union public services. The EACP, Silicon Europe, EuMaT are partially funded by the European Union and Cleantech International started as a European project and then got self-reliant through a number of members of the old consortium.

Some of the analysed meta-clusters also do not get funding from the European Union but from national or regional governments, such as the German Circular Economy Initiative acatech, MANU-KET in Spain

or TIPPS in Piemonte, Italy. Others are funded through their members, such as the European Cluster Association, MANUFUTURE and the EACN.

#### 4.3.2. Scope of collaboration

Some meta-clusters mainly promote the exchange of ideas and the forming of project consortia. The fostering of bilateral collaborations, for example between technology or service providers and other types of manufacturing companies is common for the clusters' and meta-clusters' activities. Both, bilateral collaborations or projects emerge from the collaboration within meta-clusters. Then, there are multi-stakeholder projects that require bigger consortia. In order to find the needed expertise from reliable and experienced partners, organisations take part in matchmaking events (and other activities) of clusters and meta-clusters. Meta-cluster members and meta-clusters among each other exchange knowledge about funding programmes, open calls and trending topics.

In most cases, collaboration aims at the exchange of knowledge between the partaking parties. Monitoring trends (such as external pressures like international competition, the energy crisis, disruptions in the supply chain due international events or conflicts, development and implementation of technology, changes in legislation and regulation, innovative businesses) is partly done by meta-clusters and clusters for companies and other stakeholders.

Only some meta-clusters also develop explicit common strategies or position papers. One example for this type of common goal and related activities is what the ECA does. The ECA's members do develop joint recommendations directed at public authorities. One example is the "Recommendations for the update of the EU Industrial Strategy" (ECA, 2021) in which the role of clusters and SMEs are emphasised. The ECA then also takes part in public consultation processes of the European Commission with their positions clarified among members.

A specific way of collaboration within meta-clusters is the subsidiary organisation in regional offices that are in charge of collaboration on the regional level but who also work closely together with the offices in the other regions and an overarching organisation. One example is the way the EIT Manufacturing works. The experiences from the regional level and the specific needs of the regional sectors are compared and discussed on the overarching level, with the effect that the contact to the "needs on the ground" is given. This is translated into common goals and a common strategy for actions. At the same time the EIT Manufacturing participates in European high-level discussions and public consultancy processes of the European Commission. This way, the meta-cluster manages to create added value for the sector on both levels: regional and European. A similar approach can be found in the Enterprise Europe Network which is organised in member states offices with regional experts that function as contact points and advisors for companies. They also organise in thematic sub-groups (internationally) and sector-oriented divisions.

#### 4.3.3. Collaboration between meta-clusters and with external stakeholders

Collaboration of meta-clusters with other meta-clusters has been mentioned by some interview partners, but they tend to happen only sporadically so far. One example is a collaboration between the Enterprise Europe Network and the ECCP, in which the experts of the Enterprise Europe Network can be contacted for consultancy on certain topics via the ECCP's website.

Another example is the collaboration between the EIT Manufacturing and other EITs, such as EIT Raw Materials or EIT Mobility, to exchange knowledge and develop common actions in the field of sustainability, bringing together different sectors where it seems fruitful. Another example is the collaboration of EIT Manufacturing with EFFRA for the *Factories of the Future* partnership in which one of the important topics of sustainability is circular economy.

On the regional level, there may be more examples, as the the example of the EIT Manufacturing shows. The EIT Manufacturing regional branches take part in regional cooperation with public agencies and other local stakeholders.

Overall, the meta-clusters did mention surprisingly few collaborations with other organisations or meta-clusters on the topic of sustainability, especially on a European level.

#### 4.3.4. Insights into gaps in the ecosystem

Some interview partners do not yet see a European Sustainable Manufacturing Ecosystem. They see a lack of coordination for implementing effective measures of sustainability in the European manufacturing sector as a whole. Others mention a lack of a common strategy to reach sustainability in the manufacturing sector. When asked, who should be responsible for this kind of coordination, opinions differ. While the role of the European policy makers is considered influential and powerful in this regard, some interview partners see potential problems with another layer of centralised top-down meta-meta-cluster organisation. Rather, they see a need for bottom-up, decentralised governance to reach a common strategy to facilitate sustainable manufacturing throughout Europe. Regional differences in the motivation to become more sustainable and differences of the level of technology use are mentioned as a barrier to a centralised one-size-fits-all strategy. Rather, the regional and local levels are seen as a main reference point for tailor-made paths towards more sustainability.

### 4.4. Advantages and Chances of the EUSME

While the last chapter put an emphasis on understanding what already is being done by meta-clusters, this section comes back to the overarching level and the question what is still needed for a well-functioning EUSME. As described in the beginning, the EUSME has the mission to support sustainability in SMEs of the Manufacturing sector in Europe and on a pan-European level. As the meta-clusters already bring together various stakeholders and coordinate support of companies in many ways, this section aims at clarifying what kind of added value the European ecosystem would have and what requirements and chances the meta-clusters identify that will help to achieve a well-working EUSME.

#### 4.4.1. Advantages and chances of an EU Sustainable Manufacturing Ecosystem

Various arguments about advantages and chances of the EUSME came up in the interviews that can be summarised into the Following points.

1. **Enhanced coordination:** The creation of a unified approach to sustainability would allow stakeholders to establish common goals and strategies. By focusing on specific technologies and solutions, the EUSME could tackle pressing environmental challenges more effectively. This collaborative approach is expected to foster a sense of shared responsibility, creating synergy and innovation.
2. **Fostering inter-regional and international collaboration:** Building on the success of initiatives like the described meta-clusters, the EUSME would provide valuable connections and opportunities for knowledge exchange between relevant stakeholders across Europe and between the meta-clusters. These collaborations could significantly accelerate progress towards sustainability by leveraging the collective expertise and resources of multiple regions, countries and the different sub-sectors in manufacturing. One part of this should be a strengthened collaboration between clusters and meta-clusters across different European regions. Robust connections within the ecosystem would ensure effective reach and access to a diverse range of companies, propelling innovation and growth. Only by creating a

supportive environment for collaboration, the ecosystem would be able to harness the potential of various stakeholders to drive sustainable manufacturing.

3. **Mutual Learning and Knowledge Sharing:** Encouraging the exchange of best practices, experiences, and lessons learned on a cross-sectoral and overarching European level would enable the meta-clusters' members to empower their stakeholders to avoid potential pitfalls and adopt successful strategies for implementing new sustainable solutions. This mutual learning process is suggested as it is expected to foster continuous improvement and accelerates the transition towards more sustainable manufacturing practices. One step that was suggested by one of the meta-cluster representatives was the establishment of a Europe-wide repository of good practices. This repository would work as a centralised database of successful approaches and case studies. It would promote knowledge sharing and the adoption of effective practices across Europe. This repository would then serve as a valuable resource for clusters and also stakeholders on the ground seeking guidance on sustainable manufacturing, enabling them to learn from the experiences of others and implement tried-and-tested solutions.
4. **Levelling the Playing Field:** Standardising processes and solutions required for sustainable production could promote fair competition and help companies adapt to upcoming environmental regulations. By establishing a common set of rules, the EUSME would ensure a level playing field, fostering a more sustainable and competitive manufacturing landscape. This argument goes hand in hand with the provision of good practice examples and support for the implementation of these standards without risking financial sustainability of the companies in question.
5. **Sustainable finance and funding of the EUSME:** Allocating funding for the development and implementation of the EUSME could catalyse progress and help achieve common goals. The interview partners mentioned that it would be important to have the funding of overarching activities of such an EUSME sorted for it to become attractive for stakeholders. Only if it is financially sustainable in itself, the EUSME could encourage stakeholders to invest in innovative technologies and practices that advance sustainability in the manufacturing sector as continuous provision of knowledge and support would be guaranteed. Current funding, for example by the European Commission's programmes, has helped meta-clusters sustainability so far and has funded several innovative R&D projects relevant for sustainable manufacturing.

#### 4.4.2. What type of governance or organisation would be useful?

When asked about the requirements for the EUSME, the question of how to best coordinate or govern the ecosystem was raised by the respondents in several interviews. The interviewed representatives favour a bottom-up approach as the interests and needs of different types of clusters and regions need to be factored into joint decisions. Differences, for example in the focus of clusters (for example high-technology tool-making is different from textiles manufacturing), the status of circular economy and technology use of different regions and sectors as well as the differences in regional networks and cooperation make it difficult to find one-size-fits all solutions or strategies. Clusters on the regional level were mentioned as a potential level of well-informed collection of needs and requirements from the sector (and especially SMEs) that could inform the support structure of the European ecosystem.

Nonetheless, some interview partners stressed that a stronger coordination of all the meta-clusters, regional activities and clusters and the development of a common strategy towards sustainability in the manufacturing sector is needed in order to achieve sustainability. Centralised decisions on a strategy and the standardisation of certain technology implementations were suggested to actually help companies and especially SMEs to implement solutions more easily and reduce complexity of the process of finding and implementing new solutions. One important aspect mentioned of this centralised coordination approach was that, instead of "only a platform" such an ecosystem should be

a living ecosystem with concrete actions and projects put into practice. In this way, a European Sustainable Manufacturing Ecosystem could achieve easier access to new solutions for SMEs and make it easier for the European level to use joint forces in an effective and efficient way.

Interview partners see both aspects (a strong coordination and a bottom-up approach) as complementary and not necessarily contradictory. The question remains who could identify common issues of the sector that require a centralised solution or even a standardisation. The other question is how they could do so.

#### 4.4.3. What are lessons learned from the meta-clusters' experiences that might be useful insights for the EUSME? (including what formats of collaboration work well)

The meta-cluster representatives named important success factors for the EUSME based on their experience with fostering collaboration within the sector.

Several interview partners stressed the importance of close interaction with companies and understanding their perspective, needs and the context they act in. Building strong relationships with businesses is essential for ensuring that the ecosystem remains relevant and effective. The EUSME should prioritise open communication channels and regular consultations with the companies it wants to support. The role of the local or regional level is important and is the right starting point for reaching SMEs and the active engagement of other important stakeholders. The EUSME should thus prioritise establishing a strong presence in the regions it serves, fostering trust and cooperation among stakeholders.

Next to the companies, the involvement of local authorities has proven to strengthen clusters and meta-clusters. Collaborating with governments (this could mean local and regional, but also national or European policy-makers) ensures that the ecosystem aligns with development strategies and benefits from their support. EUSME should actively seek or support partnerships with authorities to maximise its impact.

One aspect of this collaboration is also to garner public endorsement. Gaining support from policy stakeholders is critical to the success of the ecosystem. The EUSME should actively engage these stakeholders through transparent communication and active participation in regional, national or European initiatives. This already happens in many of the analysed meta-clusters and in clusters.

Generally, communication is a crucial factor for the success of an ecosystem. Interview partners emphasised that maintaining a steady flow of information, updates, and engagement opportunities is vital. Examples for elements of successful communication strategies, keeping stakeholders informed about the ecosystem, are newsletters, well-maintained webpages, social media presence with timely posts and updates, (online and on-site) and talks about relevant sustainability topics.

Other types of collaboration formats have been described as useful and successful in establishing ongoing exchange and collaboration:

- **Thematic working groups:** Focused groups encourage collaboration on specific topics and allow for a more efficient exchange of ideas between those actors that want to learn about and act on a certain topic and the access to expertise as experts partake here. The ECESP founded several so-called leadership groups with different sector-related or task-related foci, such as the leadership group on building and infrastructures or the leadership group on network governance and circular economy hubs. The Enterprise Europe Network organises one of their pan-European types of activities along thematic groups, including one on sustainability. In this example, the sustainability topic is addressed mainly in the thematic group, while the overall organisation addresses more

topics. Similarly, the EACP formed thematic working groups, such as “Internationalisation”<sup>5</sup>.

- **General assemblies and annual conferences:** Regular gatherings facilitate networking, knowledge sharing, decision-making and developing common strategies.
- Explicit **match-making events** foster autonomous collaboration between members of a network or organisation, especially with regards to common projects and consortia building for project proposals for third-party-funded endeavours. This type of collaboration might be adapted to the requirements of an EUSME.

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<sup>5</sup> <https://www.eacp-aero.eu/working-groups/internationalisation.html>



## 5. Reflections on the status of the EUSME

This chapter aims to provide an assessment of the current status of the EUSME and to put the presented findings into context. The focus of the EUSME, as described in previous chapters, is to promote the implementation, application and dissemination of solutions and innovations that increase sustainability in SMEs at a higher European level. Those solutions can be social innovations, advanced technologies and other non-technological innovations. The gaps and needs with regard to these aspirations that could be identified on the basis of the qualitative research with meta-clusters are also presented in this chapter.

In order to select meta-clusters that are potential actors within a EUSME three criteria were identified. They should act in the manufacturing sector, address the topic of sustainability in manufacturing and consider SMEs and their specific position in the value chain and their needs or have solutions that are also useful for SMEs and not only large companies. The findings of the research are put into context along those important dimensions of the EUSME in the following. Then, further important lessons learned from the research are summarised, that help understand the status of the EUSME and give important arguments for an improvement of the same.

### 5.1. The representation of the manufacturing sector and of SMEs

Not all of the meta-clusters analysed represent only the manufacturing sector. Some operate **cross-sectoral** and have the mission to **support companies or clusters overall** and address sustainability topics as part of their work (such as the Enterprise Europe Network, ECCP, the SuperEcosystem, Tipps and the ECA), some operate cross-sectoral because they work **on cross-cutting topics of sustainability** that **require the collaboration of different sectors**, such as the circular-economy-related meta-clusters (ECESP, Circular Economy Initiative acatech) and IRISS working on SSbD.

The other side of the spectrum can be seen in meta-clusters that mainly **formed because of the sector perspective** but **do not focus on sustainability** as described above. Those are for example, MANUFUTURE and its national-level counter parts like MANU-KET, the EIT Manufacturing, EACN and EACP.

It should be noted, that two meta-clusters have potential to combine the manufacturing perspective and the **scope of the Europe-wide sector with ambitious goals in terms of sustainability**: the ECESP (although also cross-sectoral) and MANUFUTURE. But both, again, do not alone manage to address all types of companies and sub-sectors of the manufacturing sector and all manufacturing-related sustainability topics and solutions. Further collaboration between the meta-clusters could be an efficient way of promoting sustainable solutions to manufacturing SMEs across Europe.

One important finding is that **almost all of the meta-clusters address SMEs in dedicated formats** of services, events, or knowledge provision. The role of SMEs for the sector is acknowledged and guides the actions of the meta-clusters.

None of the identified meta-clusters combines the three selection criteria in full scope. This is why the connections between the analysed meta-clusters are so important when assessing the status of the EUSME.

### 5.2. The role and understanding of sustainability

One important criterion for the selection of the meta-clusters was the role of sustainability as a topic and an area of action. Sustainability has varying relevance among the meta-clusters and the approach to and the understanding of sustainability of the meta-clusters differ.

While some of the meta-clusters are explicitly founded for **the goal of fostering sustainability** (such as the ECESP, Greater Green, the Circular Economy Initiative acatech in Germany, IRISS) others include sustainability topics into their work **among other areas of action** (such as the Enterprise Europe Network, EIT Manufacturing, the SuperEcosystem in Finland, Tipps in Piemonte, the EACP and EACN or Silicon Europe) and a third category of meta-clusters collaborated because of **certain technologies** that are also relevant for sustainable manufacturing (e.g. Silicon Europe Network and Euroclusters, MANUFUTURE and its national counterparts such as MANU-KET, EUMAT, the International Cleantech Network).

The approaches to the topics of sustainability also vary. The European Circular Economy Platform, for example, focuses on the promotion of Circular Economy, helps to develop regional and national roadmaps and allows for discussion and exchange of solutions for challenges related to various types Circular Economy implementation. IRISS focuses on safe-and-sustainably-by-design of materials, products and processes and brings together different sectors. Silicon Europe and the Cleantech Network promote and market technologies such as nanoelectronics, IoT solutions, renewable energy, waste-water treatments and others. The larger, more overarching organisations such as Enterprise Europe Network and EIT Manufacturing support a wider spectrum of sustainability actions, but thus have less of a systematic approach or strategy to the development of a sustainable industry in Europe.

Also, not all of the addressed topics of all meta-clusters are specifically relevant to the manufacturing sector and its SMEs, while topics that were named important in the interviews seem **not to be addressed sufficiently, such as a standardised, accessible way of measuring the CO<sub>2</sub>-emissions of a product over its lifecycle**. The EMAS is a good example of how a European agency provides a label for a certified environmental management which is trustworthy and has clear rules<sup>6</sup>. Also, some non-technological aspects of sustainability in manufacturing companies are not addressed sufficiently, such as **green skills for the workforce and support for implementing needed changes in reporting and data analysis for the compliance with sustainability policies**. And, in a more general perspective, companies would like to have more knowledge about upcoming changes in legislation. This could be provided by a EUSME with regards to sustainability in the manufacturing sector and would facilitate the SMEs' engagement in sustainability measures, as compliance with legislation (changes) is one of the most powerful drivers of such.

One important step would be to have a common definition of sustainability and its aspects relevant in the manufacturing sector and standardised metrics. These are underway, although there are different sustainability certifications emerging on national or regional levels. The variety of different definitions and certifications has slowed down international comparison and collaboration across Europe in the past.

### 5.3. Social and other non-technological innovations

Most interviewed meta-cluster managers did stress that there are already useful technological solutions on the market that help manufacturing companies to become more sustainable, but that the awareness about them and the capacity to implement them in SMEs is a crucial gap. This is especially relevant for manufacturing SMEs.

Non-technological possibilities of increasing sustainability in manufacturing SMEs also need to be mapped and promoted. Their implementation in SMEs needs as much support as technological solutions do. This point has been risen in several interviews.

One important issue here are **green skills and the upskilling and re-skilling of employees** in the sector. While the need for adequate skills has been mentioned, almost none of the meta-clusters address the

<sup>6</sup> [https://green-business.ec.europa.eu/eco-management-and-audit-scheme-emas/about-emas/how-does-emas-work\\_en](https://green-business.ec.europa.eu/eco-management-and-audit-scheme-emas/about-emas/how-does-emas-work_en)



topic or offer services such as consultancy or skill audits in this regard. Green skills are much needed for promoting and implementing sustainable development. A clear and common definition of which the major green skills demanded by the industry are is still underway.

Generally, the **stakeholder group of education providers is not as present** as other stakeholder groups such as companies and public actors and should be integrated more. The education programmes promoted by the EIT Manufacturing<sup>7</sup> are notable exceptions.

Other social innovation aspects seem to need more attention and a more prominent role in the EUSME:

- **Change management of implementing sustainability measures**
- **Support of companies for the provision of green skills Continuous Vocational education (CVET) and other upskilling pathways**
- **Support with implementing co-creation processes that allow for all stakeholders to provide their expertise and perspective with helping sustainability-raising processes**
- **Awareness raising and education for changing social practices** (such as management or working practices) in companies that **allow for better efficiency of energy and material use and decreased waste production**

Social innovation is seen as underrepresented in innovation/R&D projects and implementation, but is mainly seen as needed and an important topic of support missing for the manufacturing SMEs.

#### 5.4. Governance, structure and successful cooperation of the EUSME

When analysing the structures and formats of collaboration of the meta-clusters, the difference between overarching subsidiary meta-clusters, like the Enterprise Europe Network, EIT Manufacturing, MANUFUTURE or the ECA and sustainability-focused meta-clusters with smaller scope, such as CleanTech, Greater Green, ECESP becomes visible. The Enterprise Europe Network and the EIT Manufacturing have a similar type of organisation in terms of having regional-level contact points, with consultancy and information services, taking an active role in regional ecosystems, and an overarching structure, where European-wide trends and topics are addressed and the organisations partake in European public consultancy processes. The European level also includes the exchange of representatives from the regional offices, bundling experience, needs, topics and good practices from the regions in a common forum.

In the interviews, when we asked about advantages and possible chances of an EUSME, the topic of the appropriate structure and type of governance was brought up in some of the interviews (see chapter 4.4.2). At the current moment, the missing interaction and connection points between the meta-clusters point to a gap in governance. Two seemingly contradictory requirements for the appropriate type of governance were expressed in the interviews: one the one hand the importance of the regional level for direct contact to SMEs and collecting topics and needs bottom-up and on the other the need for a common strategy of the manufacturing companies and other stakeholders on a European level is needed on how to reach a sustainable manufacturing sector. A governance structure that is able to deliver to both requirements seems most adequate. One possibility is a subsidiary structure, similar to the ones that the Enterprise Europe Network and the EIT Manufacturing have. Another possibility is to establish structures of exchange and interaction between the different meta-clusters like the ones we have portrayed. As they already bring together many stakeholders and together have a lot of expertise in the field of sustainable manufacturing, this might be a viable alternative.

<sup>7</sup> <https://www.eitmanufacturing.eu/what-we-do/education/education-programmes/>

Summarising, it can be stated, that the lack of coordination, well-informed standardisation processes and exchange on common strategies to reach sustainability was pointed out in the interviews as gaps in the EUSME and that they need to be addressed in order to establish a working EUSME.

## 6. Conclusions

This deliverable 1.1 of the greenSME project mapped what is already done on the European level by which actors to foster environmental, social and economic sustainability of manufacturing SMEs. It looked at the current status of a European Sustainable Manufacturing Ecosystem on the basis of desk research and 13 expert interviews with meta-clusters, assessing what elements and functionalities are already present and what gaps can be identified. Several questions have guided this endeavour, as presented in the introduction, which shall be answered in the following.

- What elements and functionalities of an EUSME are there already?
  - A variety of stakeholders is already engaged in meta-clusters and clusters, collaborating towards the goal of fostering sustainability in manufacturing. Education providers and civil society stakeholders are the least often represented although they seem to have an important role to play.
  - Different aspects that are highly relevant to manufacturing SMEs for increasing sustainability are addressed by different meta-clusters such as Circular Economy by the ECESP and several technologies for greening products, production processes and machine use are monitored, developed and promoted by meta-clusters (Cleantech Network, Silicon Europe, MANUFUTURE, EUMAT, MANU-KET, EACN, EACP).
  - More topics were mentioned as important ones to address but were not taken up in the meta-clusters' activities in a sufficient manner. Those were especially non-technological measures to increase efficiency of material use, energy use and decreasing waste production and the topic of skills needed for sustainable change and the role of education.
  - One important aspect is that there is already funding for research and development and for meta-clusters in the area of sustainability in the manufacturing sector.
- Which meta-clusters (e.g. European networks, organisations, initiatives) are active in supporting manufacturing SMEs' sustainability?
  - The meta-clusters with both, a large, Europe-wide scope and a clear focus on sustainability topics are the MANUFUTURE platform and the European Circular Economy Stakeholder Platform.
  - Meta-clusters with less scope but important activities that contribute clearly to the sustainability of manufacturing SMEs are TIPPS, MANU-KET, Greater Green, and the SuperEcosystem in Finland.
  - Important promoters and disseminators are Enterprise Europe Network, EIT Manufacturing, ECCP, ECA, and EACN as they are meta-clusters with a large scope and they address sustainability at least as one topic among others.
  - Further relevant meta-clusters are the German Circular Economy Initiative acatech, IRISS, and the EACP. Also, there are meta-clusters that could not be analysed in great detail, but are part of a potential EUSME, such as other national CE initiatives, the Ellen McArthur Foundation, ERMA, further EIT organisations, such as the EIT Climate KIC, and further European initiatives, e.g. in ERASMUS+ or Horizon programmes or sector-specific funding schemes. There are overviews of relevant projects, for example in the SPIRE-SAIS project Deliverable 2.1<sup>8</sup> on Industrial Symbiosis and Energy Efficiency

<sup>8</sup> [https://www.aspire2050.eu/sites/default/files/users/user85/spire-sais\\_deliverable\\_d2.1\\_technological\\_foresight\\_version\\_2\\_final.pdf](https://www.aspire2050.eu/sites/default/files/users/user85/spire-sais_deliverable_d2.1_technological_foresight_version_2_final.pdf)

initiatives in the energy intensive industries and at the EIT Manufacturing Website on Circular Economy<sup>9</sup>.

- What kind of connections and networks between different actors are already there? Which are missing?
  - Meta-clusters are a collaboration between different types of stakeholders, including multi-stakeholder organisations such as clusters. The objective of the meta-cluster defines the objectives of the collaborations supported and their scope. While larger meta-clusters have the strength to bring together companies and other stakeholders from various regions, thematic meta-clusters allow for a more focused joining of forces and expertise on a particular topic. This can enable a quicker development of solutions and innovation. In the case of sustainability-related topics, meta-clusters in our analysis worked on Circular Economy solutions, clean technologies, materials and safe and sustainable by design processes and products, and advanced IoT-technology in manufacturing.
  - The European Commission plays an important role for almost all of the analysed meta-clusters, as source for funding and as legislator. These functions lead to somewhat a coordinating role of the European Commission, guiding the understanding of sustainability, setting requirements for sustainable companies and reporting and supporting some areas of R&D over others, for example.
  - There are few collaborations between meta-clusters on the topic of sustainability on the European level, as members rather enter collaboration on sustainability topics on the regional level.
  - There is a lack of an adequate governance structure that brings all actors together.
- What are the requirements for a well-functioning EUSME?
  - A governance structure that allows for the need of regional manufacturing sectors to take centre-stage and a coordinated development of a more concrete common strategy towards a sustainable manufacturing sector
  - Continuous interaction with the SMEs, for example through clusters and business and sector associations
  - Further engagement of education providers
  - Further engagement of civil society stakeholders, at least with regards to the implementation of Circular Economy
  - Well-elaborated, up-to-date and continuous communication with members and mutual learning and knowledge sharing
  - Alignment with European policies relevant for sustainability in the manufacturing sector
  - Continuous and sustainable funding of the EUSME structures where it is needed.
  - Fostering inter-regional and international collaboration between clusters
- Where do meta-clusters see gaps and potential for development?
  - To provide information on the legislative activity at European and national levels, as well as on financial support programmes information to implement coming legislation.
  - Support with change management of implementing sustainability measures for SMEs
  - Support of companies for the provision of green skills through Continuous Vocational Education and Training (CVET) and other upskilling pathways
  - Support with implementing co-creation processes that allow for all stakeholders to provide their expertise and perspective with helping sustainability-raising processes

<sup>9</sup> <https://www.eit-circulareconomy.eu/system-maps/>

- Awareness raising and education for social innovation in companies that allow for better efficiency of energy and material use and decreased waste production
- A repository of best practices and examples for the implementation of useful sustainability measures in manufacturing SMEs
- Standardisation of processes and solutions required for sustainable production to promote fair competition and help companies adapt to upcoming environmental regulations
- Support for more collaboration between clusters and meta-clusters from the different European regions.
- An adequate governance structure is still to be established that brings together the needs and insights from the regions and a coordinated strategy development.

These requirements and gaps are important starting points for the establishment of a self-sufficient, well-working EUSME.

Further lessons learned from the meta-clusters' experience could be collected in the report:

A close interaction with companies and their needs and reality is crucial. Open communication channels and a presence on the regional or local level are important.

The involvement of public authorities strengthened clusters and meta-clusters and a EUSME should involve them as stakeholders. Also, some specific formats of collaboration proved helpful to work towards a common goal effectively: thematic working groups to advance and exchange expertise in relevant topics, annual general assemblies to exchange perspectives and discuss common topics and dedicated match-making events to foster collaboration between members.

Overall, many elements of a mission-oriented innovation ecosystem are already there, while several gaps have been identified.

Three important dimensions of the mission-oriented innovation EUSME were defined in the beginning of this mapping: it should act in or supporting the manufacturing sector, address the topic of sustainability in manufacturing and consider manufacturing SMEs and their position in the value chain and their needs or provide useful solutions for manufacturing SMEs.

The meta-clusters relevant for the EUSME are either sector-specific, work cross-sectorally to support businesses and clusters in general and address sustainability as part of their work, work cross-sectorally and collaborate on a dedicated sustainability topic, such as Circular Economy or SSbD, or they work cross-sectorally and research, produce or implement specific technologies that are relevant for sustainable manufacturing. Summarising, the manufacturing sector-specific meta-clusters would profit from a collaboration with the cross-sectoral meta-clusters in the mapping, as they can provide valuable know-how, technological and social innovations and solutions and insights sharing similar risks. The cross-sector meta-clusters can in turn benefit from the reach and good access to companies of the manufacturing sector meta-clusters. Further collaboration with adequate formats is certainly a needed step to come closer to a functioning EUSME.

Accordingly, the topic of sustainability is addressed in different aspects. Some meta-clusters focus on Circular Economy, such as the ECESP and the Circular Economy Initiative acatech in Germany. There are regional meta-clusters that work towards regional prosperity and sustainability, such as TIPPS in Piemonte, the Superecosystem in Pahjois-Savo, and Greater Green in the border-regions between Belgium, Germany, Luxemburg and the Netherlands. As already mentioned, some meta-clusters organise around certain types of technologies and specialisations useful for sustainable manufacturing. The Silicon Euroclusters project promotes electronics solutions for sustainable manufacturing, the Cleantech Network aims at disseminating and marketing various technologies needed for the green transition, covering various sectors (such as manufacturing, construction, mobility and transport, water). MANUFUTURE, EUMAT and its national counterparts, such as MANU-KET also have a

technology-focus: for example, MANU-KET focused on 5 key technologies: advanced materials, biotechnology, micro-electronics, photonics, and nanotechnology<sup>10</sup>.

The remaining question for the development of the EUSME is, if all technologies useful for the sustainability of manufacturing SMEs are already covered and how to make sure that all SMEs in the European manufacturing sector can make adequate use of them. A lack of a central European repository has been mentioned in the interviews. Here also, further collaboration or exchange between meta-clusters could promote better overview of viable sustainability pathways for manufacturing SMEs.

Sustainability has also differing importance relatively to other addressed topics within meta-clusters, depending on their objectives and scope of organisation. The overarching and larger organisations like the Enterprise Europe Network, the ECCP and the ECA and the sector-specific meta-clusters such as EIT Manufacturing, EACN and EACP, MANUFUTURE, address sustainability in a rather broad way and among other topics. Then there are some meta-clusters, that were founded specifically to address sustainability topics, such as the ECESP, the CEI acatech in Germany, IRISS, or Greater Green where all activities aim to foster sustainability and there are the regional ones mentioned in the last paragraph, where sustainability is thought of as a cross-cutting topic that gets also integrated into other activities. Thereby, a dedicated exchange of meta-clusters can help to enable each other to inform and support clusters (and thus their member SMEs ) about all addressed sustainability topics. In this way, they can make the different foci and services visible and known to each other. This would make for a big step towards a functioning EUSME.

The non-technological side to sustainability, such as social innovations, is generally not addressed enough. From the interviews we can summarise the following main needs of manufacturing SMEs in this regard:

- Support of Change management of implementing sustainability measures
- Support of companies for the provision of green skills in continuous vocational education and training (CVET) and other upskilling pathways
- Support with green skills monitoring in companies
- Support with implementing co-creation processes that allow for all stakeholders to provide their expertise and perspective in sustainability-raising processes
- Awareness raising and education for changing social practices (such as management or working practices) in companies that allow for better efficiency of energy and material use and decreased waste production

These aspects of sustainability need to be acknowledged, understood and addressed better by meta-clusters, especially the sector-specific ones, and the clusters. Collaboration on these topics is a clear gap of the current situation and is needed for the EUSME.

Overall, the results show that SMEs are considered, acknowledged or even addressed in dedicated formats by almost all the analysed meta-clusters. Their role is important. It is also stressed, that SMEs have very differing situations, needs, levels of expertise, and levels of technology use and need tailor-made solutions in many cases. This fact hinders the clusters and meta-clusters to always provide the adequate support to their target SMEs.

More generally speaking, the lack of a sector-wide European strategy on how to reach sustainability in the manufacturing sector and a lack of adequate coordination and governance is an important gap of the EUSME. Two seemingly contradictory requirements for the appropriate type of governance were expressed in the interviews: on the one hand there is the importance of the regional level for direct contact to SMEs and collecting topics and needs “on the ground”, and on the other there is a need for

<sup>10</sup> [https://www.manufacturing-ket.com/wp-content/uploads/2020/09/MANU-KET\\_Mision\\_EN.png](https://www.manufacturing-ket.com/wp-content/uploads/2020/09/MANU-KET_Mision_EN.png)

a common strategy of the manufacturing companies and other stakeholders on a European level is on how to reach a sustainable manufacturing sector. A governance structure that is able to deliver to both requirements seems most adequate. One possibility is a subsidiary structure, similar to the ones that the Enterprise Europe Network and the EIT Manufacturing have. Another possibility is to establish structures of exchange and interaction between the different meta-clusters. As they already bring together many stakeholders and together have a lot of expertise in the field of sustainable manufacturing, this might be a viable alternative. Here, the question is, whether such a horizontal and open type of governance can achieve enough coordination of interests, topics and needs, that it could reach agreement on standardisation processes and a common strategy.

Summarising, it can be stated, that the lack of coordination, well-informed standardisation processes and exchange on common strategies to reach sustainability was pointed out in the interviews as gaps in the EUSME and that they need to be addressed in order to establish a working EUSME.

Based on the mapping of the EUSME, the requirements expressed in the interviews and derived from the results of the desk research, and the identified gaps, the next step will be to develop a roadmap towards a well-functioning EUSME. The results will be validated and further research will be conducted in the course of the greenSME project to support sustainability of manufacturing SMEs.



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## Annex I. Profiles of meta-clusters of the EUSME

### Circular Economy Initiative acatech

The *Circular Economy Initiative*<sup>11</sup> (CE Initiative) at acatech – [German] National Academy for Science and Engineering - has a **cross-sectoral focus** and discusses **strategies to promote circular economy in Germany** and thereby has a **national expansion**. Combining all **sustainability dimensions is targeted** here, especially with regard to optimising material and energy cycles. To consider the viewpoints of stakeholders on all sustainability dimensions, discussions and research of about **130 experts from over 50 institutions** (3 ministries, 24 companies – also including targeted activities for SMEs, 22 research institutions and other relevant civil society organisations), the German Circular Economy Roadmap was developed and **published in 2021**.

#### Key facts of the meta-cluster

- The subject of the meta-cluster is sustainability (Circular Economy), but it also addresses digitalisation (e.g. with regard to digital product passports, etc.)
- The sectors that are addressed depend on the respective projects within the initiative. Accordingly, it does not have a specific sectoral focus. E.g. one of these projects focuses on battery pass development and includes manufacturers and raw materials suppliers for battery materials, automotive and legislation.
- A variety of different stakeholder groups is represented, among these are academic research, policy makers and companies.
- CE Initiative has about 300 to 400 members from different stakeholder groups, although not all are involved in current projects
- The main objective of the initiative is to promote Circular Economy in Germany – the scope is national.
- The CE Initiative was initiated in the year 2019.
- CE Initiative has state financed projects, which are always limited to 2-3 years. Yet, at Acatech, the Initiative will continue working on different projects.

#### Offers and Services for Sustainability

##### *Does it work virtually or physically or both?*

- Project meetings usually take place every three months in person combined with regular virtual meetings in between. Additionally, there is communication work on-site (for example: exhibitions, network events etc.). The majority of the project work is done remotely.

##### *Sustainability-related actions*

- Enabling communication between different actors within the supply chain to enable circular economy
- Giving impulses/sharing knowledge by providing results of projects (e.g. for topics like “responsible sourcing”)
- Environmental sustainability is addressed on policy level, e.g. with regard to awareness raising

<sup>11</sup> <https://www.circular-economy-initiative.de/>

- Provision of different webinars, demonstrations on exhibitions on the topic of circular economy
- Awareness raising on different aspects from different disciplines with regard to circular economy
- Work in funded projects addressing the topic of CE

### ***Services about sustainability for SMEs***

- CE Initiative as network and communication platform for different actors on different levels, of which SMEs also benefit

### **Sustainability perspective**

- CE Initiative offers a broad network for different players (policy makers, suppliers at different stages of the supply chain etc.), which is beneficial for its members. The initiative has the overarching function of providing mutual understanding of Circular Economy and also contributes to its implementation
- Advanced Technologies are subject of many projects supported by the initiative (e.g. sensor data to evaluate scrap parts, battery pass using digital data for product handling in battery sector)

## **European Automotive Cluster Network (EACN)**

**EACN**<sup>12</sup> is a network of European automotive clusters aiming at collaborating to reach common goals: Strengthening competitiveness of the European Automotive Industry, increasing cooperation among clusters, boosting transnational and international business and innovation among cluster members.

### **Key facts of the meta-cluster**

- EACN's main focus is to help its members (automotive & mobility clusters) to become more competitive. Green and digital transition is currently one of the main drivers for automotive industry and therefore also part of EACN activities. Regarding social innovation, reskilling is an important issue due to the need to adjust to new competencies.
- The EACN is a network of clusters active in the sectors automotive (car components and parts, passenger cars, as well as heavy duty vehicles), and mobility (electric mobility and mobility services) in Europe.
- The EACN comprises 26 clusters from 13 European countries. EACN represents more than 5.000 companies (out of which about 2.700 are SMEs) covering the whole value chain, R&D institutions, public authorities, and other institutions. All OEMs and main Tier-1 suppliers with plants in Europe are members in at least one EACN cluster.
- EACN has a European expansion
- EACN was established at the end of 2016 by 8 clusters. The network opened itself for joining by other clusters in 2020 and since then the network grew significantly; in 2021 a new, more formal association-like structure of EACN was accepted at the first General Assembly meeting.
- the EACN board and the General Assembly decide on the future of the network. As long as member clusters find it valuable, the network shall be sustained.

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<sup>12</sup> <https://www.eacn-initiative.eu/>

## Offers and Services for Sustainability

### *Does it work virtually or physically or both?*

- The EACN mainly works virtually but the network has the objective to meet at least once a year physically – usually parallel to a sectorial, European event, which is also of interest to the members. In 2022, it was the European Cluster Conference in Prague. Members of EACN take part (on-site) in the events organized by other EACN members as well.

### *Sustainability-related actions*

- Environmental and social sustainability issues are not the main focus of EACN actions. Yet, the topic of sustainability is addressed in projects of the EACN members. Many exchanges at EACN level focus on environmental and social sustainability issues.

### *Services about sustainability for SMEs*

On the meta-cluster level of EACN, exchange between clusters is facilitated and best practice examples are identified, which in turn is also beneficiary for the partner clusters' members (especially SMEs). Still, the main target group of EACN's services are the partner clusters.

### *Members' services about environmental, social and/or economic sustainability for SMEs*

EACN members engage in various European projects which directly and indirectly are related to supporting environmental and social sustainability. Within the projects, there are various activities (networking, matchmaking, counselling, consulting) on sustainability issues.

- Projects are e.g.:
  - Euroclusters RESIST
  - Euroclusters Sure5.0
  - E-BOOST project
  - Amulet
  - greenSME
  - EDIHs – many of EACN clusters are coordinating or being members of EDIHs

### *Sustainability perspective*

- The main added value for the members is **the exchange between clusters** which enables them to identify best practices, investigate into services which are being implemented by clusters and help clusters find partners for joint projects by promoting events and open calls.
- Advanced Technologies are addressed within the activities/services of EACN:
  - more flexible production and small series production → Flexibility thus needs to be addressed when modernising the production processes in SMEs.
  - additive manufacturing allows manufacturing individual parts in just-in-time scheme, rather than produce large batches that require storage.
  - new materials can have both positive and negative impact regarding sustainability. E.g. composites are light and resistant and help reduce the weight of vehicles which also accounts to lowering emissions, but on the other hand are difficult to recycle. Thus, the introduction of AT has to be connected to the promotion of circular economy
- the role of non-technological innovations:
  - Companies (mainly OEMs) need to adapt their business models when mobility changes on the large scale. E.g. more people are prone to rent cars instead of owning them,

public transport gains in importance in comparison to cars and thus, companies need to prepare for a future scenario of selling less vehicles.

## European Aerospace Cluster Platform (EACP)

*EACP<sup>13</sup> network is a meta-cluster consisting of 45 aviation clusters in 18 European countries. It is coordinated by the Hamburg Aviation Cluster in Germany. The EACP is a forum for clusters to get to know each other and exchange information; it is about opportunities to coordinate with other, similar clusters.*

### Key facts of the meta-cluster

- The EACP serves as a platform to exchange ideas, to initiate transnational projects and to make the aviation industry visible to policy-makers.
- Sustainability:
  - Sustainability is a present topic, but not yet a focus of the EACP.
  - The partner clusters are interested in sustainability and all agree that the topic will become more and more important in the next few years; nevertheless, aviation clusters are rather more broadly positioned; e.g. focus on resilience; skilled labour competences, etc.
- The EACP is entirely dedicated to the civil aviation sector.
- EACP stands as a point of contact for 45 clusters and thousands (4300) companies in the aerospace sector; the majority of them are SMEs, approx. 70%-80%)
- EACP has a Europe-wide expansion
- EACP was founded in 2009
- EACP is not running for a limited time period.
- Main focus on exchanging best practices of partner clusters. Facilitating transnational projects and creating access to markets as well as networks with other European and international clusters

### Offers and Services for Sustainability

#### *Does it work virtually or physically or both?*

- Through COVID, most meetings of EACP take place virtually.
  - There is a general calendar that is maintained: When many partner clusters are in one place physically, events are organised
  - Conduction of a General Assembly once a year in a place in Europe
  - Fairs are used to meet in person

#### *Sustainability-related actions*

- The EACP is organised in working groups: There is little focus on sustainability; however, there is a working group called "Supply Chain and Technology" – sustainability as an important cross-cutting factor for current challenges in the aviation sector supply change.

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<sup>13</sup> <https://www.hamburg-aviation.de/eacp.html>

### Sustainability-related actions for SMEs

- EACP also acts as an advocate for SMEs: EU policy should also be influenced in the interests of EACP's members; the partner clusters have a high potential to mobilise SMEs - e.g. how must funding be organised so that SMEs have access? Clean Aviation with focus on sustainability; EU policy should be influenced (SME-oriented), on the other hand, opportunities should be opened up for SMEs to work on their topics within the framework of funded projects.
- EACP: the approach and perspective of SMEs is often missing; EACP tries to support SMEs in the field of sustainable aviation and to make sure that SMEs are not forgotten. SMEs are understood as important innovators next to larger companies.

### Sustainability perspective

Sustainability is mainly addressed as the reduction of CO<sup>2</sup> emissions through new technology and materials.

## European Clusters Alliance (ECA)

The European Clusters Alliance (ECA)<sup>14</sup> is described as a cluster network and can also be considered a meta-cluster or an umbrella organisation of European clusters, as it is **aggregating 22 associations of clusters**, nearly **1000 clusters and tens of thousands of European SMEs**. Yet, not just businesses, but also actors from other societal fields, such as universities, research centres and public institutions are part of the different clusters that are active in the network. As a **collaborative forum**, it aims at giving a voice to the clusters' interests, needs and opportunities at European and global level.

### Key facts of the meta-cluster

- Different topics are covered by the ECA. Most of these topics are connected to the pillars sustainability, digitalisation and resilience.
- A wide variety of sectors are covered
- ECA comprises 22 national cluster associations, public agencies or country ambassadors, nearly 1000 cluster organisations, 150,000 innovative businesses (approximately 60% of them are SMEs) and over 11,000 universities, research centres and public institutions
- The ECA has a European expansion.
- In 2019, the ECA was officially launched
- The expectation is that the ECA will continue to be useful in the coming years.
- ECA focuses on bringing added value to both the networks of clusters being ECA members as well as their associates. The end-level-beneficiaries are companies (both SMEs and large companies), technological centres, universities, and public agencies.
- ECA directly promotes regional and national associations of clusters, while keeping in mind that the final beneficiaries are the companies and members of clusters organizations

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<sup>14</sup> <https://clustersalliance.eu/>

## Offers and Services for Sustainability

### *Does it work virtually or physically or both?*

- ECA works in a hybrid form. European Clusters Alliance continuously works on initiating, hosting and supporting multitude of events in face to face, hybrid and online format

### *Sustainability-related actions*

- ECA is highly involved in actions linked to sustainability
  - ECA “curates” a task force related to Transition Pathways in the EU Industrial Forum Expert Group
    - As part of this group, ECA contributes with ideas on how clusters and cluster networks can help with regard to sustainability
    - ECA is not only involved in the design phase of the Transition Pathways, but also in supporting their implementation on aspects related to sustainability
  - ECA is a part of the consortium managing the European Cluster Collaboration Platform (ECCP). The ECCP also has a concrete service called “Green Transition Support”
    - As an example of activities of the “Green Transition Support”: During 2021, 25 cluster projects were selected to be trained and advised on a range of green transition topics (business models, circular economy approaches, etc.) to enable them to support their members (especially SMEs) to become more resource efficient
  - ECA has also established a cooperation with the OECD on initiatives on sustainability.

## Sustainability perspective

- Advanced Technologies are seen as crucial with regard to sustainability. Artificial intelligence in particular is thereby seen as a key technology. AI together with IoT are seen as helpful technologies in order to efficiently use resources, and to reduce the amount of energy consumed. Another important area of work for advanced technologies is their application to circular economy

## Enterprise Europe Network

The *Enterprise Europe Network*<sup>15</sup> is based at DG Grow of the European Commission. One of its main tasks is to facilitate change processes that lead to sustainable innovation. The aim of this task is to move from a linear approach to a circular approach and to promote circular economy among companies in Europe.

### Key facts of the meta-cluster

- Sustainability is an important topic at the Enterprise Europe Network. Thereby, a distinction is made between the dimensions of social, environmental and economic sustainability.

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<sup>15</sup> <https://een.ec.europa.eu/>

Enterprise Europe Network is directly tasked with supporting companies in sustainability across Europe

- Within the network, different sectors are addressed. The network also works across countries in Europe and beyond and can be considered a global network.
- All work according to the principle of subsidiarity; the Enterprise Europe Network thus complements offers that are provided regionally by other organisations (in NRW, Germany, for example, complementary to the Chamber of Industry and Commerce, the Employment Agency, or business development agencies).
- Different stakeholder groups are integrated: Economic development agencies; etc. research institutions, also universities
- On the customer (beneficiary) side: SMEs (and companies that want to profit from innovations and technological solutions), universities; intermediaries; consulting firms
- The Enterprise Europe Network is designed as a network and is supported by the Commission.
- The Enterprise Europe Network has been established in 2015

## Offers and Services for Sustainability

### *Sustainability-related actions*

- Awareness/Information: The services start with awareness issues – leading to increased sustainability/circular awareness in companies
- The Enterprise Europe Network is in direct contact with companies and identifies challenges; Enterprise Europe Network thereby aims at finding solutions together with the companies
- The Enterprise Europe Network also makes recommendations for support programmes.

### *Services about sustainability for SMEs*

- The Enterprise Europe Network 's services range from very general services and information to very specific - with a combination of awareness/information, specific assessments and a moderated advisory process.
- There are also service/advisory schemes in the form of different audits on different topics: E.g. Innovation Management Audit; Sustainability audit

## Sustainability perspective

- The Enterprise Europe Network takes a holistic approach: it is about technological innovation (1), about adapting business models (2), and about developing an innovation roadmap for the next years (3).
- Methodologically, classic management approaches are used; e.g. Canvas & road mapping methods and audits to moderate processes.

## EIT Manufacturing

*EIT Manufacturing*<sup>16</sup> has the mission to support innovation for the manufacturing sector on a European level. EIT Manufacturing is a Europe-wide organisation with regional centres and a European office. On the regional level, offices are engaged in innovation ecosystems and work

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<sup>16</sup> <https://www.eitmanufacturing.eu/>



together with various stakeholders from policy, manufacturing sector, research, education, and other backgrounds.

### **Key facts of the meta-cluster**

- Sustainability as a very prominent part of EIT Manufacturing's activities
- Strategic agenda with five objectives: key areas. One of them is sustainable manufacturing, another is skills and social sustainability
- EIT Manufacturing's has Co-Location Centers (CLCs) that are strategically situated to link regions with high levels of manufacturing activity and advanced technology:
  - Headquarters in Paris
  - CLC North Gothenburg
  - CLC Central Darmstadt
  - CLC West San Sebastian
  - CLC East Vienna
  - CLC South Milan
  - CLC South-East Athens
- EIT Manufacturing is focused on the Manufacturing sector
- Members are only single organisations, except Aerospace valley in France, which is a cluster (Airbus and ecosystem around it) → As it works to connect manufacturing actors, EIT Manufacturing has a goal of engaging more than 70,000 SMEs
- EIT Manufacturing has a European expansion.
- EIT Manufacturing was initiated in 2019 and will receive funding for altogether 14 years, until it is expected to be self-sustainable.

### **Offers and Services for Sustainability**

#### ***Does it work virtually or physically or both?***

- Both, virtually as well as physically

#### ***Sustainability-related actions***

- Funding/open calls
- Matchmaking events for proposal development
  - With regard to match-making: Companies come with challenges and the EIT Manufacturing team identifies start-ups with technological solutions, who then pitch their solutions to larger companies.
- Platform online, being matched
- Through its partnerships with key financial institutions, at both the national and European level, EIT Manufacturing also works to ensure high value-creation and ease the investment necessary to turn research into industry-ready solutions and bring AT innovations to the market

#### ***Services about sustainability for SMEs***

- Matchmaking between manufacturing companies and technology providers
- Open call funding, mostly targeting start-ups and scale-ups

## Sustainability perspective

- The sustainability understanding references the European legislation, such as the European Green Deal and the industrial strategy of the EC.
- Advanced Technology implementation for sustainability often addressed and supported
- With regard to non-technological innovations: Social innovation is an important topic for the meta-cluster; such as providing green skills or management innovations such as green business model innovation.

## European Technology Platform for Advanced Engineering Materials and Technologies (EuMaT)

**EuMaT** – European Technology Platform for Advanced Engineering Materials and Technologies<sup>17</sup> has been launched to assure **optimal involvement of industry** and other important stakeholders in the process of establishing of R&D priorities **in the area of advanced engineering materials and technologies**. EuMaT was created in 2004 with the objective of improving coherence in existing and forthcoming EU projects, in the field of materials R&D. See more details in the following [link](#).

### Key facts of the meta-cluster

- Within EuMaT, **Safe and Sustainable Materials** development and their integration in the process are supported. Within this concept, the **safety of the materials** (non-toxic for health, environment and workers), **and sustainability criteria**, increasing performance for the intended use, minimizing the environmental footprint and social impact is considered
- EuMaT (Materials Platform) covers all the sectors, since materials are everywhere, but within the AMI2030 RoadMap, the needs and challenges of 9 sectors are addressed (health, sustainable construction, new energies, sustainable transport, home and personal care, sustainable packaging, sustainable agriculture, sustainable textiles, and electronics). The number of sectors might grow in the future.
- EuMaT has more than 900 members and AMI2030 more than 400 members
- EuMaT has a European expansion.
- EuMaT European Materials Platform was created in 2004 and AMI2030 was created in 2022, whereby EuMaT is a permanent Network and AMI2030 is a long-term partnership.

## Offers and Services for Sustainability

### Sustainability-related actions

- Within the EuMaT Platform, environmental and social sustainability issues are included. There is a working group related to risk assessment, environmental and social impact and another related to circular economy.
- EuMaT has been requested by the EU Commission to elaborate the future research and development RoadMap together with EMIRI (Materials for energy initiative), MANUFUTURE (Manufacturing Platform), and SUSCHEM (Sustainable Chemical European Platform). This initiative has consolidated as AMI2030 Initiative. In December 2022 the RoadMap was published.

<sup>17</sup> <http://www.eumat.eu/en>

### ***Members' services about environmental, social and/or economic sustainability for SMEs***

- It is planned to create services to train SMEs on safe and sustainable by design implementation. greenSME project could facilitate the invitation to participate SMEs in this initiative.

### **Sustainability perspective**

- EuMaT focuses on the role of advanced materials with significantly improved properties (e.g. strength, electrical conductivity), functionalities (e.g. antimicrobial properties, anti-icing properties, anti-slipping), and durability as part of most manufacturing sub-sectors.
- Sustainable advanced materials (e.g. Bio-based materials, non-harmful materials, recycled materials)
- The non-technical innovations, organization practices and new ways of collaboration, play an important role to facilitate communication between stakeholders (e.g. Teams connectivity), avoiding travels, and reducing carbon footprint. Innovation in new working modalities, also facilitates teleworking.

## **Greater Green**

**Greater Green**<sup>18</sup> is an inter-regional meta-cluster aiming at inter-regional collaboration on sustainability. It brings together stakeholders from different societal fields, such as regional administration, companies, industrial clusters and research institutes. Greater Green currently operates in Wallonia, Luxemburg, Saarland, Grand Est, Rheinland-Pfalz.

### **Key facts of the meta-cluster**

- Subject is sustainability in the involved regions. The focus has been so far on environmental technologies, such as waste water and water solutions.
- Open to all sectors
- Companies, public administration, research institutes, business development agencies
- 7 operative and 17 strategic partners, ca. 50 SMEs in direct contact
- Interregional in Wallonia, Luxemburg, Saarland, Grand Est, Rheinland-Pfalz
- 2016 – 2020, with follow-up project planned

### **Offers and Services for Sustainability**

#### ***Does it work virtually or physically or both?***

- Focus on on-site activities, but some online events happen

#### ***Sustainability-related actions***

- promotion of good practices,

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<sup>18</sup> <https://www.greatergreen.eu/en/>

- informational events,
- elaboration of joint actions, workshops etc.
- the focus lies on environmental issues and specifically the implementation of supporting technologies (but not on social)

### Services about sustainability for SMEs

- Not for SMEs directly: GreaterGreen organised various events and workshops on particular technological solutions, where clusters and SMEs could attend.
- Match-making across regions is offered for collaborations on environmental technologies
- Access to information materials is offered

### Sustainability perspective

- Greater Green's focus is on environmental technologies, mainly plastics recycling, water and waste water management and treatment, sustainable construction, and smart green energy.

## International Cleantech Network (ICN)

The **International Cleantech Network (ICN)**<sup>19</sup> is a meta-cluster, consisting of **19 regional cleantech clusters** of the world's leading cleantech regions. As its name suggests, the ICN has an **international scope**. With its focus on clean energy and clean technologies, it clearly **aims at environmental sustainability through technological solutions**. The clusters in the network consist of a triple helix structure, including economy, public authorities and research institutions. Thereby, the **SMEs of the ICN clusters are on the international forefront** of sustainable energy and environmental industries. The network mainly aims at providing opportunities for the clusters to expand their international networks and to associate with project owners outside of their region.

### Key facts of the meta-cluster

- Focus on technology and sustainability in all member clusters– focus on environmental and climate sustainability
  - ICN aims at supporting internationalisation, finding business opportunities and funding for members on the international agenda as well as networking
- The members of ICN are cluster organisations, mostly in Europe, but also some in Africa and the Americas. The member's members are mainly focused on technological providers. Thereof most are start-ups and SMEs → These member clusters represent the world's leading cleantech regions, connecting thousands of organizations consisting of businesses, public authorities, and research institutions
- ICN has a focus on cleantech, with its members' members mainly coming from the water sector, the energy sector or work in the field of circular economy.
- ICN has an international expansion.
- ICN starting as EU funded project (2009) building an international network for clean technologies.
- 6 out of the 12 cluster members took over ownership and coordination when the EU project was finalised (2016). The members fee covers the secretariat – now ICN has 21 members. In

<sup>19</sup> <https://internationalcleantechnetwork.com/>

the last years also larger funded projects were run (such as Horizon Europe) funding the secretariat and actions.

## Offers and Services for Sustainability

### *Sustainability-related actions*

- ICN 3 core areas of action/services:
  - **Knowledge sharing** – focus on best practices. Also impact assessments and relevant developments in countries, areas etc. “sometimes it is easier to talk with people who is not in your back-yard”
  - **Connection** – often through different programs connecting providers & customers. Match making business level.
  - **R&D collaborations** – match making in the field of research and testing solutions cross sector, cross-country.

### Sustainability perspective

- Focus on technology supporting sustainability in industry
- No direct focus on social sustainability or social innovation in ICN

## IRISS

**IRISS**<sup>20</sup>, *The international ecosystem for accelerating the transition to Safe-and-Sustainable-by-design materials, products and processes*, is a three-year project, start date 1<sup>st</sup> of June 2022, funded by the EU’s framework programme for research and innovation, Horizon Europe. It has a budget of €4.3 million, of which approximately €3.5 million come from the EU, as well as additional funding through the University of Birmingham and Swiss Federal Laboratories for Materials Science and Technology. One of the main challenges from IRISS project is to create a permanent International Network of members interested in safe and sustainable by design materials and chemicals.

### Key facts of the meta-cluster

- IRISS has a clear focus on Safe-and-Sustainability-by-design-materials. It aims to reach a common view and understanding for the criteria to be met.
- The sectors addressed till now are packaging, automotive, construction, electronics, textiles, energy and fragrances. But the list of sectors will be upgraded in the future.
- The IRISS consortium consists of European research institutes, trade associations, companies, authorities and universities, as well as National Technology Platforms within SusChem. Swedish partners are IVL Swedish Environmental Research Institute, which is the coordinator, the Innovation and Chemical Industries in Sweden, IKEM, and the SusChem Sweden platform.
  - The consortium consists of 20 partners<sup>21</sup>:

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<sup>20</sup> <https://iriss.com/>

<sup>21</sup> IVL Swedish Environmental Research Institute; Leuphana University of Lueneburg; BNN, BioNanoNet Forschungsgesellschaft mbH; RIVM, National Institute for Public Health and the Environment; University of Birmingham; Fundación Tekniker; Cefic, European Chemical Industry Council; EMPA, Swiss Federal Laboratories for Materials Science and Technology; ETP, EU Technology Platform for the Future of Textiles & Clothing; CLEPA, European Association of Automotive

- Having started in June 2022, IRISS has already more than 400 stakeholders interested in its activities.
- IRISS has an International expansion, covering different countries in Europe and outside of Europe.
- Since June 2022
- The funded project has a duration of 3 years, but at the end of the project a permanent network will be created.

## Offers and Services for Sustainability

### *Does it work virtually or physically or both?*

- IRISS organises meetings and workshops virtually and physically.

### *Sustainability-related actions*

- Fundamental in the IRISS project is the concept of Safe-and-Sustainable-by-Design (SSbD) which includes focusing early in the supply chain on providing products that are part of circular models while avoiding material's ingredients that may be harmful to human health or the environment. It integrates circularity, climate neutrality, functionality and safety of materials, products, and processes throughout their life cycle.
- The concept of Safe-and-Sustainable-by-Design is a pre-market approach to chemicals and that focuses on providing a function (or service), while avoiding volumes and chemical properties that may be harmful to human health or the environment – in particular, groups of chemicals/material likely to be (eco)toxic, persistent, bio-accumulative or mobile. Overall sustainability should be ensured by minimising the environmental footprint of chemicals on climate change, resource use, ecosystems and biodiversity from a lifecycle perspective.

### *Services about sustainability for SMEs*

- One of the main objectives of the IRISS project is to build an International permanent SSbD community. Create a structure for continuous cooperation and services to network members, potential members, network associates as well as other stakeholders with interests in SSbD. Different services provided by the platform will be defined and addressed to different key target groups:
- Training service for SMEs
- Service for start-ups to boost business collaboration with industry
- Co-creation service to establish hubs for specific value chains
- Knowledge exchange services
- Knowledge sharing services

### *Sustainability perspective*

- Advanced technologies:
  - SSbD methodologies for materials and chemicals can include the use of computing tools and advanced characterization techniques to predict at the design phase the materials and products behaviour, their toxicity, ecotoxicity and lifecycle impact.

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Suppliers; EMIRI, Energy Materials Industrial Research Initiative ; EFCC, European Federation for Construction Chemicals; INL, International Iberian Nanotechnology Laboratory; IPC, Industrial Technical Centre for Plastics and Composites; KI, Kemijoki Institut; VTT, Teknologiska Forskningscentralen; IKEM, Innovation and Chemical Industries in Sweden; APRE, Agenzia Per la promozione della Ricerca Europea; Czech Technology Platform for Sustainable Chemistry; National Technical University of Athens

- non-technological innovations
  - The non-technical innovations could be for example, to involve citizens organizations, and social stakeholders, in the design phase of the products developments. The deployment of the circular economy will require the involvement of citizens to recover, as a previous step to the recycle of the materials. Their opinion is also highly relevant for the acceptance of the use of the secondary materials in the products.

## MANU-KET

**MANU-KET**<sup>22</sup> is a technology platform, established in 2013, focused in advanced manufacturing technologies. It was born in parallel with MANUFUTURE, the European Technology Platform, to complement at national level the activities of the Spanish MANUFUTURE node. It is an ecosystem of organisations that are interested in advanced manufacturing, with industrial companies (and specially SMEs) being particularly important.

### Key facts of the meta-cluster

- The community and the platform itself are multisectoral, with some focus in automotive, machine tools, capital goods, telecommunications, aeronautics, railway, consumer goods, household appliances or health, among others.
- MANU-KET has, by the end of 2022, 256 member-organisations: 149 companies, 52 research institutions, 24 associations, 20 universities, and 11 governmental organizations and agencies.
- The focus of MANU-KET is completely national (Spanish).
- MANU-KET was established in 2013 and is not developed only for a limited period of time.

### Offers and Services for Sustainability

#### *Does it work virtually or physically or both?*

- MANU-KET works in both ways → MANU-KET works mainly virtually, offering services online, but there are also some events that are held physically, like the General Assembly or specific workshops.

#### *Sustainability-related actions*

- MANU-KET has a strategic priorities agenda for research, where 6 main areas are identified for action. Many of them include direct references to sustainability, while other focus more in excellence, quality, zero defects, etc. The main area where sustainability is faced is sustainable manufacturing. Not only issues related to manufacturing with less environmental impact are mentioned, but also manufacturing that promotes circularity and sustainability of components.
- Research on technologies that can help introduce materials and components, give them a second life once they reach the end of their life cycle, with remanufacturing processes,

<sup>22</sup> <https://www.manufacturing-ket.com/en/manu-ket-2/>

requalification processes or processes that help provide certain functionality to that component and extend its durability.

### **Services about sustainability for SMEs**

- MANU-KET supports developments that lead to a better traceability of component behaviours and parts along the life-cycle, in order to increase the possibilities for re-cycling and re-using of materials.
- Main challenges identified with regard to social sustainability revolve around the lack of qualified workforce, especially in technologies related to digitalization, manufacturing, sustainability and circularity; leading to training needs. MANU-KET also supports its members in matters related to talent attraction, thereby also aiming at improving the image of the industry.

### **Sustainability perspective**

- Both, environmental (traceability, digital passport, knowledge about product life cycle, etc.) and social (training, inclusion, workforce satisfaction, etc.) sustainability have a great relevance in MANU-KET

## **Silicon Europe Alliance (SEA)**

*Silicon Europe Alliance*<sup>23</sup> is meta-cluster made of 11 clusters from different European Regions, representing about 2000 stakeholders and members. These clusters bring together the technological expertise and resources of Europe's leading research institutes and companies in the digital technologies and IoT areas such as micro and nanoelectronics, photonics, ICT and software.

### **Key facts of the meta-cluster**

- The alliance was born in 2012 and its main focus is digitalisation, closer to microelectronics, while sustainability is also one of the main topics that the SEA is aiming to achieve. One important example for sustainability activities is the project Silicon Eurocluster, which is currently under development and focuses on sustainability aspects of electronics.
- Which sectors are addressed:
  - Smart Mobility
  - Smart Living
  - Smart Health and
  - Smart Industry
- The Alliance members are leaders in digital technologies including Micro- & Nanoelectronics, Cyber Security, Photonics and Robotics.
- More than 2000 of the members are SMEs
- SEA has a European dimension
- The meta-cluster existed since 2012

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<sup>23</sup> <https://www.silicon-europe.eu/home/>



## Offers and Services for Sustainability

### *Does it work virtually or physically or both?*

- Mainly virtually due to the location of the different members across Europe. Physical meetings take place once per year and where possible – coincide with big EU events/fairs.

### *Sustainability-related actions*

- **Elaboration of joint actions /services**
- Silicon Euro-cluster project offering SMEs green vouchers to support their sustainability path: to address sustainability challenges or to improve their processes.
- **Awareness raising, informational events**
- A series of activities events, webinars, fairs were put into place, to increase the awareness on this topic: Semicon Taiwan and Semicon Europe
- **Policy**
- Recently Silicon Europe Alliance accelerated the signing of Memorandum of Understanding among 13 EU regions concerning electronics and semiconductor. Details here <https://www.silicon-europe.eu/nc/news/news/news-detail/archive/2023/march/article/saxony-initiates-foundation-of-an-alliance-of-european-semiconductor-regions/06/>
- Benefits for members – individual clusters and SMEs: The members benefit from synergies and connections of more than 10 years of collaboration, sharing best practices and work methodologies, as well as fairs/networking events and lobbying to present the ecosystems as one European value chain.

### *Sustainability perspective*

- Sustainability is seen as one of the outputs of digitalisation.
- Advanced technologies: Digital technologies enable sustainability through optimization/zero defect, monitoring, predictive maintenance and other uses. Digitalisation and sustainability are understood as one unique thing, namely the twin transition.
- non-technological innovations: Organisational practices are understood as having a potential big role, as they act on people. People are understood as the most important element for realising changes

## TIPPS Piemonte

TIPPS is a regional system (Piemonte, North West Italy) that groups the local clusters (Innovation Poles). Each one of them specialised on a specific strategic sector. TIPPS, which is funded by the Regional Government, has formalised the collaboration among the seven Poles, creating a structured system working on three priority transversal transitions:

- GreenTransition
- Digital Transition
- Health and Food

## Key facts of the meta-cluster

- The green transition is one of the three priorities of the cluster system in Piemonte
- The sectors that are represented are:
  - Agrifood
  - Life Sciences and Health
  - Green Chemical and Advanced Materials
  - Energy and Clean Technologies
  - Smart products and manufacturing
  - Textile
  - ICT
- Over the 85% of the clusters' members are represented by SMEs: the remaining associates are Large companies, Universities and Research Centres
- The Innovation Clusters have grown to directly involve over 1,200 companies and all the academic and research institutions in the region, supporting over 1,300 regional innovation projects in partnership.
- The journey of the Innovation Clusters in Piemonte began in 2009, when the Piemonte Region, first in Italy, decided to invest in collaborative innovation.

## Offers and Services for Sustainability

### *Sustainability-related actions*

- **TIPPS, by default, has a policy endorsement, since it has been created by the Regional Authority. Sustainability, therefore, since it's a strong Regional pillar, is always taken into consideration in all the operations.**
- The approach could be synthesised as follows:
- Technology innovation support, advice, assistance, ...
- information awareness
- Best practices
- Contamination among the several sectors

### *Services about sustainability for SMEs (organised by TIPPS and its members)*

- Workshops, awareness actions, networking, best practice identification are provided, also to foster sustainability of SMEs

## Sustainability perspective

- On the role of Advanced Technologies
  - Technology innovation is the basis for being competitive: however, the technology progress has to respect the sustainability principles in order to assure social equity and sustainable future.
  - TIPPS understands digitalisation and green transition as fundamentally intertwined
- On the role of non-technological innovations:
  - Activities are always also considered from an environmental and social perspective
  - societal level change of attitudes towards more sustainability, less pollution and less waste production is understood as a driving force for company behaviour.

## 8. Annex II: Short Profiles of further meta-clusters of the EUSME

### European Cluster Collaboration Platform (ECCP)

#### Key facts of the meta-cluster

The *European Cluster Collaboration Platform (ECCP)*<sup>24</sup> is an **online hub for industry clusters**, aiming at facilitating the collaboration among them. The focus of the ECCP is on the green and the digital transformation – accordingly, the ECCP aims at **fostering sustainability as well as digitalisation**. The platform may thereby stand as more than a meta-cluster, as it nearly fully maps all clusters in Europe, including meta-clusters. On the ECCP, it is possible to search for green clusters or for meta-clusters. **It exists since 2015**, will run for an indefinite period and generally **addresses industrial sectors**, without targeting specific industries **and expands EU-wide**, including a variety of European industrial clusters. The ECCP particularly aims at **strengthening the competitiveness and sustainability of SMEs**, improving their performance in terms of productivity, innovation, internationalisation and resource efficiency. The platform encompasses **more than one thousand different clusters** from different industrial sectors and different European (and also a few international) countries.

The ECCP acts as a service facility aiming to provide cluster organisations, cluster partnerships, initiatives and networks, cluster associations and resource efficiency support actors (EREK) with a variety of modern tools. It thereby offers various concrete services, which are primarily intended to improve networking between clusters, learnings, and the sharing of information and news. Among these services are EU Cluster Talks, matchmaking events and short-term exchanges to better connect Europe's industrial clusters and their ecosystems. Further services include open calls and publications. Some of ECCP's services are directly targeting SMEs.

### European Circular Economy Stakeholder Platform (ECESP)

The *ECESP*<sup>25</sup> is a European-level EU-funded platform for stakeholders interested or active in Circular Economy that was founded in 2017. It connects national and regional initiatives all over Europe, provides an online knowledge hub, and develops strategies and roadmaps with regions and member states.

Its subject is Circular Economy with economic, social, environmental and technological aspects considered. The meta-cluster addresses all sectors, but most active ones are cement, steel, chemistry, and biochemistry, water, manufacturing, food industries. There is a coordination group. The coordination group represents 24 stakeholders from different stakeholder groups, including think tanks, NGOs, business associations, European administration and research. The platform functions as a network of networks.

The meta-cluster has a clear focus on Circular Economy in its different aspects. Non-technological innovations are seen to be important for members' sustainability measures: e.g. collaboration on regional level between different stakeholders, including citizens, participation formats needed, better exchange about good experiences with the establishment of CE measures.

<sup>24</sup> Source: <https://clustercollaboration.eu/>

<sup>25</sup> <https://circulareconomy.europa.eu/platform/en>

Services and offers include awareness raising about Circular Economy through circular talks, providing connections between the member networks to work together on Circular Economy, the promotion of good practices and the maintenance of a Knowledge Hub that serves the provision of a database on roadmaps and examples, strategies, training material, and studies on Circular Economy.

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## MANUFUTURE

### Key facts of the meta-cluster

The technology platform *MANUFUTURE's*<sup>26</sup> main objective is to foster research and innovation strategies which are capable of speeding up the rate of an industrial transformation towards high-added value products, processes and services. Thereby, **environmental sustainability and sustainable manufacturing** (e.g. eco-efficient products) **are targeted**, as well as social sustainability by securing high-skilled employment. The technology platform was launched in 2004 and is not running for a limited time period. In order to foster competitive, sustainable and resilient European Manufacturing, MANUFUTURE also focuses on the financing of strategic manufacturing R&D, innovation and education and training activities.

MANUFUTURE thereby has a twofold role: It governs research, technological development and innovation (RTDI) efforts at two levels – firstly at policy level (e.g. by continuously developing a strategic research and innovation agenda), secondly at operational level (e.g. by employing a technological approach exploiting all possible synergies arising from the converging nature of science and technologies). All in all, **about 150 organisations are members of MANUFUTURE**, organised in different groups (Working Groups; High Level Group; Implementation Support Group), sub-platforms and initiatives. **Among the members are different stakeholder groups, such as companies, research institutions, universities, public authorities, associations and technology platforms.** MANUFUTURE has targeted activities, information and events for SMEs.

As response to the European Economic Recovery Plan and the Public-Private Partnerships (PPPs) that the European Commission initiated in automotive, construction and manufacturing, the MANUFUTURE Technology Platform launched the *Initiative EFFRA, European Factories of the Future Research Association* and *EIT Manufacturing*. These two initiatives stand as powerful means to boost research efforts in the manufacturing sector.

## Ellen McArthur Foundation

### Key facts of the meta-cluster

The main focus of the *Ellen McArthur Foundation*<sup>27</sup> is a charity committed to create a circular economy, which is designed to eliminate waste and pollution, circulate products and materials (at their highest value), and regenerate nature. Accordingly, **environmental sustainability is at the core** of the

<sup>26</sup> Source: <https://www.manufuture.org/>

<sup>27</sup> Source: <https://ellenmacarthurfoundation.org/>

foundation. The Ellen McArthur Foundation is ***not running for a limited time period and was launched in 2010.***

The Ellen McArthur Foundation aims at ***integrating stakeholder groups from all parts of society***, engaging businesses, international institutions, governments, cities, universities, non-governmental organisations, innovators, and others. It serves as a network, which brings together industry leading corporations, emerging innovators, affiliate networks, government authorities, regions, cities and more in order to understand barriers and pilot circular economy practices. In this context, the Ellen McArthur Foundation creates resources, publications and tools that help set effective policies, find new ways to do business and design better products. Thereby, ***SMEs are not directly targeted in the activities*** of the foundation. The activities of the network are also not concentrated on a particular sector, but rather target industry and society as a whole.

Main objectives:

- creating evidence-based original research on the benefits of a circular economy and its contribution to global challenges such as climate change and biodiversity loss
- exploring the opportunities across stakeholders and sectors, and highlighting examples of *how circular economy principles are being put into practice today.*
- supporting organisations and individuals with formal learning opportunities through *circular economy courses*, and *creating resources* for teachers and academics

## European Association on Smart Systems Integration (EPoSS)

### Key facts of the meta-cluster

The ***European Technology Platform on Smart Systems Integration (EPoSS Association)***<sup>28</sup> is an ***international non-profit association*** according to German law. The EPoSS Association was ***founded in 2013*** and does not have a limited time frame. Its structure consists of Board, General Assembly, Executive Committee, Working Groups and an Office. EPoSS is focused on the development and integration of intelligent and green Smart Systems technologies and ***solutions for a sustainable society***. It stands as an industry-driven policy initiative, defining R&D and innovation needs as well as policy requirements related to Smart Systems Integration and integrated Micro- and Nano-systems. One of the main objectives is to set up a Strategic Research and Innovation Agenda. ***EPoSS has a European scope and brings together companies, research organisations and other public and private stakeholders of the value chain.*** Thereby, ***SMEs*** are among the members of EPoSS and also ***represent an important target group.***

EPoSS currently concentrates on seven applications sectors and three cross-sector domains: The seven sectors are Transport & Mobility; Health & Beyond; Manufacturing / Factory Automation; Communications; Energy; Aerospace; Smart Systems for the Environment. The three cross-sector domains are Safety, Security & Reliability; Technologies Supporting Smart Systems; and Production Processes for Smart Systems.

Main services of EPoSS are the following:

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<sup>28</sup> Source: <https://www.smart-systems-integration.org/>

- EPoSS issues a variety of strategic documents. The EPoSS Strategic Research Agenda considers transversal fields such as technologies and production processes for Smart Systems, reliability and functional safety as well as security of Smart Systems.
- ECS-SRA is the first ever joint Electronic Components & Systems Strategic Research Agenda of the three European industry associations AENEAS, ARTEMIS-IA and EPoSS, spanning the entire value chain
- Furthermore, EPoSS contributes to the development of different roadmaps, e.g. the European roadmap “Electrification of Road Transport”

## EIT Climate KIC

### Key facts of the meta-cluster

*Climate KIC*<sup>29</sup> is a Knowledge and Innovation Community which aims at **accelerating the transition to a zero-carbon, climate-resilient society**, thereby solely focusing on sustainability. It is supported by the European Institute of Innovation and Technology (EIT). The main objective is to identify innovations that help society mitigate and adapt to climate change, contributing to a decarbonised, sustainable European economy. Climate KIC brings together **partners from the worlds of business, academia, and the public and non-profit sectors** to create networks of expertise, through which innovative products, services and systems can be developed, brought to market and scaled-up for impact. As for the economic sector, it **targets not only large corporations, but also start-ups and SMEs** → e.g. through an incubator programme, “Accelerator” which provides funding, structure and assistance for small and medium-sized companies.

Generally, EIT Climate KIC identifies, sources and places public and private funds that stimulate innovation and thereby also functions as an exchange network which connects partners and fosters cooperation opportunities. **Not only environmental sustainability, but also social sustainability is supported**, e.g. by training and education courses provided by Climate KIC.

EIT Climate KIC has **more than 450 partners** and had more than 58 thousand people engaging in their education activities since its **founding in 2010**. The KIC is running for an indefinite time period and is not targeting a specific sector.

## Efficient and Sustainable Manufacturing (ESM)

### Key facts of the meta-cluster

*ESM*<sup>30</sup> is launched by Vanguard and aims at the development of a European network of pilot plants in **manufacturing efficiency and sustainability**. It focuses on sustaining the competitiveness of the European Manufacturing sector and also focuses on contributing to the reduction of pollution and energy consumption and the facilitation of the smart usage of resources. Thereby, **ESM has a European expansion and clearly is targeted at sustainability issues connected to manufacturing**. The **main**

<sup>29</sup> Source: <https://www.climate-kic.org/>

<sup>30</sup> Source: <https://www.s3vanguardinitiative.eu/pilots/efficient-and-sustainable-manufacturing-esm>

**target groups are companies (mainly SMEs)**; yet, the initiative and the development of pilot plants is also driven by regional authorities and experts from the manufacturing sector.

As described on the ESM website, “[t]he ambition of the ESM pilot plants will be to address multiple enabling technologies in a systemic perspective, making available an infrastructure that is currently not existing, due to its complexity and to the high innovation level of the industrial applications for which it is conceived. These pilots will be open to companies, constituting a neutral and cooperative playground for cross-sectorial and interregional collaboration, facilitating access to state of the art and newest process technologies to all European manufacturing environment”.

Since its existence, ESM pilot uses a mixed bottom-up and top-down process, involving regional actors – also to align the ESM pilots to existing regional Smart Specialisation strategies and to assure better possibilities to reach companies. Within ESM, inter-regional expert teams are developing the pilot plant projects. Out of about sixty regional proposals, five pilot plants projects emerged. Up to now four demo cases are following the steps of a defined methodology which consist of:

- i) Pilot Concept definition,
- ii) Business planning,
- iii) Pilots funding and implementation

## Superecosystem of Pohjois-Savo

The **Superecosystem of Pohjois-Savo**<sup>31</sup> is a cross-sectoral meta-cluster that brings together stakeholders from the industries in the region, regional public bodies, intermediary actors such as the business development agency, as well as education providers and civil society actors. The overall goal is to achieve economic success while also increasing social and environmental sustainability of the region and all of its stakeholders. It was established in 2021 and counted 250 members in the end of 2022. It involves several sectors, such as wood production, manufacturing, or health.

The green transition is perceived as a cross-cutting topic that needs to be considered always and especially in the regional development strategy. Several businesses were able to bring new products to the market and connect to partners within and beyond the region, selling sustainable products and sustainable business solutions.

The meta-cluster raises awareness on green transition and importance of the topic on EU level to regional businesses. It functions as a platform for exchange between different sectors and different stakeholder groups and helps to elaborate joint actions with local and regional governments, business, public sector, research, education and civil society towards being a sustainable region. For that, the meta-cluster collects and disseminates information on green transition and connected initiatives, funding and, exchange, collaboration and marketisation opportunities.

It offers advice, networking and matchmaking, workshops and direct one-on-one support with marketisation and marketing strategizing for local companies. For SMEs specifically, support of marketisation of green inventions from the region and support with marketing strategies of green inventions from the region are offered.

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<sup>31</sup> <https://superecosystem.fi/>