



ChemClust

Chemical Cluster Development in European Regions



Best Practice Guide

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Improving Innovation Capacity of European Chemical Clusters

Best Practice Guide



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1. Introduction

This Good Practice Guide is one of the outputs of the ChemClust project, co-financed by the Interreg IV C programme, that aims at improving the effectiveness of regional policies in business innovation and clustering in the chemical sector through regional cooperation and the exchange of good practices. The project intends to contribute to the transformation of traditional chemical regions by seeking new processes and products based on innovation and entrepreneurship.

The ChemClust partners are regional authorities and development agencies from Saxony-Anhalt (DE), North Rhine Westphalia (DE), Asturias (ES), Mazovia (PL), Usti Region (CZ), Cheshire West and Chester (UK), Novara (IT), Limburg (NL), Teesside (UK) and Schleswig-Holstein (DE) which are responsible for the establishment and support of clusters and the implementation of regional innovation policies.

The ChemClust project outputs included a Benchmarking system to assess current cluster strategies on innovation in chemical regions actions, and a “Best Practice Inventory” that compiles good practices to promote innovation and the improvement of competitiveness of the Chemical and Process Industries. Overall, 26 good practices have been compiled and analysed from different points of view:

- Sector focus.
- Policy objectives.
- Policy instruments and measures.
- Transferability and innovativeness.

This Good Practice Guide builds on the analytical work done by the ChemClust partner and provides an insight on the content of the good practices in connection with the policy objectives. Moreover, this Guide incorporates the main findings and recommendations resulting from the ChemClust Pilot Projects, which deal with specific topics in which some of the partner regions have been cooperating more intensively.

As a conclusion of the work done by the ChemClust partners at the Inventory and at the Pilot Projects, six key action lines have been identified. These action lines could be considered the foundations for any advanced industrial policy:

- Connect industry and society.
- Promote business cooperation and public-private partnerships.
- Increase R&D potential.
- Foster innovation and business creation.
- Retain industrial base and avoid relocation, and increase the attractiveness of the regions as chemical industry location.
- Improve industry competitiveness.

Each action line is illustrated by several of the good practices. By picking the best examples for the different policy objectives, this Good Practice Guide provides an integrated picture of the industrial development strategies carried out by some of the leading chemical regions in Europe.

Action line	Good practice	Region
Connect industry and society	Alliance pro industry and sustainability Children Challenging Industry Programme	NRW Teess Valley
Promote business cooperation and public-private partnerships	Surface Network Chemergie CHEMaterials Campus Cross Sector Cooperation Implementation of the IBIS consortium’s cooperative model, through the new device of the “network contract”	NRW NRW Limburg Asturias Novara
Increase R&D potential	Centre for Advanced Laboratory Techniques (CALT) Centre for Process Innovation (CPI) Development of Fraunhofer Pilot Plant Centre for Polymer Processing and Synthesis New procedures and processes of biomass gasification Remediation of groundwater by permeable reactive barriers Integration of Lignite as an alternative raw material into Chemical Industry	Usti Teess Valley Saxony-Anhalt Usti Usti Saxony-Anhalt
Foster innovation and business creation	Open Innovation “Mazovian Innovator” Contest Innovation Accelerator Mazovian Network of Information – Advisory Centres for Innovation	Limburg Mazovia Teess Valley Mazovia
Improve other industry competitiveness factors	Talent management Development of Gold Standard Framework Manual on Safety Good Practices in Chemical and Process Industry Compendium of Good Environmental Practices for the Chemical and Process Industry Training and Technology transfer between Academia and the Chemical and Process Industries	Usti Cheshire West Asturias Asturias Asturias
Increase regional attractiveness as chemical industry location	Site Selection in the Chemical and Process Industries A model of a new governance in the framework of the innovative bio-based and sustainable chemistry Development of Innovation Location Network of Central German Chemical Parks (CeChemNet)	Asturias Novara Saxony-Anhalt

The good practices provide practical examples of measures that, with the obvious adaptation to the specific situation of each region, can be implemented in any region. They tackle the key issues for industrial development and competitiveness.

Despite of its traditional and current economic relevance, it seems that industry has lost some of its former prestige in Europe. Although all industrial activities, and particularly the chemical sector, are now subject to very tight environmental and public health regulations, the social support to industry is somehow weak even in areas where industry is an important job source. As the conclusions of the “Skills Foresight” pilot project shows, the chemical sector faces image and communication problems. Industry is not visible as a career option, and faces some difficulties to attract talented workers. Two of the reported good practices, from NRW and Tees Valley, are aiming at building or strengthening the connection between industry and society, to raise the awareness of the needs and the contribution of industry to wealth and well being, and increase the support to industrial activity and its attractiveness for professional careers.

The cooperation between companies is a popular topic in any industrial development policy. According to Porter, rivalry and cooperation are key factors in generating competitive advantages. Within the ChemClust project, NRW, Novara, Saxony-Anhalt and Asturias are reporting initiatives that bring companies together to develop joint projects. These initiatives show that business cooperation produces good results, indeed, and have successfully increased innovation in the chemical sector and across the industry. However, they also teach that it is not easy to overcome the traditional company individualism. Public involvement and support seems critical to boost cooperation; yet cooperation may be heading to a dead-end without a strong private sector leadership.

The good practices also deal with public policies and private initiatives to improve facilities in chemical related research and development: labs (Usti), R&D Centres (Saxony-Anhalt, Tees Valley). Others refer to concrete R&D projects (Usti, Saxony-Anhalt) in areas in which technology breakthroughs can be produced, or in which regions have got some competitive advantage. As in other capital and technology driven sectors, the chemical industry requires a continuous flow of investments to update the supporting research and development infrastructure. Companies need to be in front of technology development to remain competitive. The experiences in Saxony-Anhalt show also the strong public support and the private involvement are also key factors to give a push and get the most out of research related initiatives.

Infrastructure and other fixed assets provide the basic support to innovation. However, innovation increasingly depends on attracting knowledge and talent. That is widely recognized by ChemClust regions. New models of innovation, such as Open Innovation schemes are beginning to change the way innovation is produced, in a knowledge based and ever connected economy. The Open Innovation intends to develop an environment that stimulates the knowledge flow between companies, research centres and other relevant institutions to generate new opportunities for joint development and accelerated innovation. The pilot project on Open Innovation has allowed ChemClust regions to exchange their views and

explore the possibility of applying it in other regions. The development of the Open Innovation model for the chemical industry may be an interesting tool for the strengthening of innovation capacities at regional, national and European level. Open innovation would be particularly important in the chemical industry, as chemistry is an important enabler for many branches, not only for chemical regions but for all regions in Europe.

Large companies and more advanced regions are quite aware of the need of continuous innovation, but smaller companies, especially in less developed or traditional industrial regions, are still less aware of the importance of innovation to protect and improve their competitiveness. Regional innovation strategies provide for different kind of measures aiming at raising industry and innovation drivers’ awareness and information on innovation (Mazovia) or at fostering innovation and business creation (Limburg, Tees Valley).

Human capital is a key factor on the competitiveness of the companies, also in capital based industries like chemical industry. Regions have reported a number of initiatives directly or indirectly related to human capital. The “Skills Foresight” pilot project gathered information and opinions from the chemical industry stakeholders, as well as from the education and training institutions, on the skills required by the industry and on the resources and activities available which seek to help attract interest from young people towards the chemical sector. The main findings of the research show that whilst there is a prevalent demand for technicians, workers are increasingly required to be multi-skilled (e.g. time management, project management, team working skills...) and that commercial, business to business and innovation management skills are important. As the sector operates at a national and international level, the findings resulting from the research done in Tees Valley or Cheshire West and Chester may be translated to other similar areas elsewhere.

The initiatives to improve the competitiveness cover a wide range of activities, framework training schemes to specific training actions in key industry areas, such as production, safety, or environmental protection and remediation. Work safety and environmental protection are now key issues for the chemical industry that should not be neglected and they are very much dependent on the staff qualification. The involvements of the industry and of the workers themselves have also been key factors for the success of the different initiatives.

The ChemClust regions are striving to keep the job creating industries. The ChemClust regions are recognised as hubs of chemical sector activity within their countries and in Europe. They confront the risk of delocalisation of companies looking for lower production costs, growing markets and sometimes, unfortunately, lower social or environmental standards. European regions cannot compete on lower costs or standards, and therefore they have to offer other type of incentives, in line with the needs and priorities of the companies: transport infrastructure and communication network, availability of quality industrial land in appropriate location, reliable and competitive prices of the water, gas and electricity, trained workforce, industrial tradition. As the large grants are increasingly restricted by state aid regulations, public action is mostly shifting towards providing high quality infrastructure, such as innovation



and research facilities (Saxony-Anhalt) or even further, to create innovative environments where knowledge flows.

That is the backdrop to the pilot project “Knowledge Sites” based on the experience of the Central European Chemical Network – CeChemNet, a network of six chemical parks that improve their R&D infrastructure and services, to increase the attractiveness of the park for the settlement of new companies. The concept of knowledge sites is worth being explored as a broader strategy and could be actively integrated in the future innovation and cluster policy at European level— especially in the Regional Innovation Strategies (smart specialisation in the framework of EU 2020 Innovation Union).

2. Connecting industry and society

Industry is the base of the wealth and well being of modern society. However, the undesired consequences of industrial development, such as environmental damages, and the growth of the service sector have deteriorated the public image of industrial activities. This also has practical consequences, such as the resistance of local communities to new industrial sites, or the difficulty to attract highly qualified human capital to industry. This is an issue of growing concern for regional authorities, and two of the ChemClust partners have developed **successful initiatives to build bridges between industry and the community.**

A closer and better connection between industry and society helps to build an appropriate environment for companies to work, and therefore encourages and facilitates them to stay in their current location. A good relationship between industry and the hosting communities also reduces conflicts and helps attracting valuable human resources, therefore increasing industry competitiveness. Good practices like the **NRW’s Alliance pro industry or the Tees Valley’s Children Challenging Industry Programme** are good examples of these objectives.

The **Tees Valley Children Challenging Industry Programme** targets schoolchildren and their teachers to improve their perceptions and understanding of industry and its relationship with science. The initiative has been promoted by the Department of Chemistry at the University of York, with the support of the industry, associations of industry sectors and industry clusters, and also public funding.

The main aim of the programme is “to promote science teaching in primary and secondary schools in the context of industry in the 21st century”¹. The programme is mainly based on:

- Training for primary teachers.
- Provision of teaching and learning resources.
- School visits to industry sites.

The programme was initially piloted in 5 schools in 1996 and has since been rolled out across the north of England providing interventions in over 1500 schools, in areas (North West, North East and Yorkshire and Humber) where there is a high incidence of industrial activity. 40-50 schools in each sub-region can be involved each year, and around 20-30 companies provide site visits for these schools. The schools are charged a fraction of the cost of running the programme which is subsidised by in-kind support and donations from industry (individual companies, groups and associations).

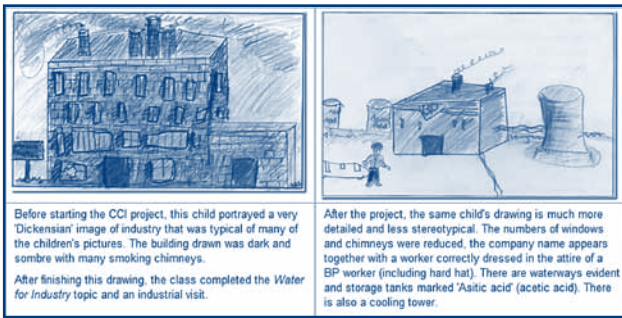
The programme consists of class lessons, staff development, teaching resources and linking primary schools with local industry over typically a four week period. The classroom sessions are supported by an industry “ambassador” or followed by a visit to local industry where they can see the scale of the operation and have an introduction to the close links between scientific concepts explored in the classroom and what happens on site.

The University of York provides technical support to the programme through an advisory teacher for each sub-region. The advisory teachers recruit and train companies and their staff to work with children on site and to become ambassadors working in schools. The University also provides printed and web based resources to support teaching and learning. The programme also offers primary teachers continuing professional development that includes initiation of structured links with local industry.



Although the programme has been designed for educational purposes, it is also contributing to a better reputation of the chemical industry and to an improved understanding of its role in society, and it also brings the industry an opportunity to liaise with the local communities and to attract the interest of pupils for pursuing a career in science. Perceptions about industry change among the children that participate in the programme.

¹ <http://www.ciec.org.uk/index.htm>



There is also evidence that many of the teachers involved continue to use the resources and teaching techniques to support their science teaching and value the opportunity to learn more about the links with industry.

Industry has also found the programme useful: "Those working in industry find school links worthwhile. The visits help with creating new ideas for business, improve morale and allow companies to put something very tangible back into their communities. The links improve children's views of business, hopefully encouraging them to take up careers in science-based industries"².

Some issues that may become obstacles to the successful implementation of the programme have been identified:

- Schools need to be motivated, although they become very enthusiastic afterwards.
- Need to allow time for contacting industry and arranging visits. Otherwise it can result in the classroom element (science practices) taking place but the industry visit being delayed.
- Practical help with the organisation of the visits by the supporting team has been highly valued by the schools and provides industry with a sense of continuity in that they have a regular contact.
- The programme has been implemented in regions with a concentration of industrial sites. That increases the opportunity for site visits; in other some regions it may be more difficult to engage suitable companies that can provide visits.
- There is also an issue about how far children may have to travel.
- The use of an industry "ambassador", scientists and engineers from industry to support the classroom activities has helped to save some travelling.
- The companies involved are responsible for the risk assessment and insurance to cover all site visits, and adults in contact with children need to undergo criminal checks.

The North-Rhein-Westfalen **Alliance pro industry and sustainability** was an ambitious effort to build increased social support to industrial activity. This public-private partnership is undertaking a widespread effort to communicate the importance of industry in regional economy (and in wealth generation) and turn it into an integral part of society, to overcome or to reduce unjustified resistances against industrial activity. The initiative was based on communica-

ting the relevance and impact of innovation produced by regional companies. It also helped to raise awareness on innovation both among the companies and the population.

The Ministry for Economic Affairs, Energy, and Industry of NRW set up a team to coordinate the steering committee and to provide information and counselling for the development of the initiative.



The initiative was built on a broad social consensus to investigate the environmental and economic needs and opportunities of the NRW industry. Industrial progress and sustainable development depend on each other and challenge each other. Activities at local, regional and national level were carried out to convey this message:

- Reporting activities of local and regional developments.
- Continuous exchanges of the participants about industry and sustainability.
- Support services for the establishment of regional and local (sub)-alliances:
 - Strategy workshop: definition of common goals, measures for the implementation of the 3 stages - attention, benefits, attitude.
 - Kick-off event: support the organization of the event.
 - Information: support services to local groups of associations, chambers and other interested organizations.

The Alliance was launched in June 2009 with the signature of the "Düsseldorf Declaration" by the State Government, the main industrial companies, the trade unions, the Chambers of Commerce and other stakeholders. Since then it has evolved stronger with the creation of the Düsseldorf regional alliance (February 2010: <http://www.industrie-duesseldorf.de>), the Dormagen local alliance (November 2010: <http://www.lokale-allianz-dormagen.de>), and lately the Münster "Industrie-Gemeinsam. Zukunft. Leben" (2011) and the Krefeld initiative "The future of industry" (February 2012: <http://www.industrie-krefeld.de>).

The initiative was successful to attract the support of all agents by a careful strategy focused on the innovation potential of the regional industry (communicating the latest news about innovations of NRW's industrial companies via the "Industrieticker") and its economic and environmental sustainability.

² Allan Clements, former Managing Director of ICI Nobel Enterprises, quoted at <http://www.cciproject.org/industry/scienceIndustry1.htm>



3. Business cooperation and public-private partnerships

Company cooperation is frequently both an objective and an instrument of industrial policies. A number of the good practices collected in the ChemClust regions (NRW, Novara, Saxony-Anhalt, Asturias) are aiming at promoting business cooperation or are using cooperation as a tool to improve company competitiveness, or other policy objectives, such as a closer connection between industry and the community. Cooperation initiatives range from loose networking to very tight cooperative research initiatives, and also include public-private partnerships and private consortia.

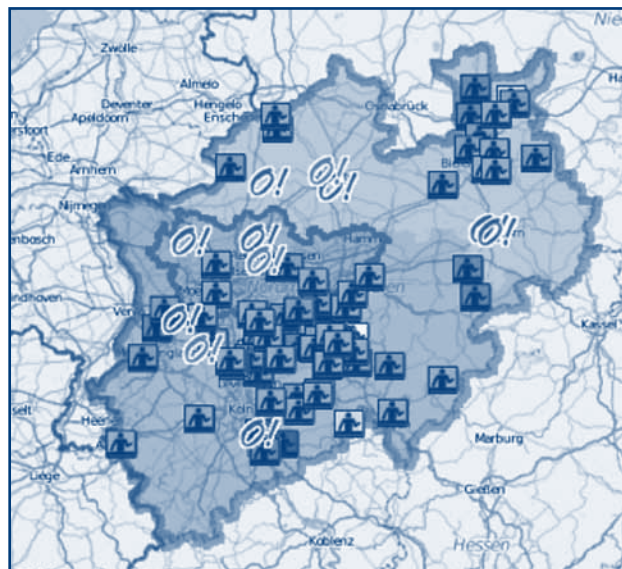


The **Netzwerk Oberfläche NRW-Industry Network for Surface Technologies** links companies, universities and research centres along the value chain of the surface technologies industry in the Ruhr area. Surface technology is a significant industrial sector in the Ruhr region and in North Rhine-Westphalia, providing about 300,000 jobs and turnover of approximately EUR 100 billion.

In 2008, some of the main sector organizations, namely a research association for Surface Treatment (DFO³), a regional economy development agency (WiN Emscher Lippe GmbH) and a technology promotion company (TFM⁴) submitted individual proposals to the "CheK.NRW⁵" contest of the Ziel2 programme for establishing a state-wide surface technologies clusters to boost the competitiveness of surface technology. The three proposals shared similar objectives to connect surface technologies actors, to offer a better knowledge of the industry, a growing number of personal contacts, collaboration for development of new solutions and shorter path to market for innovations. The three submitted concepts complemented each other very well, and therefore the three institutions reached a co-operation agreement to establish the Industry Network for Surface Technologies under the coordination of VCI NRW (Verband der Chemischen Industrie e.V. Landesverband NRW), with the mediation and the support of the NRW Ministry of Economic Affairs, Energy, and Industry.

The project received funding of more than 2 million € from the European Regional Development Fund (ERDF) and the state of NRW for a period of 3 years. It also counts on a financial contribution from the 3 sponsoring organizations, DFO, WiN and TFM. During the 3 year period, the network was expected to create a sustainable structure that should turn financially independent after this support ends.

The network is currently composed of 43 partners. The network brings together the different sector players (raw material suppliers, paint industry, equipment manufacturers, R&D institutes, service providers and companies utilising the surface technologies) and focuses in two main areas of activity:



- Strengthening the innovation capacity:
 - Acceleration of knowledge and technology transfer in the market: Identification of potential innovation and initiation of projects, particularly in the field of efficient processes, knowledge-based quality improvement, multifunctional surfaces and new surface properties; access to know-how from Universities and R&D Institutes.
 - Increase in public funds for R&D projects in the region.
- Strengthen international competitiveness:
 - Better communication tools and channels in NRW, for instance through the XING-platform based social network "Netzwerk Oberfläche NRW" with 96 members.
 - Regional information on current events and industry-specific topics.
 - Providing new business contacts.
 - Assistance in finding cooperation partners.

Wider partnerships involving companies and research and technology centres, in some cases in cooperation with public authorities, are the source of some of the most innovative and interesting good practices. Partnerships are not only used for concrete industrial objectives (research and development projects) but also for the inception and implementation of ambitious and comprehensive initiatives. Good practices in Saxony-Anhalt (CeChemNet), NRW (Chemergie, Network Surface), Novara (IBIS Consortium), Limburg (CHEMaterials) or Asturias (Cross Sector Cooperation) show the potential and strength of this type of partnerships, which can successfully achieve quite ambitious goals in different areas. Partnerships are probably the right vehicle for initiatives intending to connect industry and the community, as it is shown in the NRW's Alliance pro industry and sustainability.

³ Deutsche Forschungsgesellschaft für Oberflächenbehandlung e.V.

⁴ Technologieförderung Münster GmbH.

⁵ An annual competition to identify best ideas to promote the strengthening of existing and new networks for chemicals and plastics in North Rhine-Westphalia.

Cooperation shows its potential for innovation in some of the initiatives reported by ChemClust partners, regarding ambitious long term research that usually requires a mix of competences and risk-sharing. Public-private partnerships are a frequently used tool to develop wider initiatives bringing together multiple regional actors to support them. That is the case of initiatives to connect industry and community, or to consolidate the region as a leading location for chemical industry.

The **Chemergie** project (www.ecc-knapsack.de) shows the reorientation of the traditional industrial park Hürth-Knapsack with the goal to develop an experiential research and a production environment that combines competencies between chemistry and energy, and the development of a regional centre of excellence. "Chemergie" brings together the expertise of both disciplines, helps to make more effective their respective processes, and identifies the basis for innovative pilot projects, for example in hydrogen technology or interdisciplinary development.

The concept combines different project components and objectives in the fields of urban planning, economic development, infrastructure and innovation in a meaningful way, while developing a compelling future prospect of a regional subject-specific competence centre.

The project Chemergie started in 2007 and was qualified within a regional funding competition programme "Regionale 2010". It is supported by its seven partners, through a public-private partnership: the Regionale 2010 programme, the city of Hürth, Infraserv Knapsack, the Rhein-Erft Academy, HyCologne (Hydrogen Region Rhineland Association), RWE Power and the Rhein-Erft County.

The Chemergie project intends to boost the transformation of the industrial park into a new centre of excellence along the interface between chemistry and energy competence, thus improving the regional competitiveness and employability:

- Knowledge, application and knowhow transfer (R&D pilot project, tests and evaluation).
- Exchange and information platform (special events e.g. congresses, trade shows and forums; open houses / technologies).
- Education and training.
- Representation / economy (more transparency towards the public, presentation of local and regional companies).

So far, the Chemergie project has successfully provided the following outputs:

- The local Rhein-Erft-Academy is present as an educational institution on the site, since March 2010, receptive to the innovative topics. The project aims to its further development into a nationwide University of applied sciences.
- Hydrogen filling stations have been erected on the site and an information centre as symbol of the hydrogen cluster.
- 2 fuel cell hybrid buses have been provided for everyday operation in the Hürth city transport network. The fuel used is the hydrogen that accumulates in Hürth Knapsack Chemical Park as a by-product.

The future assignments include further pilot projects that interface competence areas in chemistry and energy, for e.g. a fuel cell power plant to generate electricity and heat, and the development of the Rhein-Erft-Academy.

There is a strong consensus across the good practices in considering that the leadership and involvement of the industry is a good instrument to achieve the objectives sought. That is evident in projects that are based on or implemented by public-private partnerships (NRW, Saxony-Anhalt), in bottom-up industry led projects (Novara, Asturias, Cheshire). Personal involvement and strong commitment of key leaders was critical to kick-off and develop some of the projects. That leadership helped to involve other companies. The good practices reported show that the commitment of the companies and other actors is the key factor for achieving good results, even in areas of the highest technological demand. Partnership is also the origin of the Cheshire Gold Standard Frameworks, which are being developed by the employers' skills council.



The "**CHEMaterials Campus**" –in full: "High Chem & New Materials Campus" project–, started in 2008, is a cooperative venture between DSM (Chemelot) and Zuyd University to promote the Chemelot site in Sittard-Geleen as the number one Materials Valley of Europe by focusing on Open Chemical Innovation. The objective is to improve the business climate for entrepreneurs and attract companies that are active in the field of chemicals, materials and life sciences to the South Limburg region as ideal location for business, research and development and education. The project is also supported by the Province of Limburg and the Ministry of Economic Affairs.

The project includes continued strengthening and expanding of the open innovation environment within which early phase start-ups and young companies, with some level of business experience within chemistry, materials and life sciences, are capable of introducing innovative products or developing new technologies more quickly through collaborations with knowledge institutes and companies already established at Chemelot.

The programme developed by DSM and Zuyd University is based on two pillars:

- CHEMaterials Business Creation.
- CHEMaterials Business Awareness.

CHEMaterials Business Creation relates to activities that are oriented towards the facilitation and creation of new commercial activities. This includes all of the physical preconditions required, as well as activities initiated in the context of the CHEMaterials programme, such as:



1. Creating a walk-in lab.
2. Screening new ideas and/or companies.
3. Support and bringing parties together (building the Campus Community).
4. Coaching and training.
5. Organizing events to promote innovation.
6. Gaining and sharing knowledge.
7. Service Boulevard.

The second pillar relates to activities that use communication, knowledge transfer and joint innovation processes in a bid to make companies aware of the opportunities that open chemical innovation offers. In this way, new activities are created indirectly. They include:

8. Chemical Innovation Congress.
9. Network formation and Open Chemical Innovation.
10. Chemelot Colloquium.
11. Smart regions for 'power clusters'.

All the activities undertaken within the project are aligned to each other and have a central objective to create business and to bring in *new companies* (component 2). The *walk-in lab*, called Zuyd-lab offers the physical space necessary for (shared) lab activities (component 1). The *service boulevard* enables companies to concentrate on their core activities (component 7).

Cross-cluster themes relating to the innovation areas will be defined and discussed in consultation with various companies from the cluster (component 11). These companies will be brought together via *networks* that reflect campus development (component 9). Depending on the needs that the participating SMEs have, the themes may be developed further in the other project components.

The project provides for a continuous flow of knowledge between the cooperating companies. If innovation issues can be resolved by bringing specific companies into contact with each other, the CHE-Materials Business Creation pillar will provide a setting in which companies can share knowledge (component 6). Otherwise a 'dedicated' *collaboration project* may be set up (component 5) if the topic can be properly "packaged".

The *Chemelot Colloquium* addresses specific technical subjects that are of interest to knowledge workers employed at the Chemelot Campus. These knowledge workers may also originate from the collaboration process (component 10). *Community building* focuses specifically on strengthening the Chemelot business community (component 3). The focus of these activities includes providing information about campus developments, about each other's businesses, etc. An extension of this, are the *coaching and training activities*, which focus specifically on start-ups at the Campus (component 4).

A two-yearly *convention* will be organized on the basis of the results achieved and experience of the programme as a whole (component 8).

Limburg's experience in the CHEMaterials Campus and in Open Innovation, Asturias Cross Sector Cooperation, NRW Alliance pro Industry, or Novara Consortium experiences are showing the potential for cross cooperation between different subsectors of the chemical industry or between chemical industry and other process industries. The cooperation between different subsectors is able to identify new opportunities for radical innovation, but also in other topics of common interest, like environmental protection, human resources (that is also the lesson out of the Cheshire Gold Standard Framework).



The **Cross Sector Cooperation in the Chemical and Process Industries** initiative reported by the chemical industry from the Principality of Asturias, Spain, led to the creation of the **Association of Chemical and Process Industries of the Principality of Asturias (AIQPA)**.

The Chemical industry in Asturias has its own particularities which makes it slightly different of the most regions with a strong concentration of chemical companies. The chemical plants are distributed throughout the territory and there are no Chemical Parks. The chemical plants belong to different sectors –Pharmaceutical, Synthetic Fibres, Fertilisers, Industrial gases, Coke derivatives, Biochemistry (Production of agar), Pulp processing–, and are not as closely related as it is usual in other chemical regions.

In order to foster the development and cooperation among the companies from the chemical and process industry located in Asturias, in areas such as finance, innovation and technology, marketing and labour issues, the AIQPA was created in year 2000. The Association has been established by the companies themselves, and some of its activities have been supported by Regional Development Agency (IDEPA) and other public funding sources. Its main objectives are to:

- Turn industry diversity and noncompetition into an opportunity for exchange of experiences and cross fertilization in key areas for the chemical and process industry.
- Identify areas of improvement for firm competitiveness.
- Enhance the image of the industry.
- Address industry key issues from a cross sector point of view, with a wider perspective: environmental issues, logistics, hazard prevention and safety at work.

The diverse sectors to which the companies belong, resulted in the fact that each sub-sector has just one or two companies at most, and therefore there is no competition among them, leaving room for a wide horizontal cooperation. This cooperation within the Association has been evolving from basic networking and sector representation onto the production of specific outputs in areas of interest for member companies.

The Association identified specific areas of interest and created Working Groups which allowed a much more intense cooperation and in-depth analysis of specific issues. The work of these Groups led to the production of manuals, studies, organisation of technical seminar, business forums and specialized training courses for company staff.

The activity of the Association has shown that Chemical Industries belonging to different subsectors can find topics of common interest, and there are possibilities of cross fertilisation. In fact, the Association is exploring cooperation with other sectors, such as the food processing industry, or with other related national and international clusters, for knowledge and experience transfer.

Novara's experience in the implementation of the IBIS consortium's cooperative model, through the new device of the "network contract" is a good example of the favourable effect of flexible and targeted incentives.

The ChemClust partner from Novara (Regione Piemonte, North of Italy) is reporting on an interesting initiative that makes compatible a flexible company networking, avoiding too rigid structures, with a straightforward access to supporting funding for cooperative research. It is the Sustainable Chemistry Innovation Pole and its managing body that has resulted in the **Implementation of the IBIS consortium's cooperative model, through the new device of the "network contract"**.



The initial idea has been to set up an aggregation of entities (companies, research institutions, associations...) which could share their research and innovation resources, and promoting joint research projects, taking the best advantage of the public support schemes. The promoters wanted to avoid building rigid structures and to proceed step by step in creating the network.

Seeking flexible but efficient models of company cooperation the IBIS consortium has taken advantage of a new legal tool called "network contract". The network contract is a new instrument of support for the creation of companies' networks. The network contract allows companies to cooperate among many sectors of their activities, to share information or to create industrial services, as commercial, technical and technological activities, or to practice it in many common interest activities.

The network contract can be considered as an evolution the much older and better known "common purpose contract". The network contract is much easier and "lighter" than a contract of association, where a new body with legal personality is created, with its statutes, governing bodies, legal obligations... The companies remain legally independent and free to decide what kind of cooperation they want to pursue and with what means, without any form of structured obligation. The "network contract" has no restriction on the sector, size or location of the companies.

On the other hand, the network contract offers a suitable tool to clarify agreements between companies that want to set up a long-lasting cooperation without excluding their subjectivity and without the need of setting up a new legal entity. The managing structure of the Innovation Pole, the IBIS Consortium is characterized by a very simple organization open to other members interested in its opportunities and potential.

Structure of the Sustainable Chemistry Innovation Pole



The companies from the region able to offer or interested in development of biobased products and sustainable chemistry have progressively joined the Pole. They share their own research projects in order to identify the most interesting and useful ones to be developed within the Pole itself. Starting from 25 projects, three strategic lines, divided into three Organic Integrated Projects, have been developed. They consider: innovative coatings, bio-based products and more eco-compatible processes/products.

The cooperation among the companies of the Pole, often competitors on the market, has produced innovative proposals that have been largely co-financed by the Regional Public Authorities (the 100% of the presented proposals have obtained a co-financing of about 50% of their total budget).

The good practices aiming at promoting business cooperation or using cooperation as a tool for achieving other objectives confirm the need of offering financial incentives to involve companies in such initiatives. It seems that companies are still considering that cooperation involves additional costs or that it does not offer the return they expect. Financial support to company initiatives is one



of the most frequent industrial policy measures. The good practices reported include different type of support models. A novel support format is reported by Novara, which connects business cooperation and tax policy: companies involved in cooperative innovation may qualify for tax deferral to support the innovation projects.

The Italian government is using tax reductions to boost business cooperation. Companies willing to collaborate and set up a network to increase their innovation capacity and competitiveness in the market may qualify for a tax deferral. The Italian authorities have set aside a budget for the next three years for the implementation of the measure in total of €48 million (€20 million for 2011, €14 million for 2012, €14 million for 2013). All companies eligible to the measure will benefit from it and in case of a larger number of participating companies, the tax benefits may be proportionally reduced for all beneficiaries.

To be eligible for the tax break, companies need to formalize their cooperation through a “network contract” (*contratto di rete*) defining a common programme (such as an industrial programme) with which participating companies aim at increasing individually or collectively their competitiveness and their level of innovation. A part of the taxable revenue earmarked by the participating companies for achieving the purpose of the “network contract” is put in a specific reserve and can be excluded from the calculation of taxable income, for the duration of the contract. This tax benefit is temporary as the money put aside for the participation to the network will be included in the tax base once the contract is fulfilled. The maximum amount that can be put aside for the purpose of the network is €1 million per company. The tax deferral is administered directly by the Italian tax authority (*Agenzia delle entrate*), which has no discretion as to its’ implementation, i.e. when companies fulfil the requisites of article 42 of Law n. 122 of 30 July 2010, the tax authority will automatically defer the payment of tax for the eligible part.

The procedure to apply for the tax deferral is easy and straightforward: the companies need to register the “network contract” before a notary (as a general prescription in Italian Law) and in the companies’ general register; afterwards a standard form, accessible online at www.agenziaentrate.gov.it should be filled in and the companies will automatically benefit from the tax deferral.

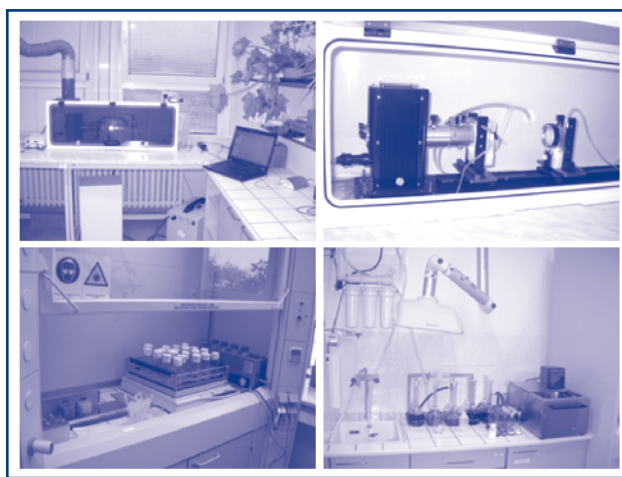
4. Research and Innovation

Through investments in research facilities, supporting research and innovation projects, or by other soft support, ChemClust regions are trying to increase the research and innovation activity, and also the potential for future research.

A number of the ChemClust partner initiatives are focusing on the improvement of research facilities, such as university labs or R&D and technology centres. Most of the regions consider that the availability of good and updated research facilities is a prerequisite for a solid innovation activity. Decisions on basic infrastructure are usually

taken by public authorities, eventually in consultation with the industry. Good practices reported include some of this kind of investments, connected with other measures. The most relevant ones are the creation or development of Research and Technology Centres and of Industrial Parks, as in Saxony-Anhalt, Tees Valley or Usti.

This is particularly relevant in regions lagging behind, where research centres may lack state of the art research equipment. That explains why the creation of new laboratories with high-tech equipment is a usual strategy in the new member states. The creation of the **Centre for Advanced Laboratory Techniques (CALT)** at the Faculty of Environment of the University of Jan Evangelista Purkyně in Ústí nad Labem aimed at establishing modern laboratories for teaching and training but also for other forms of education and training in line with the increasing demands for skilled workers.



The creation of the Centre was a joint project of the Faculty of Environment at Purkyně University and the Research Institute of Inorganic Chemistry. The project started in 2004/2005, when the special laboratory was built up and equipped in the building of the Research Institute of Inorganic Chemistry. Laboratories have been gradually put into operation in the first half of 2005, when first students made lab, and were fully operational by September 2005. Presently, CALT serves as an education centre for practical training of university students in the field of advanced laboratory techniques utilized in industry and environmental protection. Every year special courses in advanced instrumental methods are carried out for students from other European countries through the ERASMUS programme.

The Centre also fostered the start of various national and international research projects focused mainly on the interactions between the industry and environment, in particular the study of the chemical equilibrium in the environment and its expected applications both in industry and agriculture.

The good practices show that the improvement or equipment of a new research facility tends to produce an immediate increase in innovation effort by the companies, and that research activities tend to consolidate around the available facilities (Tees Valley’s Centre for Process Innovation; Saxony-Anhalt’s Development of

Fraunhofer Pilot Plant Centre for Polymer Processing and Synthesis). Improving the research infrastructure has also a direct effect in the competitiveness of the local industry, probably more than any other factor, and in the attractiveness of the area as an industrial location.

The **Centre for Process Innovation** (www.uk-cpi.com) at Tees Valley, UK, is a technology innovation centre that uses market knowledge and technology understanding to develop and prototype products and processes, quickly and efficiently, with minimal risk to its public and private sector partners. The Centre bridges the innovation space between the discovery of an idea and the delivery of a product or service to the commercial market.



The **Centre for Process Innovation (CPI)** was established to address the difficulties associated with turning ideas into commercial revenue through commercialisation and innovation. It has a particular focus on the process industry sector in the North East of England. CPI helps the companies in this sector to compete globally on a knowledge basis through development of new technology and innovation.

CPI was created by the Regional Development Agency One North East in April 2004 and offers state of the art process and product development facilities in printable electronics, industrial biotechnology, smart chemistry, anaerobic digestion and thermal technologies. It acts as a Centre of Excellence for the Process Industry. Through its six specialized centres it provides solutions for the pharma, food, chemical, energy, transportation and printable electronics markets.



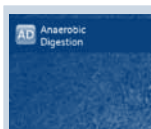
The **Printable Electronics Technology Centre (PETEC)** is a design, development and prototyping facility for the emerging printable electronics industry. It provides access to state of the art deposition, patterning and printing equipment and proven performance conducting, semiconductor, resistive materials and inks.



The **National Industrial Biotechnology Facility (NIBF)** is designed to help companies of all sizes develop biotechnology based products and processes quickly and cost-effectively. It explores alternatives to traditional chemical processing techniques to create cleaner and more sustainable manufacturing processes. The facility is equipped to take processes from lab-scale to 10,000 litres. It has a development Laboratory, Pilot plant and Demonstrator Facility.



The **Smart Chemistry** facility applies novel technologies to deliver innovative solutions to traditional chemical industry challenges. The technology used is neutral, not restricted to any particular reactor technology platform, enabling testing of several different options and selection of the right process.



The **Anaerobic Digestion Development Centre** is designed to assess a wide range of waste-to-energy processes in single or mixed streams. It has a range of pre-treatment, digestion and post-treatment technologies that are rapidly reconfigurable to allow the development of novel and improved anaerobic digestion processes.



A joint project with TATA Steel, the **High Temperature Innovation Centre** carries out development and innovation to provide novel sources of fuel and energy, the recovery of raw materials and reduction in wastes produced. The unique facilities offer pyrolysis options ranging from laboratory to demonstration scale (1 to 350kg) and gasification processes with operating temperatures of up to 1500°C in an environment with strictly controlled levels of air/oxygen.



The **Sustainable Engineering** service bridges the gap between concept and scale-up. Through examination of critical scientific, technical and economic parameters at an early stage of development, the CPI team of engineers will focus the R&D process on areas that really matter, reducing risk and saving time and expense.

The CPI business model has already delivered substantial benefit because it links the needs of business to CPI assets and technology expertise. The Centre has helped UK businesses to participate in European projects, through diverse programmes FP7, Eco-innovation, and secure grants in total of €143M. It has also managed projects through ERDF (the European Regional Development Fund) with revenue of £17M – four in the 2000-2006 programmes and four in the 2007-2013 programmes. Additionally, CPI participates in innovative projects funded by national bodies as ONE, the Northern Way, the North West Regional Development Agency, the Department for Business, Innovation and Skills (BIS) and the Technology Strategy Board (TSB).

For the direct involvement in UK and EU innovation strategies, in 2011 CPI was named as the process element of the government's elite network of Catapult centres, created to revitalize the UK's economy by stimulating innovation and accelerating growth.

The most successful investments on innovation facilities are those more closely connected to the existing business structure. In some cases they have been built in cooperation with the private sector (public-private partnerships), in others they are based on existing facilities (for instance a chemical park, as it happen with the Fraunhofer Pilot Plant for Polymer Processing and Synthesis) or in the demand of local industry. It also seems quite relevant that the investment in innovation facilities is accompanied by complementary measures to make sure that new facilities are properly and extensively used.

The **Fraunhofer Pilot Plant Centre for polymer synthesis and polymer processing (PAZ) at Schkopau Value Park** (<http://www.polymer-pilotplants.com>) was established to support the future development of the polymer industry as an important driver for the chemical cluster in Central Germany. It is part of a broader strategy to improve the research infrastructure in the chemical parks in Central Germany. To this purpose several partners from research, industry and administration have worked together to set up the pilot plant, which has been opened in 2005.



The Pilot Plant Centre has been developed as a Public Private Partnership by the Fraunhofer Institute, as main research stakeholder. It has involved several national and regional institutions that have cooperated in the funding the development or the operation of the Pilot Centre:

- The Merseburger Innovation and Technology Centre –Mitz GmbH was responsible for the building of the PAZ, with the support of the national funding scheme “GA” Gemeinschaftsaufgaber zur Verbesserung der regionalen Wirtschaftsstruktur – which is mainly financed by EU Funds.
- The Dow Chemical company has provided the area on the chemical park in Schkopau as location for the PAZ.
- The technical equipment was funded by the Land Saxony-Anhalt and the Federal Ministry for Research and Technology, with EU co-financing.
- The main research stakeholder of the pilot plant center is the Fraunhofer Institute, but other research partners are involved, such as the Fraunhofer for Applied Polymer Research IAP in Golm, the Fraunhofer Institute for Mechanics and Materials in Halle, the University of Applied Science in Merseburg and the Martin Luther University Halle-Wittenberg.

The Pilot Plant Centre are located at the newly-erected buildings of the Merseburger Innovation and Technology Centre (Mitz GmbH). The Pilot Plant Centre has a 1000m² technical area of approximately and 700m² of office and laboratory space, offering its clients modern polymer synthesis and processing technology under a single roof.

The PAZ has been funded out of the national funding scheme “GA” (Gemeinschaftsaufgabe zur Verbesserung der regionalen Wirtschaftsstruktur) – which is mainly financed by EU Funds: Mitz has spent 8.3 Million Euros (90% funded by GA/EU funds and 10% credit by Mitz). Additional have been invested by the Saxony-Anhalt Lander (38.9%) and the Federal Ministry of Research and Technology (16.1%) in the Centre technical equipment, with ERDF support (45%). Furthermore, the Fraunhofer Institutes invested money from its own programmes.

The close cooperation between Fraunhofer Institutes, the Dow Chemical company and the Mitz, which have joined forces and implemented an innovative operational and funding model has secured the successful establishment of the PAZ and has enabled its development as an important research centre for the regional chemical and plastic industry, especially to the SME.

The integration of the research infrastructure on the Dow Value-Park⁶, which aims at integrating the company's strategic partners and customers on site and to create and make use of long-term synergies, has offered immediate vicinity to several polymer producers and close contact with small and medium-sized plastics-processing businesses, thus promoting support to the companies at the location, in particular SMEs, and facilitating innovation development and research co-operation. In order to facilitate the networking between the companies and research entities the Polykum association has been founded. The association brings together polymer producers, processors, universities and other research enti-

ties, mechanical companies, service providers and other industry related entities. In order to augment the access of SMEs to the research infrastructure the “research voucher” financial tool has been introduced, which allows SMEs to buy some research services.

Some of the good practices reported are concrete R&D projects promoted by company consortia or by public-private partnerships. R&D projects are usually supported by public funding, using different schemes. Some of these projects may be exploring technology breakthroughs, like in the energy sector (biomass, hydrogen) or in testing new materials (lignite as raw material for chemical industry); others are new technologies to remediate some of the environmental damages caused by the chemical industry (remediation of groundwater by permeable reactive barriers).

The main objective of the project “**New procedures and processes of biomass gasification**” is to get research information and complex know-how for construction and sustainable operability of a power unit for “Pyrolysis of biomass co-generation” using biomass as a renewable energy source. The main objective of the project was the design of a theoretical model for gasification of wood pallets in pyrolysis gas and the optimization of technological parameters of the process for obtaining the gas from pyrolysis of biomass as energy system, including the cogeneration of electricity and heat.

The project was promoted by D.S.K. Ltd. Rtyne Bílinou and the Faculty of Environmental Sciences of the University of Purkyne. The project was partially funded by the Technology Agency TACR, of the Ministry of Industry and Trade. Other institutions as the Institute of Chemical Process Fundamentals, and experts from ICT and other companies were also involved in the project.

The Research Institute of Inorganic Chemistry in Usti nad Labem has been developing new technologies for the “**remediation of groundwater by permeable reactive barriers**”, to remove heavy metals from contaminated water. The project was supported by the Ministry of Industry and Trade. The project explored different water remediation techniques and has resulted in the successful capturing of cadmium and thallium from industrially polluted waters. The project resulted in at least two patent applications.

Other research and innovation initiatives refer to ambitious long term initiatives, promoted by research and technology centres or by private consortia, eventually attracting receiving public support. They involve not only financial support, but also building or financing special-purpose research infrastructure. Strong public and private support to long term research and innovation initiatives has shown to be critical to bring strategic decisions into real actions. The NRW's Chemergie, and the Saxony-Anhalt's Pilot Plant for Polymer Processing and Synthesis and the Integration of Lignite projects have successfully attracted strong support to carry out the implementation of the projects. The implementation has already generated new opportunities for companies.

The research project “**Integration of Lignite as an alternative raw material into the Chemical industry**” attempts to develop

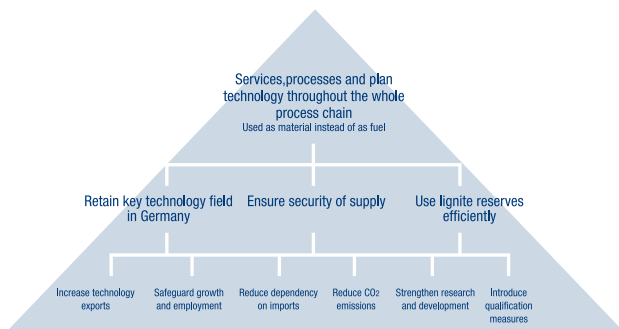
⁶ Dow ValuePark is the industrial park concept of Dow Olefinverbund GmbH, a wholly-owned subsidiary of the Dow Chemical Company.

plant and processes technologies to obtain chemical raw materials from lignite, thus minimising the dependence of overseas sources of oil and natural gas.

This strategic project brought together 12 strong research and business partners from two federal states of Germany (Saxony-Anhalt and Saxony) with skills in three fields, lignite mining, the chemical industry and plant engineering, to create the “IBI - Innovative Braunkohlen Integration in Mitteldeutschland” alliance in 2008. This combination, together with the knowledge available at local universities, is the central component in the project to develop the use of lignite as a chemical resource. The concept was presented in mid-2010, and the Federal Ministry of Education and Research (BMBF) which rated the project as strategic with impact on the research and industrial policy for Central Germany. The BMBF allocated around 14 million of Euros. Additional 7 million Euros were co-financed by the alliance’s own funds.

The focus of the IBI alliance is on obtaining chemical raw materials from lignite, whereby the greatest attention is paid to using the chemical compounds that are already present in the coal. A concept this comprehensive can be cost-effective, especially in the development phase, only if the best use is made of structures already available in the chemical industry park. To keep the efficiency at the maximum and the added values as greatest as possible, an integrated chain needs to be developed from the coal deposits through production and on to refining. A cascade of lignite refining processes is one of the unique features of the technology partners grouped together in the alliance.

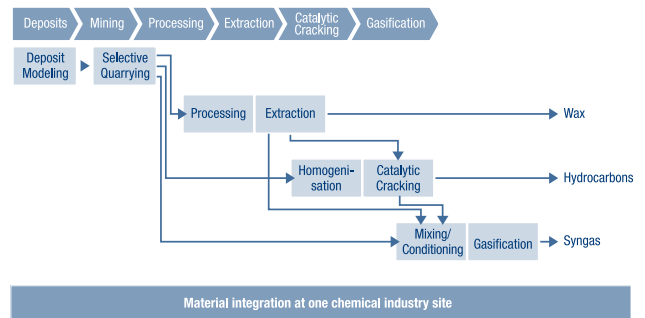
Project’s final result will be a large scale realization of a lignite chemical industry park, to be located in Leuna, Germany by the year 2020. This park should unite the overall value chain from coal deposits throughout production and on to refining, so that the production of the chemical compounds has maximum efficiency and the greatest possible added value. By using local lignite, the region’s contribution to the value added chain can be increased significantly. In addition, the chemical industry’s security of supply will be raised and the innovations made will benefit local engineering companies specialising in chemical and mining technologies, reinforcing their position on the global market. Tie-ups with existing users of chemical precursor products will support the local economy and safeguard jobs.



The alliance of companies will bring the individual processes –from the deposits via mining and processing through to material use

(extraction, catalytic cracking, gasification)– together into a lignite chemical industry park. The organization in the park will minimize waste and reduce environmental impacts, while paying close attention to efficiency. In addition to developing a range of new technologies, systems and processes, the alliance will also collaborate on integrating them on an industrial scale.

The result of this integration of the lignite industry with the chemical industry (IBI - Innovative Braunkohlen Integration in Mitteldeutschland) will provide Central Germany the chance of becoming world leader in services, processes and systems relating to the future use of lignite. In the future, the world will need processes, technologies and facilities which can make alternative sources of hydrocarbons accessible to the chemical industry. With regard to efficiency and cost-effectiveness, a particularly important role will be played by complete solutions which take into account the whole spectrum of coal’s properties, starting during the mining and continuing through to the refining process.



The IBI alliance’s aim is to attune the individual modules in the process chain to the interaction between the chemical and plant parameters in such a way that the solution developed can be adapted to any number of clients operating under differing conditions. As well as complete solutions, the alliance plans –initially within the next 5 years– to develop and market process technology, plant system and also service components.

The IBI alliance also plays an active role in boosting growth and safeguarding jobs in the region. The main contribution to achieving will be made by using local lignite as a chemical raw material as this will ensure that a greater portion of the value added chain remains in the region. In addition, the chemical industry’s security of supply is raised and the innovations made will benefit local engineering companies specialising in chemical and mining technologies, reinforcing their position on the global market.

There is a benefit to the environment as well, as by integrating the processes and arising energies using lignite as a chemical raw material, the emission of greenhouse gases in the chemical processes can be significantly reduced as the transfer of carbon from the coal into the end product can be achieved with a minimum expenditure of energy.

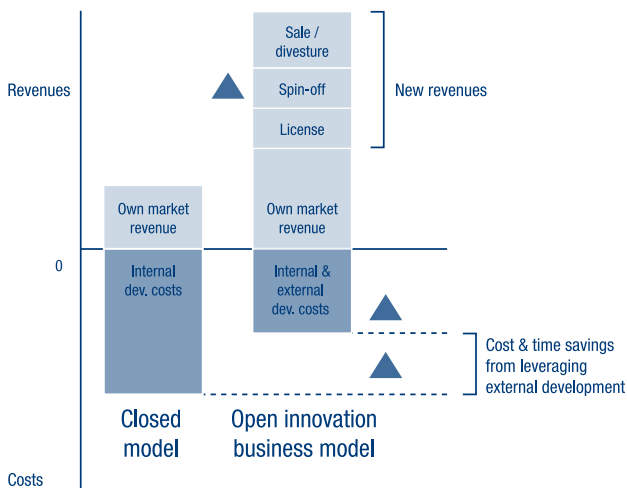


5. Fostering innovation and business creation

Either through soft or hard measures, ChemClust regions are paying special attention to promoting industrial innovation to improve business competitiveness. Some measures are directly intended to promote the creation of new innovative businesses, others to foster innovations within traditional companies.

Business creation is an important policy objective in some of the good practices reported. In some cases traditional instruments as the business incubators are used (Tees Valley's Innovator Accelerator); in others, a more innovative approach is attempted: using different formats both the Limburg Open Innovation scheme and the Mazovian Innovator Contest are trying to promote the identification, analysis and dissemination of innovative business ideas that may become viable business models.

The new business model of open innovation



Chesbrough, H. (2006)

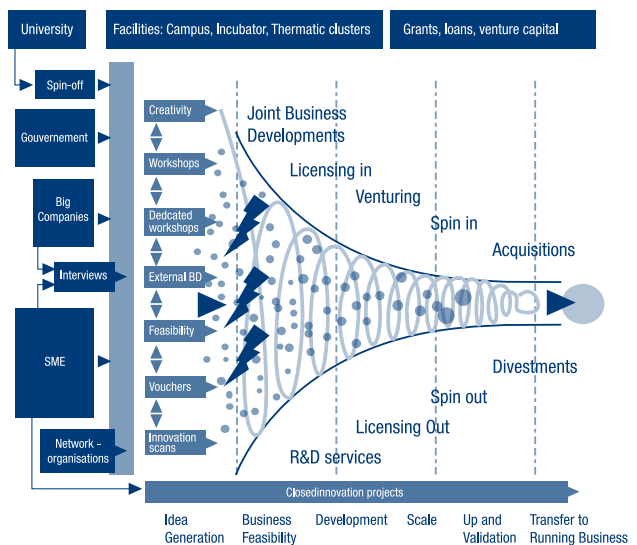
The **Limburg's Open Innovation** initiative is an innovative approach that offers promising opportunities to produce and disseminate innovation and generate new businesses. The main goal is to develop an open working environment that stimulates the knowledge flow between the companies and creates unique opportunities for joint development and accelerated innovation. The Open Innovation logic is based on several postulates:

- Good ideas are widely distributed today. We must find and tap into the knowledge and expertise of bright individuals who are outside our company.
- External R&D can create significant value; internal R&D is needed to claim some portion of that value.
- We do not need to originate the research in order to profit from it.

- Building a better business model is better than getting to the market first.
- If we make the best use of internal and external ideas we will win.
- We must manage IP in order to manage research:
 - Need to access external IP to fuel our business model.
 - Need to profit from our own IP in others' business model⁷.

These logic postulates have been widely incorporated into the activities and services promoted by LIOF and the Province of Limburg at the Chemelot site. Venturing and licensing activities enabled the new companies to use the knowledge and know-how of big companies with decades of research history such as DSM and SATEC and benefit from the innovations that have already proved successful. Within the Chemclust project, the Open Innovation has been one of the selected pilot projects in which the partner regions have been cooperating and exchanging experiences. The Open Innovation approach developed by Limburg has roots on a long tradition of technology transfer from the research centres of large local companies, such as DSM, to SMEs. DSM has been developing research co-operation with smaller companies located at the Chemelot chemical site.

The concept of Open Innovation, as opposed to closed innovation, focuses on collaboration and clustering between companies and research institutions. It provides enterprises and institutions the opportunity to use, in a world of widespread knowledge, not only their own research and development opportunities, but also those of others. In addition, proprietary inventions not in use can be brought out (e.g. through licensing, joint venture programmes, spin-offs) by other actors. The Open Innovation approach promotes activities that increase the focus on the surrounding business environment, in order to identify opportunities more easily, gain abilities to generate faster and more effective outcomes, reduce risk in innovation and time to market.



⁷ Source: H. Chesbrough, Sloan Management Review, Spring 2003.

The Open Innovation concept is represented as a continuous flow of ideas into an innovation funnel and a controlled process of selection of the ideas with the best chances of success. The projects that do not make it to the finish line can be spun out, transformed into an R&D service company, licensed out or sold. At the same time, the projects portfolio can be enriched through shared business development, in sourcing of knowledge, venturing of companies or a spin-in of new projects or the acquisition of new or existing companies.

The concept nourishes the creativity, not as a talent or gift, but as a way of thinking that can be learned. It discards premature rejection of brainstormed ideas and supports further development despite of initial improbability or cost. It promotes co-creation as a much more effective way to produce and sell products.

The main problem of **generation of ideas** that can result in good projects and business opportunities is overcome by activities that promote constant watch on new technology trends and promising developments; stimulation of the creativity and open thinking; discussions on potential developments and concrete innovation projects; specialist's support to transfer the ideas into innovation projects; elaboration of feasibility studies on the expected project results; financial support (innovation voucher) for fast research outcomes or structural scans for the company's innovation potential. Within the regional open innovation model the following activities were developed:

- Interviews with leading (innovative) companies and institutes to look for important trends and promising technology-developments.
- Creativity sessions.
- Dedicated workshops; presentation of specific items, related with the focus to form concrete innovation projects.
- Support of External Business Developer, experienced specialists to help companies and institutes with the transfer from project lead into concrete innovation project.
- Feasibility studies.
- Innovation vouchers to be used by companies to access specialized services to solve technology issues.
- Innovation scans: structural scan for innovation possibilities within a company.

To further develop these new ideas, the model nourishes collaboration activities between external business parties (customers, suppliers, competitors) to share the risk of innovation as well as the results. Through various financial schemes, the use of third party R&D services and infrastructure is also encouraged.

A distinguishing feature of Open Innovation scheme is the use of IP generated by others for development of the new business model. Licensing in of products and services, and support in a form of venture capital is essential to lower the costs of innovation. The newly generated knowledge can be revenue by licensing out the new IP. Specific activities are:

- Licensing in: is used to obtain IP that is interesting to develop new business.
- Licensing out: is used to leverage IP in order to create strategic and financial value.

- Venturing: investing in start-up companies, having an interesting fit with companies' technologies or markets, with the aim to shorten the time to market. In this way specific technologies can be absorbed or specific markets can be opened.

The model supports the spun in of small start-up companies that have been identified of special interest. If the developed project produces valuable results the model promoted the creation of start-up companies to spin out the knowledge and develop further the business:

- Spin in: Small start-up companies that are sold off by other companies, or which have been identified or in which investments have already been made can be spun in if their technology or market is of special interest.
- Spin out: After the development phase of a project, a start-up company is established to develop the business further. After evaluation a decision is made to continue or to spin out the company.
- Acquisitions: acquisitions are a major route to realize the business and strategies.
- Divestments.

In order to stimulate the innovation and growth of the newly installed companies Limburg province promotes the model of Open Innovation, trying to involve the big companies, SME's, universities and institutes in a collaborative mode, assisted by supporting facilities and public/private financing sources. The result is the augmented innovation capacity of the companies located at the site reflected in the growing number of patents ranging to more than 250 per year, new start-up companies and running businesses establishing their offices.

Combining key component of this methodology (Joint business development, R&D services, Licensing, Venturing) the innovation potential grew exponentially, producing promising start-up companies with patented technology able to convert in successful spin-offs: Isobionics (www.isobionics.com), Claryl (www.claryl.com); knowledge centres and licensing units: BasicPharma Technologies (www.basicpharma.nl), and attracting already developed business to establish at the site their production and R&D units - Chemtrix (www.chemtrix.com), Kriya Materials (www.kriya-materials.com), MagnaMedics (www.magnamedics.com).

In other regions, where innovation is not so consolidated, information, dissemination and advice services are bringing innovation opportunities closer to traditional companies and to potential entrepreneurs. Specific measures like the **Innovation Contest**, or other communication initiatives, can be very useful in these areas to raise the awareness of companies and other agents about innovation.

*"Highly developed regions in Europe and elsewhere in the world see a huge potential in the appropriate management of innovation. We are also aware of the importance of innovation in economic development and, consequently, in the general development of the province. This is why we promote innovative ideas and solutions, and grant awards to people who are not afraid to overcome stagnation."*⁸

⁸Adam Struzik, Chairman of Mazovia Province.



The “**Mazovian Innovator**” Contest started in May 2008 was one of the first activities carried out under the Regional Innovation Strategy 2007-2015 for the Mazovia region in Poland. The Regional Innovation Strategies operate in 150 regions of Europe, providing a basis for the use of the Structural Funds for innovative activities. These strategies should help regional authorities to build permanent structures for the development of the regional innovation and identification of priority areas of development.

The contest's goal is to promote pro-innovation attitude among the population of the Mazovia Region of Poland, particularly among the scientific community and the SME's. The idea of the “Mazovian Innovator” contest emerged during the preparation of the Regional Innovation Strategy 2007-2015 for the region of Mazovia, when it became evident that it is necessary to promote co-operation between science and business in order to augment innovation. The contest is organized by the Innovation Section at the Department of Strategy and Regional Development of the Mazovian Marshal's Office as a yearly event; so far three editions have been held.

The “Mazovian Innovator” contest awards financial and non-financial rewards for the best ranked participants. The financial prizes range from 10,000 to 25,000 PLN (EUR 2,500 to 6,250) for the “Young Innovative Company” category, which is intended for small and medium enterprises operating in Mazovia that offer new products or services applying advanced methods of technology, organization or marketing in their daily business activities; and from 5,000 to 10,000 PLN (EUR 1,250 to 2,500) for the “Young Innovative Scientist” category, for young, creative scientists who in their doctoral thesis, completed in the past five years, have focused their work on innovation which can be used in practice. Non-financial rewards, sponsored by the contest partners, offers promotion at international exhibitions of inventions and innovative technologies, free consultations on protection of innovative solutions, preparation of documentation for the Patent Office, workshops on intellectual property rights and industrial competition, consultancy on EU funding and others.

The experience with the “Mazovian Innovator” contest has been very positive as it has accomplished its initial goal and a wide range of new products and services have been presented each year. The awards have fostered the growth of the region, as the winners became more confident on the products they deliver and motivated to undertake ambitious plans. Further on, the participation in the contest helps the SME's and young scientists in the efforts to obtain financial support from various institutions as for example the “Patent Plus” programme of the Ministry of Science and Higher Education.

The “Mazovian Innovator” contest was singled out as a good practice by the Polish Agency for Enterprise Development in the competition “Leaders of the implementation of Regional Innovation Strategies”. This activity can be easily transferred to regions undertaking the first steps towards the creation of innovation communities, as it enables broad presentation and acknowledgement of the innovation undertaken by the research institutions and enterprises; deepens the co-operation among the academia and business and facilitates the sharing of scientific achievements which can be practically applied in business.

Industry and business support may also be provided under the form of services. Services may range from providing basic information or advice, to very sophisticated support on research projects, or eventually the use of research facilities or equipment. Examples of good practices may be found in almost every ChemClust region. More significant ones may be the advisory centres for innovation in Mazovia, or the Innovation Accelerator and the Centre of Process Innovation in Tees Valley, but also the support provided through the more subtle initiatives in Limburg (the CHEMaterials Campus and the Open Innovation).

State aid regulations and financial constraints are turning this form of support more popular, as it is made equally available to all companies with a relatively limited cost. Services are often provided through intermediate bodies, such as Business Incubators, Technology Centres or Industrial Parks. Increasingly, and particularly when it involves high value-added services, soft support may be provided on commercial terms, as the providers are working on self-financing basis. Some of the service providers are partly funded by public sources or have access to funding sources to enhance their infrastructure or co-finance the services provided.

Dedicated to nurturing innovative businesses within the science, technology, engineering and life sciences sectors, the **Innovation Accelerator** combines the industry know-how and small laboratory facilities to support new and established companies in the Tees Valley in North East of England.

The Innovation Accelerator Incubator embodies the partnership between CPI (Centre for Process Innovation), ONE and the Wilton Centre landlord. It is a public-private partnership project with 33% of the funds provided by the European Regional Development Fund and the remainder from the Wilton Centre landlord.

With a cutting edge new facility comprising a 1000m² fully integrated technologies for the chemical and process industry, the Innovation Accelerator is able to offer pilot plants, specialist laboratories and office space to enable fledgling companies to develop new products and processes.

This CPI concept is designed to overcome the problem of new business start-ups spending initial investment on peripheral costs, such as provision of industrial services and purchase of general laboratory equipment. It offers practical ‘plug-and-play’ accommodation solutions where SMEs can focus on technology and business development.



The area covered by the Incubator comprises of:

- Exclusive R&D pods (10 x 50 m² R&D individual pods each one with private write-up and processing areas).
- Equipped communal laboratories.
- Offices and meeting rooms.
- Other open access areas (reception, breakout area, bistro, toilets, showers & lockers).

In addition, the Innovation Accelerator team based at the Incubator offers its tenants on-site business/commercial support, as part of a 3-year programme started in May 2009 to endorse the creation and growth of process sector SMEs in North East England. The support is focused on:

- Business start-up support, to help develop new business strategies and prepare for investment.
- Market Intelligence, to help understand the market opportunities and identify potential competitors.
- IP landscaping, to aide understanding of the freedom to operate, plan and protect intellectual capital.
- Technology commercialisation, to plan technology roadmaps, scouting and brokering, and provide access to extensive scale-up expertise.
- Entrepreneur programme, to develop the entrepreneurial skills and provide with tools required for business growth.

Most of the regions are still finding difficulties to involve SMEs in research projects. Difficulties are in some cases caused by the financial constraints SMEs are facing; in others SMEs are lacking human resources or innovation skills. SMEs are looking for short term returns that are not evident in research activities, especially in basic research. Good practices also reflect that it has also been difficult to involve SMEs in cooperative research. The SME involvement in innovation is even more difficult in less advanced areas, and some of the good practices refer to specific programmes to encourage and support SME involvement (Mazovian Network of Information and Advisory Centres). Specific financial support schemes are also proposed or used (innovation vouchers).

The Polish ChemClust partner, the Mazovian Voivodship, reports on the low awareness of the benefits that innovation brings to the companies, and that this small interest in innovation solutions, services and products mainly characterizes micro and small companies (up to 49 employees). Therefore, micro and small entrepreneurs need more support in terms of information about the needs and benefits of taking pro-innovation actions. The project **“Mazovian Network of Information - Advisory Centres for Innovation”**, promoted by the Department for Innovation of the Mazovian Voivodship government, establishes a network of Advisory Centres on innovation throughout the region Mazovia to support companies that want to undertake innovation activities.

The Advisory Centres provide information and consultancy on innovation for the business sector (including, among others: the creation and management of innovative enterprises, support for innovation from idea to implementation, and funding of innovative projects). Their activities also focus on capacity building on the regions, promotion of partnerships between the regions and co-operation among



universities, businesses, chambers of commerce, business associations and local government units. They will also play the role of promoters of co-operation and pro-innovation attitude in the region.

To achieve these objectives the project has implemented actions:

- To improve the existent research infrastructure through purchase of equipment and creation of research facilities.
- Organisation of information campaigns on innovation, seminars and regional conferences with speakers from the university and business sector.
- Development of the web page www.msodi.mazovia.pl to exchange interesting and useful information in the field on innovation, entrepreneurship, science and technology.

The project which is a key component in the implementation of the Regional Innovation Strategy for Mazovia Region 2007-2015, is composed of two stages:

- First stage (December 2009-March 2011) was dedicated to the establishment of the Network of Information and Advice Centres for Innovation composed of delegations from the Marshal's offices of Warsaw, Plock, Radom, Ciechanow, Siedlce and Ostroleka. The participation of the public authorities is to allow effective co-operation with the sub-regions, and reach out to local communities.
- Second stage (April 2011-June 2013) will aim at developing the networking and information exchange between the scientists and entrepreneurs in innovation and technology transfer at regional and local level, in particular by campaigns and events aimed at bringing together the partners and the promotion of knowledge transfer and innovation, and the development of communication and information exchange.

The budget for this project is 1,000,000 PLN (app. 250,000 €). The project aims to inventory and identify areas of functioning of the centres in question, both in terms of similar, currently existing initiatives, as well as the selection of the needs of each sub-region, which in turn should lead to build efficient and effective network of reliable cost planning and the implementation of the next stage of the project, the start-up network.

According to the research done and given the low pro-innovation profile of the local companies, the project may evolve to the creation



of a platform of knowledge on innovation that could be made available to all operators. Such a platform would include:

- A database of activities and initiatives undertaken by operators focused on an innovative economy.
- An innovative resource database from various industries, which will collect innovative solutions from around the world.
- Information on how to obtain funding to carry out its own product.

Another policy directly supporting the research activities SMEs need to undertake is through the implementation of “**innovation vouchers**” promoted by the Limburg province.



The **innovation vouchers for SMEs** scheme, incorporated in Limburg's Open Innovation initiative, was developed and introduced in the Province of Limburg, Netherlands in 1997 under the name “research voucher”, as an incentive to encourage businesses to engage in knowledge transfer. They are also known as “knowledge voucher”. This innovation instrument takes the form of a coupon and entitles the owner to approach a knowledge institution (university or R&D centre).

It is well known that SMEs can be creative and have innovative ideas, but they often lack on in-house technical expertise and solid innovation management skills to perform the requested research activities or transform the ideas into new products and services rapidly and profitably. Also the capacity of many SMEs to hire skilled people for innovative projects and activities is limited. In order to overcome these limiting factors and provide SMEs access to external knowledge, the voucher schemes were introduced by policy makers, enabling the knowledge held by (usually public or semi-public) research and technology organisations to be available to other companies, especially SMEs in the development of new products, processes and/or services.

Activities that are usually endowed by the innovation vouchers are:

- Product / process / service development.
- Testing and measuring.
- Feasibility studies.
- Usage of special research facilities.
- Prototyping.
- Product design.
- Business plan for innovative products.
- Economic impact assessment.
- Market analysis / marketing strategy.
- Innovation / technology audit.
- New business or management model.
- Optimization of internal operational processes.

Because of the much faster application process compared to other innovation support measures, the “innovation voucher” scheme has

gained popularity and is often implemented to facilitate SMEs access to external knowledge, ultimately improving their level of competitiveness.

The “innovation voucher” scheme has the following workflow:

1. A company applies for voucher to solve a specific problem or get an entry of new ideas for business.
2. The application is evaluated by Public/Regional agency implementing the programme.
3. The company is awarded one or several vouchers to seek academic expertise, usually from pre-approved research institutes or universities. The voucher entitles the SME to a number of free consultancy/research visits to large knowledge-intensive organisations (e.g. companies, research institutions and universities). There is a maximum number of hours/days that can be spent per SME and of participating SMEs per project.
4. The company pays the researchers or consultants with the voucher.
5. The R&D institution redeems the voucher with the authority.
6. The state or regional authority pays the voucher value to the R&D institution.

The innovation voucher serves as an instrument to improve the competitiveness of SMEs by enhancing their knowledge level and broadening their innovation capacities. It also stimulates the recruitment of external experts and improves the knowledge transfer between SMEs and knowledge providers. The voucher projects are financed by various authorities (Department of Trade and Industry, the Province of Limburg) as well as by the European Commission.

6. Improving other industry competitiveness factors: human resources and environmental management

Improving competitiveness is the final goal of most of the reported good practices. Most of them are trying to influence and improve some of the key aspects of company competitiveness: innovation capacity, human resources or environmental management. Research and innovation are obviously the most influential factors, therefore good practices related to research and innovation have been analysed separately.

Other measures are directly addressed other key factors determining company competitiveness, such as human resources, improvement of environmental management, or safety at work and hazard prevention.

The **Talent management** initiative carried out by Spolchemie a.s. of the Ústí region, Czech Republic, aims to develop the basic professional and managerial skills of the company's key employees. It begun in June 2011, when the application process to enter the training was opened, and is to be fully implemented by 2013. The initiative is developed in collaboration with Gustav Käser Training International, Drill B.S. and the Association of Chemical Industries of the Czech Republic. It is entirely financed by the company's own sources in range of total costs of CZK 1.4 million (56.000 €).

The project is based on complete follow-up trainings for the company employees. The participants are selected on the basis of their application form, managers' evaluation and successful completion of the Development Centre courses. The training activities are focused in the following areas:

- Coaching.
- Improvement of communication and presentation skills.
- Language courses and other soft skill trainings.

The improvement of the employees' skills and professional expertise through the Talent Management project should encourage their personal and career development.

The **UK Gold Standard** (http://www.cogent-ssc.com/Gold_Standard/index.php) is the Cogent Sector Skills Council's national employer-led framework for competency management in the process industries including Chemicals, Polymers, Pharmaceuticals and Petroleum.



The Gold Standard Framework for continuous professional development sets out the skills required for world class performance in key job roles in the process industry. It describes and maps the competences required to do each job across four key areas of competence:

- Technical Competence.
- Business Improvement.
- Compliance.
- Functional and Behavioural.

The framework can be used both by organisations and individuals to access their level of collective and/or individual competence against the Gold Standard for each role. They can start this at any point on the Gold Standard depending on development needs.

The Gold Standard offers advantages both to employers and employees:

To the employers:

- An industry skill benchmark for world-class performance.
- Assurance that a company's investment in skills hits all the right targets.
- The accreditation of existing skills and identification of gaps.
- Transferability of skills across the Process Industries.
- Signposting to fundable training programmes.
- Quality assured, bite-sized training programmes delivered flexibly to meet the needs of individuals and businesses.

To the employees:

- The ability to transfer their skills across the Sector.
- Accreditation of their skills to world-class standards.
- Clear role progress and career pathways.
- An aspirational framework for individuals to fulfil their potential.
- Support to Trade Unions Representatives in promoting training.

Through nationally accredited qualifications, companies can access the Gold Standard via Cogent website, and ask the NSAPI staff for assessment of their skills competence against the Gold Standard for each role. Appropriate training provision will be identified within the Gold Standard to close any skills gaps. The training offered from NSAPI providers will take place at a pace and time that suit employers and their employees.

In April 2011, the European Chemical Employers Group (ECEG) and the European Mine, Chemical and Energy Workers' Federation (EM-CEF) signed ground-breaking agreement on job competences and training covering the chemical sector in all 27 European Union countries. The Gold Standard competency framework is to be used to establish European competency standards.

Today's society has raised consciousness on issues related to sustainable environmental management, hazard prevention and safety at work; topics of great importance to the chemical industry as well. Diverse laws and protocols have been developed to mitigate the negative impact of this industry to the environment, to raise consciousness on the problem, to enable hazard-free and safe working environment. Industries unable to implement the proposed measu-



res risk repetitive lawsuits, prohibitions and closures of unregulated plants, personnel sick leaves, and market-share losses.

However, implementation of each new measure requires additional investment in resources, time and personnel with reduced or no economical impact, and therefore the companies carefully calculate the adoption of each new measure, sometimes at own detriment.

Guidelines that address these issues, written in easily understandable style with readily applicable solutions, help companies to decide faster on the implementation of the regulation and become competitive on the market.

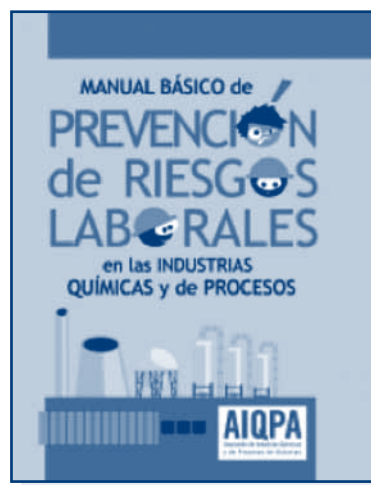


The **Compendium of Good Environmental Practices for the Chemical and Process Industry** produced by the Association of Chemical Industries of Asturias (AIQPA) provides a practical manual of good environmental practices, technical as well as action-oriented, to be rapidly implemented in the companies of the chemical sector, saving costs and time for preliminary studies. It summarizes the best environmental practices that will obtain customer satisfaction and at the same time will allow less resource usage, lower levels of contamination and lower production of residues, spillage, noise and emissions. The document was published in 2009 by AIQPA⁹ with the financial support of the Regional Development Agency (IDEPA).

It is an action-oriented working document, as it is structured as a catalogue that briefly describes the environmental objective and proposes a selection of the good practices to be implemented based on the stage of processing activity (prime materials, resources and products, and fabrication processes and installation), on the environmental aspect to be targeted (use of resources, air quality, residual waters, noise, water contamination) and on the specific best practices that need to be taken in emergency situations. Most of the good environmental practices require minimal investment. The Compendium was elaborated by the personnel responsible for environment protection from the chemical companies members of the Association (Arcelor, DuPont, Bayer, Ence, Fertiberia) that have identified the need to raise awareness on the environmental protection among the companies of the chemical and process industry of Asturias and the importance it has to the society.

The compendium proved to be a valuable document to the sector and several chemical installations have been improved using the described best environmental practices and also to minimize the environmental impact risen from their activities. It also served to prove the importance of joining expertise from diverse areas and the cross-fertilization effect it carries.

Hazard prevention and safety at work are particularly important in the chemical and process industry and subject to tight national and European regulations. Moreover, they are increasingly relevant competitiveness factors, as accidents influence personnel motivation and may eventually increase company costs.



In order to harmonize the security standards and risk prevention guidelines of the chemical industry in Asturias, based on the current legislation, the international standards and the necessities of each company, the Association of Chemical and Process Industries of Asturias (AIQPA) developed the **Manual on Safety Good Practices in Chemical and Process Industry**¹⁰. It provides the chemical and process industry a catalogue of good safety practices to be implemented in everyday work in order to maximize safety at work and minimize risks.

The manual was first published in 2004, and later updated and digitalized in 2006. The publication was supported with funds from the Regional Development Agency (IDEPA).

The manual was elaborated by the personnel in charge of safety and health at work in the member companies. They analysed the regulations and standards that should be applied in his company and the information gathered was summarized in a guidelines of the common best safety practices under thematic chapters:

- General guidelines for risk prevention.
- Safety procedures before starting a job.
- Signalization, blocking mechanisms and beacons.
- Ditches and excavations.
- Chemical risks.
- Fire risks.
- Electrical risks.

⁹ Guía de buenas prácticas ambientales en las industrias químicas y de procesos, ISBN 978-84-613-3096-6.

¹⁰ Manual básico de prevención de riesgos laborales en las industrias químicas y de procesos, ISBN 84-609-3285-0.

- Mechanical risks.
- Working at height risks.
- Load manipulation and lifting equipment risks.
- Working in confined spaces risks.
- Working at extreme temperature risks.
- Personal Protection Equipment.
- Transport, load and unload of dangerous goods.
- Waste management and other environmental considerations.
- Actions in case of an emergency.
- Actions in case of an accident.

This process gave as result a reference document that is very practical to use and that can be easily consulted by company worker or contractor any time doubt on a protection related issue arises.

The manual was widely used for internal training of the newly incorporated workers and contractors in the chemical companies, and became an integrated part of the activities and developed decisions of hazard prevention and safety at work at the companies. Copies have also been requested by other chemical industry associations and companies for their hazard prevention and safety at work courses.

Another practice promoted by the Association of Chemical and Process Industries of Asturias titled “**Training and Technology Transfer between Academia and the Chemical and Process Industries**” aims through constant development of the human resources to improve the competitiveness of the companies and the attractiveness of the region as chemical industry location.

The practice focuses on identification of areas of interest for the industry, and on carrying out training actions coordinated and conducted by the University of Oviedo and other invited lecturers from Industry and Academia.

Since 2002 various workshops, seminars and courses have been organized and carried out by the AIQPA with financial support of the Regional Development Agency (IDEPA), the University of Oviedo and FORMIC Programme (Fundación para el desarrollo de la Formación en las Zonas Mineras del Carbón).



The thematic areas covered a wide variety of subjects and key issues of interest to the companies:

- In 2002 AIQPA organized several seminars on Industrial Safety, Seveso II Directive and experience exchanges with Spanish industrial associations from other regions.
- In 2003 the main training activity consisted in safety courses related to Preventive Management, IPPC Directive, DELT@ Accident Reporting System and Dangerous Goods Security (ADR, RID, IMO-IMDG).
- The 2004 courses focused on safety: Risk analysis for management and technical staff, National, Regional, ATEX and IPPC Directives, the Human Factor, SQAS, Safety Report preparation, etc.
- 2005 was marked by the publication and dissemination of the Occupational Hazard Prevention Handbook, but also included seminars on areas such as REACH Regulations and other.
- Specific training programmes have been carried out in multiple editions.
- Prevention and control of legionellosis and legionella for technical staff at industrial facilities (Certification approved by the Spanish Ministry of Health) in 2005 and 2006.
- IUCLID 5 and REACH-IT in 2008.
- Product Engineering for management and technical staff in the Chemical Industry in 2007, 2008 and 2009.
- Water Industrial Applications Specialist; a 280 hrs course with theoretical and practical contents followed by a 320 hrs internship. The course had two editions in 2009 and 2010, was delivered by 11 university professors and 22 highly qualified senior staff from the chemical and processing industry.



7. Increasing regional attractiveness and attracting inward investment

As with company competitiveness, many of the good practices reported are intended to improve the basic conditions for regional competitiveness. Regions need to offer companies the best conditions to carry out their activity to become or keep their attractiveness as industrial locations. In fact, one of the good practices reported is a research conducted by the Asturias Chemical Cluster identifying the main factors for site location in the chemical and processes industries. The conclusions of the study show that availability and cost of resources (water, energy), infrastructure, qualification of human resources, financial support and favourable business environment are the key factors companies assess when choosing a new site or enlarging industrial facilities.

The “**Site Selection in the Chemical and Process Industries**” report produced by the Association of Chemical Industries of Asturias (AIQPA) offers the companies and policy makers full and accurate view of the main location and relocation factors for the chemical and process industries, which have been identified through interviews with more than 75 companies from southern and central Europe. It intends to offer an insight on the industry site selection criteria, in order to help companies in their location – relocation process and also to provide information on the theme to Development Agencies working on investment attraction.



A thorough bibliographical research identified some location criteria (Strategic Factors, Labour and Socioeconomic Factors, Technical Factors and Industrial Environmental Factors). Then, interviews of high managers or location managers of companies and industry associations (over 50 companies and chemical industry associations located in Spain and over 25 in other European countries (Italy, Belgium, France, Germany, Netherlands, Switzerland and UK) helped to rank the location factors and analyse them, taking into account the possible territorial bias.

The study identified some of the key factors for location-relocation of the chemical industries:

- Good transport infrastructure and communication network.
- Availability of quality industrial land in appropriate location, far from highly developed urban and tourist areas.
- Reliable and competitive priced utilities: water, gas and electricity.
- Trained and flexible labour force.
- Industrial tradition, particularly in chemical industry; no reluctance against industrial activity in community.
- Grants and taxes, technical and corporate services, safe environment, personal services for company employees and managers also influence the selection.

The report highlights that Spanish companies tend to rank higher strategic and technical factors, whereas European companies give more importance to socio-economic and industrial environment factors.

The report, which may be the first of this kind in Europe identifying location was elaborated in 2007 and updated in 2012 to include the insights of the companies and associations from northern Europe. Traditional location factors (good transport infrastructure and communication network, availability of quality industrial land in appropriate location, reliable and competitive prices of water, gas and electricity, trained workforce or industrial tradition) have been identified in the report to be still of great importance if the region is to increase its attractiveness as a chemical industry location, and are the primary criteria evaluated by the companies when making the decision of locating or relocating their businesses.

However, the report reveals that other factors have also become relevant in the case of similarly offered conditions. If the region wants to promote itself as an attractive chemical location it has to take in consideration socio-economic and environmental factors too, such as grants and tax breaks, availability of technical and cooperative services, safe and sustainable environmental management or personal services for the staff. The European Chemical Site Selection report could be reviewed to include study of the location factors focused on the high added value chemical industry. This new study may help to increase the attractiveness of the EU for the chemical industry. Additionally, a “European Map of Location Factors” taking into account the territorial differences in factor endowment can be of interest to the companies and development agencies in the global European market.

A number of the good practices are trying to improve the conditions enjoyed by local industry to encourage companies to stay in the regions, offsetting some of the higher costs they may face. That is mostly done through investments to improve the basic infrastructure (industrial sites, research facilities, communications, logistic infrastructure...), but also by promotion of novel cooperative models and financial incentives or by improving the qualifications of the human resources (Gold Standard Frameworks in Cheshire, Training actions in Asturias).

The best practice “A model of a new governance in the framework of the innovative bio-based and sustainable chemistry” reported by the IBIS Consortium of the Novara province in the Piedmont region, Italy, emerged to avoid possible relocations of Piedmont companies operating in the field of the innovative, bio-based and sustainable chemistry.

The Piedmont region in Italy has a strong chemical vocation, and chemistry is an important pillar for its economy. The millennium's challenge for innovation is seen both through research and development of models capable of retaining the world's resources while preserving and enhancing the quality of life of its inhabitants, through environmental sustainability and co-operation of various stakeholders. Therefore, in order to avoid possible relocations of the chemical companies, the region of Piedmont has initiated the Sustainable Chemistry Innovation Pole (Polo di Innovazione per la Chimica Sostenibile - www.poloibis.it) and the creation of a light and open structure for management its actions - IBIS (Innovative Bio-based and Sustainable products and processes) Consortium.



The Sustainable Chemistry Innovation Pole is one of the twelve Innovation poles identified by the Piedmont region on the specific technological vocations of each provincial area. These Innovation Poles are tools of synergistic coordination between different actors involved in the innovation process; their aim is to make available facilities and services with high added value, to interpret the technology needs of businesses, and to guide the regional actions in support of research and innovation.

The Sustainable Chemistry Innovation Pole was created in April 2009. It groups 24 companies, 3 Universities and the Province of Novara. The Pole was founded with contribution of the European Regional Development Fund (ERDF) within the Regional Operative Programme for the Piedmont Region ROP FESR 2007-2013, and is co-financed by the European Union, the Ministry of Economy and Finance and the Piedmont Region. The Pole's objectives and activities focus on:

- Promotion of research projects in the field of the innovative bio-based and sustainable chemistry.
- Help to private companies (in particular SMEs) in the execution of these research projects.
- Promotion of co-operation among private companies, public administration and universities in the framework of innovative bio-based and sustainable chemistry.

Throughout periodical meetings among the representatives of the organisations that compose it, the IBIS consortium decides on the fields of research of interest to the Sustainable Chemistry Innovation Pole. On the basis of their needs, competences and know-how, each member collaborates for the drawing and presentation of innovative bio-based and sustainable chemistry projects. This methodology enabled the elaboration of 25 projects in the field of the innovative research and 4 approved integrated projects with a total budget of 7,2 million Euros, of which 3,5 million co-financed by the Piedmont region. In addition, the light and open structure of management (no properties or own research organisations) have permitted the Pole to be flexible with reference to the challenges of the market.

The measures to improve regional attractiveness as industrial locations are evolving from providing basic infrastructure or reducing the cost or availability of natural resources (reported to be the key traditional factors) to making innovation and research facilities available - (Saxony-Anhalt) or even further, to create innovative environments where knowledge flows. Improving infrastructure and other key factors for industrial activity is increasing the “territorial capital”, and therefore making the regions more attractive as industrial locations. A number of good practices are addressing these and other issues: improving industrial sites (Saxony-Anhalt), technology centres (Saxony-Anhalt, Tees Valley, Usti), support services (Mazovia), financial incentives (Novara), human resources (Cheshire, Asturias).

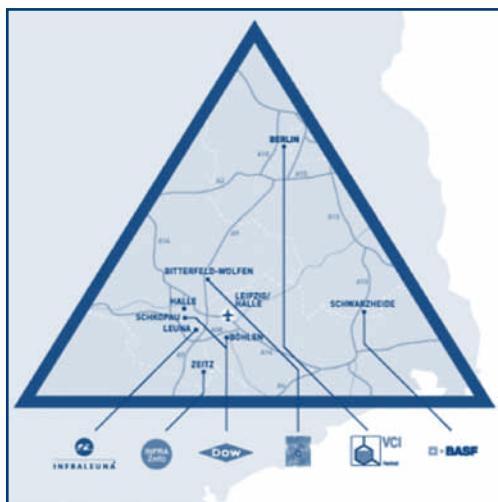


The **Innovation Location Network of Central German Chemical Parks - CeChemNet** (www.cechemnet.de) is an initiative worth mentioning for its continuous investment in restructuring production plants and setting up an ultra-modern infrastructure for the chemical industry using stakeholders' experiences since 1990. It has also served as base for one of the ChemClust Pilot Projects, “Chemical Parks as Knowledge Sites”.

The chemical industry in Saxony-Anhalt has a leading position among the different industries in the region, generating 14 per cent of overall turnover and employing 9 per cent of the total workforce. To preserve this position, after the successful reorganization and modernization of the Central Germany's chemical sites in the nineties, focus was given to promotion and strengthening of the co-operation among producers, fabricators and research institutions. In 2002, the chemical sites in the Central German chemical triangle - ChemiePark Bitterfeld-Wolfen, InfraLeuna, BASF Schwarzheide, ValuePark Dow Olefinverbund and ZSG Zeitzer Standortgesellschaft, supported by the state of Saxony-Anhalt, established the **Central European Chemical Network –CeChemNet–** their own network to develop their capacities, create synergies, promote cross-acquisition of know-how and provide assistance in the settlement of new enterprises.



It has promoted the innovation development of the chemical parks by attracting research infrastructure and better co-operation with the regional innovation landscape. It has attracted research-driven companies and institutes, such as the Fraunhofer Pilot Plant Centre for Polymer Synthesis and Polymer Processing (PAZ) and the Fraunhofer Centre for Silicon Photovoltaics (CSP) in Schkopau, and the Fraunhofer Chemical-biotechnological Process Centre (CBP) in Leuna. Chemical parks are becoming a driving force in the Eastern German innovation landscape, as they evolve as 'knowledge sites'



A success factor of the innovation location network is the strong commitment of the chemical park operators to focus innovation development on a specific area, which matches well to the value added chain of companies already present on the park. Each of CeChemNet's sites is specialized in a certain field of engineering excellence that has emerged from their historical background and through a variety of privatization models. Each facility has its own know-how in solving problems occurring in the course of restructuring processes. CeChemNet combines this knowledge in a comprehensive list of services and competences offering single and system solutions in security management, environmental protection, contaminated industrial site reclamation, feedstock integration, infrastructure, site management and information technologies.

CeChemNet also aims its activities at the outside by supporting the development of tailor-made strategies for investors in the Central German Chemical Triangle. Its range of services includes know-how on restructuring contaminated industrial sites as well as expertise in developing successful chemical park management systems. A special service of the network partners is to provide support for developing chemical parks in identifying, systematizing and describing existing or needed competencies and outlining the technical, organizational, financial as well as funding modalities.

Moreover, the CeChemNet initiative coordinates information exchange among industry, scientific research organizations and policy-makers, and supports the marketing efforts of the chemical parks in collaboration with investment and marketing agencies at the national and federal state levels.

CeChemNet focuses regional capacities in chemical park development, creates synergies with its feedstock integration while promoting the cross-acquisition of know-how in its six chemical sites. This process of establishing a network of innovation sites in the Central German chemical triangle is leading to a winner proposition in competing for investments on a global scale.

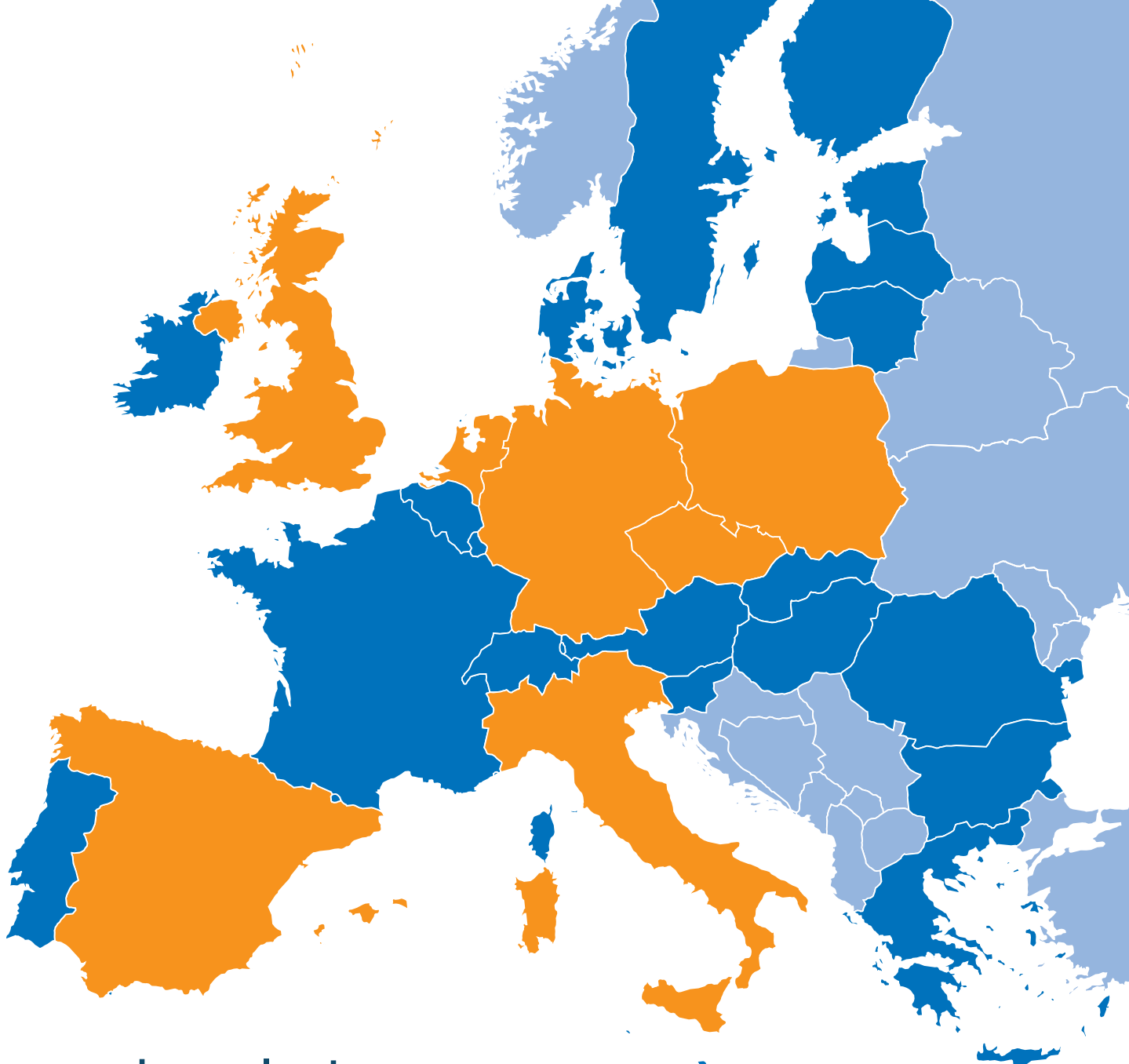
In order to meet the challenges of the knowledge society in terms of attracting innovative investors as well as qualified staff, the CeChemNet partners pursue the approach of chemical parks as 'knowledge sites'. Every site has developed its own innovation profile with specific priorities in terms of research and development (see graph below) creating a rich compendium of services and competencies of the CeChemNet network.



CeChemNet-Network of Innovation Sites

The Central German Chemical Triangle Innovation and R & D

Leuna	Bitterfeld-Wolfen	ValuePark, Schkopau	Zeitz	Schwarzheide
Fraunhofer Chemical-Biotechnological Process Centre (CBP)	R & D in the fields of fine chemicals, pharmacy, agrochemicals, catalysts, OLED-technology, functional coating	Competence Centre for synthetic rubber and PET	Competence Centre for industrial utilization of biomass	service Centre for process optimisation
Hydrogen Technology of Linde Group	Walter treatment/ion exchanger	Fraunhofer Pilot Plant Centre for Polymer Synthesis and Polymer Processing (PAZ)	Centre for material utilization of used oil	Technical Centre for alkoxylation and product development
Coal to chemicals - utilisation of domestic brown coal		Technology Centre of Fraunhofer Centre for Silicon Photovoltaics (CSP)		Establishing an Innovation Centre for biopolymers



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