PARTNERSHIP CHEMICALS

THEMATIC SMART SPECIALISATION PLATFORM 'INDUSTRY MODERNISATION'

SCOPING NOTE

RECONFIRM

24 January 2019

Lead Regions: Lombardy (Italy), Limburg (The Netherlands).

Partner regions: Catalonia (Spain), Mazowieckie (Poland), Wallonia (Belgium), Ústí nad Labem (Czech Republic).

Lead support: ECRN, European Chemical Regions Network

Executive summary

The Scoping Note

Through a literature review and a survey, the Scoping Note aims at mapping the differences in the regions and providing a basis through which priorities and next steps can be determined. The Scoping Note aims at becoming the **reference document** to start the process of preparation of the investment protocols, and together with the mapping exercise, launches a (**preliminary) discussion** on the **priorities** and **next steps** of the partnership.

Main challenges and opportunities for the Chemical regions

In the baseline mapping, several trends are identified that influence the Chemicals sector. The European Chemicals Industry is facing **intense competition** from Asia and the US and overall is losing market share, while its overall exports remain relatively stable giving raise for **(untapped) potential**. **Lagging innovation**, relatively high labours costs and regulatory and tax burdens are considered main causes of a decline in competitiveness. The importance of the Chemicals Industry for the EU is evident: it accounts for about 7% of the EUs total industrial output and employs 1.14 million people, and two to three times that number are (indirectly) reliant on the value chain. In the partnership regions, several trends are similar, with the survey results indicating that there is **little interaction between the regions** and that **value chains** are not yet effectively interlinked with one another.

Regional specialisation

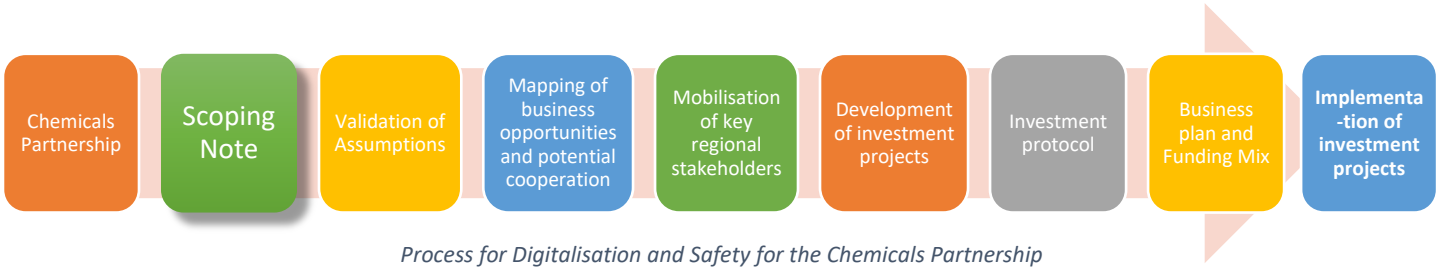
The regions that participated in the survey show **a variety of specialisations and priorities** that could result in **complementarities**. The respective industries in the regions appear to have an overall strong presence in the **production of polymers** and technologies related to the **utilisation of raw materials as a feedstock**. Yet, there appear to be significant differences in the innovation-intensity of the different industries and their related challenges.

Future priorities of the partnership

Most regions have indicated to prefer a **light form of cooperation** through a memoranding of understanding or concrete projects. The priorities point out that interregional networks and improved **access to innovation centres** is considered most important. Further mapping at this stage, such as gaining a better overview of specialist expertise, or the identification of leading regional firms, is also deemed a necessary step in creating viable investment projects.

Next Steps

The next steps for the partnership include the validation of assumptions with the regional industries and the **determination of priorities** by the partnership. The identified priorities will form the basis of a working group that can further develop the shared interests into concrete actions and investment projects.



Process for Digitalisation and Safety for the Chemicals Partnership

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1. Introduction

The scoping note is aimed at becoming the reference document for the Chemicals Partnership of the S3 Platform (TSSP) on Industry Modernisation to start the process toward the preparation of the investment protocol(s).
It is divided in the following main sections:

- **Baseline mapping of the partner regions**: this chapter is divided in the following subchapters:
  - **Key market, societal and technology trends influencing the Chemicals sector:** identifies the main trends and context in which the Chemicals sector operates and that can (asymmetrically) influence the regions in the partnership.
  - **Main challenges for chemical business in the partner regions:** presents the guidelines, defined by the partnership, for the entire process - from scoping to implementation of investment projects.
  - **Regional specialisation and expertise in key chemical sector technologies:** Presents the key building blocks of the partnership and will be a filter (and/or variable) used to select and organise the upcoming actions.
  - **Strategies and policies supporting the chemical sector:** reviews the different thematic areas targeted by the partnership, and should be the repository of intentions and actions toward each investment project to be implemented in the form of cross-regional collaborations.
- **Future priorities of the S3 partnership:** on the basis of the aforementioned baseline mapping this section aims to identify how the S3 partnership can address and complement existing initiatives and provide synergies in the regions' efforts to innovate and face their respective challenges.
- **Next Steps and governance**: this section gathers the key next steps and process milestones applied to the partnership, it will also map the type of governance that is most suitable given the priorities and challenges.

Additionally, the annexes provide an overview of the technology providers and demonstration centres in the regions (annex 3) and the involvement of the regional partners in European projects or platforms (annex 2) as well as the key technologies in which regional technology organisations are most specialised in (annex 1).

1.1 Objectives of the partnership

This thematic area is focused on new technologies, production methods, smart materials, digital transition and new value chains and business models aimed at:

- Sustainable production based on renewable raw materials and clean energy (decarbonised fossil energy and solar- and wind power) that contributes to environmental protection goals
- Reduction of greenhouse gas emissions (mainly CO2) and energy and resources consumption in chemical plants
- Promotion of new high value-added value chains and their integration across regional borders and across sectors, such as logistics, agriculture, forestry, energy, etc., in a way that complementarities of regional specializations are utilized
- Support to close-to-the-market products, scale-ups, pilot and demo plants
- Implementation and adoption of new chemical technologies, including digitalisation

The focus area of this thematic partnership is the Chemical Industry and its related industries. The main objective is the modernization of the chemical industry to a sustainable, energy- and resource efficient sector that is globally competitive and that provides innovative solutions. The collaboration under this thematic area has been developed on the ground of the inter-regional partnership formed under the European Chemical Regions Network (ECRN). ECRN is a network of regional authorities across Europe where chemical industry plays a key role for

regional economic growth. The network has more than 10 years of experience of connecting chemical regions and their stakeholders across borders.

This thematic area is focused on supporting the development and market uptake of new technologies, production methods, smart materials and business models that would allow raw materials to be used more efficiently, production to shift from fossil-based to bio-based, waste to be reduced, chemical sites to function with higher energy efficiency, and production to result in positive CO2 balance.

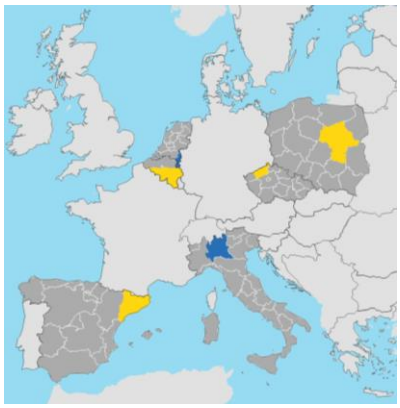
These sub-objectives shall be reached by improving cooperation and the business case for investment, together with combined public and private funding. Technological developments to be sought relate to the production of:

- Circular and Biobased Materials
- Renewable\Biobased chemical building blocks
- New high-added value biobased molecules from lignin
- Bio-based fertilizers
- High performance materials
- Key enabling technologies

The platform will aim to develop further emerging industries, especially:

- Advanced Packaging, promising lower power consumption
- Bio-pharmaceuticals and synthetic biology, connecting life sciences and chemical industry
- Environmental Industries (waste treatment and recycling, sludge recovery, etc.)

Figure 1: Regions involved in the S3P



Source: Smart Specialisation Platform.

The partnership consists of 6 regions (Limburg, Lombardy, Catalonia, Mazovia, Usti and Wallonia), with Limburg and Lombardy as the lead regions. Upper Austria and Saxony-Anhalt, along with several other regions that are part of the S3Chem cluster, have shown an interest in participating in the partnership and have been included in the analysis.

Table 1: Survey respondents[1]

	Organisation	**Type of organisation**	**Website**
Lia Voermans	Brightlands Chemelot Campus	Triple Helix Organization	www.brigthtlands.com

[1] Wallonia (BE) is also part of the Partnership, but did not fill out the survey

	Organisation	Type of organisation	Website
	(Limburg, NL)		
Jan Kadraba	Regional Authority of the Ústí Region (Ústí, CZ)	Government department	www.kr-ustecky.cz
Folco Ciulli	Regione Lombardia (Lombardy, IT)	Government department	http://www.regione.lombardia.it
Sylwia Sztark	The Office of The Marshal of the Mazowieckie Voivodship in Warsaw (Mazovia, PL)		www.mazovia.pl
Werner Pamminger	Business Upper Austria (Upper Austria, AU)	Public agency; Cluster organisation	www.biz-up.at; www.kunststoff-cluster.at
Maria-Dolors Núñez	ACCIÓ (Catalonia, ES)	Public agency	http://www.accio.gencat.cat/ca/inici/
Andreas Fiedler	Cooperation network Chemistry+	Cluster organisation	http://www.cluster-chemie-kunststoffe.de/

Source: survey responses

1.2 Actions to date to develop the S3P

The Chemicals Partnership is in its initial phase. In July, ReConfirm services were presented to the Partnership and on 28 September 2018, another planning meeting took place during which the Partnership was introduced to its broker. The Chemicals Partnership kick-off meeting took place in 24 October in Brussels. The meeting was widely attended and included regions from the S3Chem partnership meeting that were also interested in participating in the ReConfirm initiative. Members of industry were also present. A questionnaire was sent out to the partner regions that forms the basis of this scoping note. The next meeting with the lead regions is planned on 21 January 2019 in order to discuss the draft scoping note and prepare the next Partnership meeting ((back-to-back with S3Chem) taking place on 25 February 2019 in Halle, Germany.

Table 2: Key developments since establishment partnership

Activity	Details	Who	When
Project Launch meeting	Presentation of the ReConfirm methodology	ReConfirm Partnership	17/07/2018
Kick off meeting	Presentation of the ReConfirm methodology Thematic scope discussion	ReConfirm Partnership	28/09/2018

Questionnaire	ReConfirm conducted a mapping questionnaire among the partners to build on scoping paper	ReConfirm Partnership	October – November 2018
Scoping note	Analysis of threats and opportunities and draft survey	ReConfirm Partnership	January 2019

2. Baseline mapping of partner regions

In this chapter the main challenges and opportunities facing the chemical regions is described, including overall competitiveness of the sector in which the regions and businesses operate. A particular focus of the chapter is on mapping the different regions. What are their main specialisations, what are considered important challenges for the regions and what is their level of innovations and activity in the sector.

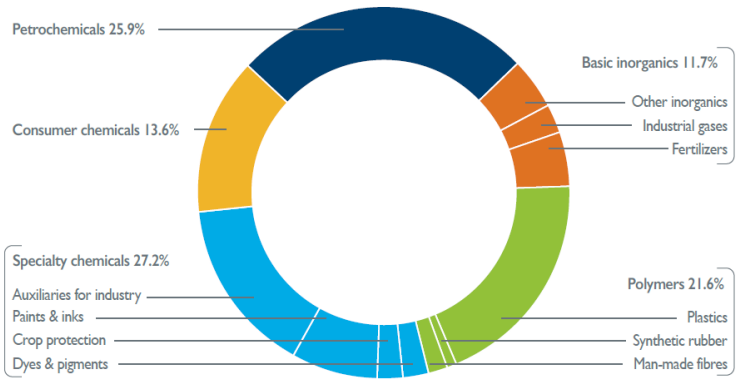
2.1 Main challenges and opportunities facing the chemical regions

2.1.1 Key market, societal and technology trends influencing the chemical sector

The chemical industry is an important industry for the EU and is part of important elements in value chains and sectors of the European economy (e.g. rubber and plastics, construction and automotive). It accounts to about 7% of EU manufacturing output. The chemical sector employs about 1.14 million people, and about two to three times the number of indirect jobs in the value chain.[2] Output from the EU chemical industry covers three broad product areas:

- Base chemicals such as petrochemicals and their derivatives along with basic inorganics. Considered commodity chemicals, they are produced in large volumes and sold in the chemical industry itself or to other industries. Base chemicals in 2016 represented 59.2% of total EU chemical sales.
- Consumer chemicals such as soaps and detergents as well as perfumes and cosmetics. They represented 13.6% of total EU chemical sales in 2016.
- Specialty chemicals covers areas such as paints and inks, crop protection, dyes and pigments. Specialty chemicals are produced in small volumes but they nevertheless made up 27.2% of total EU chemical sales in 2016

Figure 2: Chemical industry sales breakdown by sector



Source: Cefic Chemdata International

[2] CEFIC (2017). Facts & Figures 2017 of the European chemical industry. Brussels

Developments in the chemical industry in the last 20 years indicate that the position of the European Union has weakened vis-à-vis Asia and NAFTA. In 1996, the EU chemical sales made up 32.5% of world chemical sales value. In 2016, the EU chemicals market share has dropped to 15.1%, largely due to a continuous expansion of the Asian market. In other words, despite the EU chemical sales having increased over the years, the Asian and North American markets have increased at a vastly faster pace.[3]

Within the EU, there are considerable differences in competitive dynamics. The largest EU countries generally saw a marked deterioration of competitiveness in the 1990s. Lower production costs in countries like Poland and the Czech Republic eventually allowed them to take export market share from Germany (and other higher-cost Western European nations, for that matter).

Unlike Germany, France continued to lose competitiveness and export market share through the 2000s, a pattern that accelerated after 2008. As a result, export market share declined by nearly 50% over the entire period. Italy shows a similar pattern to France, although the decline in market share is not so dramatic. In the Netherlands, there was a sharp deterioration in the late 1990s, but through the 2000s export market share clawed back some of those losses, driven primarily by improvements in competitiveness. Belgium also made significant competitiveness progress in the 2000s, but the decline in market share since the financial crisis has been due as much to worsening competitiveness as to slow-growing markets. Spain stands out as the only Western European country to maintain export market share above 1991 levels. This is all the more remarkable when one considers that the relatively slow growth dynamics might have led one to expect a decline in export market share – making Spain something of a competitiveness success story (at least relative to the rest of Western Europe) over the entire period. Nonetheless, the absolute increase in Spanish market share is fairly small. The outlier is Poland, which has taken advantage of its 2004 entry into the EU to grow its market share significantly, even though the structural effect of slower growth in Russia and Western Europe weighed on demand in destination markets.

Due to the erosion of competitiveness, the EU has slipped from number three to four out of seven leading global chemical exporters with regard to absolute levels of competitiveness. Within the EU, the countries with the highest level of competitiveness are the Netherlands, Belgium and Germany, while Spain and Poland have leapt in the rankings at the expense of France and the UK. There are many potential reasons for the EU's competitiveness decline, including high energy prices, lagging innovation, currency appreciation, high labour costs, regulatory and tax burdens, among others. Chemical competitiveness is strongly linked to drivers such as R&D intensity, energy prices and the exchange rate. Higher labour costs are associated with a decline in competitiveness, but the quantitative effect is not large.[4][5]

2.1.2 Main challenges for chemical businesses in the partner regions

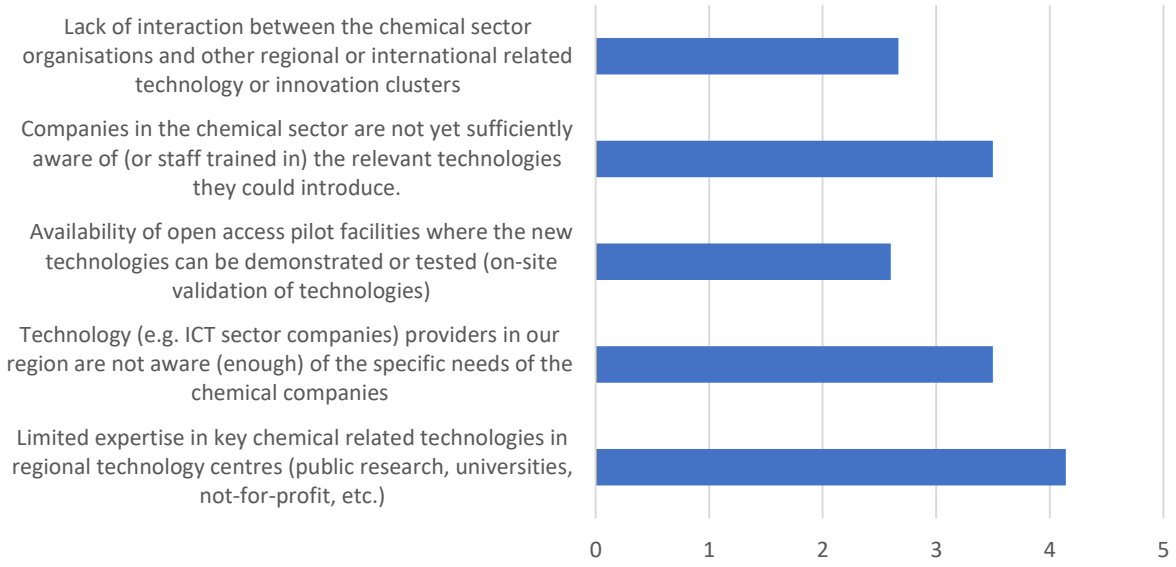
The main challenges for the chemical businesses in the surveyed partner regions are considered the lack of interaction between the chemical sector organisations and other regional or international related technology or innovation clusters, followed by that companies in the chemical sector are not yet sufficiently aware of the relevant technologies they could introduce.

The challenges for the chemical businesses in the (partner) regions appear to follow the general trends in the EU. Nevertheless, on a more practical level, the lack of interaction between the chemical sector organisation and

[3] F. Du Plessis (2018). Improving Competitiveness of European Chemical Industry Clusters. Ecssp & Cefic: Brussels.
Fred du Plessis
[4] Cefic (2015). Competitiveness of the European Chemical Industry. Brussels.
[5] Oxford Economics (2014). Evolution of competitiveness in the European chemical industry: historical trends and future prospects

other regional technology or innovation clusters is considered the most important challenge. That gives a relatively strong rationale for the introduction of this partnership and increased cooperation between regions and clusters. Also the issue of open access pilot facilities indicates a possible area of cooperation. The other scores appear to indicate that the regions can tap into a significant amount of expertise on a local level. In general, there appears to be sufficient expertise and awareness about key technologies, and regional technology centres as well as an availability of open access pilot facilities.

Figure 3: Average score for key challenges (7 regions) – 1 = most important, 5 = least important



Source: survey responses

Apart from figure 3, the scores of the regions do indicate a certain disparity between the perceived challenges of the regions. The Usti region, for example, emphasized the challenge of companies' awareness of technologies and technology centres, whereas Lombardy and Catalonia emphasised the lack (and need of) of open access pilot facilities.

The challenges for the regions reach further than these five categories. Skills shortage is considered an important challenge for Upper Austria. Mazovia mentioned **the lack of awareness of the availability of R&D infrastructure**, **lack of mutual trust, low technology transfer and commercialisation and a general lower level of innovativeness of companies despite a significant R&D base**. Lombardy points out additional challenges such as a **risk-averse financial sector** that would limit radical innovation, overall competitiveness issues that result in small margins in the value chains and the **lack of interaction between (publicly funded) R&D centres and industry**. Lastly, Limburg emphasised that decision-making units, often acting globally, do not match local interests and innovation dynamics. The strategy of these larger companies would cause local branches to often act as production plants without effectively using regional or international science, technology or innovation clusters. Limburg further considered that the shared utilities and plant service organisations are cost oriented and optimized financially, which could hamper an accommodation to change and innovation due to the diverging interests and cost orientation of the parent companies. In general, the risk of making the step to bridge **the development gap between desk- and lab scale-based concepts into a fully operating demo plant is considered an important challenge** for the Limburg Region. Many underlying problems are related to this challenge, ranging from complexity, bias, and ignorance, to lack of experienced human resources,

unwillingness. Cross border legislation is also an important innovation hurdle. Lastly, in similar vein to the Upper Austria region, the Limburg region stresses **the need for expertise in key chemistry-related technologies in regional technology centres** (public research, universities, not-for-profit, etc.), especially in scaling up and technology implementation.

2.2 Regional specialisation and expertise in key chemical sector technologies

Ústi Region

Chemicals have been a staple of production in Ústi Region for decades. The total number of number of chemical companies in reach 215, with 20 enterprises larger than 100 employees and have their head office in the region. In the sector 50% is dedicated to the production of chemicals, cosmetics, pharmaceuticals and synthetic fibres, 45% to production of rubber and plastics and 5% production of coke, fissionable fuel and crude oil processing. The Chemicals industry accounts for 11% of industrial employment in the Region. Regional strategic priorities in the field of chemical businesses and related technologies involve: Petrochemistry Polymers, Inorganic chlorine chemistry, Fertilizers, Qualified chemistry, Nanomaterials, nanotechnologies, Lithium, Green chemistry, Nonenergetic utilization of coal and Alternative fuels.

According to the Regional Innovation Scoreboard 2017, the region is ranked as a moderate - innovator with an innovation performance below the EU average. Moreover, the innovation performance of the region is the worst among the Czech regions. Enhancement of innovation performance has been rather weak in recent years, therefore the innovation performance relatively decreased in comparison with the other EU regions (RIS, 2017).

The innovation performance lags behind the EU average in nearly all indicators, only employment in knowledge intensive activities and export of these products exceeded the EU average (RIS, 2017). Nevertheless, the relatively high share of such employment is driven by mere assembly activities. R&D employment is very low (0,2% of the active population in FTE, compared to 1,2% nationally and 1,1% in the EU) and is concentrated mainly in the Jan Evangelista Purkyně University in Ústí nad Labem. Compared to the EU and Czech Republic averages, the region's weaknesses consist of low R&D expenditure in the business as well as public sector and a low share of population with tertiary education (RIS, 2017). The strengths results from the geographical location (the region borders with the German region Sachsen), relatively skilled labour force and a developed spa sector.[6]

Catalonia

The Chemical industry of Catalonia consists of 750 enterprises that together represent 3.4% of the EU's Chemical industry output. It employs 32,679 people with a total revenue of € 16,268M. The Chemical industry is 12.8% of Catalonia's industrial GDP and is highly diverse and interlinked with other (regional) industries. The strengths of the industry lie in its powerful and diverse chemical sector, particularly its basic chemistry (API, flavour and fragrances, dyes and pigments) is well developed. In terms of research activity, Catalonia is specialized in biotechnology, bioprocess engineering, biomass processing, materials science and chemistry. Due to its large number of universities and research institutes offering degrees related to Chemical industry the region has ample supply of skilled labour. For its raw materials, Catalonia's chemical industry is largely dependent on foreign supplies.

According to the Regional Innovation Scoreboard 2017, Catalonia is ranked as a "Moderate + Innovator", with innovation performance decreasing over time. The Regional Innovation Index (RII) in 2017 was 0.402

[6] Regional Innovation Monitor Plus: https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/northwest-region

(normalised score), 115.3 relative to Spain and 88.5 relative to the EU. The RII change between 2011 and 2017 was - 1 (normalised score).[7]

Mazovia

Mazovia is responsible for about 26% of the total domestic production of chemicals, chemical products and pharmaceutical substances and medicines, and for c.a. 14.5% of the total sold value of these products nationwide.

30% of national chemicals producers, 31.5% pharmaceutical products, and medicines producers and 11.5% of rubber and plastic producers are operating in the Mazovia Region, emphasising its dominance in the national chemistry sector.

The latest data were gathered for the Regional Innovation Scoreboard 2017 for the old Mazowieckie region comprising the entire voivodship. Then, the region is ranked as a moderate innovator with an innovation performance below the EU average. The innovation performance had been improving in earlier years, however over the past few years it has returned to similar levels as in 2011. Main weaknesses relate to low SMEs innovation inhouse and innovative SMEs collaborating with others, as well as low marketing and organisational innovations. The score in SME innovation inhouse was less than 40% of the EU average, but close to the country average, whereas marketing and organisation innovations were over 20% above country average, but still only at around 30% of the EU average. The relative strengths of this region are population with tertiary education and trademark applications, both of which are above EU and national averages. Tertiary education particularly stands out as it is 60% higher than EU average and 40% higher than national average.[8]

Upper Austria

Chemicals are the third largest industrial sector in Austria, generating about 10.2% of industrial added value. The industry provides about 11.7% of total Austrian industrial employment, 11% of R&D expenditure and 17% of industrial spending on environmental protection. The chemical sector comprised 245 companies in 2016, employing nearly 44,800 people. These are primarily mid-sized companies that employ an average of 145 people. One of the key clusters of chemical companies is located in Upper Austria (near Linz).). Plastics is the predominant output with more than 49.8% of the production value. Over the last ten years, investment in the chemical industry has fluctuated widely.[9]

Only Western Austria (NUTS1) as a whole was analysed by the Regional Innovation Scoreboard 2017. This region was ranked as a “Strong + Innovator”. Western Austria’s characteristics must serve as a proxy for Upper Austria’s. Western Austria’s relative strengths were: innovative SMEs collaborating with others (0.655); R&D expenditure in the business sector (0.594, i.e. 130 % of the EU average); EPO patent applications (0.556); and public-private co-publications (0.316). Weaknesses included the share of population with a tertiary education (0.458; i.e. only 83% of both the Austrian and EU average). Although Upper Austria shows a rather low percentage of population with a tertiary education, as well as a pronounced male-female imbalance, there has been a steady improvement within the last decades.[10]

Limburg

Limburg is part of the Trilateral Region (the largest chemical cluster in the world and a cooperation between Flanders, The Netherlands and Nordrhein-Westphalia). The Chemelot Industry Park in particular has a Unique

[7] Regional Innovation Monitor Plus: https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/catalonia
[8] Regional Innovation Monitor Plus: https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/mazowieckie-regional

[9] CEFIC (2018). Landscape of the European Chemical Industry 2018. Brussels.
[10] Regional Innovation Monitor Plus: https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/upper-austria

Value Proposition to bridge the gap between the world of the present and the world of the future and therewith help industry to stay at the forefront of their field further innovate. The Trilateral Region is a global player and represents a market share of the pharmaceutical and chemical industries of 3.1%. Also their per capita sales are above important competitors such as China and the US.

In the most recent Regional Innovation Scoreboard 2017, Limburg scored as an innovation leader, which shows that innovation performance of the region has significantly improved over the last years (in 2014 it was considered a moderate innovator). Limburg outperforms the EU average on many innovation indicators. Compared to the national level, Limburg lags slightly behind. It does however perform better than the national level on R&D expenses in the business sector (0.461 normalised score, 101 relative to EU and 110 relative to NL), EPO patent applications (0.533 normalised score, 142 relative to EU and 121 relative to NL) and exports of medium- and high technology manufacturing (0.692 normalised score, 109 relative to EU and 137 relative to NL). The change in the overall Regional Innovation Index was 10.3 basis points in the period 2011-2017.[11]

Wallonia

The chemical sector accounted for 5.1% (EU28, 2.7%) of added value in the Walloon economy in 2015 and almost 2.1% of employment (EU28, 1.5%), or 26,000 jobs, with a productivity rate 2.3 times higher than the regional economy as a whole. The sector also accounts for some 8% of fixed capital formation and 28% of total exports. However, the Walloon chemical sector is highly heterogenous with some sub-sectors much more dynamic than others (notably pharmaceuticals). On average, Walloon chemical firms are small and perform less strongly than those in Flanders. Despite the strong productivity performance, the sector as a whole has a weak rate of direct value added as many firms are located in the upstream part of the value chain[12].

Building on the businesses and expertise structured in the GREENWIN (green chemistry and sustainable materials) competitiveness cluster[13], Wallonia has been selected by DG GROW as 'Model Region' for sustainable chemistry and is a partner of the Interreg Europe project on smart specialisation in chemistry (S3CHEM). In this context, one of the development niches that is priortisied is the development of the biobased economy. This may constitute an answer to important challenges such as reducing dependency on oil, promoting more sustainable chemical production and developing new products through new innovative value chains. In terms of feedstock, Wallonia has a strong position due to its efficient agriculture and due to the fact that it borders ten other regions in five countries. This effectively creates a vast supply capacity for biobased feedstock, from domestic sources and by import. In terms of infrastructure, Wallonia is well positioned for attracting new investments for sustainable chemicals. Obtaining finance in this area is challenging. However, the increasing focus on sustainable chemicals helps in attracting more investments.[14]

According to the Regional Innovation Scoreboard (RIS) 2017, Wallonia is ranked as Strong with an innovation performance below EU average over the last 6 years. However, the progress has been relatively rapid in other EU regions and there is no RIS indicator in Wallonia that followed a constant decreasing trend over the last year. In comparison to the EU average, Wallonia performs particularly well as regards the level of education of the population, the R&D expenditures in the business sector and the non R&D innovation expenditures, the share of SMEs innovating in-house, the innovative SMEs collaborating with others and the EPO patent applications. The main weaknesses in Wallonia relate to the low level of public expenditures for R&D, the share of SMEs

[11] Regional Innovation Monitor Plus: https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/limburg
[12] See chapter 3 in Service Public de Wallonie (2018) Rapport sur l'économie wallonne 2018. Available at : https://www.iweps.be/wp-content/uploads/2018/04/REW_2018.pdf
[13] https://www.greenwin.be/
[14] De Coster, M. & VandeCasteele, F. (2017). Policy briefing Wallonia for the Establishment of the "European Sustainable Chemicals Support Service". Circe, CEFIC, PNO: Brussels.

introducing marketing or organisational innovations, the employment in knowledge-intensive activities and the sales of new-to-market or new-to-firm innovations.[15]

Lombardy

The chemical sector employs over 42 thousand workers in Lombard. In 2017, Italian chemical companies have exported goods totalling 30 billion euros, of which 12.8 billion are owned by companies in Lombardy. In Lombardy there are 151 multinationals (21,000 employees) belonging to the chemical sector. Lombardy is home to 31% of Italy's chemical firms, 41% of jobs and 45% of chemicals turnover, and it is among the top five chemical regions in Europe (in terms of employees and number of companies). Chemical industry in Lombardy has different features than other European regions with strong chemicals presence: production is not concentrated in a handful of highly integrated sites, but across a network of foreign multinationals, Italian medium and large groups and local SMEs.

More than 83% of chemical companies involved in research and development activities make product innovation. Italy maintains a significant and strategic presence in basic chemicals but is relatively more specialized in specialties and consumer chemicals, accounting for 57% of total production value.

According to the Regional Innovation Scoreboard 2017, Lombardy is a moderate innovator. Moderate innovators are those regions with performance between 50% and 90% of the EU average. On several indicators, such as on Business R&D expenditures, SMEs innovating in-house or EPO patents the scoreboard shows a slight deterioration of its position as one of the best performing region in Italy. Other fundamentals, such as the population with tertiary education and public R&D expenditures are improving and contributing positively to the innovation score of the Lombardy region.[16]

Saxony-Anhalt

The region of Saxony-Anhalt has a long tradition of chemical industry and plastics. The region is part of the Central German chemistry triangle, with 206 companies (with over 20 employees) producing chemical products and plastics at a turnover of more than €8 billion. In total, the chemical industry employs 23,000 employees and consists predominantly of small and mid-sized companies (around 10% is categorised as large company). The region has a long tradition in the chemical industry and has - after a period of severe stagnation - revitalised due to intense modernization, highly qualified employees and the pioneering of chemical parks. The combination of chemical parks, significant number of research institutes, the access to raw materials and the focus on innovation make Saxony-Anhalt host of a valuable ecosystem and one of the leading regions in the chemicals and plastics industry.

According to the analyses of the Regional Innovation Scoreboard 2017, Saxony-Anhalt belongs to the group of "strong Innovator" and has held that position since 2008. Saxony-Anhalt has specific strengths concerning the collaboration between innovative SMEs (normalised score: 0.441) and is performing above average regarding the expenditures on R&D in the public sector (103% of the German average and 116% of the European average). On the contrary, specific weaknesses concern the share of adult population that has completed tertiary education (53% of the German average and 42% of the European average). The share of R&D expenditure originating from the business sector R&D, presents 42% of the German average and 53% of the European average. Patent applications to the European Patent Office EPO attain 46% of the German averages and 66% of the European average.

[15] Regional Innovation Monitor Plus: https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/wallonia
[16] Regional Innovation Monitor Plus: https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/base-profile/lombardy

Table 3: Regional Innovation Scoreboard 2017 for participating regions

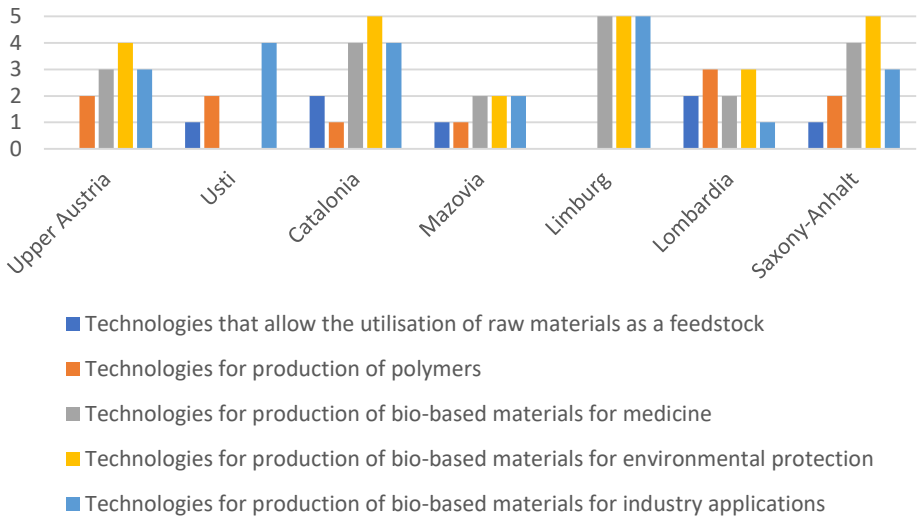
NUTS	Region	RII 2017	Rank	Group	Change
ITC4	Lombardy	79.6	127	Moderate +	-0.8
NL42	Limburg	124.0	43	Leader	- 10.3
AT3	West Austria[17]	115.5	63	Strong	+ 9.2
ES51	Catalonia	88.5	114	Moderate+	-1.0
CZ03	Northwest Region (CZ)[18]	75.0	135	Moderate+	-4.2
BE3	Wallonia	106.0	86	Strong	+2.7
DEE0	Saxony-Anhalt	93.6		Strong	- 10.6

Source: Regional Innovation Scoreboard 2017

Figure 4: Examples of chemical sector technology and innovation initiatives

To discuss with ECRN and lead regions

Figure 5: Illustrative mapping of regional technological specialisation – 1 = critical, 5 = low priority

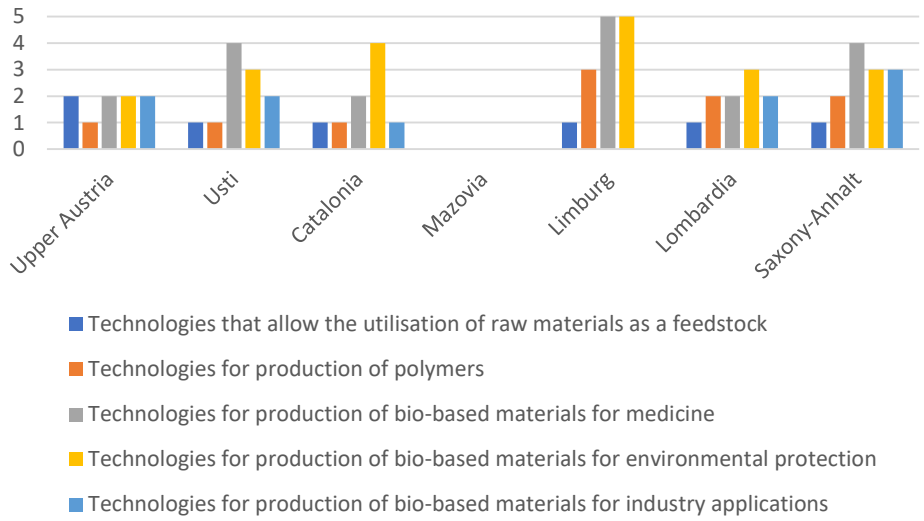


Source: survey responses

The regions that participated in the survey show a variety of foci, specialisations and types of priorities, this is also reflected through the survey when asked about the regional technological specialisation (see figure 5). The production of polymers appears to take the most prominent role across the different regions as well as technologies that allow for the utilisation of raw materials as a feedstock.

[17] Upper Austria was not included as a separate region, rather, it was considered as part of West-Austria
[18] Ústí was not included as a separate region, rather, it was considered as part of the Northwest Region

Figure 6: Importance of key technologies for regional chemical firms – 1 = critical, 5 = low priority

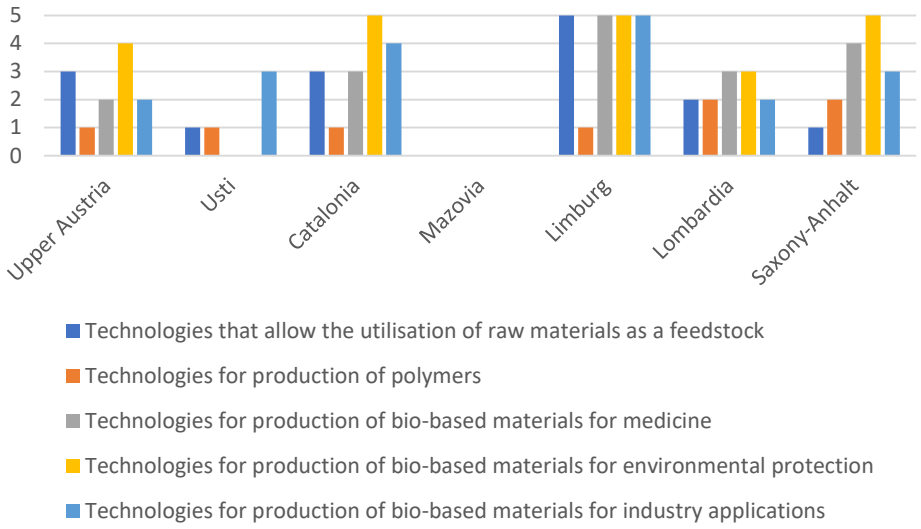


Source: survey responses[19]

The question on the importance of key technologies for regional chemical firms indicates which type of technologies chemical firms consider as critical for their operations (see figure 6). It also signals the type of specialisation that these firms might have. Upper Austria, for instance, considers most technologies as relevant for their regional chemical firms, indicating a broad industry base, as opposed to Usti that appears to have stronger focus on raw materials as feedstock and the production of polymers. Overall the production of polymers and the utilisation of raw materials as a feedstock appear to be the most important key technologies for the regional chemical firms across the regions and could therefore indicate some common focus areas.

[19] The Mazovia region could not identify the importance for regional businesses to adopt technologies

Figure 7: Actual application of key technologies in regional businesses – 1 = state of the art, 5 = not currently used



Source: survey responses[20]

The actual application of key technologies in regional businesses (see figure 7) portrays a slightly different image than the importance of key technologies for regional businesses (see figure 6). Particularly the application of technologies for the production of polymers is noticeable here. Other state of the art applications of key technologies are more scattered, with technologies for bio-based materials for medicine and the utilisation of raw materials as a feedstock also have a comparatively stronger application than other types of technologies.

Concluding, the results of the surveys seems to indicate a degree of specialisation in technologies for the production of polymers and the utilisation of raw materials as a feedstock. The results in Annex I also seem to confirm that. At the same time, the list of other technologies and (sub-)technologies seems to indicate that within these categories there is still a vast variety in the application of these technologies and that the overall level of innovation and type of chemical industry activities vary from highly advanced materials (Limburg, to basic chemistry (Usti, Mazovia, Catalonia), to chemistry that is particularly consumer-oriented (Lombardy).

2.3 Strategies and policies supporting the chemical sector

The strategies and policies supporting the chemical sector are numerous and involve both regional, national and international actors. Mapping existing strategies and policies provide insight into what is effective in a regional, and more importantly, interregional level. Additionally, it allows to identify the possible added value of the partnership and further specify the required nature of the partnership (see section 3).

Five of the regions are already involved in the S3Chem project that has some natural overlaps with the ReConfirm initiative. In S3Chem the particular focus is on mutual learning and exchange of best practices between the regions and their public authorities.[21] These best practices could be incorporated in the investment protocol, as well as a number of regions in S3Chem have expressed interest in participating in ReConfirm. Other initiatives and policies, such as the ChemMultimodal focus on mobility and transport and is aimed at supporting chemical companies and logistics service providers.[22] Another example that could provide leads is the Ilbitz 2016-2019 project in Upper Austria, that aims to organise information events and awareness-raising measures in

[20] The Mazovia region could not identify the importance for regional businesses to adopt technologies
[21] S3Chem. https://www.interregeurope.eu/s3chem/
[22] ChemMultimodal. https://www.interreg-central.eu/Content.Node/ChemMultimodal.html

order to disseminate bionics as a possible innovation method. Awareness raising has been expressed as challenge for other regions (e.g. Mazovia) as well.

Table 4: EU or inter-regional projects in which partner regions are involved

Region	Project	Website
Lombardy, Mazovia, Catalonia, Saxony-Anhalt	S3Chem 2016/2021	https://www.interregeurope.eu/s3chem/
Mazovia	C-VOUCHER (2018-2021)	
Mazovia, Saxony-Anhalt	ChemMultimodal	https://www.interreg-central.eu/Content.Node/ChemMultimodal.html
Mazovia	POWER4BIO (2018-2021)	
Mazovia	Digiclusters (2018-2021)	
Limburg	Trilateral Strategy (2017 and beyond)	
Limburg	Interreg EnOp (2016-2019)	
Limburg	Interreg LUMEN (2019-2022)	
Upper Austria	Ilbitz 2016-2019	https://www.kunststoff-cluster.at/kooperationen/nationale-und-internationale-projekte/detail/news/ilbitz/
Upper Austria	Lit Factory	https://www.jku.at/en/linz-institute-of-technology/research/open-innovation-center/lit-factory/
Upper Austria	Chase K1	
Upper Austria	Comet 2019-2027	https://www.ffg.at/sites/default/files/allgemeine_downloads/strukturprogramme/comet_centre_k1c5_factsheet_chase_de_1fp.pdf
Saxony-Anhalt	Beyond EDP (2016-2021)	https://www.interregeurope.eu/beyondedp/

Source: survey responses

Besides specific policies and projects most regions are engaged in the Smart specialisation strategy (2014), the Chemical sector strategy (2017) and Specific technology strategies (2017), therewith providing further room for cooperation and opportunities for synergies. Annex 2 further lists all the regional strategies, priorities and policy measures. Further mapping of these regional initiatives and their success and potential for expanding to an interregional level could provide opportunities for further investment. In coordination with the regions, and a further qualitative assessment on these initiatives, the regional policies and the regional technology providers and demonstration centres (Annex 3) might have important synergies and provide venues for cooperation and smart specialisation. In the mapping paper these strategies and policies can be further elaborated upon and help determine what regions and companies are good candidates for matchmaking.

3. Future priorities of the S3 partnership

In a final step of the survey, the regions were invited to list up to five thematic priorities for future co-operation. The responses varied from region to region. The Word cloud provide a visual snapshot of the most used words while the table summarises the responses into three 'stylised' priorities.

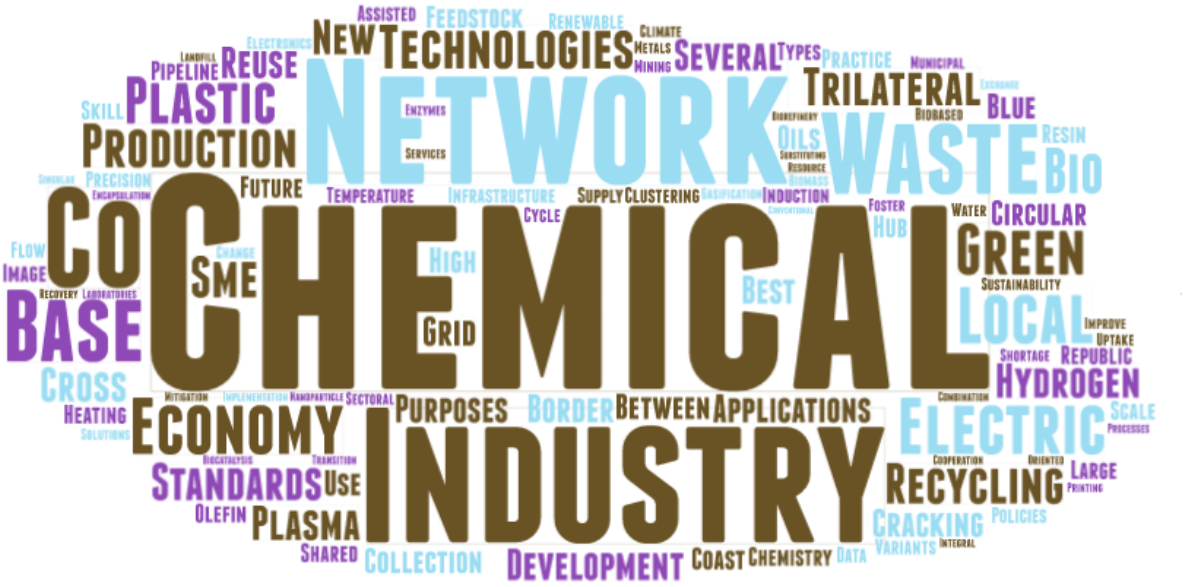


Table 5: Three main 'stylised' thematic priorities for future co-operation

Priority rank	Summary priority
1	Developing bio-based solutions including the use of local biomass, new feedstocks (resins, waste and landfill mining, metal recovery, etc.), and joint work on sustainability standards, policies and technologies for large scale production. This implies cross-sectoral co-operation to boost circular economy (integrated water
2	Development of electric high-temperature technologies (plasma cracking, etc.)
3	Joint investment in new technologies such as green chemistry (enzymes as biocatalysis, nanoparticles, combining electronics and plastics, industry 4.0). This could be support by a joint industry-oriented service network.

Source: survey responses

The regions were then asked to rank a number of options for priority actions and the table below shows the average score with the highest ranking (1.8) given to the development of an inter-regional network of research and innovation centres and a related 'inter-regional innovation voucher' scheme for businesses.

Table 6: Priority actions (7 regions)– 1 = highest priority, 5 = lowest priority

Type of activity	Average
Create an inter-regional network of research and innovation centres that businesses can access (e.g. using an inter-regional innovation voucher)	1.7
Mapping specialist expertise in relevant technologies in each region	2.5
Mapping leading regional firms in chemical sector value-chains/clusters to identify potential synergies	3.1
Sharing of best practices with regard to the implementation of new technologies in the chemical industry.	3.5
Cooperation on mobilising financial support for investments/projects e.g. pooling of regional funds through a joint programme initiative, development of an investment platform	3.6
Co-investment in living labs demonstrators, pilot applications, technology validation actions, etc.	3.6
Co-development of technology demonstrators pilot plants or smart factories	3.7
Partner search, match-making and brokerage services for partnership development	4

Source: survey responses

As can be seen, the regions also ranked highly mapping specialist expertise and leading regional firms to identify potential synergies, suggesting that that the next stage in partnership development should be focused on **a more fine-grained analysis of business potential and complementary positioning in emerging (e.g. biobased) value chains in each region**.

3.1 Expansion of the partnership

This subsection identifies further regions and actors from EU countries, which could be interested in being included in the Chemicals partnership, promoting their industrial modernisation and collaborating with other regions and stakeholders in coordinated investment projects.

Table 7: Suggested regions for future activities.

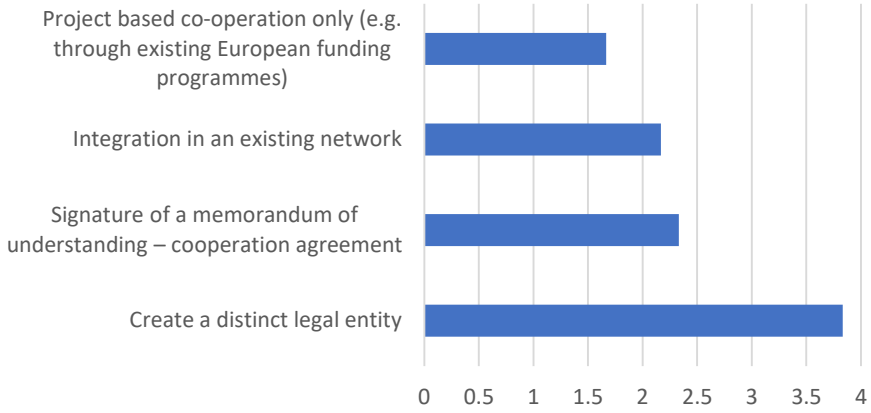
Region	Specific expertise relevant for the proposed activities
Central Ostrobothnia	Not elaborated
Pardubice Region	Qualified chemistry
Moravian-Silesian Region	Qualified chemistry
Rhône-alps	Plastic valley
Trilateral Region Netherlands, Flanders, Nord Rheine-Westphalia	Existing cross border integrations regarding infrastructure (for import- export-transport: energy, industrial products); entire value chains, shared market, multinational settlements, services, education, cooperation, legislation etc.
West Pomerania Voivodeship	Chemical Cluster
Kujawsko-pomorskie Voivodeship	
Lusatia region	As an energy region, Lusatia is a region undergoing an energetic transformation with a large number of chemical settlements.

Source: survey responses

3.2 Governance of the partnership

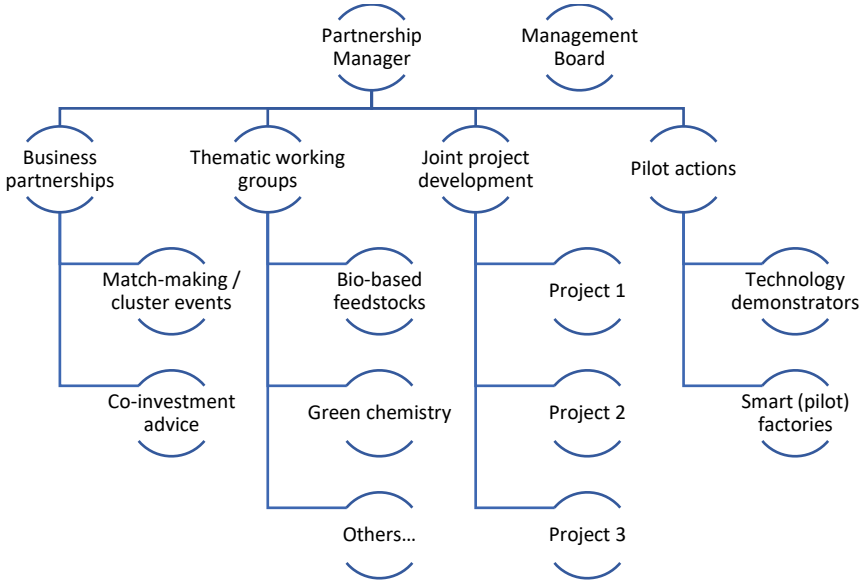
Most of the partner regions prefer a project-based co-operation only, potentially tied to European funding programmes. A cooperation agreement (or memorandum of understanding) is also considered a viable option as a governance model. There is little appetite for the creation of a distinct legal entity.

Figure 8: Average score for preference governance model (7 regions) – 1 = preferred option



Source: survey responses

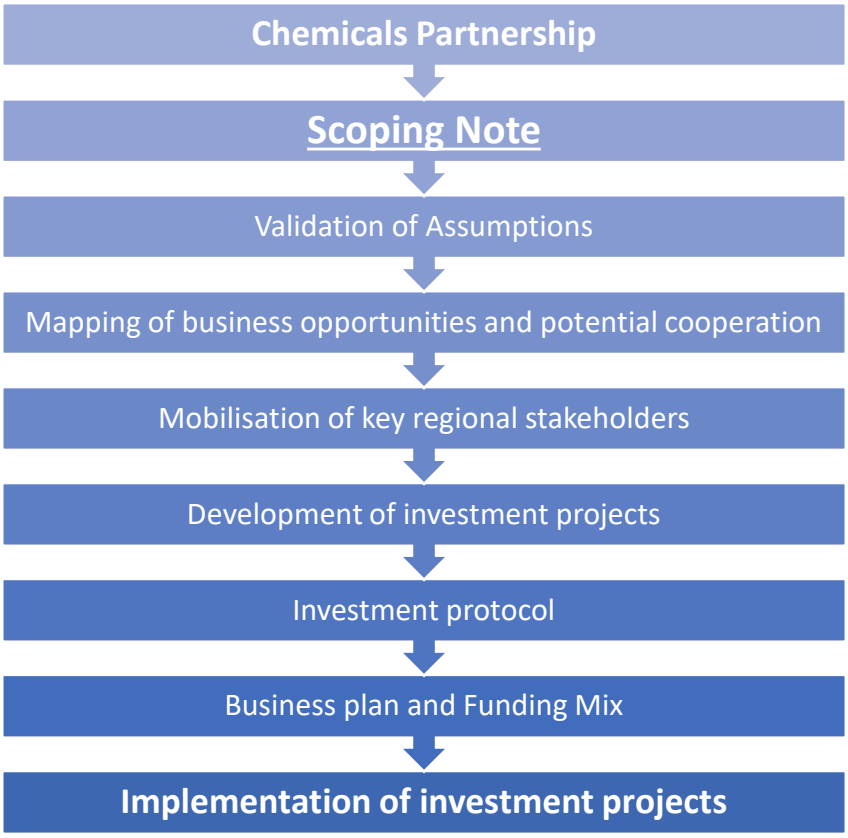
A possible governance structure is set out below.



4. Next steps

The next steps will be discussed during the working meeting on 21 January. An overall step by step process is outlined below.

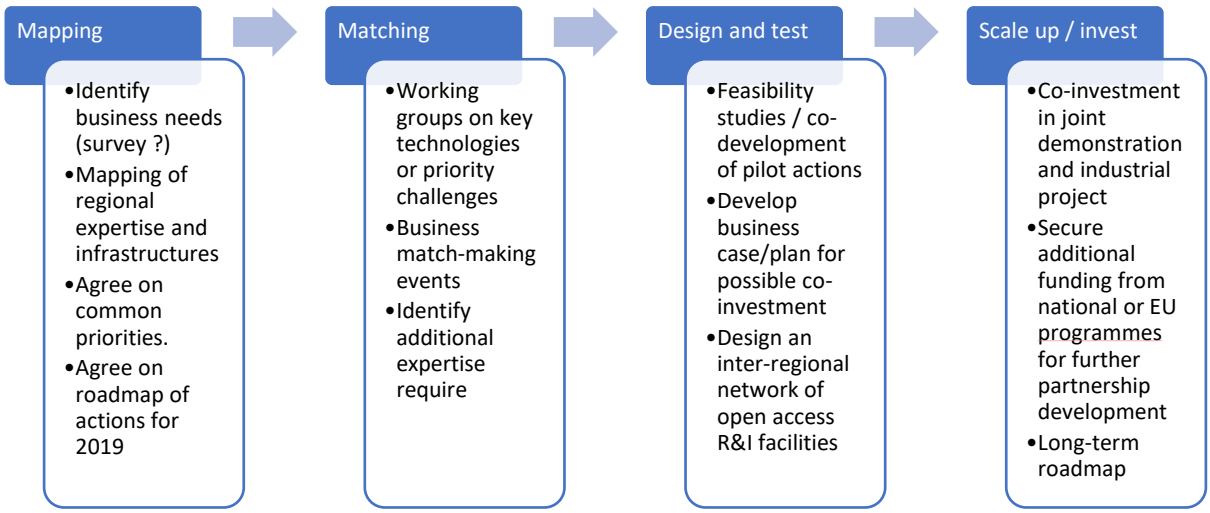
Figure 9: Tentative roadmap for the development of the S3 Partnership.



The planned workshop in Saxony in February should aim at agreeing on a limited number of priority areas for the partnership to work on further deepening the mapping analysis – notably in terms of complementarities between businesses located in different stages of chemical value chains or cross-sectoral opportunities (e.g. re-use of waste, ICT firms for digitalisation, etc.).

The creation of a number of inter-regional working groups involving business and specialists from the government and technology/research centres should be envisaged. These working-groups could focus on either developing specific topics (e.g. or on technological applications prioritised by the partnership. Each working group could consider the positioning of regional businesses/RTOs on a technological value chain scale. The outcome would assist in matching relevant expertise and in identifying missing know-how or additional expertise required for the partnership to develop co-investment proposals.

Figure 10 : Detailed steps process for future partnership development


Mapping
•Identify business needs (survey ?)
•Mapping of regional expertise and infrastructures
•Agree on common priorities.
•Agree on roadmap of actions for 2019
Matching
•Working groups on key technologies or priority challenges
•Business match-making events
•Identify additional expertise require
Design and test
•Feasibility studies / co-development of pilot actions
•Develop business case/plan for possible co-investment
•Design an inter-regional network of open access R&I facilities
Scale up / invest
•Co-investment in joint demonstration and industrial project
•Secure additional funding from national or EU programmes for further partnership development
•Long-term roadmap

Annex 1: Key technologies in which regional technology organisations are most specialised

Table 8: Technologies in which regional technology organisations are most (1) to least (5) specialised

Key technologies	Upper Austria	Usti	Catalonia	Mazovia	Limburg	Lombardy	Saxony-Anhalt	Average
Technologies that allow the utilisation of raw materials as a feedstock	**4**	**1**	**2**	**1**	**1**	**1**	**1**	**1.6**
Technologies for production of polymers	**2**	**2**	**1**	**1**	**1**	**2**	**2**	**1.6**
Technologies for production of bio-based materials for medicine	**3**		**4**	**2**	**5**	**2**	**4**	**3.3**
Technologies for production of bio-based materials for environmental protection	**4**		**5**	**2**	**5**	**3**	**5**	**4**
Technologies for production of bio-based materials for industry applications	**3**	**4**	**4**	**2**	**5**	**3**	**3**	**3.4**
Plastics converter	**1**							
Engine construction for plastics industry	**1**	**3**						
Engine construction for recycling industry	**1**	**5**						
Tool design and construction	**2**							
Fertilizers		**3**						
Qualified chemistry		**5**						
Water treatment /Integral water cycle			**1**					
Energy New fuels CO2			**2**					
Several technologies for the cracking of naphtha, LPG, or natural gas					**1**			
Technology to produce ammonia from atmospheric nitrogen gas and hydrogen					**1**			
Several technologies for the production of chemical building blocks, industrial chemicals and -gases					**1**			
Several technologies for the production of engineering plastics, rubbers, polymers, resins, films, materials					**1**			
Several technologies for the production of nitrogen-based fertilizers					**1**			
Several technologies for environmental protection and care (safety, waste treatment techs, sewer system)					**2**			
Emerging technologies for preventive maintenance and asset performance					**2**			
Several technologies for the generation, modification, preparation and/or supply of industrial utilities					**3**			
Formulation chemistry						**2**		
Process Intensification (from batch to continuous operations)						**4**		

Additive Manufacturing and 3D Printing						**5**		
Technologies for production of fine and specialty chemistry							**3**	
Technologies for hydrogen economy							**2**	

Source: survey responses

Annex 2: Regional strategies, priorities and policy measures

Table 9: Regional strategies and priorities relevant to the chemical sector

Partner	Strategy (year of adoption)	Relevant priorities
Usti, Limburg, Upper Austria, Lombardy, Mazovia, Catalonia, Saxony-Anhalt	Smart specialisation strategy (2014)	✓
Usti, Limburg, Upper Austria, Lombardy, Mazovia, Catalonia, Saxony-Anhalt	Chemical sector strategy (2017)	✓
Usti, Limburg, Upper Austria, Lombardy, Mazovia, Catalonia	Specific technology strategies (2017)	✓
Limburg	Triple Helix strategy BCC (2012)	✓
Limburg	The KT industrial competence model and related HC / HR strategy and tech scale-up approach (2016 – 2018_	✓
Mazovia	Mazovian Chemical Cluster Strategy till 2020 (2015)	✓
Mazovia	Mazowieckie Voivodeship Development Strategy till 2030 (2013)	✓
Catalonia	National Agreement for Industry. (Pacte Nacional per a la Indústria) (2017)	✓

Source: survey responses

Table 10: Policy measures in the participating regions by broad category

Partner Region	Specific to chemical sector	Industry 4.0/digitalisation	Innovation support
Usti			OP Enterprise and Innovations for Competitiveness 2014 - 2020
Usti			TRIO Program
Usti			EPSILON Program
Usti			National Centres of Competence
Limburg	Brightlands Chemical Sustainable Technology Institute (BSTC)		
Limburg	Brightlands Materials Center (BMC)		
Limburg	Brightlands Innovation Factory (BIF)		
Limburg	Brightlands Chemelot Campus		
Limburg		Trilateral Strategy Innovation	

Partner Region	Specific to chemical sector	Industry 4.0/digitalisation	Innovation support
		Table	
Upper Austria			TIM
Upper Austria		Easy 2 Innovate	
Upper Austria		CKP	
Upper Austria			FFG Basisprogramm
Lombardy			Iperammortamento
Lombardy		"Digitalization" Voucher for SMEs	
Lombardy			Patent Box
Lombardy			R&D tax credit
Lombardy			Training tax credit
Lombardy			Nuova Sabatini
Mazovia	INNOCHEM		
Mazovia			RPO WM 2014-2020
Mazovia	PARP		
Mazovia			POIR
Mazovia		Operational Programme Smart Growth	
Catalonia		Innovation Vouchers	
Catalonia		INNOTECH	
Catalonia			NUCLIS Collaborative R&D projects
Catalonia			RIS3CAT Communities
Catalonia			TECNIOSpring Plus

Source: survey responses

Annex 3: Technology providers and demonstration centres by region

Name	Type*	Expertise
Upper Austria		
		Please select from one or more of the technologies listed in previous question &/or list other expertise
Borealis AG	Manufacturer/raw materials	Production of polymers(Polyolefins)
ENGEL GmbH	manufacturer	Engine construction for plastics
EREMA GmbH	manufacturer	Engine construction for recycling
Haidlmair GmbH	manufacturer	Tool design and construction
AGRU KunststofftechnikGmbH	manufacturer	Plastics converter
Starlim Spritzguss GmbH	manufacturer	Plastics converter
FACC AG	manufacturer	Plastics converter (Duro-&/Thermplast Composites)
Hexcel Composites GmbH	manufacturer	Plastics converter
Next Generation Recycling GmbH	manufacturer	Engine construction for recycling
Tiger Coating	Manufacturer/raw materials	New polymeric duroplasts
Poloplast	manufacturer	Plastic Converter
Usti Region		
Unipetrol Centre for Research and Education, a.s.	R&D + Education	A, B, C
J. E. PURKYNĚ UNIVERSITY	R&D + Education	B, E
Brown Coal Research Institute, Inc.	R&D	A
University of Chemistry and Technology, Prague	R&D + Education	A, B, C, D, E
Mazovia Region		
Mazovia Chemical Cluster	cluster	
Mazovian Green Chemistry Valley	network of science institutions	
Polish Chamber of Chemical Industry		
Płock Industrial and Technological Park;		
Mazovia Development Agency;	regional agency	
Warsaw Technology Zone- Centre for Innovation and Technology Transfer Management of Warsaw University of Technology	research centre	
Institute of Industrial Organic Chemistry	research centre	
Institute of Nuclear Chemistry and Technology	research centre	
Limburg Region		
Sitech	Industrial service provider	Industrial services (chemical industry): maintenance, safety, chemical technology implementation, large

		capital project management, integral chemical process scaleup, conceptual process engineering, industry 4.0, wastewater treatment
USG	Industrial utility provider	low temperature heat technologies, site utility management
Brightlands Chemelot Campus	pilot facilities	biobased, materials, materials processing
Sabic	manufacturer	pilot plastic recycling
DSM	private industrial R&D	materials
Brightlands Material Center	private/public development center	light strong recyclable polymer-based materials
Brightlands Sustainable Technology Center	private/public development center	infrastructure (scaleup, piloting, living lab, field lab), knowhow, training
NIAGA		carpet recycling demo
QCP		plastic recycling
InnoSyn		biocatalysis, (bio)chemistry, fine chemicals labscale and multipurpose scaleup
Maastricht University	University	Evidence-based sensing, digitization
Catalonia Region		
Universitat de Barcelona	University	
Universitat de Lleida	University	
Universitat Rovira I Virgili	University	
Univesitat Autònoma de Barcelona	University	
Institut Químic de Sarrià	University	
ICIQ	Research center	
IREC	Research center	
CTQC	Technological center	
LEITAT	Technological center	
Saxony-Anhalt		
Fraunhofer-Society	Technology Provider	
Fraunhofer Pilot Plant Center for Polymer Synthesis and Processing PAZ	Demonstration Centre	• performing polymer synthesis and processing procedures on an industrial-orientated scale • The technical possibilities as well as the concentration of resources in both polymer synthesis and processing that can be found at the Pilot Plant Center offer unique selling points on the R&D market.
Fraunhofer Center for Chemical-Biotechnological Processes CBP	Demonstration Centre	• The Fraunhofer Center for Chemical-Biotechnological Processes CBP in Leuna focuses on the combination of biotechnological processes with chemical processes, and with its pilot scale technical equipment it closes the gap between the laboratory and industrial implementation • providing the infrastructure and

		technical facilities as well as a staff of highly qualified experts, it enables partners from research and industry to develop and scale up processes for the utilization of renewable and petrochemical raw materials to production-relevant dimensions
Institute of Polymer Materials / Polymer Service GmbH Merseburg	Technology Provider	• Conducting research & development projects, supporting and promoting the transfer of knowledge to the business community as well as the organization and realization of further education events, symposia and conferences • Knowledge transfer to the economy as well as organization and realization of advanced training events, symposia and conferences
Martin-Luther-University Halle-Wittenberg; Hochschule Anhalt – University of Applied Sciences; Hochschule Magdeburg-Stendal – University of Applied Science; Otto von Guericke University Magdeburg; University of Applied Sciences Merseburg	Development and Demonstration	• Conducting research and & development projects and supporting the transfer of Knowledge • Cooperation with research institutions, e.g. Fraunhofer Society, and creating knowledge and innovation in different fields of the chemical industry and bioeconomy, e.g. fine and special chemicals
Fraunhofer IMWS Institute for Microstructure of Materials and Systems		• The Fraunhofer Institute for Microstructure of Materials and Systems IMWS is a methodologically oriented Fraunhofer Institute in the disciplines of materials science and materials engineering ▪ The work of Fraunhofer IMWS aims to identify faults and weaknesses in materials, components and systems on the micro- and nanoscale, to elucidate their causes and to offer solutions for the customer. The industrial clients of the institute are among others from microelectronics and microsystem technology, photovoltaics, plastics technology, chemical industry, power engineering, automotive engineering and aircraft construction.
High Performance Center for Chemical and Biosystems Engineering		• Center of excellence for research and innovation in the Halle / Leipzig region • Basic research, application-oriented and industrial research are brought together in order to sustainably stimulate the added value of companies based in the region

		• Universities and scientific institutions transfer their knowledge into industrial value creation • Thematic focus: Research and optimization of process engineering process chains of the plastics processing, chemical, biotechnological and biomedical industry from raw material to product

Source: survey responses