



European Union
European Regional
Development Fund

Smart Chemistry Specialisation Strategy

**“Report on current status of implementation of Regional Innovation
Strategies in Saxony-Anhalt”**

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1. Introduction

The promotion of innovation in chemical related areas is an important objective of the partner regions Saxony-Anhalt, Masovia, Limburg, Lombardy, Catalonia and Asturias. All regions have highlighted these topics in their Regional Innovation Strategies (RIS) as basis for ERDF innovation funding from 2014 until 2020. Chemical innovations are important for many downstream industries and help to find solutions for societal challenges in areas such as new materials, energy, alternative feedstock, etc.

The S3Chem project wants to improve the implementation of RIS with focus on chemical related topics with the help of interregional exchange of experience and mutual learning between public authorities from seven European chemical regions. Chemical companies and relevant research institutions should be supported to better access ERDF innovation funding. The governance of the RIS in the chemical related innovation areas should be improved in close cooperation with triple helix clusters and networks. In the framework of the project, the partners want to change the strategic focus of their policy instruments based on good experiences from the whole partnership.

The partners have undertaken a first analysis to describe the current situation of implementation of RIS with focus on chemical related topics. The report starts with a general description of the partner regions and their economy. The second chapter is focused on the analysis of the chemical industry active in the particular region and their current challenges. The third chapter introduces the Regional Innovations Strategies from general perspective and the respective thematic priorities with chemical related topics in more detail.

The fourth section is dedicated to the ERDF Operational Programme, which builds the framework for innovation funding at regional level. The existing funding programmes for promotion of innovation are summarised here. Chapter five looks at the governance of the RIS in describing the relevant innovation stakeholders from industry and academia. An overview about active networks and clusters is also given. The final chapter concludes with current challenges that the regions are facing in the implementation process of their RIS and their expectations from the S3Chem project by learning from the experiences of their partner regions.

2. Regional Innovation Strategy Saxony-Anhalt 2014-2020 with focus on Lead Market Chemistry and BioEconomy

2.1 Description of Partner Region

2.1.1 General Description

Saxony-Anhalt is one of the 16 federal states of Germany, located in the Eastern part of the country. The neighbouring regions are Saxony, Thuringia, Lower Saxony und Brandenburg. Despite the fact that Saxony-Anhalt has no external borders, Poland and Czech Republic are not far.



Figure 1: EU 27 States of the European Union NUTS-2.
Source: Wikimedia Commons; Eurostat.

The area of Saxony-Anhalt extends about 20.452 km² and the federal states has a population of 2,23 million inhabitants.¹ The population has decreased constantly over the last years. The consequent demographic challenge remains for the society and the labour market.

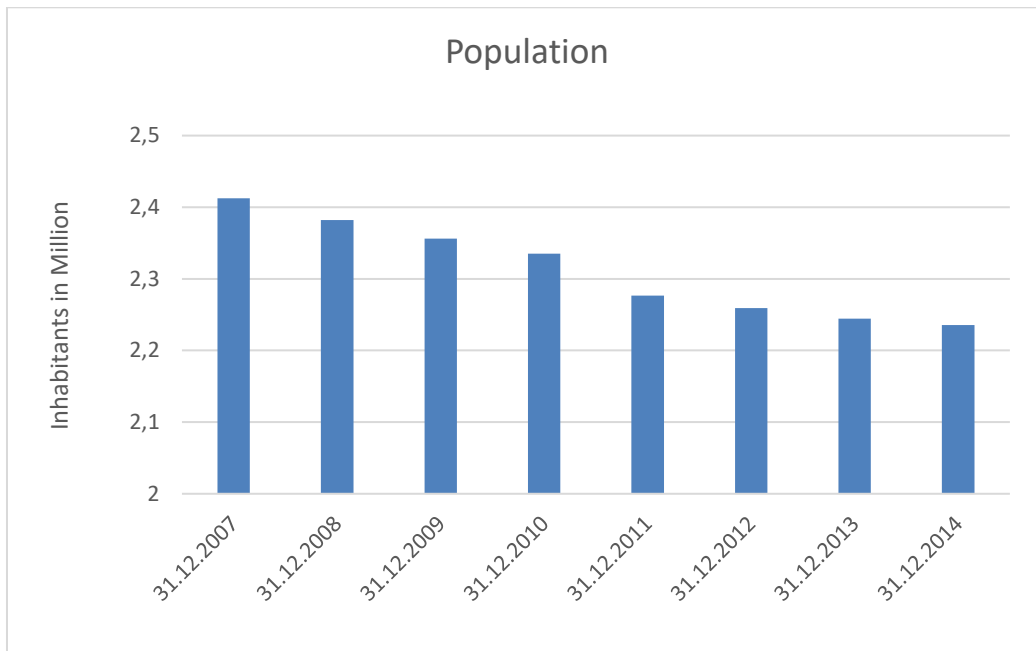


Figure 2: Population development in Saxony-Anhalt
Source: regional statistical office Saxony-Anhalt; Design by isw

The three biggest cities in Saxony-Anhalt are Halle (Saale) (231.440 inhabitants), the capital city Magdeburg (229.924) and Dessau-Roßlau (83.616).² The federal state is subdivided into 14 administration units, consisting of 11 rural districts and three urban municipalities.

2.1.2 Economic Indicators

Saxony-Anhalt is a region with urban and industrial centres and rural areas. Compared to other German regions, it has a rather low population and population density. Before the unification Saxony-Anhalt was part of the former socialist state GDR. During the nineties it had to pass through a process of transformation from a centrally planned economy to a free market economy. Saxony-Anhalt was able to scale down the gap of economic performance compared to the West Germany regions during the nineties. While there was a continuous growth of the GDP during the nineties, the GDP stagnates with an average growth rate of 0,5% from 2000 onwards. A similar situation exists for the export quota of Saxony-Anhalt. The export quota was increasing from 15,7% in 2000 to 25,6% in 2006, but now stagnates on a nearly constant level of about 26-28%.

¹ Status 31.12.2014 federal statistical office

² [The population size is dated from 2013](#)

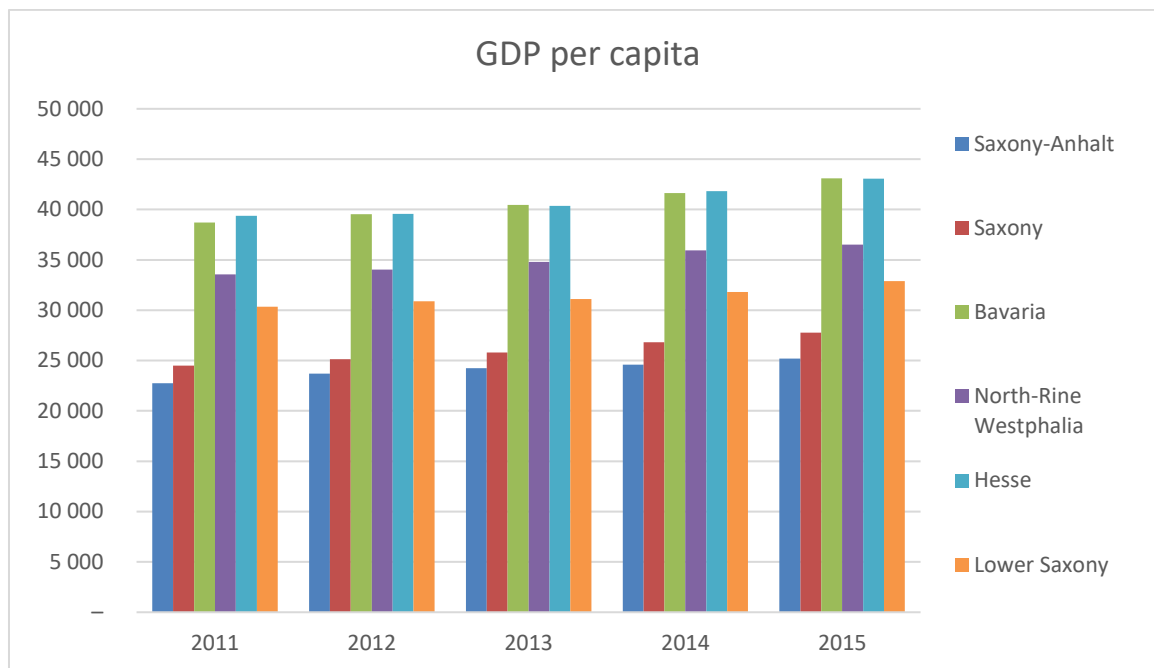


Figure 3: GDP per capita (in prices) of selected federal states with a strong chemical industry
Source: federal statistical office; Design by isw.

Saxony-Anhalt has a good scientific infrastructure, which consists of seven academic facilities and several research institutes, e.g. the Fraunhofer, Helmholtz and Max-Planck institutes. Additionally, Saxony-Anhalt funds and supports nine scientific and entrepreneurial clusters. There are several activities in the field of R&D by the federal state, but Saxony-Anhalt could increase its financial contribution. If the R&D expenditures are measured by the share of the GDP, Saxony-Anhalts financial contribution is with 1,48% under the average in Germany with 2,9%. But still the expenditures for R&D activities were increasing in Saxony-Anhalt. While the amount spent in 2013 was about 776,8 million, the total budget increased up to 816 million Euro in 2014. It must be stated that while the expenditures for R&D activities contributed by the federal state remained constant, the contribution by the universities increased from 276 million Euro to 301 million euro and the private contribution from 228,2 million euro to 243 million euro. Although the private expenditures for R&D activities were increasing, they are still much lower compared to other federal states.

Saxony-Anhalt is very good positioned for European wide transport and logistics. The network of rail and roads is one of the most capable and dense networks in Germany. The freight traffic is able to make use of 11.000 km fully developed roads and of 3.100 km long railway network. Additionally, the freight transport is well developed at the airport Halle/Leipzig. 910.000 t of goods were transported in 2013 at the airport Halle/Leipzig.³

³ Investitions- und Marketinggesellschaft Sachsen-Anhalt. Logistik in Sachsen-Anhalt. Online available: <http://bit.ly/29RMZEH>

2.1.3 Challenges for the region

Saxony-Anhalt is facing several challenges. On the one hand the demographic change has huge impacts on Saxony-Anhalt. The continuously aging of the society is further enhanced by a constant emigration of young people and young qualified persons. E.g. Saxony-Anhalt had to face an internal migration balance of -4,2 per 1000 inhabitants at the midterms of 2010. Especially the age-specific migration balance of the age groups of 18-24 years and 25-29 years. Their aggregated sum of migration is -28,72 per 10000 inhabitants.⁴ The lack of qualified persons and young people can negatively affect industry and is an identified weakness for the bio-economy industry and fine and specialty chemicals industry.⁵ On the other side the “Mittelstandsoffensive”⁶ of Saxony-Anhalt has further identified challenges within the fields of research and development, energy, investments and internationalization. Those challenges can also be understood as specific chances for the industrial location. For this reason, Saxony-Anhalt has to increase the private contribution to R&D expenditures, because the private contribution to R&D expenditures in Saxony-Anhalt is lower than the average in Germany up until now. A reason for this situation might be the operational structures of the companies, that are composed mostly by SME. It is more complicated for small and medium sized enterprises to join R&D activities and to reach an international alignment compared to multinational companies. The access to international markets is a relevant element for Saxony-Anhalt.⁷ On the one hand the chemical industry in Saxony-Anhalt is an exporting sector and on the other hand there is a higher unused potential within Saxony-Anhalt for exporting more goods, because the export quote with 27% is smaller than the German average of about 40%.⁸

Another challenge is the implementation of the energy transition in Saxony-Anhalt, because a positive economic development is connected to an affordable energy supply. But still Saxony-Anhalt is one of the federal states with a high share of renewable energy sources, that could even increase in the next years. These developments put additional pressure on energy costs.

2.2 Description of chemical/BioEconomy industry

2.2.1 General Description

With the privatisation and restructuring of Central German Chemistry Triangle, the chemical industry became a leading industry in the in the 90s. The products of the chemical industry were the basis of the establishing of manufacturers of plastic products, automotive suppliers,

⁴ Leibert, Tim. Die demographische Entwicklung Sachsen-Anhalts 1990-2011 in lokaler, regionaler und nationaler Perspektive. Leibnitz-Institut für Länderkunde. Online available: <http://bit.ly/29APKZI> (28.06.2016)

⁵ isw Institut für Strukturpolitik und Wirtschaftsförderung gemeinnützige Gesellschaft mbH. Endbericht zur Erstellung einer Roadmap Etablierung Sachsen-Anhalts als führenden Forschungs- und Produktionsstandort durch den Entwurf einer Roadmap des Leitmarktes Chemie/Bioökonomie der Regionalen Innovationsstrategie. S. 101;116

⁶ The „Mittelstandsoffensive“ is a SME-initiative by the federal state of Saxony-Anhalt for supporting small and medium sized companies.

⁷ Ministerium für Wissenschaft und Wirtschaft des Landes Sachsen-Anhalt: Mittelstandsoffensive Sachsen-Anhalt I3 – Wachstum durch Innovationen, Investitionen und Internationalisierung. Magdeburg 2014.

⁸ Cf. Regional statistical office Baden-Württemberg. Exportquote im Bundesländervergleich 2015. Online available: <http://bit.ly/29Abrs0> (12.07.2016)

the solar industry and another industries. Also in Saxony-Anhalt the chemical and plastic industry is counted among the leading industrial sectors, which act as a supplier for many downstream industries and a constitute pillar of the local added value. With the majority of products, it is in the beginning of many value chains and offers a wide range of products. These include basic chemicals (including synthesis gas, ethylene, propane, butane, etc.), specialty chemicals (including paints and varnishes, plant protection products, special plastics and consumer chemicals) as well as pharmaceuticals.

Traditionally the production is based on the use of fossil resources. At the same time sustainable bio-based products and biotechnological raw materials are used. It is to be expected that renewable raw materials like biomass become more attractive in the long term and new fields of application for the material use of renewable resources in the chemistry will be implemented in the future as a result of the growing scarcity of oil and corresponding rising prices.

Important factors for success for the locations of chemistry and bio-economy are the close interconnection and industrial collaboration possibilities. The model “chemical park” has been newly developed. Not only large companies, but also numerous SME´s are supplied with composite materials and an effective infrastructure. Supply and disposal systems, the energy supply, safety, logistics and further services are managed by competent specialised companies, so that chemical manufacturers can concentrate on the production and marketing of their products. The model of the chemical park is a model of success, which becomes more and more popular also at global level in the meantime. The chemistry and the bio-economy are characterised by the following locations in the Central German Chemistry Triangle:

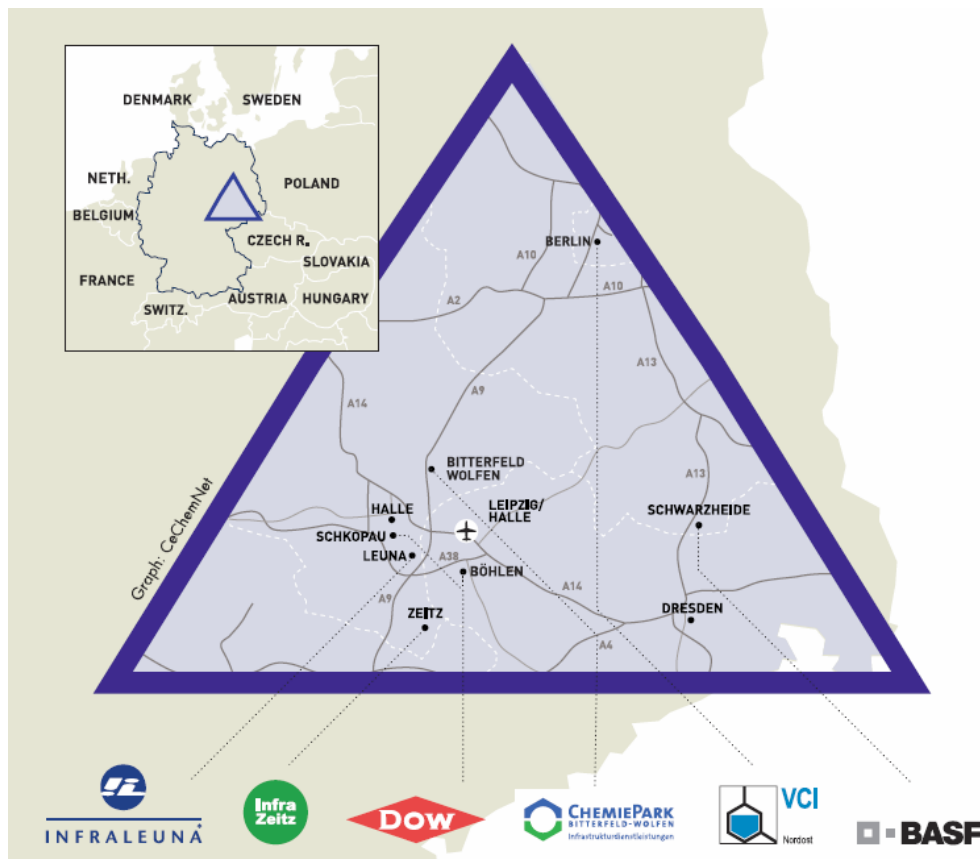


Figure 4: Overview chemical park locations Central Germany
Source: isw gGmbH.

The regional feedstock integration of the locations in the Central German Chemistry Triangle gives an overview of inter-site networking of the material flows. This graphic illustrates the comprehensive integration with regard to delivery and distribution routes.

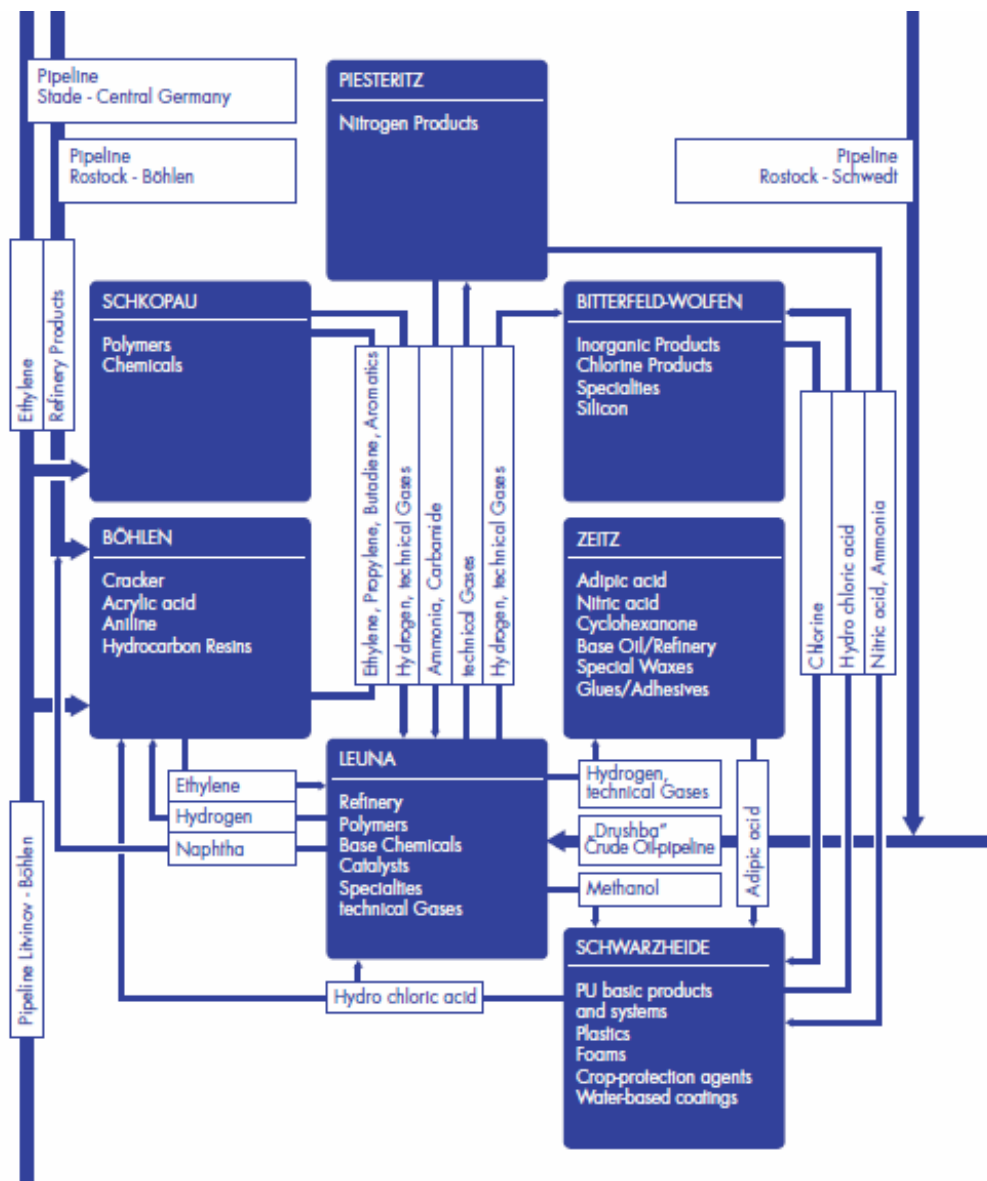


Figure 5: Feedstock Integration in the Central German Chemical Triangle
Source: CeChemNet.

Cooperative relations exist with new investors and service providers - internal as well as external of the chemical sites. A powerful network at product, logistics and energy level has been created. The infrastructure and logistics can be shared, know-how can be transferred and there is a standard regulation for the supply and disposal systems. In this regard the resources can optimally be used and products and energy streams can be organised efficiently.

The major industrial and business locations have got a complex feedstock integration. With its approach of "Innovation Location Network – chemical parks as Knowledge sites" they want to develop the research and innovation profiles of their locations. By linking the research and development potential and the needs of companies with the current orientation of

the research priorities of universities and non-university research institutes, further innovative location advantages will be created.

The Fraunhofer Research Centre for Silicon Photovoltaics CSP and the Fraunhofer Pilot Plant Centre for Polymer Synthesis and Processing PAZ in the ValuePark® in Schkopau as well as the Fraunhofer Centre for Chemical-Biotechnological Processes CBP in the chemical park in Leuna are renowned non-university research institutes, which are focused on application-oriented research and innovative developments for products and technology. This research centres compensate the structural deficiencies (mainly SME´s with low equity; value chains, which are not well-developed; more supply industry and no company headquarters) of the industry research in Eastern Germany.






Leuna	Bitterfeld-Wolfen	ValuePark®, Schkopau	Zeitz	Schwarzheide
				
<ul style="list-style-type: none"> • Fraunhofer Centre for Chemical-Biotechnological Processes CBP • Hydrogen technology 	<ul style="list-style-type: none"> • R&D in sectors fine chemistry, pharmacy, agrochemical industry, catalyst, OLED-Technology 	<ul style="list-style-type: none"> • Fraunhofer Pilot Plant Centre for Polymer Synthesis & Processing PAZ • Fraunhofer Centre for Silicon Photovoltaics CSP 	<ul style="list-style-type: none"> • competence centre of green chemistry • R&D focusing on chemistry, environmental sciences 	<ul style="list-style-type: none"> • innovation centre of biopolymers • service centre for process optimisation

Figure 6: Overview chemical park locations and innovation profiles
Source: isw gGmbH.

2.2.2 Indicators

Saxony-Anhalt has a long tradition in the different economic sectors and branches. With a number of 23.000 employees in over 200 companies and a turnover of approximately 9 billion euros the chemical and plastic industry (Manufacture of chemicals and chemical product, Manufacture of rubber and plastic products) belongs to the most important economic sectors in Saxony-Anhalt. There are a few large chemical global players like Dow, Total, BASF and Linde. But the majority of companies are small and middle sized enterprises.

WZ08-20 Manufacture of chemical products

		2009	2010	2011	2012	2013	2014
Companies	number	96	99	100	100	107	110
Employees	number	10.873	11.031	13.047	13.183	13.356	13.441
Turnover	thousand EUR	4.396.640	5.164.191	6.412.452	7.027.974	7.485.681	6.908.860
Domestic turnover	thousand EUR	2.596.926	3.073.000	3.556.650	3.804.927	4.342.570	3.893.699
foreign sales	thousand EUR	1.799.714	2.091.191	2.855.802	3.223.047	3.143.111	3.015.161
Productivity *	EUR/L	404.363,1	468.152,6	491.488,6	533.108,9	560.473,3	514.013,8
Export quota	in %	40,93	40,49	44,54	45,86	41,99	43,64

* calculation turnover/employment

Figure 7: Sum of chemical Production in Saxony-Anhalt, 2009-2014
Source: Statistical Office of Saxony-Anhalt, calculation isw gGmbH.

WZ08-22 Manufacture of rubber and plastic products

		2009	2010	2011	2012	2013	2014
Companies	number	94	98	99	101	105	108
Employees	number	7.913	8.366	8.663	8.925	9.182	9.474
Turnover	thousand EUR	1.478.251	1.795.693	2.031.734	2.034.020	2.049.667	2.111.513
Domestic turnover	thousand EUR	1.084.462	1.270.995	1.424.720	1.441.842	1.422.459	1.413.156
foreign sales	thousand EUR	393.789	524.698	607.014	592.178	627.208	698.357
Productivity *	EUR/L	186.813,0	214.641,8	234.530,1	227.901,4	223.226,6	222.874,5
Export quota	in %	26,64	29,22	29,88	29,11	30,60	33,07

* calculation turnover/employment

Figure 8: Sum of plastic Production in Saxony-Anhalt, 2009-2014
Source: Statistical Office of Saxony-Anhalt, calculation isw gGmbH.

Sum of chemical and plastic Production in Saxony-Anhalt

		2009	2010	2011	2012	2013	2014
Companies	number	190	197	199	201	212	218
Employees	number	18.786	19.397	21.710	22.108	22.538	22.915
Turnover	thousand EUR	5.874.891	6.959.884	8.444.186	9.061.994	9.535.348	9.020.373
Domestic turnover	thousand EUR	3.681.388	4.343.995	4.981.370	5.246.769	5.765.029	5.306.855
foreign sales	thousand EUR	2.193.503	2.615.889	3.462.816	3.815.225	3.770.319	3.713.518
Productivity *	EUR/L	312.727,1	358.812,4	388.953,8	409.896,6	423.078,7	393.644,9
Export quota	in %	37,34	37,59	41,01	42,10	39,54	41,17

* calculation turnover/employment

Figure 9: Sum of chemical and plastic Production in Saxony-Anhalt, 2009-2014

Source: Statistical Office of Saxony-Anhalt, calculation isw gGmbH.

As a result of the different sectors (e. g. agriculture, forestry, food industry), which are included in the BioEconomy, there are no statistic surveys of companies, employees, turnover, etc. in Saxony-Anhalt. The BioEconomy includes all economic sectors, which refine biological resources with physical, chemical and biotechnical processes in order to produce primary products, intermediates and finished products. So the BioEconomy includes a wide range of industries, which have been seen as a separate topic before, but are increasingly interlinked because of the same resources "biomass".

Chemistry and BioEconomy offers good conditions for the implementation of innovative projects and ideas for existing companies and research institutes as well as new investors. Important location factors are:

- 5 chemical parks: Chemical Park Bitterfeld-Wolfen, Chemical Park Leuna, ValuePark® Park Schkopau/Böhlen, Agro-chemical Park Piesteritz, Chemical and Industrial Park Zeitz,
- raw materials supply: feedstock integration and material-specific know-how in the chemical locations; pipeline systems,
- 15 research-centres and
- 7 universities.

2.2.3 Challenges for the industry

The challenges of the energy revolution and the unilateral dependence of the chemistry on oil and gas will require particular efforts during the next ten years in order to overcome the given disadvantage step by step as a result of high energy and logistics costs. In the commission of enquiry for the future of the chemical industry in North Rhine-Westphalia the following mega trends were considered as further challenges for the chemistry in Germany with regard to renewable raw material bases, products and production processes⁹:

- demographic change (skills shortage),

⁹ cf. Enquetekommission zur Zukunft der chemischen Industrie in Nordrhein-Westfalen im Hinblick auf nachhaltige Rohstoffbasen, Produkte und Produktionsverfahren, S. 6 -10, 2015.

- new patterns of mobility (new vehicle concepts and drive technologies, intelligent networking of the use of individual and public transport systems),
- learning from nature (decentralisation and circular economy),
- the convergence in technologies (information and communications technology, the convergence of various disciplines),
- globalisation 2.0 (the relocation of economic centres of power),
- knowledge-based economy (innovation as a key driver for growth and competitive factor),
- business ecosystem (networking and dissolution of traditional system structures),
- new patterns of consumption (sustainability issues),
- transformations in the use of energy and resources (increasing importance of renewable energy sources and renewable raw materials, demand for decentralized infrastructure (for production),
- climate change and environmental pollution (increase of CO₂-emissions) and
- Urbanisation (increasing use of resources and increased requirements to infrastructure and logistic.

One of the structural characteristic of the region is the weakness in the field of industrial research. The preferred privatisation of production facilities, missing company headquarters and the patchwork structure of the companies complicate the sustainability of the Central German Chemistry and BioEconomy.

Funding programmes of the federal government like „company region“ or the initiative „Twenty/20“ of the Federal Ministry of Education and Research (BMBF) as well as the support within the framework of "improvement of regional economic structure" (GRW) and "Central Innovation Programme for medium-sized businesses" (ZIM) (both instruments are in the responsibility of the Federal Ministry for Economic Affairs and Energy (BMWi)) are aiming at a compensation of the disadvantages. Furthermore public funded research institutes were actively established by the federal government and by the federal states close to the industrial sites. The first example was the Fraunhofer Pilot Plant Centre for Polymer Synthesis and Processing PAZ in the ValuePark® in Schkopau. This was followed the Fraunhofer Centre for Chemical-Biotechnological Processes CBP in the chemical park in Leuna and the Fraunhofer Research Centre for Silicon Photovoltaics CSP in Schkopau and Halle. The model of the chemical park was upgraded to a "knowledge site". This range of research services is unique for the regional but also supra-regional companies.

In the next EU structural funds period from 2020 this special features of the innovation funding in East Germany will no longer exist. A regional funding with a concentration on structurally weak regions is currently under discussion. This approach, which is derived from the "improvement of regional economic structure" (GRW) does not meet the structural needs and features of East Germany. The Central German Chemistry Triangle, but also the centres of excellence in Dresden, Jena, Potsdam/Berlin and Chemnitz with their concentration of universities and non-university research institutes would not be able to continue offering the existing support for the SME´s in East Germany.

To secure the future of the Chemistry and BioEconomy in Central Germany political guidance is needed in the current structural funds period, which promote the structural change in order to use renewable energies and domestic brown coal with Chemistry and bio-systems technology as a raw material and energy source in the next ten years:

- Building up an innovation system in accordance with the requirements of the structural change
- Further research and development of steam-based hydrogen technology
- Further development of BioEconomy
- Further development of low-emission coal chemistry
- Development of an advanced feedstock integration for SME´s

2.3 Description of Regional Innovation Strategy

2.3.1 General Description, Challenges and Objectives

Saxony-Anhalt has adopted the “Regional Innovation Strategy Saxony-Anhalt 2014-2020 on 18th February 2014, to strengthen innovation capacity of companies as well as the potential of innovation of science, research and development by facilitation of better collaboration.

Based on existing competences in the field of science and economy in Saxony-Anhalt 5 important leading and growth markets were chosen in order to be able to face the future global challenges and mega trends like the demographic change or the climate change. The Lead Markets with future potential in Saxony-Anhalt are:

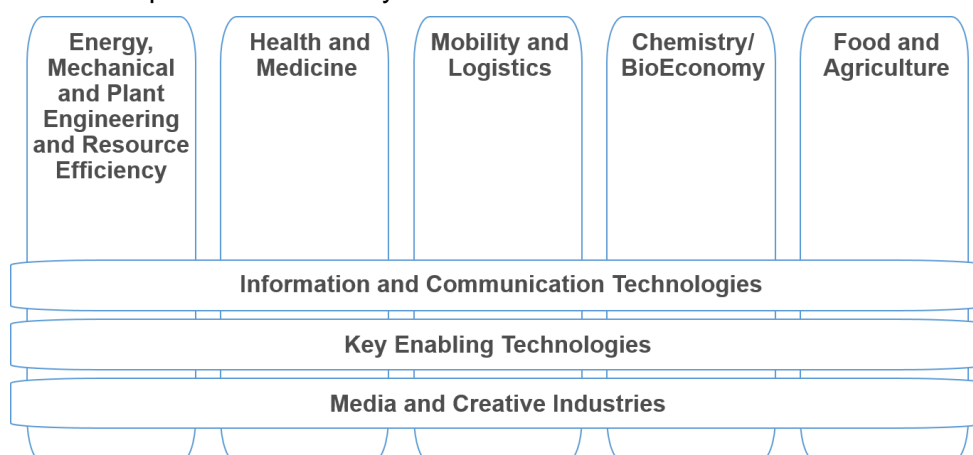


Figure 10: Regional Innovation Strategy Saxony-Anhalt 2014-2020
Source: isw gGmbH.

For the implementation of the Regional Innovation Strategy Saxony-Anhalt the following principles were formulated in order to improve the position of the country as an innovative science and economy site within international competition in the Lead Markets:¹⁰

1. Increase of the location profile of Saxony-Anhalt by focusing of regional innovation policy to the Lead Markets, by investments of high quality and the use of cluster and innovation networks.
2. Integration of innovations a cross different Lead Markets for different horizontal challenges.
3. Mobilising, developing and promoting of the innovation potentials in the corporate landscape by outreach transfer and low-threshold services.

¹⁰ cf. Ministerium für Wissenschaft und Wirtschaft des Landes Sachsen-Anhalt, Regionale Innovationsstrategie Sachsen-Anhalt 2014-2020: Hier ist Zukunft Strategie, Oktober 2014, S. 5-6.

4. Targeted expansion of the science landscape and further professionalization of the knowledge and technology transfer between the research institutes and companies in order to achieve an innovative leap.
5. Development and efficient use of business orientated research infrastructure.
6. Improving the competitiveness of existing productions sites by investments as well as by the increase of the existing innovation potential.
7. Support of the business culture by broad awareness raising in the education sector and by the promotion of start-ups.
8. Securing of the qualified labour force in the country by investments in an efficient education system, extra-occupational qualification, supporting of young people and by increasing childcare provision.
9. Internationalisation of the innovation policy: Integration of the local production and services in international value chains, increase of the export potentials by innovations, involvement in international networks.
10. Consistent gender mainstreaming.
11. Bundle the financial instruments: cross departmental use of funds as well as the increased raising of project funding out of the national and international funding programmes.
12. Continuous development and success monitoring of the Regional Innovation Strategy.

Every Lead Market is broken down with specialised profiles, topics and projects, which have a really particular relevance for innovative growth in Saxony-Anhalt.

2.3.2 Focus on chemistry/BioEconomy, etc. – highlight thematic priorities

The Lead Market Chemistry/BioEconomy contains 4 important topics, in which pilot projects are defined for the future. These pilot projects include substantial infrastructure measures and network activities and offers only an orientation at the time. Furthermore, another projects of innovation should activate and implement in the topics for the future. The following graphic X gives an overview of the specialised profile of the Lead Market Chemistry/BioEconomy.

Chemistry/BioEconomy		
<p>New polymer materials</p> <ul style="list-style-type: none"> Plastics processing, lightweight materials (CFK) Hybrid technology, rubber industry, photovoltaics Nanotechnology for surfaces 	<p>BioEconomy</p> <ul style="list-style-type: none"> Bio refinery, bioplastics 	<p>Hydrogen economy</p> <ul style="list-style-type: none"> H₂ as energy sources and recyclable material (raw material for new products)
<p>Coal Chemistry – CO₂ Economy</p> <ul style="list-style-type: none"> Material use of lignite Bio-lignite, CO₂ as raw material (algae) 	<p>Fine and speciality chemistry</p> <ul style="list-style-type: none"> Functional pigments Catalyst Products for the pharmaceutical, electronic and fine and speciality chemistry 	

Figure 11: Innovation priorities of Lead Market Chemistry/BioEconomy
Source: Ministry of Science and Economic Affairs Saxony-Anhalt, 2015.

The topic » **New polymer materials – development and application of polymer-based lightweight materials for mobility/energy/Medicine**« is one of the key issues in the Lead Market Chemistry/BioEconomy. New priorities are derived on fields of new materials and material combinations, improvement of characteristics of materials, component safety and quality, manufacturing technologies as well as sustainability and economy as a result of the ongoing activities in the market, existing requirements and projections to future fields of innovation. The focus of implementation and strategic prioritisation is set on the following 4 pilot projects as lighthouse projects, which represent a sustainable infrastructural and application-oriented research base for innovations of lightweight materials:

- Expansion of the Fraunhofer Pilot Plant Centre for Polymer Synthesis and Processing PAZ,
- Expansion of the technical centre – University Magdeburg-Stendal,
- Implementation of the centre of excellence for chemistry and biotechnology,
- Implementation of the innovative technology and application centre Merseburg (ITAM) and
- Development of the competence and transfer network of polymer based lightweight construction in Saxony-Anhalt.

One of the main objectives of the priority »**BioEconomy**« is the establishment of Saxony-Anhalt as a central region for bio-based value chains. In this regard the joint production and the cascade utilisation of biomass is the strategic approach. Appropriate technologies and production processes should be developed and tested for the material but also energy use to enable the rapid access to the market development. The focus is set on bio-based basic, fine chemicals and special chemicals. Renewable raw materials should be used most likely for the chemical industry, if the characteristics equal the conventional oil-based platform chemicals.

With so called „drop-in“-approaches it is possible to integrate some steps of production in existing systems without significant changes for the downstream processes. Starch, sugar, cellulose, lignin, plant-based oils and proteins are perfectly suited for the production of numerous base chemicals. These renewable raw materials can be processed to new platform chemicals and provide a basis for chemical intermediates, fine and special chemicals. In addition, wood and other bio-based materials and composites (Wood Plastic Composites and Natural Fiber

Composites) as well as bio-based energy sources (supply of biofuels from the treatment of lignocellulosic substances) are counted among further priorities within the BioEconomy. The pilot projects and network supported in the future BioEconomy in Saxony-Anhalt are:

- Implementation of the demonstration projects for hybrid materials (plastic/wood),
- Development of the network forest,
- Centre for urban buildings/innovations,
- Planning and construction of a demonstration plant for disintegration of biomass according to the procedure to the Organosolv-method,
- Expansion of the Fraunhofer Centre for Chemical-Biotechnological Processes CBP and further investments and
- Exploitation of results of the cluster BioEconomy in Saxony-Anhalt.

One of the key challenge in the topic » **regenerative hydrogen production, hydrogen storage and hydrogen distribution** « is the electricity surplus, that is generated by wind and sun. In this process hydrogen should be generated out of the electricity surplus by means of electrolysis on a large scale and economic way, which can be used as a basic chemical product, as a fuel for mobile applications, for heat production as well as the reconversion, this means for the appropriate electricity production. With the project "HYPOS - Hydrogen Power Storage & Solutions East Germany" out of the initiative „Twenty20 – partnership for innovation“, which is supported by the Federal Ministry of Education and Research (BMBF), the electricity grid and material flow of chemistry in Schkopau and Leuna, the gas storage in Bad Lauchstädt and the electricity grid in East Germany should be connect by the green hydrogen in a model approach. The objective is to achieve system and network infrastructure innovations for the economic efficiency of safe and green hydrogen until 2019.

The project „Kopernikus Chemie“⁴⁴ will transfer the existing developments of „Power-to-X“ to market solutions by systemic and integrated approaches. The methods to transfer the energy in material energy sources or industrial raw materials: gaseous substances like hydrogen or methane (power-to-gas), liquid fuels (power-to-liquid) for the traffic and base chemical for the chemical processing industry (power-to-chem) should be developed in order to achieve the economic efficiency by the scale-up and their linkage with value creation. In this regard pilot projects are:

- Electrolysis Platform Leuna EPL Sachsen-Anhalt
- Exploitation of the results of the project HYPOS in Saxony-Anhalt
- Implementation of the pilot project Chemie⁺ within the phases 2 und 3 of Kopernikus

The topic » **Coal Chemistry – CO₂ Economy** « deals with the material use of lignite. The Innovative Regional Growth Cores (BMBF) "ibi" (Innovative Lignite Integration in Central Germany), did the technical groundwork from 2010 until 2014, which were necessary for an innovative and modern material use of lignite in consideration of the local structures. A nucleus of innovative technique and open-minded companies exists for all steps of the value chain. The aim of the following step is the establishment of the technologies at pilot and demonstration scale at the chemical site in Leuna. In this process the economic efficiency and the technical functionality of the elements of the lignite-based added value can practically be proved in an industrial environment. The pilot projects include:

- Large-scale pilot plant of gasification
- Development of a competence centre of carbon chemistry

- Detailed examination of arising CO₂-emissions with regard to a material use of lignite at the chemical site

The following graphic gives an overview of interrelationships between the several topics in the Lead Market Chemistry/BioEconomy:

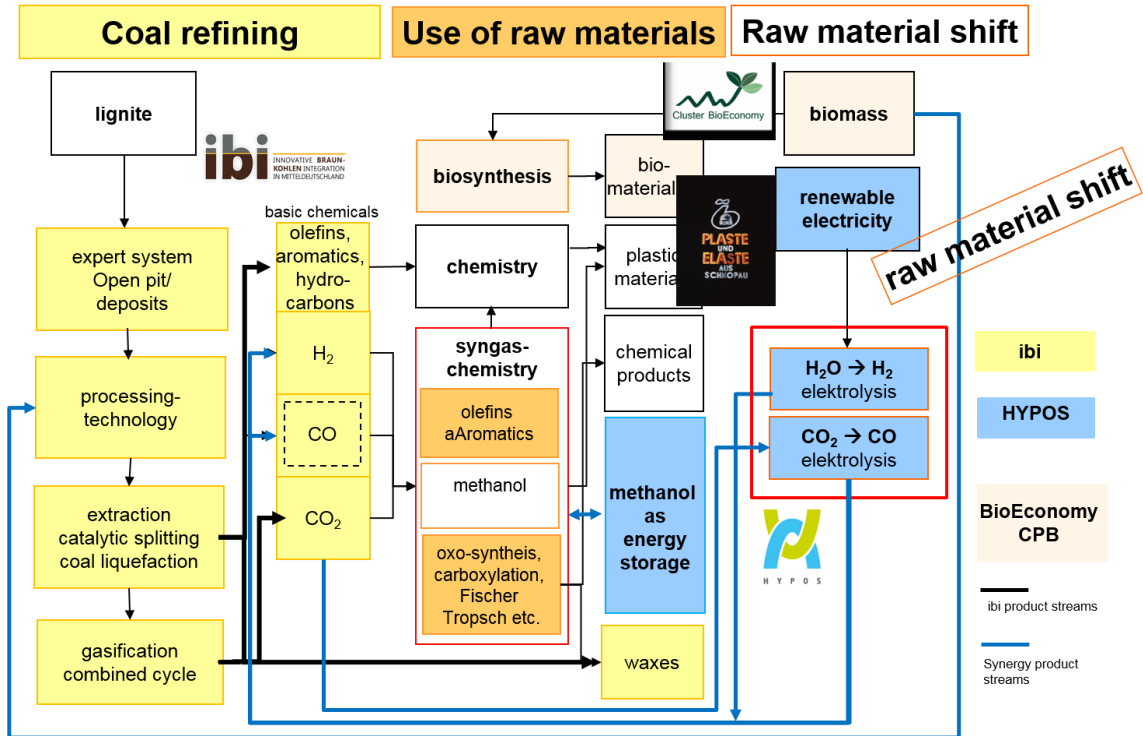


Figure 12: New Feedstocks for the chemical industry in Saxony-Anhalt
Source: Innovative Lignite Integration in Central Germany (ibi) 2014.

2.3.3 Further activities to specify innovation topics

In 2013 a fundamental study for the Regional Innovation Strategy Saxony-Anhalt 2014-2020 was published by the “VDI Technologiezentrum GmbH” (technology centre) und the “GIB Gesellschaft für Innovationsforschung und Beratung GmbH” (Innovation Research and Consultancy) on behalf of the Ministry of Science and Economic Affairs Saxony-Anhalt. In this study all Lead Markets were analysed regarding to competences, requirements, trends and investment priorities. In the analysis of the Lead Market Chemistry/BioEconomy experts were involved in two steps. In the first step individual interviews with representatives of the universities and research institutes, company representatives, technology transfer institutions, chambers and associations as well as with the cluster managers, were organised. In the second step they invited to roundtable-discussions. Representatives of science reflected upon the results of collaboration between science and economy. The identified results and topics of the Lead Markets as well as cross-cutting issues information and communication technologies have been discussed in 6 roundtable-meetings. The activities were supported by an inter-ministerial working group (IMAG RIS). The development of the Regional Innovation Strategy Saxony-Anhalt was consciously prepared as an iterative multi-level process, which was essentially pushed by the region itself. Furthermore another players were involved in the regard to regular meetings of the inter-ministerial working groups as well as meetings to the RIS with economic and social partners (Monitoring Committee of the EU-structural funds) and with the Committee on Industry of both Chambers of Industry and Commerce in Saxony-Anhalt. The topics for the future with his pilot projects had confirmed by the meeting of the Advisory Committee for Innovation and Cluster Saxony-Anhalt. On 18th of February 2014 the “Regional Innovation Strategy Saxony-Anhalt 2014-2020” was adopted by the Cabinet.

The draft of the roadmap for the Lead Market Chemistry/BioEconomy was drawn up by the isw Institute in close cooperation with the Cluster Chemistry/Plastics Central Germany on behalf of the Ministry of Science and Economic Affairs Saxony-Anhalt. The aim of this draft was to elaborate already existing strategic approaches with the stakeholders of the Lead Market in order to develop the identified topics for the future more detailed with a substantiated work scheduling. This process was supported by working groups in the individual priority topics for the future too. As a result, summaries of the current state were discussed and new project ideas were developed. During further proceedings of the roadmap-draft recommendations for actions and approaches of the methodical and organisational implementation for the Lead Market initiatives were developed and appropriate organisational structures were proposed.

At the end the Ministry of Economy, Science and Digitalisation Saxony-Anhalt finalised the roadmap-draft in an intensive process of coordination with all stakeholders of the working group of the Lead Market. In this Development Strategy of the Lead Market Chemistry/Bioeconomy specialised profiles, responsible actors, pilot projects and networks as well as a rough project schedule were defined for the 4 priority topics. Furthermore, there is a part for description of additional projects in form of data sheets, which can be continuously updated.

2.4 Description of ERDF Operational Programme

2.4.1 General Structure

On 19th December 2014 the Operational Programme ERDF for the funding period 2014 until 2020 in Saxony-Anhalt was confirmed by the European Commission. 1.427 million euros are available for the implementation in Saxony-Anhalt in total. The aim of the country is to achieve a use of funds as efficiently and effectively as possible with a high added value for the EU. The Europe 2020 Strategy sets the framework for the content-related design of the OP ERDF Saxony-Anhalt with the following EU headline targets:

- „improve conditions for innovation, research and development“ (R&D expenditures of 3 % of the GDP, improvement of the circumstances for R&D) and
- „reduce greenhouse gas emissions, push renewable energies and energy efficiency“ (until 2020 reduction of greenhouse gas emissions by 20 % as compared to 1990, increase the share of renewable energies of overall energy consumption to 20 %, increase in energy efficiency by 20 % as compared with forecasted developments).

Saxony-Anhalt focuses on 12 of 40 possible investments priorities in order to achieve a high effectiveness and visibility. In preparation of the Operational Programme a socio-economic Analysis was carried out in 2012, which showed the important structural weaknesses in the field of R&D in Saxony-Anhalt, the competitiveness of the economy is expandable for the future and the potential in order to raise the energy efficiency and the use of renewable energies are not exhausted in the country. As a result of thus urgent need for action the use of funds will be primarily focused in support for research and technical development and innovation with 30 % of the ERDF funds. 27 % of the ERDF funds are intended for the support of SME´s. Overall, the ERDF funding is split into 7 priority axes.

2.4.2 Responsible Bodies

The OP ERDF was developed in leadership of the Ministry of Finance Saxony-Anhalt. The content-related design was carried out in close partnership between:

- The government,
- The parties represented in Parliament,
- The local authorities and
- The economic, social and environmental partners.

The authorities and institutions below are responsible for the management, control and audit of the OP ERDF:

Authorities/institutions	Name of the authorities/institutions
administrative authority	Ministry of Finance Saxony-Anhalt – inter-ministerial office in order manage the EU-structural funds (EU-administrative authority ERDF/ESF)
certifying authority	Ministry of Finance Saxony-Anhalt – EU-certifying authority ERDF/ESF
audit authority	Ministry of Finance Saxony-Anhalt – EU-audit authority
Authority on which the payment of the Commission has to be made	Federal Office of Economics and Export Control (BAFA) – Unit 415

Figure 13: Responsible authorities and bodies of the EU structural funds.
Source: Ministry of Finance, 2014.

The key element of the programme implementation is the Monitoring Committee, who informs in detail at least once a year and includes every partner in the coordination of important topics of the programme implementation and control. The members comprise institutions/persons of the public sector (departments, which are responsible for the programme, Representatives from the cities), economic, social and environmental partners as well as relevant non-governmental organisations. Further experts were consulted for special topics. The second instrument is the steering group called “monitoring and evaluation”, who act as a subsidiary body of the Monitoring Committee and is responsible for the technical support of the monitoring process.

Moreover, the objective is to ensure a multi-fund consultation and coordination between the funds, the EAFRD and ESF and existing European financial instruments, without negligence of clear distribution of tasks of the funds. For this, a steering group consisting of the administrative authorities of the ERDF, ESF and EAFRD, the state chancellery as well as the ministries met regularly.

2.4.3 Priority Axes and Available Funding

For the implementation of the OP ERDF Saxony-Anhalt the available funds of 1.427 million euros were split into following priority axes and investment strategies:

Priority Axes (PA)	EU contribution (share of OP ERDF)
PA 1: strengthening of research, technological developments and innovation	422,9 million € (29,6 %)
PA 2: Strengthening of the competitiveness of SME´s	384,6 million € (26,9 %)
PA 3: Promotion of efforts to reduce CO ₂ -emissions in every sectors of economy	352,6 million € (24,7 %)
PA 4: Conservation and protection of the environment as well as the promotion of the resource efficiency	78,8 million € (5,5 %)
PA 5: Promotion of adapting to climate change as well as the risk prevention and risk management	117,0 million € (8,1 %)
PA 6: Territorial dimension to develop endogenous potentials - CLLD (Community-Led Local Development)	14,2 million € (1 %)
PA 7: Technical assistance	57,0 million € (4 %)
Total	1.427.495.230 €

Figure 14: Sum and distribution of ERDF Operational Programme
Source: Ministry of Finance, 2014.

The priority axis 1 is of particular importance for the Regional Innovation Strategy Saxony-Anhalt, especially the subordinate **investment priority 1b**, which stands for the promotion of investments for companies in the field of research and innovation, the development of collaborations between companies, centres for research and development and universities. The objective is to increase the innovation of the economy in the Lead Markets, which are defined by the Regional Innovation Strategy. As a result of the weakness in transforming R&D in the companies and the below average economic in Saxony-Anhalt exists a heavy need for actions in further intensifications of the research, development and innovation activities in the country. The reasons for this development are the absence of large companies with R&D-centres in Saxony-Anhalt and the presence of SME's, which have no or only the minimum of human, financial and technological resources for research and development. The expenditure on R&D in the business sector of GDP were 0,43 % in Saxony-Anhalt in 2011. This amount should be increased to 0,70 % until 2023. The use of funds 218.581.601 million euros (the equivalent of 15,3 %) will be made for this investment priority. The following supporting measures are:

1. R&D-single, joint and collaborative projects

This measure supports R&D single projects of companies, joint projects of several companies as well as collaborative projects between companies and Universities/non-university R&D institutions in order to develop new products and procedures in the field of industrial research and experimental development activities, which raise the expectations for a rapid implementation of new products, services and new technologies.

Grantee: companies and R&D-institutions, universities, public corporations, municipalities and districts together or in collaborative projects

2. Implementation of knowledge and technology transfer

This measure supports innovation advisory services and innovation support services of the knowledge and technology transfer for SME's. The innovation advisory services include for example technological assistance; technology transfer services; training; consultancy for acquisition, protection and trade in Intellectual Property Rights and for licensing agreements; consultancy on the use of standards. The innovation support services include data banks; technical libraries; market research; use of laboratory; quality labelling, testing and certification.

Grantee: commercial SME's

3. Establishment and Expansion of the business-related innovation infrastructure

This measure supports not only existing institutions and its developments but also the establishment of new institutions. In this regard investment costs are supported, which incur for construction and equipping of the business-related R&D-institutions and if necessary start-up costs for the operation of the funded institution.

Grantee: companies, networks and collaborations between companies, research institutions with a legal personality as well as non-university institutions

4. Promotion of network and cluster

This measure focuses on the further development and establishment of efficient structures of network and cluster by promotion the cluster management.

Grantee: cluster and network management

5. Venture capital funds

This measure is established as a financial instrument in order to promote start-ups and SME's in its growth phase in technology and knowledge-intensive segments. The funding aims for the reduction of financial obstacles of start-ups and SME's in order to enable the realization of innovative projects.

Grantee: Start-ups and SME's

The identification of funding projects is carried out by an application procedure. It is only a national project funding in Saxony-Anhalt. One of the essential precondition for the funding is the high compatibility with the Regional Innovation Strategy. Moreover further criteria like degree of innovation, application orientation, practical relevance and relevance for implementation as well as the contribution in order to connect the entire value-added chain from research to production are of major importance for the project selection. According to the current state of planning the funding of major projects is not possible within the investment priority 1b.

2.4.4 Description of Funding programmes

1) Funding programmes directly related to investment priority 1b

Programme Research and Development												
a) legal basis:	Guidelines on the granting of funding for single projects, joint and collaborative projects in the field of research, development and innovation (R&D guideline)											
b) applicant:	<ul style="list-style-type: none"> ▪ industrial companies (positive list of the coordinating framework) ▪ research institutes ▪ universities of Saxony-Anhalt as co-applicant within collaborative projects <p>At least one of the partner has to be a small or medium-sized enterprise (SME) in collaborative projects.</p>											
c) object of funding:	Projects with innovative and technology-oriented contents, which promote the development of new products and procedures, shall be eligible. Personnel costs for researchers, technicians and other supporting staff, expenditures on instruments and equipment, mission-oriented research, operating expenses as well as expenditures on registration of patents and property rights are supported by the funding R&D-project.											
d) type of funding:	<ul style="list-style-type: none"> ▪ companies: Industrial research (50%) /experimental development (25%) : subsidy up to 400.000 euros per (partial) project and grantee Registration of patents and other industrial property rights: subsidy up to 50% of the eligible expenses, maximum 25.000 euros per (partial) project ▪ research institutes within their non-economic activities: <table border="1" style="margin-left: 20px;"> <thead> <tr> <th rowspan="2"></th> <th colspan="2">rate of aid</th> </tr> <tr> <th>Institutions with basic funding</th> <th>Institutions without basic funding</th> </tr> </thead> <tbody> <tr> <td>Single projects</td> <td>80 %</td> <td>100 %</td> </tr> <tr> <td>Joint projects with companies</td> <td>80 %</td> <td>90 %</td> </tr> </tbody> </table> ▪ universities within their non-economic activities: 		rate of aid		Institutions with basic funding	Institutions without basic funding	Single projects	80 %	100 %	Joint projects with companies	80 %	90 %
	rate of aid											
	Institutions with basic funding	Institutions without basic funding										
Single projects	80 %	100 %										
Joint projects with companies	80 %	90 %										

	maximum subsidy of 100 % (gross)
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Programme knowledge and technology transfer	
a) legal basis:	Guidelines on the granting of funding projects for knowledge and technology transfer
b) applicant:	<ul style="list-style-type: none"> ▪ small and medium-sized companies in the industrial economy (positive list of the coordinating framework)
c) object of funding:	<ul style="list-style-type: none"> ▪ expenditures for innovation advisory services (technological assistance; technology transfer services; training, protection and trade in Intellectual Property Rights and consultancy on the use of standards) ▪ expenditures for innovation support services (data banks; technical libraries; market research; use of laboratory; quality labelling, testing and certification for the purpose of development efficient products, procedures and services)
d) type of funding:	<ul style="list-style-type: none"> ▪ subsidy up to 75% of the eligible expenses, maximum 200.000 euros within three years

Programme common task of "improvement of the regional economic structure" (GRW) – <u>industrial and tourism infrastructure</u>	
a) legal basis:	Coordination framework of common task of "improvement of the regional economic structure" in its currently valid version in connection with regulations adopted by federal state.
b) applicant:	<ul style="list-style-type: none"> ▪ regional, local authorities and communal special-purpose associations, which are under municipal regulation's control
c) object of funding:	<ul style="list-style-type: none"> ▪ cooperation networks and cluster managements, ▪ planning and consulting projects, ▪ financing of regional budgets
d) type of funding:	<ul style="list-style-type: none"> ▪ the regular funding rate for the cooperation networks is up to 75 % of the eligible costs, but maximum. 200.000 euros for the whole funding period of 3 years ▪ the funding for innovation clusters is up to 5 Million euros, including 200.000 euros for the cluster management per year and maximum 50 % funding rate for the investment costs in a funding period up to 10 years ▪ the regular funding rate for regional budgets is up to 60 % of, but maximum. 300.000 euros for the whole funding period of 3 years

2) Funding programmes related to innovation financed by ESF

Programme "Innovation Assistant"	
a) legal basis:	Guidelines on the granting of funding for the employment of innovation assistants in Saxony-Anhalt – promoting innovation assistants
b) applicant:	<ul style="list-style-type: none"> ▪ small and medium-sized companies in the industrial economy

c) object of funding:	<ul style="list-style-type: none"> ▪ recruitment and employment of new graduates of universities, who finished in an engineering, scientific, economic or creative economic degree programme
d) type of funding:	<ul style="list-style-type: none"> ▪ funding is provided in the form of a subsidy ▪ up to 2 innovation assistants can be promoted for 24 months ▪ the amount of aid granted will correspond to 50 % of the personnel costs and in individual case one full time equivalent up to 30.000 euros per year

3) Loan based programmes provided by Development Bank

Programme Saxony-Anhalt IDEA - IB- innovation loan	
a) legal basis:	Procurement Principle of the IB innovation loan „Saxony-Anhalt IDEA“ (status June 2014)
b) applicant:	<ul style="list-style-type: none"> ▪ start-up´s ▪ SME´s ▪ freelancers
c) object of funding:	<ul style="list-style-type: none"> ▪ investments and expenditures to introduce new products, procedures or services for the research and development process up to the generation of sufficient revenues for the debt service ▪ other operating expenses
d) type of funding:	<ul style="list-style-type: none"> ▪ loan up to the full amount of the financing requirement (minimum 25.000 euros, maximum 1,5 million euros) ▪ maturity of up to 15 years, which included a 5-year grace period ▪ nominal rate of interest: from 7,95 % p.a. (subject to changes)

Programme Saxony-Anhalt IMPULSE - IB-SME- and start-up loan	
a) legal basis:	Procurement Principle of the IB-SME- and start-up loan „Saxony-Anhalt IMPULSE“ (status November 2015)
b) applicant:	<ul style="list-style-type: none"> ▪ start-up´s ▪ SME´s ▪ freelancers
c) object of funding:	<ul style="list-style-type: none"> ▪ advance financing for orders ▪ other operating expenses ▪ investments (e. g. land and buildings, construction measures, machines) ▪ advance financing of grants and allowances ▪ expenditures for research, development and innovation ▪ acquisition of an active holding
d) type of funding:	<ul style="list-style-type: none"> ▪ loan up to the full amount of the financing requirement (minimum 25.000 euros, maximum 1,5 million euros) ▪ maturity of up to 15 years, which included a 2-year grace period ▪ nominal rate of interest: from 2,99 % p.a. (subject to changes)

Programme IB together - IB-cooperation loan for SME's	
a) legal basis:	Procurement Principle of the IB-cooperation loan for SME's „IB together“ (status February 2016)
b) applicant:	<ul style="list-style-type: none"> ▪ existing medium-sized companies in Saxony-Anhalt
c) object of funding:	<ul style="list-style-type: none"> ▪ costs for advance financing/order security ▪ operating expenses ▪ investments in fixed assets ▪ advance financing of grants and allowances ▪ acquisition of an active holding
d) type of funding:	<ul style="list-style-type: none"> ▪ loan up to half of the financing needs ▪ guarantee up to the half of the guaranteed credit needs ▪ sum lent usually minimum 1 million euros, maturity of up to 15 years ▪ interest rate/guarantee commission in close cooperation with the investment bank

Programme future fund waste management	
a) legal basis:	Guidelines on the granting of funding for waste management measurements “future fund waste management Saxony-Anhalt”
b) applicant:	<ul style="list-style-type: none"> ▪ companies ▪ freelancers
c) object of funding:	<ul style="list-style-type: none"> ▪ innovative products of the waste management: <ul style="list-style-type: none"> - Development of projects of the material and energy use of waste in order to conserve natural resources - new concepts to implement the European Strategy on the prevention and recycling of waste - product-integrated environmental protection ▪ the funding can be used for all eligible expenditures of projects and parts of projects, which will be finished within maximum 3 years Eligible costs are for example investments, personal and material costs, third-party services and planning services.
d) type of funding:	<ul style="list-style-type: none"> ▪ loan up to the full amount of the financing needs (minimum 50.000 euros, maximum 5 million euros) ▪ period of time: 10 years, including a maximum of 3 years period

2.5 Governance

2.5.1 Description of involvement of innovation stakeholders in development and implementation of RIS with focus on chemical related topics

The involvement of stakeholders out of the sector Chemistry and BioEconomy was carried out in different steps during of the development of RIS in form of individual interviews and roundtable-meetings with representatives of the universities and research institutes, company representatives, technology transfer institutions, chambers and associations as well as with the cluster managers and afterwards by the development and implementation of the roadmap

of the Lead Market Chemistry/BioEconomy. For the implementation of RIS existing structures and bodies are take up:

- The **Advisory Committee for Innovation and Cluster Saxony-Anhalt** act as a steering group of the RIS.
- The **Office RIS** assume responsibility for organisational and technical support.
- The **inter-ministerial working group (IMAG RIS)** is responsible for the inter-ministerial cooperation.
- **Cluster and Networks** provide their flexible and technical competences to develop new Lead Markets as needed.
- The development and the support of the roadmap as well as technical consultant of specific themes and strategic projects are carry out by the **Lead Market Working Group and working groups for special technical issues** from case to case.

The figure X below shows the whole process organization for the implementation of RIS:

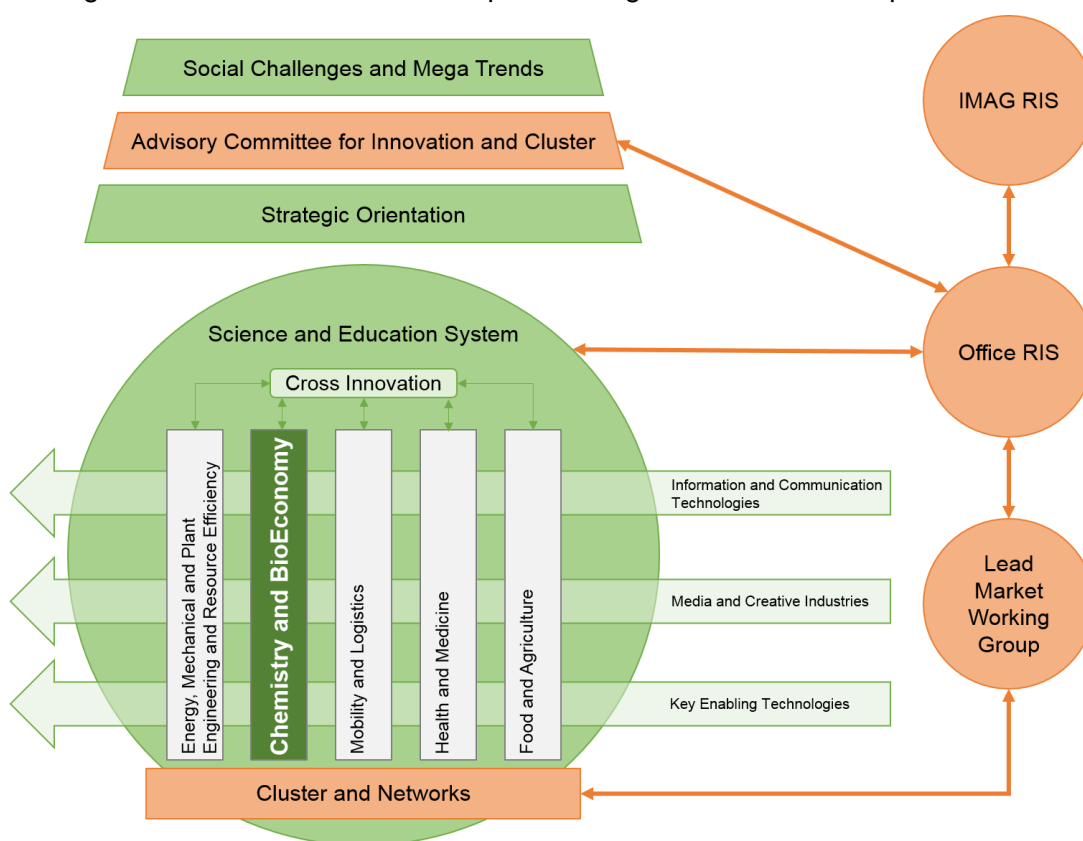


Figure 15: process organization for the implementation of RIS

Source: isw gGmbH, modelled after Ministry of Science and Economic Affairs Saxony-Anhalt, 2014.

A direct involvement of the stakeholders with chemical related topics was given through the regular meetings of the Lead Market Chemistry/BioEconomy, which took place sixth times since September 2013. Companies, research institutes, networks and associations out of the sector Chemistry and BioEconomy were invited to support the process of development and implementation of the roadmap for the Lead Market Chemistry/BioEconomy continuously.

2.5.2 Description of established structures and stakeholders

In the Lead Market Chemistry/BioEconomy science, economy and another regional stakeholder collaborate in networks and clusters to develop new future-oriented technologies, products and solutions in an industry- and technology-wide approach. In this regard following structures, clusters and networks have been established in the relevant priority topic:

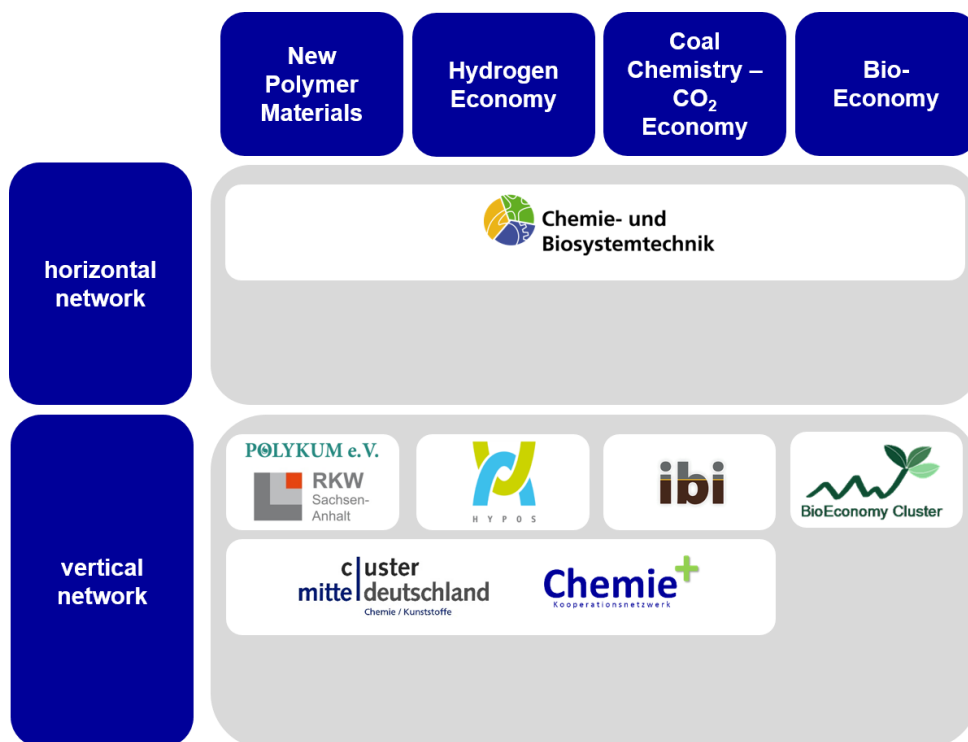






Figure 16: Network structures in the lead market chemistry and BioEconomy in Saxony-Anhalt
Source: isw gGmbH.

The different clusters and networks separate from each other because of the focus of topics and fields of research. Nevertheless, there is an interdisciplinary linkage between the networks to gain new solutions of innovation according to cross-industry networking of research approaches. Against to the background of the global challenges technical-economic as well as sustainable aspects represent a substantial component of processes of innovation. Following established structures and further stakeholder play a part in the Lead Market Chemistry/BioEconomy:

Stakeholder and Networks	Description
 Cluster Chemistry/Plastics Central Germany	The "Cluster Chemistry/Plastics Central Germany" has been initiated a transregional cluster process, which among others is aimed at improving the innovation capacity of especially the small and medium-sized companies as well as at establishing valued-added chains. Another declared aim lies in strengthening Central Germany as an internationally competitive region of chemistry and plastics, which is highly attractive for both start-ups and existing businesses and institutions that need a good market position.
 Cooperation Network Chemie+	The emergence of a new quality in connection to the structural chemistry industry with other industrial sectors should be reached through the joint development and implementation of new, effective business-models in the regional topics for the future. In this regard the newly planned cooperation network „Chemie+“ want to handle with research and development issues, building up new businesses areas in such

	<p>fields and thereby generate new value-added chains. The strategic focus is on future-proof topics: use of renewable energies as raw material for the chemical industry, the development of production-related industrial services as innovation drivers, technologies for the material utilization of lignite as raw material for the chemical industry as well as the chemical logistics.</p>
 <p>BioEconomy Cluster</p> <p>Cluster BioEconomy</p>	<p>Partners from industry and research are working on the foundations of the material and energetic use of non-food biomass. Relevant sectors, like the timber and forestry industry, the chemical industry, the plastics industry and plant engineering, are all working together as part of a regional centre of competency in bioeconomics. An integrated approach to up-scaling enables processes to be developed quickly from laboratory to industrial scale. Since 2012 the BioEconomy Cluster is a Leading Edge Cluster of the German Federal Ministry of Education and Research.</p>
 <p>POLYKUM e.V. RKW Sachsen-Anhalt</p> <p>Competence and transfer network "Polymer-based lightweight Saxony-Anhalt"</p>	<p>The function of this establishment is the networking of all relevant companies and research institutions in the country for the implementation of innovation projects in form of R&D projects in the areas of Process development (thermoplastic bound of fibre plastic composites, Surface functionalization of polymers, rubber-nanoparticle composite, thermosetting plastics), Product development/design (lightweight construction modules, InterieurDesign GreenCabin, etc.) and Component safety and quality (material and component testing, ageing behaviour of components, Tolerability of manufacturing defects).</p>
 <p>The Polymer Competence Centre Halle-Merseburg</p>	<p>The Polymer Competence Centre Halle-Merseburg bundles polymer specific competences and resources of the Martin Luther University Halle-Wittenberg and of the University of Applied Sciences Merseburg (FH) and is networked with the Network of expertise for applied and transfer oriented research (KAT) at the four Universities in Saxony-Anhalt, regional and sectoral research facilities and networks (POLYKUM e.V. association for the promotion of the polymer development and polymer technic Central Germany, Fraunhofer Institut for Mechanics of Materials and Fraunhofer Institute for Applied Polymer Research Golm, Cluster Chemical/Polymer Central Germany) as well as companies in the polymer producing and manufacturing industries. The KKZ realized basic research as well as applied research as well as product and technique development.</p>
 <p>KAT</p> <p>Network of expertise for applied and transfer oriented research (KAT)</p>	<p>The Network of expertise for applied and transfer oriented research (KAT) see themselves as catalyst for business-oriented innovation. They provide scientists and entrepreneurs, which work together on forward-looking solutions for technical and economic problems.</p>
 <p>HYPOS</p> <p>HYPOS - Hydrogen Power Storage & Solutions East Germany</p>	<p>The "Hydrogen Power Storage & Solutions East Germany" project initiated by the "Fraunhofer Institute for Mechanics of Materials IWM", the "Industrial Initiative for Central Germany" and the "Cluster Chemistry/Plastics in Central Germany" intends to develop economic solutions for using wind and solar power to produce hydrogen via electrolysis on an industrial scale until 2020. It would be a revolution in the hydrogen industry if turning the electricity out of wind and solar power systems, which is only available very inconsistently, into hydrogen through particular chemical processes was possible. Thereby, saving and transporting it for on-going use is another essential condition being met. Then this "green" hydrogen shall serve as raw material for the chemical industry being basis for an extensive electro mobility as well as energy source for electricity and heating supply.</p>
 <p>ibi - Innovative Lignite Integration in Central Germany</p>	<p>In the Innovative Lignite Integration in Central Germany (ibi) 12 institutions have come together to develop the material use of lignite. In this context the processing steps by coal deposit, the extraction and separation up to the material use of lignite (extraction, catalytic decomposition and gasification) were analysed. Apart from the economy, the amount of waste and the environmental impact should be minimized</p>

	and reduced. For this it was necessary to develop completely new technologies, systems and procedures and connect directly therewith.
 <p>Chemie- und Biosystemtechnik Centre of excellence for chemistry and biotechnology,</p>	The aim of this centre is to investigate and optimize process chains of the plastics processing, chemical, biotechnological and biomedical industry. A particular focus is the support of innovation by SMEs and the deepening of cooperation between scientific institutions in the region with local businesses. The centre is intended to reflect the entire process chain from extraction to marketing of chemical raw materials and bio-based materials. The thematic focus is set on Polymer chemistry, Plastics processing, Chemical and process engineering, Fine chemistry, BioEconomy, Agrochemical sector, Medical technology and biomedical technology and Biotechnology and Biosystems technology.
 <p>Chamber of Industry and Commerce</p>	The responsible Chambers of Industry and Commerce for Saxony-Anhalt are the "IHK Halle-Dessau" and the "IHK Magdeburg". This institutions assume a wide range of services to provide the industry in Saxony-Anhalt and act as a consultant and mediator in local, regional and national political institutions. Further legal fields of activities include the vocational training, the conception of foreign trade documents and the Appointment of experts.
 <p>VCI Nordost – Chemical Industry Association</p>	The VCI Nordost – Chemical Industry association represent the interests of the chemical industry as well as related industries and chemical-related services in the Eastern German federal states. The organization stand for the maintenance and expansion of the Eastern German chemical locations. They advise and inform their members about wide range of economic and socio-political issues and offers legal representations in principle social and labour legislation questions.
Ministries of Saxony-Anhalt	Ministry of Finance Saxony-Anhalt Ministry of Economy, Science and Digitalisation Ministry of Agriculture and Environment
State Chancellery and Ministry of Culture of Saxony-Anhalt	The State Chancellery is the official residence of the Minister-President. It assists the head of government in formulating and implementing policy guidelines as well as in his/her function as the representative of the state. It coordinates the work of the government and the administration. The State Chancellery is in constant contact with the ministries and is therefore always fully informed about the implementation of key policy objectives in the departments and at the lower levels of the administration.
Universities	Hochschule Anhalt (FH) - University for Applied Sciences Hochschule Harz (FH) - University of Applied Sciences Hochschule Magdeburg-Stendal (FH) - University of Applied Sciences Martin Luther University Halle-Wittenberg Otto von Guericke University Magdeburg University of Applied Sciences Merseburg
Scientific and Research Institutes	Fraunhofer Centre for Chemical-Biotechnological Processes CBP, Schkopau Fraunhofer IMWS, Institute for Microstructure of Materials and Systems Fraunhofer Institute for Factory Operation and Automation IFF Magdeburg Fraunhofer Pilot Plant Centre for Polymer Synthesis and Processing PAZ Fraunhofer Research Centre for Silicon Photovoltaics CSP Max Planck Institute for Dynamics of Complex Technical Systems Magdeburg
Companies	Chemiepark Bitterfeld-Wolfen GmbH ChiroBlock GmbH Dow Olefinverbund GmbH

	FEW Chemicals GmbH IFC Composite GmbH InfraLeuna GmbH Infra-Zeitz Servicegesellschaft mbH Linde AG Miltitz Aromatics GmbH NOVO-TECH GmbH & Co. KG ORGANICA Feinchemie GmbH ROMONTA Bergwerks Holding AG se ma Gesellschaft für Innovationen mbH Trinseo Deutschland GmbH (former Styron)
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2.6 Current Challenges for implementation of RIS and expectations to interregional learning

The Regional Innovation Strategy with focus on chemical related topics has been well established with the active work of the Lead Market Chemistry and Bio-economy. Several meetings with representatives from companies, research and administration have been organized to discuss thematic priorities of innovation funding in the next years. Based on an in-depth analysis and contribution from the relevant stakeholders the roadmap has been defined, that describes concrete measures for promotion of innovation in the chemical and bio-economy sector. Priority areas are New polymer materials, Hydrogen economy, Coal Chemistry – CO₂ Economy, Fine and specialty chemistry and bio-economy. Especially larger funding for lead actions has been defined.

The funding programmes are open for applications of interested organisations, who can submit continuously their applications. First funding projects have been approved and are running. Due to delays in the programming process the funding programmes started with a delay, which now has to be caught up to be in line with the spending forecast.

Saxony-Anhalt is interested to learn from other regions how they are implementing their innovation funding. An important question is how to promote innovation of SME with little innovation orientation. The majority of companies in Saxony-Anhalt are small and medium sized with little own research capacity. Main drivers of innovation projects are research institutes like Fraunhofer or larger companies.

Furthermore, stricter rules on state aid and deminimis requirements constitute a burden to finance networks and clusters in the chemical sector. So Saxony-Anhalt is interested how other regions finance their network structures and dealing with these European common requirements.

ERDF funding from regional level competes with national innovation and research funding from the federal government. Due to the existing regulations for structural funds the ERDF funding is more complicated and less flexible for the applicants and users. Especially the rules for the reporting of eligible costs are disfavoured the structural funds programmes. The two principles cost based or effort based reporting are competing with each other. We would like to know how other regions experience this situation.

Funding of research infrastructure has become more difficult in the new structural funds programme period, which is focussing more on promotion of direct innovation projects. Nevertheless, the establishment or extension of research infrastructure is important for Saxony-Anhalt,

which has a disadvantage due to missing larger private research and innovation capacity. It is interesting for us to see how this matter is handled in other regions.

Risk capital funds are seen as important element for the promotion of emergence of new and innovative companies. The operational programme foresees some budget for this kind of fund but seems to be very complicated to comply with all the requirements from structural funds. We would like to know better how other regions organise and finance their risk capital funds.

A very important question for the Ministry of Economy of Saxony-Anhalt is how to organise an efficient implementation of the funding process. How can the ministry and the Development Bank Saxony-Anhalt together ensure a fast approval procedure and reduce administrative burdens for the application and reporting process for the companies? There are no specific calls with fix deadlines and organisations can submit their applications at any point of time. It is interesting to compare both approaches and discuss effective ways of reaching the target group and achieving high rate of participation.

Finally, Saxony-Anhalt wants to use the S3Chem project as platform for promotion of European innovation cooperation on the basis of identified research and innovation priorities in the partner regions. Therefore, it is important to exchange information about ongoing research and innovation activities, about the competences of innovation stakeholders and the scientific focus of research infrastructure. Bringing together regional stakeholders in joint study visits to the partner regions or during the dissemination events should be used intensively for networking.

3. Bibliography

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