ScanBalt

A string of Competence Clusters in Life Sciences and Biotechnology

ScanBalt CompetenceRegion
Mapping Report 2006

ScanBalt
A string of Competence Clusters
in Life Sciences and Biotechnology

ScanBalt CompetenceRegion

Mapping Report 2006

Greifswald/Copenhagen/Göteborg, September 2006

Wolfgang Blank[1], Careen Krüger[1], Kim Møller[2] and Bo Samuelsson[3]

[1]BioCon Valley GmbH, Walther-Rathenau-Str. 49a, D-17489 Greifswald, Germany

[2]Oxford Group A/S, Amagertorv 19, 3, DK-1160 Copenhagen K., Denmark

[3]University of Göteborg, Department of Clinical Chemistry and Transfusion Medicine, Sahlgrenska Universitetssjukhuset, SE-40530 Göteborg, Sweden

Table of content

Acknowledgements

The authors thank their colleagues Elise Kvarnström and Peter Frank, ScanBalt fmba, for their support. The work would have not been possible without the fruitful discussions in the Expert Council (see 7.3) and the indispensable recommendations from the experts.

The project is supported by funds of the European Commission (FP6, LSHM-CT-2004-503406).

1. Foreword

ScanBalt as a network of networks in life sciences and biotechnology in the Baltic Sea Region is now running for about five years. A remarkable number of projects have been started and implemented. “ScanBalt Campus”, “Boosting Baltic FP 6” or “ScanBalt – Clinical Research Network” and others could be mentioned. With the foundation of ScanBalt fmba in Turku, 2004, as a central, bottom up-organized service organization an important structural milestone for ScanBalt was laid.

“ScanBalt CompetenceRegion” project was initiated to create transparency and identity within the life sciences and biotechnology sector in ScanBalt BioRegion. With the growing number of activities it will be more and more crucial for the actors to know who they and their partners are and what they are able to perform in a collaborative manner in order to meet the challenges and opportunities of one single meta-region. The link and integration of the new member states Poland, Latvia, Lithuania and Estonia and also the North-Western Part of Russia as an important neighbor with a lot of dynamic in the life sciences and biotechnology sector was a second important goal of “ScanBalt CompetenceRegion” and lead to the concept of decentralized ScanBalt contact points in the regions.

The present publication should be considered as an intermediary result of the “ScanBalt CompetenceRegion” project. Starting from a generally designed mapping framework the mapping produced valuable information about the bio-clusters in the Baltic Sea Region. The “ScanBalt CompetenceRegion Mapping Report 2006” gives a first comparable insight in the competencies in life sciences and biotechnology in ScanBalt BioRegion. A detailed cluster analysis on specific sectors in life sciences and biotechnology together with a regional score card model for ScanBalt BioRegion will follow and be published early 2007.

It has finally to be mentioned that the mapping does not include all regions in the Baltic Sea area. It was limited to the contract partners of the EU funded “ScanBalt CompetenceRegion” project. It is more than desirable that all regions within ScanBalt BioRegion (like Hamburg, Helsinki or Stockholm) will be included in further analysis.

2. Life sciences and biotechnology – challenges and perspectives for economical development

Europe takes part in a global competition within the biotech and life science sector. It is generally believed that the recent scientific and technological progresses in life sciences and biotechnology, e.g. in the development of novel and innovative technologies like microarrays, biosensors, protein engineering, recombinant DNA-technologies, cell cultures, monoclonal antibodies or bioprocessing technologies hold the promise to make biotechnology the dominant economic force of at least the first half of the 21st century. Furthermore the merging of life science and biotechnology with other research areas, like e.g. the nanotechnology or the information and communication sector, will open new potentials. The electronic and computer breakthroughs will allow massive amounts of genetic information to be decoded and processed. Fusing information technology and biotechnology may result in a highly effective means of disease prevention, detection and innovative, patient specific therapies.

As a science and industry, biotechnology and life sciences will mature and create enormous changes in our lives and thus have an unprecedented impact on the entire human race. Not only the medical and societal outcomes, but also the economic outcomes of where these biotechnology clusters form and grow are likely to be immense. Estimates are cited by the European Commission[1] suggesting that "by the end of the decade, global markets, including sectors where life sciences and biotechnology constitute a major portion, could amount to over 2.000 billion €".

It is doubtful however whether any single country or any single region will be able to gain an internationally competitive edge on its own within biotechnology and related disciplines. The individual European countries are relatively too small to be competitive in a global perspective. According to our own studies more than 150 regions or microregions exist alone in Europe each having the goal to become

[1] From: Life Sciences and biotechnology – a strategy for Europe, European Commission, 2002

a competitive cluster in life sciences and biotechnology and promote its commercialisation for the sake of regional development.

Within Europe, the greater Nordic-Baltic region - including the Nordic countries, the Baltic countries, North Germany, Poland, the St. Petersburg area and Kaliningrad - comprise a meta-region with a great pool of knowledge, capital and resources in the life science area. The Baltic Sea Region comprises eleven nations, more than 100 million inhabitants - equivalent to more than one third of the US market and growth rates higher than most major economies in Europe. In recognition of these potentials, the Nordic-Baltic region has marked itself as one of the world's most proactive in terms of building cross-sector and pan-regional networks and co-operations at local, regional and meta-regional levels[2]. "There are indications that the Nordic-Baltic Sea region can develop to become a world-leading region for innovation. Common values, structures and priorities in the areas of health, environment and the balance between economic growth and quality of life from a strong platform on which to build."[3]

Similarly the Baltic Sea Region takes a prominent role also in the field of life sciences and biotechnology. Germany, Sweden, Finland and Denmark are listed among the top 12 biotech locations on a global level. As a consequence the "ScanBalt BioRegion"[4] has been established as a "network of networks" to facilitate and co-ordinate the work of these initiatives and promote internal collaboration, co-operation and development within the Nordic-Baltic region enabling it to compete with other global biotech and life science clusters, sharpen the region's competitive edge towards global markets, and fulfill the region's great potentials as one of Europe's leading biotech "mega-clusters". ScanBalt BioRegion encompasses Denmark, Estonia, Finland, Iceland, Latvia, Lithuania, Norway, Poland, Sweden, northern part of Germany and north-western part of Russia and comprises more than 60 universities and over 1.000 life sciences or biotech companies.

---

[2] From: State of the Region Report 2005, Baltic Development Forum, 2005

[3] S. Schwaag Serger and Emily Wise Hansson, Innovation in the Nordic-Baltic Sea Region – A Case for Regional Cooperation, IKED, Malmö, 2004

[4] W. Blank, B. Diderichsen, A. Podhajska and B. Samuelsson, Borderless Biotech – Europe´s first Meta-Region taking shape, Euro Biotech News, 3, 2003

However, in pursuing these ambitious goals the Nordic-Baltic ScanBalt BioRegion as a whole as well as its constituting regions face several crucial challenges, including:

- identifying, mapping and assessing the resources and competencies of the region in the biotech and life science area and increasing mutual awareness and visibility of activities and conditions, strengths and weaknesses among the key actors,
- developing joint objectives and strategies to ensure maximum exploitation of the competencies and resources among all actors and institutions in the field,
- enhancing the attractiveness of the region for any kind of human resources (e.g. students or employees) to avoid any kind of brain drain (internal from East to West or to other regions),
- and last but not least strengthening the integration among key actors from the scientific, health care and business community within the meta-region and developing their capabilities and competencies - not least among the new EU countries - to benefit fully from the integration.

The “ScanBalt CompetenceRegion Mapping Report 2006” describes a first comprehensive picture of the capacities in life sciences and biotechnology in the individual bioregions and countries; from individual actors, university units, research institutions and companies in ScanBalt BioRegion. It is based upon a detailed collection and analysis of data from ScanBalt member regions to provide it in a comprehensive and structured mapping. This mapping identifies drivers such as R&D input, risk capital, human capital, biotech workforce and current impact as well as enablers such as R&D programs, university policies related to patents, tax incentives etc. The report aims to provide a tool for the integration of competencies and strengths of local clusters in the Baltic region and to develop these into a common Baltic position of strength within the field of life sciences and biotechnology.

3. Background and objectives

The Baltic Sea Region has reached an exiting point in its development. 15 years ago a process was started to integrate business, knowledge production and the creation of wealth in the countries around the Baltic Sea. The process was essentially a politically driven project: The region was a vision rather than realities. During the past 15 years, a number of initiatives have been taken to improve communication and develop synergies around the region. This period was characterised by the rise of a number of organisations such as Baltic Development Forum and ScanBalt. With the recent enlargement of the European Union, the Baltic Sea region has become increasingly important as an engine for European growth. A major industrial impetus for growth in the region is the biotech and life science industries for global health.

In July 2004, the “ScanBalt CompetenceRegion” project was started as a “model case to take a closer look an a meta-regional level and determine the potentials to boost joint activities and efforts in life sciences and biotechnology in the Baltic Sea region”[5]. The core activities of the project are the collection and analysis of data to provide it in a comprehensive and structured mapping and a scorecard process based on the collected data and a cluster analysis.

Partners from all Baltic Sea countries are involved in the project: established bioregions like Medicon Valley Academy, Bioturku or BioCon Valley, actors in the ambitious new member states Poland, Estonia, Latvia and Lithuania as well as actors in the North-Western part of Russia[6]. The results give a picture of the competencies and capacities in life sciences and biotechnology in the individual bioregions and countries; from individual actors, university units, research institutions and companies. The collected data will serve as a basis for a Scorecard analysis and subsequent cluster analysis.

---

[5] funded by EU, FP6 priority 1, SSA (Scientific Support Action), duration: 30 months

[6] Project Partners of “ScanBalt CompetenceRegion”: BioCon Valley GmbH (Coordinator), Göteborg University, University of Kalmar, Center of Technology Transfer Gdansk, Tartu Biotechnology Park, Turku Biovalley Ltd., Institute of Experimental Medicine of the Russian Academy of Medical Sciences, Institute of Biotechnology Vilnius, Biomedical Research and Study Centre Riga, ScanBalt fmba, MedCoast Scandinavia.

This first mapping is, despite its premature nature, a valuable contribution to create a foundation for cooperation and knowledge sharing between networks, organisations and other stakeholders in the ScanBalt meta-region. Furthermore, it can serve as a tool and motivation to reinforce dialogue between the meta-network's sub-regional parties on challenges and objectives, ultimately creating a platform for generating trans-national clusters. The mapping exercise itself also contributes to enhance the mutual understandings and objectives of the ScanBalt network by establishing a common point of reference through extensive knowledge sharing in the process. It is likely to increase awareness of both potential new activities and partnerships and of their own comparative strengths and weaknesses during the process. This mapping will contribute to develop in a further step a network and cluster analysis and to formulate recommendations which will included in the overall strategy of ScanBalt. The exploitation of the potentials within life sciences and biotech industries on a *Pan-European* scale is the focus of "ScanBalt CompetenceRegion". It shall support ScanBalt's efforts to expand and strengthen its services for the network in ScanBalt BioRegion - to develop a *network of networks* linking the dispersed biotech and life science activities into a biotech meta-region. Ultimately, this will lead to an improvement in terms of trans-national co-operation and integration in the region.

"Today, cluster initiatives are a central part of industrial, regional and innovation policy-making across the developed world. Cluster initiatives have come to play an important role in rejuvenating ailing clusters and regions and in promoting the emergence of new science-based industries."[7]

While firms, universities, hospitals and public institutions on the local scale have developed cluster characteristics and sustained economic growth, there is a Pan-European potential yet to be explored – and exploited. The networks and clusters in general have only few inter-regional linkages. Thus there is a need to combine local competencies and create a common Baltic position of strength within the field of life sciences and biotechnology.

[7] Ö. Sjövell, G. Lindqvist and C. Ketels, The Cluster Initiative Greenbook, 2003, Stockholm

The overall aim of the “ScanBalt CompetenceRegion” mapping is to provide a tool for the integration of competencies and strengths of local clusters in the Baltic Sea Region and to develop these into a common position of strength within the field of life sciences and biotechnology. One key element in this process is obtaining an overview of the present competencies and resources in the region by conducting a competence mapping.

The mapping distinguishes between two sets of parameters that favor innovation and growth in competency clusters (Figure 1):

- The direct drivers of innovation and growth in competency clusters are the amount of R&D input in terms of actual research, the availability of risk capital, the pool of human capital in terms of biotech graduates, the amount of trained biotech workforce and current impact in terms of actual R&D contracts, biotech start ups in incubators etc.

- Certain programs and policies can be put in place to enforce such drivers. In the mapping these factors are denominated "enablers" and they include R&D funding programs that enable actual research, university patent policies, tax incentives for risk capital that enable a broad availability of risk capital, scholarships that enable a large pool of human capital, family support structures that enable a large biotech workforce in a region and establishment of e.g. incubators that facilitate biotech start ups.

The “ScanBalt CompetenceRegion” mapping as a tool has many purposes. It is a first step in carrying out international benchmark studies, creating individual scorecards, identifying best practice cases, search partners or investment opportunities. The present mapping is the first of its kind in the ScanBalt BioRegion. Based on desk research only, data availability and data verification are a major challenge. In the years to come the mapping shall be updated and data availability shall be improved.

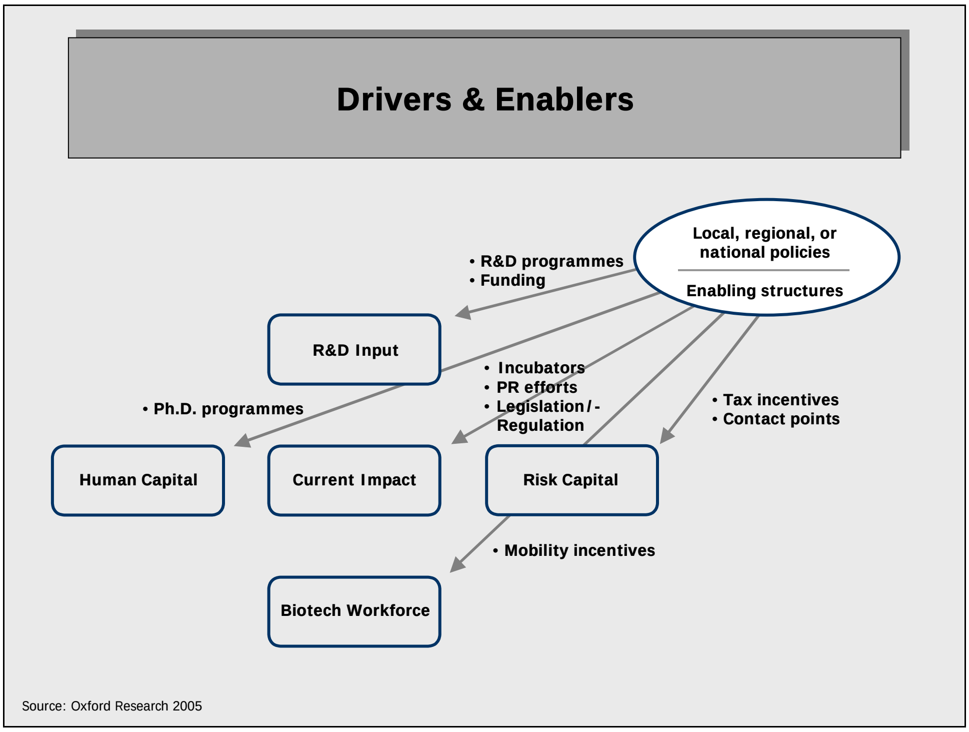

Figure 1 Drivers and Enablers

The overall results of the mapping are presented in this report and will be published in a comprehensive ScanBalt BioRegion database which will be available at the website www.scanbalt.org[8]. The database shall be an easily accessible reference tool where ScanBalt members and other stakeholders can find hard data, references and links to ScanBalt member regions.

4. Methodology approach

The actual mapping is based on data collected through desk research. Main sources of information have been regional and institutional websites, annual reviews, reports as well as data collected through telephone and email contacts with regional sources. All incorporated competence clusters have had the opportunity to adjust and correct the data collected. The indicators for the mapping were selected in accordance with the "ScanBalt CompetenceRegion" Expert Council which had been established as advisory board for the project time.

[8] The data of the mapping will be incorporated into the "yellow pages", the ScanBalt database and on a CD-ROM which is expected to be published until January 2007.

Also, the outcome of the mapping had been discussed and agreed upon by the Expert Council.

The initial phase of the mapping has been a review of existing mappings of the ScanBalt regions and other mappings. This has provided useful input when setting up the mapping framework and determining what drivers and enablers that should be studied. On the basis of the mapping data have been analysed to look at the possibilities of encircling competence clusters in the ScanBalt region as well as to identify at what development stage the clusters are.

4.1. The mapping framework

The basic inspiration for the present mapping was a study by the Milken Institute on "America's Biotech and Life Science Clusters"[9]. According to the study a cluster is defined as a "geographic concentration of sometimes competing and sometimes collaborating firms and their related supplier network. They are agglomerations of interrelated industries that foster wealth creation in a region, principally through the export of goods and services beyond their borders". This definition follows Porter's definition in "The Competitive Advantage of Nations"[10] including the production of knowledge at universities and research laboratories.

For a geographical concentration of wealth creating activities to qualify as "a cluster" both the Milken Institute and especially the definition by Michael Porter stress the commercial result of the activity. If a competitive advantage can not be identified in a significant number of companies one would not label the regional activity as a cluster in the strict sense of the term. In the case of the "ScanBalt BioRegion" and bearing the purpose of this mapping in mind, it is of strong interest to identify sole knowledge producing activities as well despite that fact that commercial links might still be weak. Accordingly, the term *"competence clusters"* has been applied in this mapping in order to distinguish the object of this mapping from the objective of a strict cluster mapping. In general terms though, the

[9] Milken Institute, America's Biotech and Life Science Clusters, Santa Monica, 2004

[10] M. E. Porter, The Competitive Advantage of Nations (MacMillan), London, 1990

theoretical understanding of competence clusters follows the understanding of clusters as analysed mainly by researchers such as Michael Porter.

Clusters develop over time (see Figure 2). What might be a high technology driven cluster at one time, such as the production of TV-sets in the US after the Second World War, might be considered a low technology production a few decades later. Applying this “product-life-cycle” way of thinking to competence clusters leads to a hypothesis that the initial development of what later becomes an actual cluster may start as what could be labelled a “Scientific Fountain”: a geographical concentration of knowledge producing activities characterized by a high R&D activity and a large pool of Human Capital. A “Scientific Fountain” may in reality be limited to a number of University Institutes with an outstanding research environment. Actual spin off’s or links with commercial partners may still be very limited, but the production of scientific articles and maybe even patents supposedly will be high.

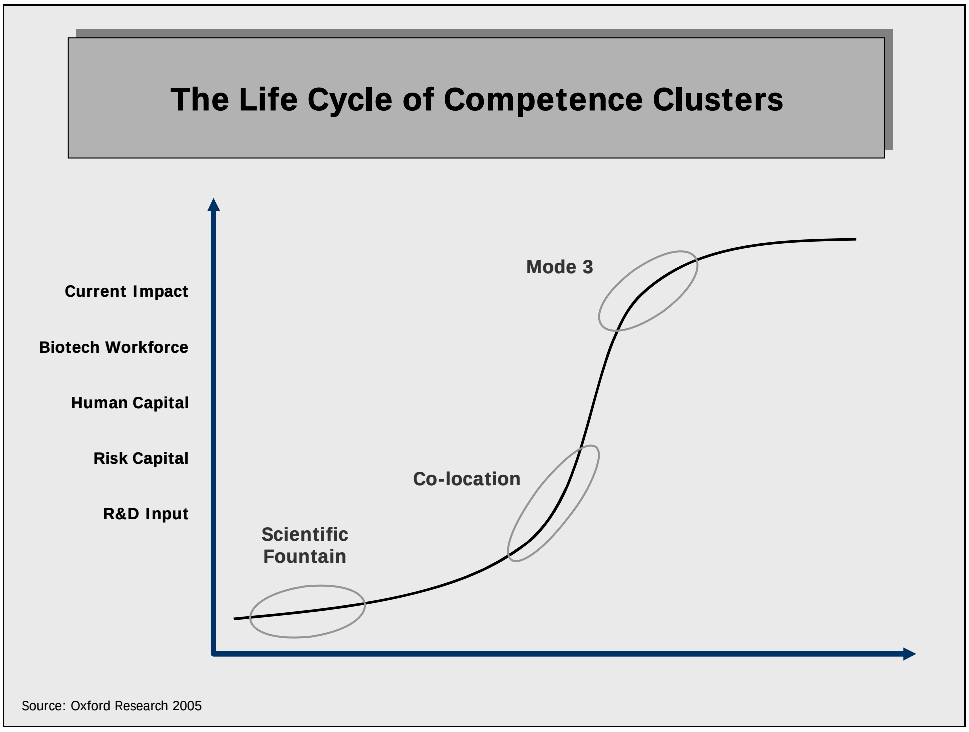

Figure 2 Lifecycle of competence clusters

Over time, some “Scientific Fountains” may develop further, producing spin off’s and/or attracting companies who benefit from co-locating their own R&D activities in close proximity to the sparkling university research institutes. Such geographical concentrations of knowledge producing activities may still not produce major commercial results but expectedly a higher level of risk capital needs to be present as well as a growing number of skilled people to constitute a biotech workforce. “Such geographical concentrations are labelled “Co-location Clusters” in the present mapping.

Taking the product-life-cycle thinking even further it is fair to expect that for some clusters the commercial capability might increase even further to reach an extent where the knowledge production and the commercial activity becomes more or less equal and starts blending together in what’s elsewhere known as a “Triple-Helix” or “Mode 3” kind of activity. Clusters developed into this stage of maturity do need to be characterized by a large pool of a Biotech-skilled workforce and impact on local business will supposedly be high. “Mode 3” clusters, though, might not be characterized by a very high pool of risk capital.

One important implication of the lifecycle theory is that clusters are different. The hypothesis of how drivers of cluster development vary over time is illustrated in Figure 3[11].

Mappings often presume linear relations between the indicators they apply: a large pool of risk capital is better than a small pool of risk capital. Applying the lifecycle thinking of competence clusters it is not necessarily true that a large pool of risk capital is better than a small pool of risk capital. Following the lifecycle thinking it is a bit more complex than that: if a competence cluster is a “Scientific Fountain” the availability of risk capital is not very important and a small pool of risk capital in such a cluster may not be a disadvantage. On the other hand, if two clusters both are “Co-location Clusters” and one cluster contains a much larger pool of risk capital than the other, the cluster with the large pool of risk capital will, all other things being equal, be more attractive for companies to work with than the other.

---

[11] The identification of drivers is taken from the Milken Institute Report 2004.

The Importance of drivers in cluster development

Drivers	Life Phase		
	Scientific Fountain	Co-location	Mode 3
R&D Input	High	Medium	Low
Risk Capital	Low	High	Medium
Human Capital	High	High	Medium
Biotech Workforce	Low	Medium	High
Current Impact	Low	Medium	High

Source: Oxford Research 2005, based on Milken Institute 2004

Figure 3 Drivers in cluster development

Another way to illustrate the different nature of clusters as they develop over time is to see how they match different elements of a presumed value chain in a company. The figure below illustrates that a "Scientific Fountain" might be a perfect match for a company screening the scientific arena for new business ideas. Another company, not screening for new business ideas but being in the development phase for certain innovations might prefer working with a "Co-location Cluster" rather then with a "Scientific Fountain", and a third company, having developed a new product and being in a testing phase, might take the most advantage by identifying a "Mode 3" cluster to work with rather than having to co-locate a R&D division in a co-location cluster.

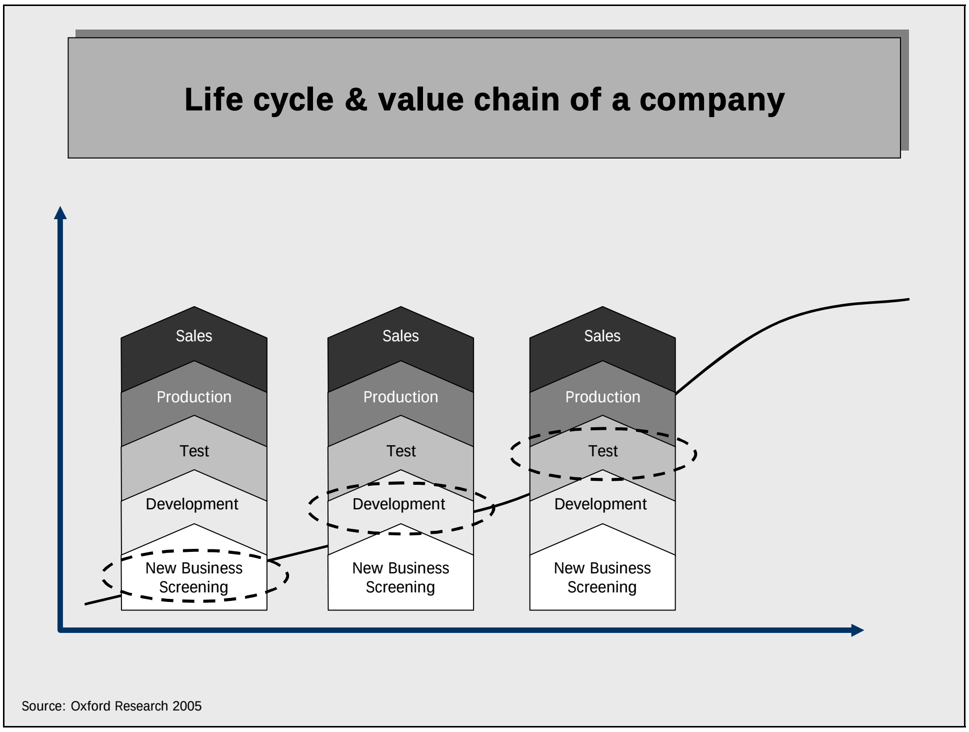

Figure 4 Regional "value chain" like cooperation in drug development

Lastly, one can take the lifecycle concept of clusters even further and argue that clusters may constitute a value chain of their own, where some clusters may be specialised in the creation of groundbreaking new scientific discoveries ("Scientific Fountains"), other clusters in taking the groundbreaking new scientific discoveries into radical innovations and other clusters specialising in the multiple generic innovations and testing of new products.

Proper orchestrated a sample of clusters, such as ScanBalt, may constitute a value chain of its own – a string of pearls – that taken together can be viewed as one meta-region containing all the elements of innovation from the groundbreaking new ideas over radical innovations to the multiple generic innovations[12]. This is illustrated in the Figure 5 below.

[12] See also: P. Frank, Decentralization the key to ScanBalt, Nature Biotechnology Vol 23. no 10, 2005

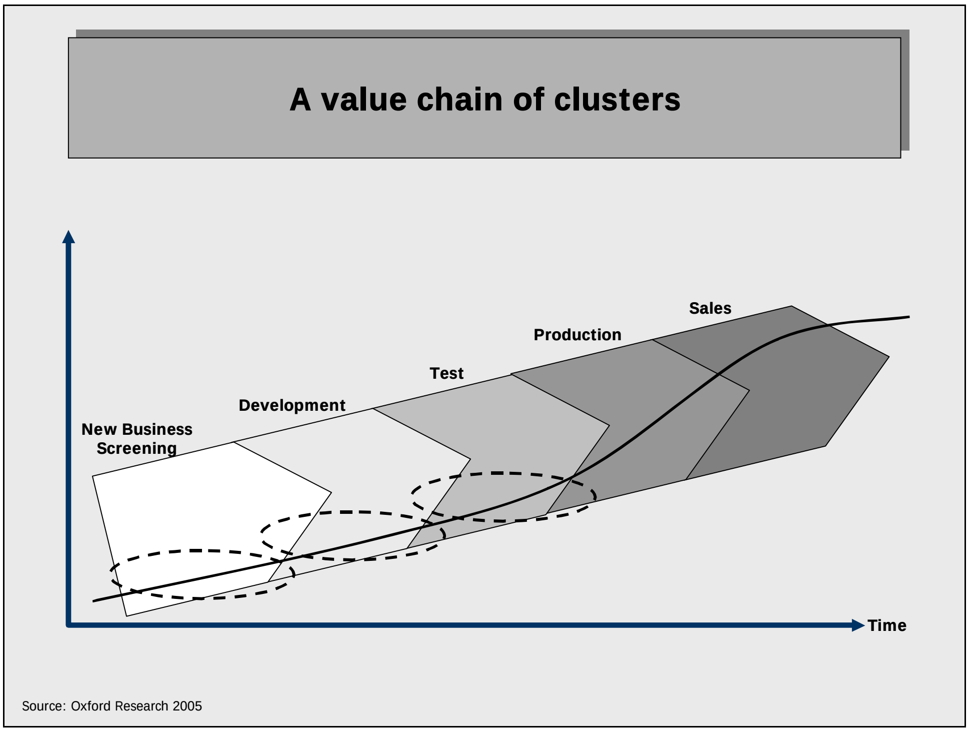

Figure 5 Model for interregional "value chain" like cooperation of competence clusters

While the lifecycle thinking of clusters identifies five distinct drivers of cluster development a specific interest is taken in this mapping also to national or local policies that enable the development of drivers. One example is that a high R&D input is very important for the development of a Scientific Fountain and one policy that enables a high R&D input is e.g. a national or regional R&D program. Another example is that a large pool of risk capital is important for the development of a co-location cluster and one policy that enables a large pool of risk capital is a national tax-policy that favours risk capital. Figure 1 illustrates the relationship between drivers and enablers and in the mapping itself a large number of enablers related to each competence cluster are identified.

It has however to be shown whether and how this model of interregional "value chain" like cooperation will work in practice. In a 2006 report on innovation systems[13], the Swedish innovation agency VINNOVA states that "opinions differ on where the geographical limits of a research and innovation environment should

[13] From: In search of Innovation Systems, VINNOVA Policy VP 2006:02, Stockholm, 2006

be set. Some people prefer to speak about the good co-operation between a university and industry in a limited geographical area, or even in a strictly campus-based environment. Others speak about similar co-operation within a limited sector, e.g. the automotive sector. The geographical environment may vary from the automotive industry throughout the country to clusters with a regional profile …". ScanBalt BioRegion could become in this respect a model case as the innovation pressure e.g. on the pharmaceutical industry with the urgent need for new compounds and therapies is high and extremely costly.

4.2. Description of indicators

Five groups of indicators have been used to map "ScanBalt BioRegion": R&D input, Risk capital, Human capital, Biotechnology workforce and Current impact. Together these indicators cover a wide range of drivers that will assist to identify the development of each regional cluster. Milken Institute's Biotech Index has inspired the identified key indicators. One difference though is that the Milken Institute Biotech Index is based on relative indicators (e.g. R&D input per thousand researchers). In the present mapping it has turned out to be very difficult to determine the exact geographical scope of several clusters and therefore to identify the relevant indexation. Accordingly all indicators are stated as absolute figures.

Table 1 Mapping framework and indicators

Indicators for R&D input	In order to estimate the amount of R&D Input in each cluster three indicators have been applied:
Biotech funding	The amount of public biotech funding to universities in each cluster have been identified for most clusters. Sources have been university annual reports, interviews with experts and for some clusters dedicated studies of actual Biotech funding. Funding is measured in TEUR.
Academic R&D experts	The pool of Academic R&D experts have been identified for all clusters, however definitions vary from one faculty to another. For some universities it has been possible to identify the number of academic R&D experts in the field of biotechnology and life science while in other universities figures also include institutes that are less relevant for Biotech and life science. Sources in general have been university annual reports and websites.
Scientific articles	The actual outcome of the R&D Input is indicated by number of scientific articles published by researchers of the respective universities. Number of published scientific articles has been identified for all clusters.

Indicators for risk capital	Risk capital is vital to commercialise new inventions. In this mapping three indicators have been applied:
Biotech venture capital investments	Venture capital actually invested in new biotech companies in 2004. This is an indicator where data has been very difficult to obtain. Sources are phone interviews with local experts but data has only been obtained for five clusters.
Biotech patents	Number of university patent fillings related to biotech in 2004 has been less difficult to obtain. In a number of clusters these data was already calculated and stated on websites and in annual reports.
Start-ups	Number of start-up companies in 2004 has been identified for most, though not all clusters. Main source of information has been phone interviews with local experts.

Indicators for human capital	A region's human capital pool gives an indication of its possibilities to continuously supply businesses with relevant know-how14. The three indicators applied are:
PhD Graduates	Includes number of PhD graduates in biotech per year from the related universities in the region.
Master Graduates	Includes number of Master graduates in biotech per year from the related universities in the region.
Bachelor Graduates	Includes number of Bachelor graduates in biotech per year from the related universities in the region.

Indicators for biotechnology workforce	The biotechnology workforce indicators measure the regions current workforce capacity and its possibilities to sustain a biotechnology cluster. The three indicators applied are:
Employment by major players	Number of people employed by the major biotech companies in the region. Data sources have been interviews with local experts plus information from company websites.
Mobility	Expected growth in employment by major biotech companies over the next 3 years. Same source as "employment by major players".
General location indicator	The general attraction of a certain region in terms of access ability by physical infrastructure (highways, airports etc.), proximity to cultural offerings and leisure, availability of day-care institutions, international schools etc. has been assessed by the research team. A scale from 1 (low attraction) to 5 (high attraction) has been applied.

[14] The main source of information has been university annual reports and websites. Two sets of challenges in collecting data on human capital have occurred. Firstly data have been available for the relevant institutes in some clusters while for other clusters data cover a whole faculty or even a whole university thus including a number of graduates that are not relevant for the bio- and life science clusters. Secondly, some universities do not apply yet the common Bachelor-Master structure.

Indicators for current impact	The current impact indicators focus on the economic outcome of the clusters. Looking at the economic outcome enables the assessment of the clusters possibilities to convert its assets into economic prosperity.
SMEs in incubators	Number of small and medium sized companies located in incubators in the region. Sources have been interviews with local experts. One bias in this mapping is that in some instances all SME's in incubators have been calculated – in other instances only SME's in biotech and life science have been reported.
Economic growth in biotechnology	Looks at the expected growth in turnover by major players in the region. Sources have been phone interviews with local experts and search on company websites.
R&D contracts	Measures universities external research contracts, i.e. contracts with other external partners. Sources have been interviews local experts and data from university annual reports etc.

5. Mapping results

The mapping essentially leads to two overall results: First, the observation that viewed as one meta-region ScanBalt is comparable to some of the well known Bio- and life science clusters in the US. Second, that the clusters are at different stages of development in a cluster life cycle and that further cluster analysis are likely to reveal a number of areas where cooperation between clusters will release substantial synergies. The two overall results are elaborated below.

5.1. ScanBalt as a string of bio-clusters

Within ScanBalt BioRegion there are already a number of bio-networks like Medicon Valley, BioCon Valley, MedCoast Scandinavia or BioTurku. All have the purpose to promote biotechnology and life sciences in their European micro-region. All together these 24 Euro bio-networks are extremely important and essential in themselves, but all are too small to be competitive on the global scene or even within Europe. ScanBalt is thus a coordinating meta-network with the purpose of promoting biotechnology and life sciences from this European meta-region on the global scene. ScanBalt`s purpose is to create new opportunities, fill gaps and remove hurdles and should be seen as a process or movement.

The Milken study identified a number of biotech and life science clusters in the US. Among the indicators used were the number of employees in the biotech sector, the number of Ph.D. graduates and the number of Bachelor Graduates. A comparison of the indicators for ScanBalt as a whole with four of the US biotech and life science clusters in the US is presented in the table below.

ScanBalt compared with leading biotechnology clusters in the USA

CLUSTER	Employees in Biotechnology	No of PhD graduates	No Batchelor Graduates
ScanBalt	39.934	1.920	3.462
Boston	99.237	1.728	2.195
San Francisco	29.589	-	1.088
Oakland	28.131	-	-
Raleigh-Durham-Chapel Hill	23.358	1.076	-

Source: "America's Biotech and Life Science Clusters", Milken Institute 2004

Figure 6 ScanBalt BioRegion in a global comparison – human resources

The benchmarking shows that the number of Ph.D. graduates in ScanBalt actually exceeds the number of graduates in one of the largest Biotech and life science clusters in the world, namely the concentration of university- and research institutes in the Boston area. The Boston Biotech and life science cluster is far larger than ScanBalt in terms of employees in biotechnology, but still ScanBalt exceeds clusters like San Francisco, Oakland or Raleigh-Durham-Chapel Hill. Applying the number of Bachelor graduates indicates that ScanBalt is second to none in terms of qualified labour for future growth.

5.2. Comparable analysis of data collection

The ScanBalt competence clusters, however, do not act as one and the benchmark in section 5.1 merely illustrates a potential than a reality of today. The potential, however, is supported by the observation that the ScanBalt clusters are in different stages of the cluster life cycle thus having different roles to play in a mega-cluster. The figure below illustrates the life cycle of clusters and the categorization of clusters.

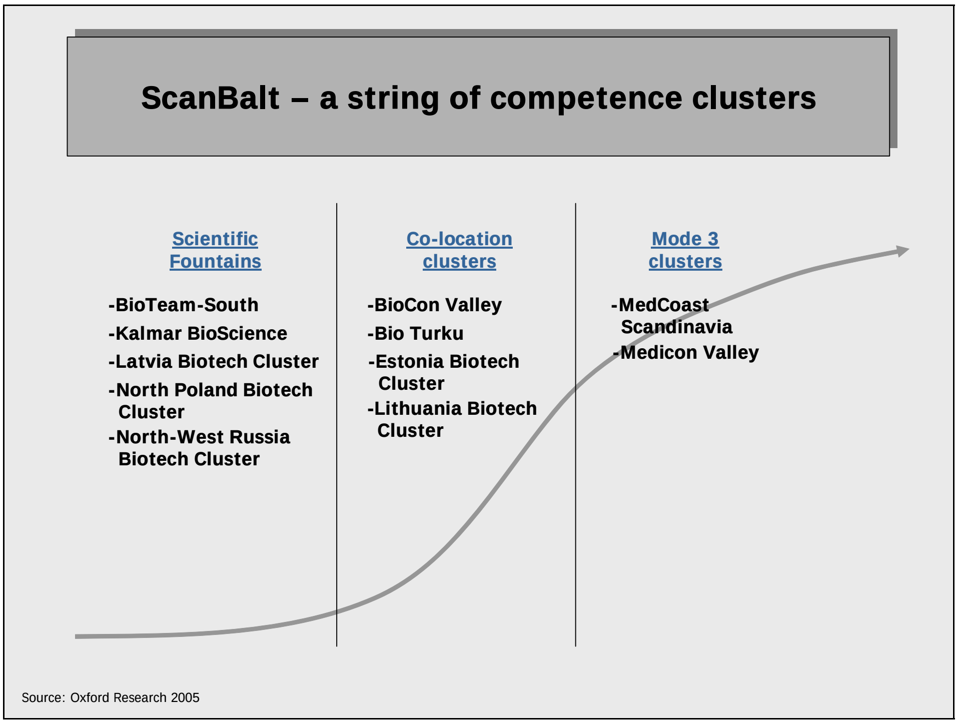

Figure 7 ScanBalt – a string of competence clusters

Five clusters are characterized as “Scientific Fountains”: BioTeam South, Kalmar BioScience, Biotech Latvia, Biotech Poland and Biotech North-west Russia. Four clusters are characterized as co-location clusters: BioCon Valley, Bio Turku, Biotech Estonia and Biotech Lithuania, while two clusters are characterized as Mode 3 clusters: MedCoast Scandinavia and Medicon Valley.

The proceeding sections take a closer look on the indicators for each of the five drivers of cluster development.

R&D input

The table below summarizes the indicators on R&D input. Due to the vulnerability of the data collected, indicators are named as intervals. Biotech funding less than 3.0 million EUR in 2004 is categorized as “low”, funding between 3.0 million EUR and 9.0 million EUR is categorized as medium while biotech funding above 9.0 million EUR in 2004 is categorized as high.

Similar a number of academic R&D experts less than 300 is labelled low, number of R&D experts between 300 and 900 as medium and clusters with more than 900 academic R&D experts as high. The same intervals are applied for number of scientific articles.

R&D input

CLUSTER	BIOTECH FUNDING (TEUR) High= >900 Medium= 300> **BF** <900 Low= <300	ACADEMIC R&D EXPERTS High= >900 Medium= 300> **AE** <900 Low= <300	SCIENTIFIC ARTICLES (no.articles) High= >900 Medium= 300> **SA** <900 Low= <300
BioCon Valley	Medium	High	Medium
BioTeamSouth	High	Low	High
Bio Turku	High	Medium	High
Biotech in Estonia	Medium	Medium	Medium
Kalmar BioScience	Medium	Medium	Low
Latvia Biotech Cluster	Low	Low	High
Biotech in Lithuania	Medium	Medium	Low
Medcoast Scandinavia	High	High	High
Medicon Valley Academy	High	High	High
Biotech in North-West Russia	Low	High	Low
Biotech in Poland	Low	High	Medium

Source: Oxford Research 2005

Figure 8 Indicators for R&D input

All R&D input indicators are high with respect to the two most mature clusters in ScanBalt, namely MedCoast Scandinavia and Medicon Valley. According to the theoretical framework elaborated in section 3.1 one should not necessarily expect a high R&D input for these clusters. However, the volume of these two clusters seems to result in high scores on most indicators.

What is even more interesting then is the fact that biotech funding is fairly high especially in BioTeam South, while the numbers of academic R&D experts are high especially in Biotech North-West Russia and Biotech Poland. Also the number of published scientific articles is pretty high, especially in BioTeam South and in Biotech Latvia.

Risk capital

The indicators on risk capital are categorized in intervals as well. With respect to Biotech venture capital investment the intervals are less than 0.5 million EUR (low), between 0.5 million EUR and 5.0 million EUR (medium) and above 5 million EUR (high). Both biotech patents and start-ups are measured in actual numbers and for both indicators the intervals are less than 5 (Low), 5 – 10 (medium) and more than 10 (high).

Risk capital

CLUSTER	BIOTECH VENTURE CAPITAL INVESTMENTS (mill.eur) High= >5 Medium= 0,5> **VC** <5,0 Low= <0,5	BIOTECH PATENTS (no.of patents) High= >10 Medium= 5> **BP** <10 Low= <5	START-UPS (no.of start-ups) High= >10 Medium= 5> **SU** <10 Low= <5
BioCon Valley	Low	High	Medium
BioTeamSouth	n.a.	High	Medium
Bio Turku	High	High	High
Biotech in Estonia	Low	Low	Medium
Kalmar BioScience	Low	High	Low
Biotech in Latvia	n.a.	Low	Low
Biotech in Lithuania	n.a.	Low	Low
Medcoast Scandinavia	High	High	High
Medicon Valley	High	High	High
Biotech in North-West Russia	n.a.	Medium	Low
Biotech in Poland	n.a.	High	Medium

Source: Oxford Research 2005

Figure 9 Indicators for risk capital

The table shows that again the two mature clusters (MedCoast Scandinavia and Medicon Valley) score high on the risk capital indicators despite that theory would predict medium scores. High scores would be expected in co-location clusters such as BioCon Valley, Bio Turku, Biotech Estonia and Biotech Lithuania.

As revealed by the table this is to some extent the fact as far as BioCon Valley and Bio Turku is concerned while Biotech Estonia and Lithuania apparently shows medium or low scores on the risk capital indicators. Taking the theoretical approach seriously the low scores on risk capital in these two clusters indicate a barrier for the development of these clusters and a hindrance to unlocking the potential R&D potential.

Risk capital in itself is not high in BioCon Valley but so are the number of biotech patents and the number of start-ups. Fairly high biotech investments and a high number of biotech patents characterize Bio Turku in this respect.

Human capital

The Human Capital indicators are divided in intervals defined as less than 50 graduates (low), 50 – 1000 graduates (medium) and more than 1.000 graduates (high).

Human capital

CLUSTER	Ph.D GRADUATES (no. of Ph.D. Graduates) High= >100 Medium= 50> **PG** <100 Low= <50	MASTER GRADUATES (no.of Master Graduates) High= >100 Medium= 50> **MG** <100 Low= <50	BACHELOR GRADUATES (no.of Bachelor Graduates) High= >100 Medium= 50> **BC** <100 Low= <50
BioCon Valley	High	High	Low
BioTeamSouth	Medium	Low	Low
Bio Turku	Medium	Low	Low
Biotech in Estonia	Low	Low	Low
Kalmar BioScience	Low	Low	Low
Latvia Biotech Cluster	Medium	Low	Low
Biotech in Lithuania	Medium	Low	Low
Medcoast Scandinavia	High	High	Low
Medicon Valley	High	High	High
Biotech in North-West Russia	Low	Medium	High
Poland Biotech Cluster	Medium	Medium	Medium

Source: Oxford Research 2005

Figure 10 Indicators for human capital[15]

[15] The relative low number of Bachelor and Master graduates in most clusters is related to the reorganization of national academic degrees to European comparative degrees Bachelor and Master. This process is not finished in all countries yet.

According to the lifecycle approach one would expect high scores for both "Scientific Fountains" and "Co-location Clusters" but medium scores for "Mode 3" clusters.

As revealed in the table both the "Mode 3" clusters score high on indicators of human capital, the number of bachelor graduates in Medcoast Scandinavia being the only exception. Apparently the low number of bachelor graduates in Medcoast Scandinavia is due to differences in definitions and not to an actual low number of graduates. At a later stage further research will have to look into this and secure that the correct data are included.

Next to the "Mode 3" clusters it is worth noticing that the number of Ph.D. graduates in BioCon Valley is categorized as high while human capital in most of the remaining clusters are characterized as either medium or low. It indicates that there is a relatively large supply of Ph.D. graduates in this part of ScanBalt which might be utilized in other parts of the chain of clusters.

Biotech Workforce

The pool of biotech workforce is indicator by employment of major companies in the cluster and the expected growth rate. Intervals applied are less than 500 employees in private biotechnology and life sciences companies in the cluster (low), 500 – 1000 employees (medium) and more than 1000 employees (high). As far as growth rates are concerned intervals are defined as less than zero expected growth (low), 0 – 5 % annual growth in employment (medium) and more than 5 % expected growth (high).

As far as the general location indicators are concerned intervals applied are 1 (low), 2 and 3 (medium) and 4 and 5 (high).

In the case of biotech workforce one would expect indicators to be high for the "Mode 3" clusters (Medcoast and Medicon Valley) and the table shows that this is actually the case. For the other clusters one would expect indicators to be low and medium. What is striking here is that both BioCon Valley, Bio Turku, Biotech Estonia, Biotech Lithuania and Poland Biotech cluster reveals indicators of a strong biotech workforce. Further research should elaborate on the potential of a comparatively high level of biotech workforce in these clusters.

Biotech workforce

CLUSTER	EMPLOYMENT BY MAJOR PLAYERS (no. of Employees) High= >1000 Medium= 500> **E** <1000 Low= <500	MOBILITY (Growth Rate. Per cent) High= >5 Medium= 0> **M** <5 Low= <0	GENERAL LOCATION INDICATORS (Index) High= >4 Medium= 1> **GL** <4 Low= <1
BioCon Valley	High	Medium	High
BioTeamSouth	n.a.	n.a.	High
Bio Turku	High	Medium	High
Biotech in Estonia	Low	High	Medium
Kalmar BioScience	Low	Medium	Medium
Latvia Biotech Cluster	Low	Medium	Medium
Biotech in Lithuania	Medium	High	Medium
Medcoast Scandinavia	High	Medium	High
Medicon Valley	High	High	High
Biotech in North-West Russia	n.a.	n.a.	Medium
Poland Biotech Cluster	High	High	Medium

Source: Oxford Research 2005

Figure 11 Indicators for biotech workforce

Current Impact

The current impact of the clusters is measured first by number of SME's in incubators. Intervals chosen are less than 5 SME's in incubators (Low), 5 to 10 SME's in incubators (Medium) and more than 10 SME's (High).

Economic growth indicators are presented in intervals of zero growth or less (low), expected growth of 0 – 5 % (medium) and more than 5 % expected growth (high).

Intervals for R&D contracts are determined as less than 5 million EUR (low), 5 – 10 million EUR (medium) and more than 10 million EUR (high).

The current impact indicators supposedly should be high in the "Mode 3" clusters, but in fact it seems, as the expected growth in Biotechnology in Medicon Valley is lower than what one could expect. Further research might look into this but one explanation might be that the level of turn over in Biotech in Medicon Valley is already on a high level; therefore modest growth rates should be expected.

Current impact

CLUSTER	SMEs IN INCUBATORS (no. of SME's) High= >10 Medium= 5>**SME** <10 Low= <5	ECONOMIC GROWTH IN BIOTECHNOLOGY (Turnover. Per cent) High= >5 Medium= 0> **EG** <5 Low= <0	R&D CONTRACTS (mill.eur) High= >10 Medium= 5> **RC** <10 Low= <5
BioCon Valley	High	Medium	High
BioTeamSouth	High	n.a.	Medium
Bio Turku	High	High	Low
Biotech in Estonia	Medium	High	Low
Kalmar BioScience	Low	n.a.	Low
Latvia Biotech Cluster	Medium	Medium	Low
Biotech in Lithuania	Low	High	Low
Medcoast Scandinavia	High	Medium	High
Medicon Valley	High	Low	High
Biotech in North-West Russia	n.a.	n.a.	Low
Poland Biotech Cluster	High	n.a.	Medium

Source: Oxford Research 2005

Figure 12 Indicators for current impact

Very interesting to note is that the current impact actually is high in clusters such as BioCon Valley and Bioteam South as well as in Biotech Estonia and Lithuania where one would have expected medium impact at the most. Again actual cluster analysis needs to be applied before a proper understanding of the strength and capabilities for impacting business can be fully understood.

6. Summary and recommendations

The mapping of competence clusters in “ScanBalt BioRegion” is the first of its kind and it is based on desk research and was completed with first hand data by the project partners. Definitions are not always strictly comparable, data are collected from very different sources and some data for some clusters have not been available even when putting in a great deal of resources in the research.

The mapping is leading to interesting results and it forms a good and necessary platform for further work in transforming ScanBalt to an actual string of clusters. It is shown that taken together the clusters in ScanBalt matches the global front running clusters in the US. It is also indicated that local strength of one cluster can match the comparative weakness of others opening a window of opportunity for increased collaboration.

The present mapping results can be taken in several directions. First of all the results can be taken further into an actual global benchmarking. Work needs to be done in order to make the indicators relative rather than absolute, but such work can be done.

Another direction is turning the mapping indicators into both individual and regional scorecards. In order to do this more dialogue on the individual cluster level is necessary, both for creating local commitment and ownership to the scorecard and second to tailor the scorecards to the needs of the individual clusters.

For taking the mapping further into both international benchmarking and scorecards it is necessary perform actual cluster analysis based on interviews and data collection in the field. That will be necessary to achieve an in-debt understanding of the actual drivers and enablers of the clusters.

The benefits from investing a more analytical resources are many. ScanBalt posses the potential to be a *Pan-European* role model for cluster development in this extremely important field of Biotech and life science. It will however be essential that all regions in ScanBalt BioRegion will be highlighted in further studies to give a complete picture of its potentials and opportunities.

The “ScanBalt CompetenceRegion Mapping Report 2006” is a valuable instrument for future steps in ScanBalt. It gives a first overview about the bio-clusters and presents a state-of-the-art by showing hard as well as soft data. The mapping will serve as a basis for a competence and cluster analysis where a deeper insight into the clusters will show the potential of innovation of one bioregion. Furthermore the linkage between the clusters and their collaboration in research and development will give an overall picture, how ScanBalt is composed and how the collaboration within the meta-region looks like. Together with the vision and mission the data collection, the cluster analysis and the scorecard will contribute to a strategy for ScanBalt which will be the basic instrument for ScanBalt in the upcoming years.

7. Annexes

7.1. List of figures

7.2. List of tables

7.3. Members of "ScanBalt CompetenceRegion" Expert Council

The Expert Council convened three times to discuss the mapping framework and its results. The sessions were chaired by Bo Samuelsson, Professor at Göteborg University and Chairman of ScanBalt fmba.

- Helle Bechgaard,
  Managing Director, Bechgaard Consult ApS, Hellerup, Denmark

- Per Belfrage,
  Chairman of the Board of Medicon Valley Academy and Professor at the University of Lund, Faculty of Medicine, Lund, Sweden

- Stanislaw Bielecki,
  Director of the Institute of Technical Biochemistry, Dean of the Faculty of Food Chemistry and Biotechnology, Technical University of Lodz, Lodz, Poland

- Elmar Grens,
  Professor at the University of Latvia, Faculty of Biology, Riga, Latvia

- Veikko Koivisto,
  Managing Director, Lilly Research Laboratories, Hamburg, Germany

- Daumantas Matulis,
  Scientist, Institute of Biotechnology, Vilnius, Lithuania

- Jaanus Pikani,
  Chairman of the Estonian Genome Foundation, Vice Chairman of ScanBalt, Estonian Biotechnology Association, Tallinn, Estonia

- Kjetil Storvik,
  Managing Director, Nordic Innovation Centre, Oslo, Norway

- Nikolai R. Toivonen,
  Professor, Head Department of Project Management, St. Petersburg State University, St. Petersburg

This report was created within the project „ScanBalt CompetenceRegion", funded by the European Commission under the 6th Framework Programme (LSHM-CT-2004-503-406).

ScanBalt – The CompetenceRegion Mapping Report 2006
Publisher: BioConValley GmbH & ScanBalt fmba
Front Cover Illustrations: Progress 4 GbR

http://www.scanbalt.org

Contact:
BioCon Valley GmbH
Walther-Rathenau-Str. 49a
D-17489 Greifswald
Phone: +49-3834-515-0
E-mail: info@bcv.org
http://www.bcv.org