Good Practice: North Rhine Westfalia (CLIB)

8/15/2015

Project acronym: BERST
Project full title: "BioEconomy Regional Strategy Toolkit "
Grant agreement no: 613671

Contents

1. Introduction

The BERST project explains the bioeconomy development path of a) BERST regions and b) selected Good Practices. Aim is to provide a practical guide and source of inspiration for other regions that wish to develop their bioeconomy potential. Under this analysis:

- **BERST regions** are structured narratives for development pathways of clusters in different bioeconomy sectors in the regions of partners in the BERST project;
- **Good Practices** are examples of regions that contain one or more successful bioeconomy clusters at the mature production stage.

Especially, Good Practices have been analysed in order to:

- understand how the various key assets interacted and performed during the development stages;
- draw a number of lessons for the development of bioeconomy clusters within their respective regions; and
- provide recommendations to other regions and clusters for each key asset and each bioeconomy sector on which issues they have to take into account in order to establish, develop and successfully operate similar clusters.

1.1 Bioeconomy clusters

The bioeconomy can be described in terms of an economy that 'encompasses the production of renewable biological resources and their conversion into food, feed, bio-based products and bioenergy. In BERST, a **bioeconomy cluster** is perceived as a geographical concentration of actors in vertical and horizontal relationships aiming to develop the bioeconomy. Bioeconomy clusters have been categorised to allow comparison and better understand synergies and interactions of the various elements involved in the formation of bioregions. BERST recognises eight bioeconomy sectors, namely:

- primary biomass;
- food and feed;
- construction;
- chemicals and polymers;
- pulp and paper;
- textile and clothing;
- energy;
- R&D biotechnology.

Given the broad coverage of sectors within the bioeconomy, bioeconomy clusters might be rather heterogeneous in their specific focus. The development and marketing of bioeconomy products does not differ from other products: the challenge is to introduce competitive bioeconomy products that can be sold in profitable quantities on the basis of its price, quality, and service combination preferred by buyers over that offered by competing products. This implies that in the analysis of the development of the bioeconomy clusters the same three factors play a role as in the case of clusters aiming at the introduction and marketing of televisions or cars: input-output linkages among firms, social capital and institutional thickness.

1.2 Key assets and development paths of bioeconomy clusters

The input-output linkages among firms, social capital and institutional thickness in the cluster are all embodied by actors with varying properties. In the analysis of the development path of a bioeconomy cluster, we assume that the actors of the region, in which the cluster is located, apply a strategy to develop the bioeconomy by transforming biomass into competitive bioeconomy products. Such a transformation process takes time. Hence, our analysis is guided by two starting points:

1. a focus on five key assets of a bioeconomy cluster, as outlined in our conceptual model for the analysis of the strategy of a bioeconomy cluster (Fig. 1). These are:
    a. **entrepreneurs**: the presence of an entrepreneurial culture with active, innovative, flexible and risk taking entrepreneurs plays a pivotal role in driving clusters towards successful development;

b. **policymakers**: political leaders who are willing to support the development of the bioeconomy by providing governance, institutional structures and financial support;
c. **knowledge institutes**: organizations that provide the technical knowhow and innovation for the development of bioeconomy products;
d. **availability of biomass resources**: a continuous supply of biomass resources of constant quality is critical for the development of bioeconomy products;
e. **competitive bioeconomy products**: commercially viable products, such as chemicals, medicines, food, bioplastics, transport fuels, electricity and heat.

2. a long run time horizon of a bioeconomy cluster, with 3 phases (Fig. 2):
   a. **initial stage and take off**: the bioeconomy is introduced in the regional planning agenda and the policy, socio-economic and R&D landscape for its establishment and operation is created;
   b. **drive to maturity**: he first competitive bioeconomy products are sold at the market. The cluster grows with the setup of new companies, cluster infrastructure (with incubator, training centre etc.) has been established, and the cluster is able to attract both private and public funding
   c. **age of mature production**: the cluster is able to produce competitive bioeconomy products at an extensive scale.

The exact duration of each of these phases differs from cluster to cluster; according to estimates of PwC (2011) the duration of the initial stage and take off is about 5 years, that of the drive to maturity 5-10 years, and that of the age of mature production 10-20 years.

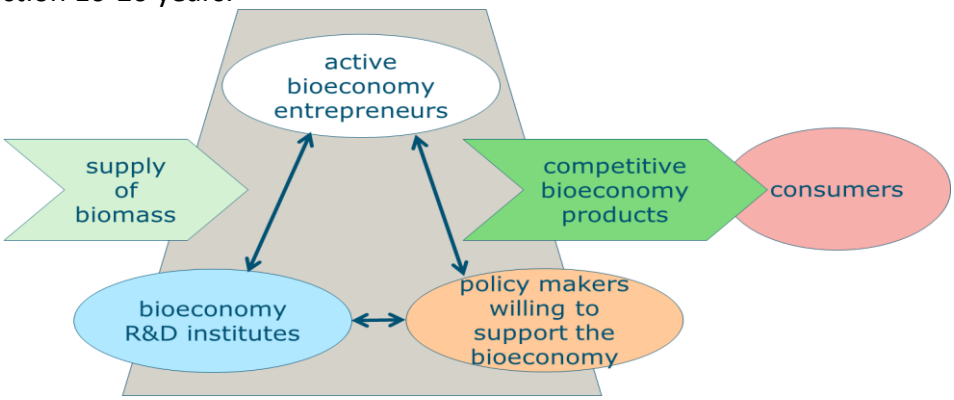

Figure 1 Conceptual model for the analysis of the strategy of a bioeconomy cluster

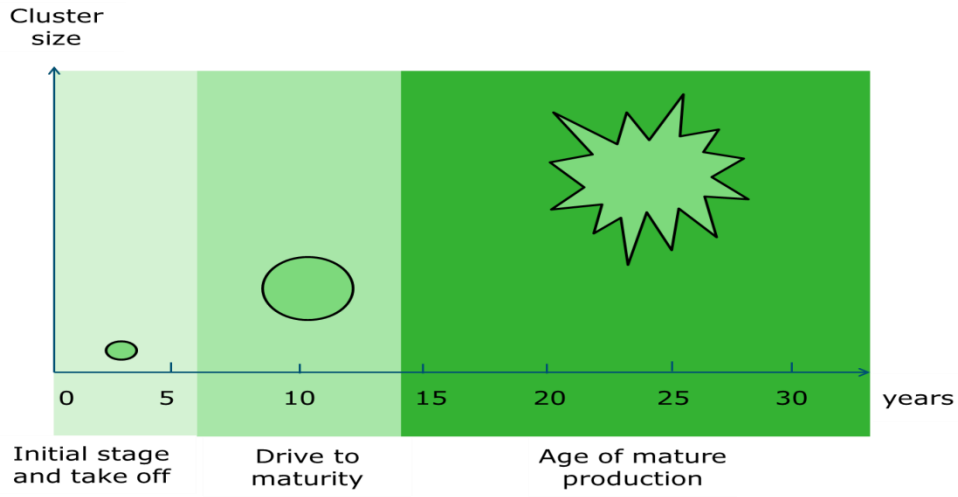

Figure 2 The development path of a bioeconomy cluster

1.3 Bioeconomy clusters in BERST project

The bioeconomy clusters that are analysed in BERST are distinguished in 'Good Practices', i.e. bioeconomy clusters within the age of mature production, and 'BERST regions', i.e. bioeconomy clusters in the regions of partners in the BERST project (Table 1).

Table 1 Studied bioeconomy clusters in BERST

Good Practices	*BERST regions*
Ghent (Belgium)	Central Finland (Finland)
North Rhine Westfalia (Germany)	Straubing (Germany)
Toulouse (France)	Biobase Westland (Netherlands)
Manchester (UK)	Biobased Delta (Netherlands)
	Madrid region (Spain)
	Western Macedonia (Greece)
	Slovenia

The bioeconomy clusters in the BERST regions are in varying stages of development, and some of them can also be regarded as Good Practices (Central Finland, lower Bavaria, Biobase Westland and Biobased Delta). Statistical data, literature and interviews with key actors have been used to collect information on the functioning of each bioeconomy cluster. The analyses of the bioeconomy clusters of the Good Practices have provided a number of key findings on the interaction of actors in the cluster. Subsequently, in the analysis of the BERST regions it has been explored to which extent the key findings of the Good Practices also apply for these bioeconomy clusters and which barriers they face in developing the bioeconomy cluster. The analysis in BERST focuses primarily on the Good Practice mature bioeconomy sectors within the study countries, but as the clusters encompass more than one sector, the performance and interactions of key assets is expected to influence them as well.

2. North Rhine Westfalia (CLIB2021)

With kind contribution from: Dr Manfred Kircher

2.1 The region and the cluster

The region

North Rhine Westfalia was formed in 1946 and is the fourth largest region in Germany by area. In the 1950s and 1960s, Westphalia was known as Land von Kohle und Stahl or the land of coal and steel. In the post-WWII recovery, the Ruhr was one of the most important industrial regions in Europe, and contributed to the German "Wirtschaftswunder". From the late 1960s, these industries contracted. On the other hand, production sectors, particularly mechanical engineering and metal and iron working industry, experienced substantial growth.

GDP in 2007 was 529.4b euro (21.8% of national GDP) making it the most important economic region in Germany, as well as globally significant[1]. From Germany's top 100 corporations, 37 are based in North Rhine-Westphalia. On a per capita base, however, North Rhine-Westphalia remains one of the weaker among the Western German states[2]. As of June 2014, the unemployment rate is 8.2%, second highest among all western German states[3].

Figure 1 Region of North Rhine Westfalia [4](Source: Wikipedia.de)

North Rhine-Westphalia attracts companies from both Germany and abroad. In 2009, the state had the most foreign direct investments anywhere in Germany[5]. Around 13,100 foreign companies from the most important investment countries control their German or European operations from bases in North Rhine-Westphalia.

[1] Ministerium für Wirtschaft, Mittelstand und Energie des Landes Nordrhein-Westfalen: Konjunkturindikatoren NRW

[2] Arbeitskreis Volkswirtschaftliche Gesamtrechnungen der Länder: Volkswirtschaftliche Gesamtrechnungen der Länder[

[3] Statistik der Bundesagentur für Arbeit". statistik.arbeitsagentur.de.

[4] hhttp://en.wikipedia.org/wiki/North_Rhine-Westphalia

[5] The Online Editor. "FDI". New European Economy.

In 2014, North Rhine-Westphalia was ranked as the European Region of the Future[6] in the 2014/15 list by FDi Magazine[7].

The cluster

CLIB2021 was founded with the aim to initiate research and development projects in the field of industrial biotechnology. The cluster has 80 members, encompassing: large industrial partners (such as Evonik, Henkel, LANXESS, Bayer, and BASF Personal Care); small and medium-sized enterprises (SMEs), which account for 40 per cent of their membership, and bring diversity of technologies and products to the cluster; and universities. Its operation and future development is structured across four key principles:

Closing gaps between science and technology: The cluster brings together academic and industrial members who are active in research, development, production and commercialization – all crucial elements of the industrial value chain.

Addressing emerging markets: Novel, innovative materials, cost-efficient production processes and simplified downstream workflows, as well as feedstock which is leading the market both economically and ecologically are crucial elements. The cluster addresses these market demands and helps its members to manage the process of innovation.

Providing win-win solutions for all stakeholders: Academia provides technologies tailor-made to real industrial needs and takes care of the rising generation of scientists and engineers. SMEs provide an extensive range of services, and products. In collaboration with big industries, SMEs find academic institutes and research companies within the cluster to partner with and fill the product pipeline. All stakeholders need infrastructure, investors and production sites as well as business support and legal advice. Through its members, CLIB provides all these competencies to develop business based on science and technology.

Drive excellence in science and technology: The cluster has a well-structured communication platform for professionals in the research and industrial field which facilitates knowledge transfer, communication, networking and dissemination activities.

2.2 Performance of key assets during the development pathway of the cluster

Clib2021 is a Good Practice in the chemicals & polymers sector in BERST.

[6] "London and Nordrhein-Westfalen, Germany best investment locations in Europe". FinFacts Ireland.
[7] "European Cities and Regions of the Future 2014/15". fDiIntelligence.com. London. 17 February 2014.

Table 1 Cluster performance in the under study key assets

Key asset	Chemicals & Polymers		
	IS	DMS	MS
Cluster Organisation			
Actor			
Entrepreneurs			
Policy makers			
Knowledge institutes			
Biomass supply			
Competitive bioeconomy product			
Funding			
Policies and measures			

Low **Moderate** **High**

Table 1 presents the performance of the various bioeconomy sectors which are present in the cluster across the key assets, during the initial (IS), the drive to maturity stage (DMS) and the mature stage (MS), based on the results from the questionnaire survey. Details on how the individual key assets performed across the development stages are provided in the following sections alongside with barriers and enabling factors which have framed their progress. Traffic light colour coding is used to illustrate the strength and performance of each key asset during the development stages and how this has impacted in the progress of the cluster's activities. The traffic light colour coding reflects discussions with stakeholders from the clusters and the region as well as the regional partners from the BERST project.

Biocluster organization

Initially there was no central management but after a short time there was a central organisation with a board and an advisory board. This was very beneficial for the cluster's development, networking and communication activities, particularly with the growing number of members (initially 32; currently circa 100).

Table 2 Cluster performance in biocluster organisation

Issue	Chemicals & Polymers		
	IS	DMS	MS
Central organisation that coordinates, manages, and facilitates the biocluster			
Role of key actors			

• *Entrepreneurs*			
• *Policy*			
• *RTD*			
Funding			

Since 2013, the cluster management is paid by member fees which were introduced at that year.

Barriers

- Lack of central management at the initial stage prohibited efficient communication and transfer of knowledge

Enabling factors

- Central organisation was developed shortly after the establishment of the cluster.

Actors

The focus of the cluster is the development of products for the chemical industry and the member comprise a mix of large scale industries, entrepreneurs and knowledge institutes.

The region of North Rhine Westfalia is favourable for the operation and development of the cluster as it is highly industrialised and the location of many chemical industrial firms.

Despite the fact that there are no policy makers on the board of the cluster, the organisational team and members are well connected at national and EU level as well as having strong cross border and cross regional relationships with decision makers at local level.

Table 3 Cluster performance in actors involved

Issue	Chemicals & Polymers		
	IS	DMS	MS
Entrepreneurs activity			
Interaction of entrepreneurs with RTD			
Geopolitical position of the region			

Knowledge providers have strong interactions with the cluster entrepreneurs and large industries and are mostly located within Germany with some from other countries including Poland and USA.

Barriers

- Initial interaction with entrepreneurs was time consuming and required effort to communicate benefits of biobased innovations.

Enabling factors

- Knowledge providers with strong capability provided a successful start to the cluster through research projects;
- Increased awareness and consistent interactions among policy, industry and research actors.

Supply of biomass

The cluster sources raw materials both from indigenous local sources (strong agriculture and forestry and well developed food industries) but also from imports (e.g. palm oil from Malaysia).

Table 4 Cluster performance in biomass supply

Issue	Chemicals & Polymers		
	IS	DMS	MS
Biomass availability			
Indigenous supply			
Biomass trade			

Scale of operation is large so industries source lignocellulosic biomass and the organic fractions of municipal and industrial waste.

Barriers

- Sourcing lignocellulosic biomass is a big challenge.
- Ensuring constant supply of raw materials with consistent quality is a challenge when producing bulk products from seasonal feedstocks.

Enabling factors

- Well-developed road infrastructure.
- Using residual or by-products from agricultural industries increases the potential for adding value for farmers and traditional markets.

Competitive bioeconomy products

The following competitive bioeconomy products have been developed within the cluster so far:

- cosmetics;
- bio-polymers;
- bio-adhesives;
- nutrition/ feed additives.

These have been a result of successful cross over and transfers between the respective sectors.

Table 5 Cluster performance in competitive bioeconomy products

Issue	Chemicals & Polymers		
	IS	DMS	MS
Innovation of bioeconomy products			
Cross over/ Transfer between sectors			
Degree of innovation			

Barriers

- Volatility of raw material prices
- Complexity over meeting product specifications due to variable and volatile physical properties of bio-based products.

Enabling factors

- Efficient cross over and transfer among the entrepreneurs and the regional chemical industries.

Financing

The cluster has had good access to public funds for RTD. The initial stage relied on research projects, with total budget of Euro60m. From the drive to maturity stage, the cluster gained additionally from substantial funds contributed by industrial actors who share the same vision for the sector in Germany and at international level.

Table 6 Cluster performance in financing

Issue	Chemicals & Polymers		
	IS	DMS	MS
Public funds			
Accessibility of funds / Procedures			
Private funds			

Barriers

- The availability of private funds was difficult to secure during the initial stage as the cross sector transfers, respective methods and products were not yet developed.

Enabling factors

- Increased access to public funding for research, development and demonstration activities provided opportunities for entrepreneurs and for increased innovation in end products.

- Successful R&D programmes strengthened the cluster's position in terms of technological excellence and brought funding from private sources/ industrial actors as well.
- Efficient process of financing start- up companies.

Policies and measures

The key policy mechanisms which have facilitated the start-up and successful development are mainly EU and national policy targets for the chemical industry as well as the respective EU and German bioeconomy strategies.

Table 7 Cluster performance in policy

Issue	Chemicals & Polymers		
	IS	DMS	MS
Presence of policy instruments			
Effectiveness of policy instruments			
Consistency of policy			
Monitoring procedures			

Barriers

- Variability of demand sectors increases the complexity of setting targets and developing cross sector policies.

Enabling actors

- Interest in initiative from public authorities.
- Possibility for funding of research and infrastructure through national and regional funding.

2.3 Difficulties, Opportunities and Lessons Learned

The most important difficulty has been the absence of local industrial actors. Most of the industrial companies are not in the region or even the country or even Europe- but are mostly international.

The major opportunity has been consistent- long term granting investment from government

Lessons learned

In this section a set of specific learning points have been collected based on the interviews with stakeholders in the Good Practice clusters / regions. The learning points are linked to the key assets, the development stages and the respective bioeconomy sectors.

Table 8 provides specific learning points learnt from the development of the biocluster in North Rhine Westphalia per key asset, development stage and bioeconomy sector.

Table 8 Specific learning points from Clib2021

Organisation	Initial Drive to maturity	Develop a strong cluster organisation body with staff combining skills from industry and academia	Chemicals & Polymers
	Initial	Develop a «Cluster culture».	R&D services
Actors	Drive to maturity	Develop a broad network with other institutions from the relevant field as well as with other clusters, both within the country as well as cross-boundary, as this will provide access to latest information as well as a platform for dissemination and promotion of cluster members' activities.	Chemicals & Polymers
	Initial Drive to maturity; Mature production	Develop an "open & participatory" approach within the innovation communication channels. Communicate and discuss findings, success and failures frequently.	R&D services
Biomass Supply	Drive to maturity; Mature production	Foster the cascading use of biomass and the circular economy in order to make full use of biomass potential	Chemicals & Polymers
	Drive to maturity	In order to use primary and secondary biomass as feedstock for bioeconomy applications, consistent stakeholder dialogues and coordination needs to be facilitated.	R&D services
Products	Initial Drive to maturity; Mature production	Steer the development of new products according to the principles of smart specialization, resource availability and market demand and in this respect improve learning mechanisms from other regional clusters with a similar economic or geographical profile	Chemicals & Polymers
	Initial	Cluster management should be more engaged in and informed about product development of its cluster partners in order to monitor project processes, recognize potential cross-overs and facilitate cooperation.	R&D services
Funding	Initial Drive to maturity; Mature production	The future strategy and perspectives of the cluster should be carefully considered with the participation of the industry.	Chemicals & Polymers
	Initial	Ask for cluster participation/membership fee, as it will heighten the value of the membership to companies.	R&D services
Policies	Initial Drive to maturity	Subsidies for initial investments can be critical for start-ups	Chemicals & Polymers

2.4 References

http://www.clib2021.de/en

http://www.germanbiotech.com/de/db/detail.php?c=6084551k$Snrm6KUYXujAQ