HEALTH AND LIFE SCIENCES
ScanBalt BioRegion

ScanBalt BORDERLESS BIOTECH HealthPort

The Health Economy in the Baltic Sea Region

Challenges and Opportunities

Market-Analysis in the scope of the project ScanBalt HealthPort

NORD/LB

SCANBALT HEALTH REGION

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Management Summary

The Baltic Sea Region on the way to becoming a "Baltic Sea Health Region"

EU strategy for the Baltic Sea Region

The EU strategy for the Baltic Sea Region agreed at the 2009 EU summit declared the area the first "macro-region" of Europe, and was a comprehensive document that brought together cross-border opportunities and challenges, defined joint objectives and areas of action and formulated recommendations and specific measures. The overarching goal of the strategy is to further develop the entire Baltic Sea area as an ecologically sustainable, prosperous, appealing and stable region. The healthcare sector is an essential element of this aim. Flagship projects comprising the whole Baltic Sea Region that have already been launched include projects for the sustainable development of pharmaceuticals, for the prevention of alcohol and substance abuse, for the expansion of healthcare, for the establishment of eHealth and telemedicine technologies and for an innovative "Baltic Sea Health Region". This would establish the health sector not only as a cost generating healthcare system, but as an interdisciplinary sector registering above-average growth and offering great potential opportunities.

Model projects in the healthcare sector

Prevailing economic, social and geographic conditions

Demographic shift

Demographic shift is a major engine of the healthcare sector throughout the Baltic Sea Region. While the populations of the Nordic countries are continuing to increase, Germany, Poland and the Baltic States are confronted by declining populations. The Baltic State populations are also becoming more and more elderly. Consequently the demand for medical supplies and services is growing at an above-average rate, particularly in the areas of nursing, geriatric and psychosocial care, palliative medicine, preventative medicine, rehabilitation, sport, wellness, health and Ambient Assisted Living (AAL).

High economic growth in the Baltic Sea Region

The Baltic Sea Region is increasingly establishing itself as Europe's economic growth engine. In 2011, the highest rates of economic growth in Europe were recorded in Estonia (7.5%), Lithuania (5.8%), Latvia (5.0%), Sweden and Poland (4.3% each), Germany (3.0%) and Finland (2.7%). Germany and Finland are proving to be particularly strong on technology. The Nordic countries are successfully positioning themselves as "model knowledge-based economies" (high importance of knowledge-intensive services, pronounced accent on research, high spending on education and research, strong focus on a culture of learning, high density of patents). For some years now, Poland has been noted for its stable economic upswing. In the wake of extensive structural reforms and modernisation, the Baltic States are once again signalling very positive growth potential. In the medium and longer term, the Baltic Sea Region is among the most dynamic healthcare markets in Europe. In tandem with this, healthcare spending in Poland and the Baltic States is growing at a disproportionately high rate and is fast approaching the average for Europe. However, the major challenge confronting the whole of the Baltic Sea Region is the high level of unemployment, particularly youth unemployment, which represents a risk for the further development of healthcare systems and the sector in general.

A North European knowledge-based economy

The process of catching up taking place in Poland and the Baltic States

Strong geographic and social polarisation

Strong geographic and social polarisation is presenting the Baltic States and their healthcare provision in particular, with major challenges. Especially in peripheral rural areas, it is extremely difficult to ensure comprehensive high quality healthcare everywhere, and here, there is a need for new organisational and technological concepts.

Major differences in health status and common challenges confronting the health sector

Disparity in life expectancy, satisfaction with health status and mortality

In spite of the processes of catching up taking place in Poland and the Baltic states, there remains a great disparity between the various countries of the Baltic Sea Region

in terms of health status and life expectancy. In the Eastern Baltic Sea Region, life expectancy and satisfaction with state of health continues to be lower, with mortality above-average.

Diabetes, dementia and cancer: challenges of the future

Some infectious diseases (e.g. whooping cough, hepatitis) and lifestyle and age-related illnesses such as diabetes, dementia and cancer are present in the Baltic Sea Region to an above-average degree, and they constitute some of the major challenges to research and healthcare provision in the region. Unhealthy lifestyles, tobacco and alcohol consumption and lack of exercise are among the main risk factors. However, at the same time, because the populations of the Baltic Sea Region are relatively active and sporty, there is also great development potential here.

Restructuring of healthcare provision and convergence of healthcare systems

Diminishing differences in healthcare systems

Cost reduction and in-creased efficiency in Germany

Marked rise in demand in Poland, the Baltic States and the Nordic countries

The discrepancies between the tax-financed healthcare systems of Northern Europe and Latvia and those financed by social security contributions in Germany, Poland and Estonia are gradually diminishing. Combination finance is growing in importance. In the Baltic States and Poland, the sums payable by private households are relatively high (particularly in Latvia), and in many countries, private hospital and healthcare insurances are becoming increasingly important. In countries with comparatively high healthcare spending, such as Germany, the health sector agenda for the coming years will be dominated by cost reductions and increased efficiency (reduction of over-capacities, increasing privatisation, concentration and specialisation). Conversely, in countries which spend comparatively less on healthcare, such as Poland, the Baltic States, Finland and in some respects, Sweden, a marked rise in the demand for healthcare services and supplies is anticipated. Tax-financed healthcare systems such as those of Northern Europe are faced by the challenge of remedying existing gaps in healthcare provision and resolving the issue of long waiting lists.

Healthcare provision: funded by national taxes or privately

Healthcare in the Baltic Sea Region continues to be very differently organised. In Northern Europe, the Baltic States and Poland, healthcare centres and polyclinics offering outpatient treatment play an important part. As in the past, state and communal facilities continue to dominate in-patient care in Northern Europe, while in Poland and the Baltic States, private insurances are becoming increasingly important in the hospital sector (in particular, where new hospital building and modernisation are concerned).

The processes of privatisation and concentration are clearly evident in Germany. There remain major differences within the Baltic Sea Region in terms of the introduction and approval of drugs and the licensing of biotechnology research facilities.

Strong growth in the healthcare sector: rising employment and demand for more skilled staff

Dynamic growth of employment

Every segment of the health sector across the Baltic Sea Region is currently on course for growth. For several years, the growth of employment in the health sector has been markedly more dynamic in the entire Baltic Sea Region than that of employment overall (except in Sweden). In the context of the economic and financial crisis, the health sector has proved to be an important stabilizing factor for regional and national economic development. The demand for health sector employees is anticipated to continue growing significantly.

Close network of universities

The Baltic Sea Region also has an extraordinarily close network of universities, which, along with educating students in medicine, biotechnology, pharmacology and medical technology, are also increasingly offering courses in health economics, public health, care management and health tourism. A strong "academisation" of the nursing care and treatment professions has been identified in the countries of Northern Europe, which are also focusing more strongly on preventive healthcare, psychosocial healthcare, movement and sport.

North European "academisation"

In future, the lack of skilled staff across the whole of the Baltic Sea Region could be jointly overcome by developing pan-Baltic quality and qualification standards and agreements on gaining and retaining skilled staff.

The Baltic Sea Region as a dynamic growth market for medical technology

Catch-up need in Poland and the Baltic States

Modernisation and expansion plans in the hospital sector

The Baltic Sea Region is a dynamic growth market for medical technology. Poland and the Baltic States in particular, have a great need to catch up in the area of technical medical equipment (and the more stringent technical and hygiene standards of the EU). However, the demand for efficient and high-grade technical medical equipment (such as surgical installations, diagnostic apparatus, monitoring systems and tele-medicine) in Northern and western parts of the Baltic Sea Region is also on a continuous upward trend. There are large-scale modernisation and expansion plans in the pipeline in the hospital sector across the entire Baltic Sea Region. A decisive role is played by EU development funding in Poland and the Baltic States.

Contemporary forms of medical treatment

There are still differences across the Baltic Sea Region in terms of the frequency and quality of forms of the available medical treatment. An increase in cross-border patient streams is anticipated. Specialisation, cooperation and common quality standards are needed throughout the Baltic Sea Region.

(University) hospitals as central hubs of the Baltic Sea Region health sector

Circa 50 university hospitals

…in the major towns and cities

…as well as in the peripheral regions

Hospitals, in particular university hospitals, are the central hubs of the Baltic Sea Region health sector. They are the most important medical training and R&D bases of the region. They offer a wide-ranging spectrum of medical services, have the necessary critical size for medical specialisations and they have also established supra-regional reputations. Very often, they attract R&D institutions, out-patient facilities, healthcare service providers, Life Science companies and infrastructures relating to science and technology transfer and organisations promoting development to their immediate geographic vicinity. There are around 50 university hospitals in the Baltic Sea Region, including some of Europe's leading institutions, such as the Karolinska Institute in Stockholm and die Charité in Berlin. Even some of the rural peripheral areas, such as Northern Scandinavia and Mecklenburg Western-Pomerania boast top class hospital infrastructures.

The Baltic Sea Region: one of Europe's leading Life Science locations

Germany, Denmark and Sweden: European leaders

In Norway, Poland and the Baltic States, Life Sciences are at an early but promising stage of their development

Close network of universities

All the states bordering the Baltic now have competencies and key capabilities in the area of Life Science: Germany, Denmark and Sweden in red (medical) biotechnology, Norway in blue biotechnology (application of technology on marine life) and the Baltic States and Poland in green and white (environmental) biotechnology. Denmark, Germany and Sweden, with their centres in Berlin/Brandenburg, around Öresund and Stockholm, are now global leaders in biotechnology, pharmaceuticals and medical technology. In some areas, their share of employment and sales is well above the average for the EU. In Norway, Poland and the Baltic States, the Life Science sector is at an early, but at the same time very promising, stage of development. In some areas, the public sector is making a considerable effort to promote the segment. However, the number of companies with a strong research and innovation capability is only gradually reaching critical mass. Overall, more than 60 towns and cities of the Baltic Sea Region have universities and study courses with a Life Science focus. Above-average growth can be anticipated for the future if regional university expertise in R&D can be combined with the available entrepreneurial potential across the region, and if at the same time, the R&D activities of the entire Baltic Sea Region can be linked into a network.

A high density of health sector clusters, networks and science parks

More than 75 health sector clusters

The Baltic Sea Region has a density of health sector cluster organisations, networks and science park which is so exceptionally high as to be virtually unequalled in other parts of Europe. More than 50 major Life Science institution clusters and in excess of 75 health sector science parks are spread across every country of the Baltic Sea Region. The major clusters are located in the metropolitan areas of Berlin, Hamburg, Copenhagen/Malmö, Oslo, Stockholm/Uppsala, Helsinki and Krakow.

Many clusters are at an early stage of development

Many of them, particularly in the Eastern Baltic Sea Region and in the peripheral areas of the Baltic, are still in their infancy (high number of research projects, high output volume of publications) or at an early stage of their development (high number of graduates, venture capital investment, patent applications and set-ups). Only a few clusters, such as Medicon Valley (Öresund region), MedCoast Scandinavia (Göteborg/Oslo) or Stockholm-Uppsala Life Science (high number of employees, high number of SMEs being nurtured, international companies, steeply rising sales figures) have already achieved sufficient maturity.

More than 75 health sector Science Parks

Science Parks with a health sector focus, industry-specific infrastructures, development programmes and close proximity to universities and R&D establishments now exist in all the major towns and cities of the Baltic Sea Region.

Cooperation and networking: the key to a "Baltic Sea Health Region"

Networking as an opportunity

It is clear that the Baltic Sea Region has a great many strengths and benefits from good health sector infrastructures. The sector will be able to exploit the available growth potential particularly well, if it can link these into a coherent pan-Baltic network and tailor its activities to suit the opportunities and challenges presented by the Baltic Sea Region.

Intensified Baltic regional cooperations can help to expand and invigorate the health sector markets, to assist in the mutual and joint learning process of restructuring healthcare provision, to jointly meet the challenges and to find new ways of exploiting the innovative potential and even out any structural imbalances which exist within the Baltic Sea Region.

A key role for ScanBalt

Here, active pan-Baltic networks such as ScanBalt have a major role to play. In this way, the Baltic Sea Region has the potential to become Europe's leading healthcare region.

Innovation as a driver for a knowledge based health economy

An Innovation ecosystem for health economy in the Baltic Sea Region

Innovation in health care is essential to address the challenges of an ageing society, epidemic threats, rising health care costs and growing health divide between healthy and unhealthy citizens. But health care is complex and models of care are changing. Support for innovation to develop new products and services has to be addressed in a holistic way. A focus on value creation and societal usefulness is essential for the long-term stability of health care systems. A focus on unmet health needs and user-driven innovation is a key success factor for a new thriving innovation system. A Baltic Sea Region innovation ecosystem provides a promising model implementing innovation support activities in a macro-regional context with a complex network of entities and relationships. Such an ecosystem in ideal form ensures that individuals are given optimal conditions to apply their skills and competencies while contributing to the interconnectedness and interdependency of all stakeholders. The main objective of such an ecosystem approach is to support the creation of sustainable, cost-effective, citizencentric healthcare systems promoting new jobs and businesses (Blank et. al. 2013).

1. EU strategy for the Baltic Sea Region: the healthcare sector as a major cornerstone

The Baltic Sea Region as a growth area

Over the past two decades, the extraordinarily dynamic development of the Baltic Sea Region has been virtually unequalled in any other area of Europe. The region mirrors the political, economic and social transformation which has taken place in the recent European past, and reflects both the convergence and diversity of Europe. In the past decade, the countries of the Baltic Sea Region recorded the highest growth rates in Europe. The process of economic catching up in the East European states bordering the Baltic has been clearly visible, so that now, the region has a great many strengths in the areas of innovation, cooperation and networking.

A close network of pan-Baltic institutions

What is remarkable is the clear common political will evident in the Baltic States to harmonise economic development with social progress and environmental responsibility and to intensify cooperation between individual states, regions, communes, in science, the economy and the general population. A variety of different institutions, such as the Council of the Baltic Sea States, HELCOM (Helsinki Committee), Nördliche Dimension (ND), the Union of Baltic Cities (UBC), the Baltic Development Forum (BDF), the Baltic Sea Forum (BSF), the Baltic Sea Chambers of Commerce Association (BCCA) testify to the growing pan-Baltic regional cooperation in the areas of politics, economics and business, culture, the environment, education and science.

EU strategy for the Baltic Sea Region: the Baltic Sea Region as a model for other areas

The EU is currently promoting trans-border cooperation within the Baltic Sea Region in the context of its Baltic Sea Programme 2007-2013 (INTERREG). The EU strategy for the Baltic Sea Region agreed at the 2009 EU summit declared the area the first "macro-region" of Europe and was a comprehensive document that brought together cross-border opportunities and challenges, defined joint objectives and areas of action and formulated recommendations and specific measures. In this way, the Baltic Sea Region will become the model for other areas of Europe.

EU strategy for the Baltic Sea Region: targets and modus operandi

At the heart of the EU strategy for the Baltic is the aim to bring together, coordinate and optimise the activities of the various players and institutions of the Baltic Sea Region at the various different levels. This makes for more efficient use of the existing structures, instruments of control and investment resources, since no additional funding has been allocated.

The overarching goal of the EU strategy for the Baltic is to further develop the entire **Baltic Sea Region as an ecologically sustainable, prosperous, accessible, attractive and safe area**.

Pioneering elements of this are 15 key aspects being dealt with by means of various campaigns, some of which are of strategic importance for the entire Baltic Sea Region and which are aimed at overcoming specific problems affecting the area as a whole (such as environmental pollution, lack of accessibility, health problems prevalent in the population).

Other campaigns have more of a cooperative nature, since they are aimed at establishing networks (as, for example, in the healthcare sector) in the region for the purposes of improved use of the existing advantages and exploitation of the available potential offered by the Baltic Sea Region. These campaigns are supported by flagship projects which are currently in the pipeline or which have already been launched).

Key areas and model projects relevant to the healthcare sector

Key area	Model project
Reduction of the use and impact of hazardous materials	- Making the Baltic one of the leading regions for **sustainable drug development**
Use of the entire R&D innovation potential offered by the region	- Interdisciplinary reference projects aimed at innovations in healthcare and bio-sciences **("Baltic Sea Health Region")** - **"Baltic Science Link"** (pan-Baltic linking of scientific infrastructures)
Promotion of sustainable agriculture, forestry and fisheries	- Promotion of **animal health** and fight against **animal diseases**
Maintaining and expanding the attractiveness of the Baltic region (incl. as a location for education, youth, tourism, culture, health)	- Prevention of **alcohol and drug misuse** in young people - Improvement of **public health** by promotion of a fair distribution of high-quality **primary healthcare provision** - ICT for healthcare purposes – strengthening **eHealth technology** capacities in the light of an ageing population - "PrimCare IT" – **Countering the brain drain** and the professional isolation of skilled healthcare staff by **tele-care and treatment**

Source: European Commission 2012. – Selected and edited by NORD/LB

2. Establishment of a "Baltic Sea Health Region"

A sector of the future: the healthcare industry

For some years, there has been a distinct change in our understanding of the significance and future importance of the healthcare industry. The healthcare sector is no longer synonymous with the high and steeply rising cost of healthcare provision, but is regarded at both national and international levels as a sector of the future with the potential to offer above-average employment and sales growth opportunities (Henke et al. 2010, 2011; NORD/LB 2011, p.4; Goldschmidt & Hilbert 2009; Forecast & IKB 2007, Nefiodow 2011).

There are three main reasons for this:

- **Demographic shift.** The proportion of older people in the population and consequently, the demand for new medical services and products is rising. Above all, preventive medicine, rehabilitation, healthy ageing, geriatrics and nursing are areas of growing importance.
- **Healthcare innovations.** Innovations in biotechnology, pharmacology, medical technology, treatments and organisational forms are helping to expand the health market.
- **Rising health awareness.** The health awareness of the population is rising. The amount of money spent on healthy lifestyles, healthy nutrition, wellbeing and preventive measures is on the increase.

Health as a factor of regional economic stabilisation

The crisis-ridden economic development of past years shows that on the whole, the healthcare industry – predominantly financed by social security contributions and taxes – is not contingent on the economic climate, so that in recent times, it has been an important **stabilising** factor for a number of regions.

However, the healthcare sector of the Baltic Sea Region remains extremely heterogeneous in structure, since in recent decades, national healthcare and innovation systems have pursued **different development paths**. The Baltic States are distinctly different from the state-organised national healthcare systems and regulatory frameworks, mainly with respect to their standards of technology and areas such as education, R&D and innovation.

The Baltic as a "macro-regional innovation system"

Any understanding of a potential "Baltic Sea Health Region" must be based on regional economic approaches to national and regional innovation systems. Here, the spotlight is on networks of state, economic, scientific and educational institutions in the Baltic Sea Region engaged in mutual endeavours to initiate, promote and disseminate innovations in the healthcare sector. **In this respect, it is worth noting that the innovatory activities are embedded in the socio-economic and cultural framework conditions specific to individual states and regions**. Included here are the regional innovation cultures and policies, planning and administrative systems as well as the prevailing demographic, economic, financial, political and geographic conditions.

3. Prevailing economic, social and geographic conditions in the Baltic Sea Region

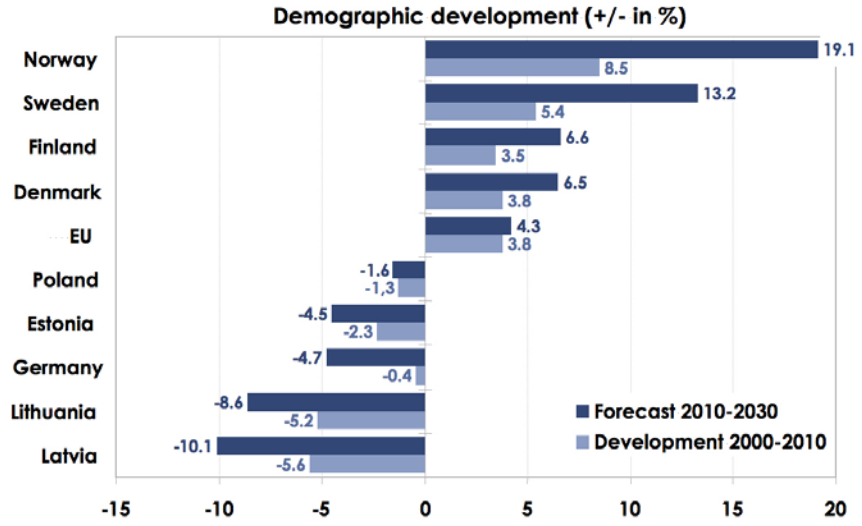
3.1 Demographic shift as the engine of the healthcare sector

North and West growing - South and East in decline

Over the past decade, the populations in the Baltic Sea Region have developed very differently. While the populations of Denmark, Norway, Sweden and Finland have increased steeply in some cases, they have declined in the Baltic States, Poland and Germany. In the Baltic States of Latvia (down 10.1%) and Lithuania (down 8.6%) in particular, demographic development has been negative.

Forecasts predict that the duality in demographic development in the Baltic Sea Region is likely to continue, with the populations in the Nordic countries continuing to grow steeply in the period from 2010 to 2030, and those of Germany, Poland and the Baltic States anticipated to decline significantly.

Norway and Sweden up - Latvia and Lithuania down



Source: EUROSTAT. – Calculations and design NORD/LB

Higher birth rates in the Nordic welfare states

Changing population numbers in individual countries can be explained, in particular, by disparate birth rates and immigrant influx. In 2010, per capita birth rates were significantly above the EU average in Sweden (1.98), Norway (1.95), Finland and Denmark (both 1.87) and also above those for Latvia (1.17), Poland (1.38) and Germany (1.39). Studies confirm the positive link between the high birth rates of the Nordic countries and the strong integration of women in the labour market, and the quality and quantity of education and care facilities (Rauh 2007; Meier 2005; Neyer 2006).

High rates of emigration of young people from the Baltic States and Poland …

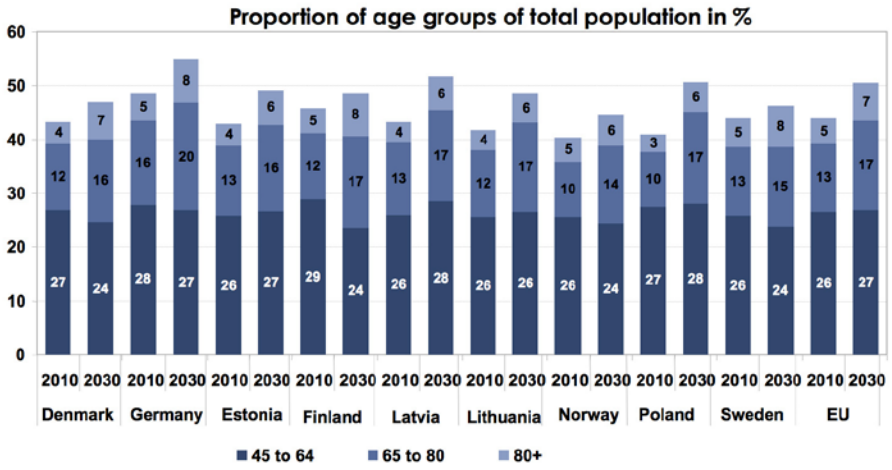
The negative effect of the demographic decline resulting from dwindling birth rates in the Eastern Baltic sea countries is further heightened by younger people emigrating. In 2010, 77,900 people emigrated from Lithuania, 26,000 from Poland, and 4,700 and 2,500 from Latvia and Estonia respectively. In the 20-34 year age group alone (young, mobile, highly qualified individuals), the number of emigrants leaving Poland, Lithuania and Latvia came to 16,100, 7,100 and 2,000 respectively (Eurostat 2011).

…are accelerating the brain drain

As a result, there is a very evident **"brain drain"**, which is likely to lead in the longer term to a loss of innovative capability and a lack of skilled employees in a series of different areas of the health sector.

Germany and Finland: particularly geriatric populations

Increased life expectancy, relatively low birth rates and in some areas, the emigration of younger people means that the populations in all the Baltic Sea Region countries are becoming increasingly geriatric. While in 2010, 17.4% of the population were aged 65+, at 20.6% and 18.1%, the number of older people in Germany and Sweden was markedly above this. By 2030m the proportion of people in this age group will have significantly risen across the whole of the Baltic Sea Region, and in Germany and Finland, it will reach a particularly high level (28.1% and 25.0% respectively).



Source: EUROSTAT. – Calculations and design NORD/LB

New growth areas in the healthcare sector

With an ageing society, the number of patients suffering from chronic and irreversible diseases in particular, is on the increase, and this is equally true of those suffering from multiple conditions (multiple morbidity) and those in need of nursing care. The overall demand for medical products and supplies is rising, mainly in the areas of nursing care, geriatrics, psychosocial care, palliative medicine, preventive medicine, rehabilitation, sport, wellness and healthy nutrition. The importance of home, leisure and care environments which are pensioner-friendly, barrier free and secure is growing, as are telemedicine concepts and technologies for ambient assisted living.

The common challenge: ageing and the supply of skilled staff

Despite differing degrees of impact, in future, every country in the Baltic Sea Region will certainly have to confront demographic shift. There is a common challenge in two areas in particular, which demand joint cooperation and solution approaches:

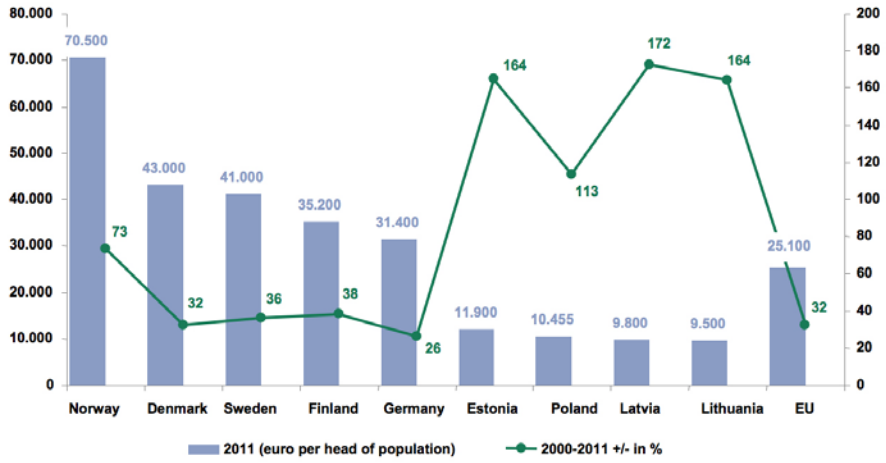
- **Ageing:** in tandem with increasing numbers of older people, the demand for new treatment and care concepts is also rising in every area of the Baltic Sea Region. Common learning curves and the development of products and services will make it possible to develop new macro-regional growth markets.
- **Supply of skilled staff.** The fact of ageing populations and declining demographics is associated with a fall in available staff capacities and at the same time a rise in the demand for skilled staff in the healthcare sector. Common concepts and agreements on the training, recruitment and retention of skilled staff are needed in order to ensure the high quality of medical care in the longer term across every area of the Baltic Sea Region.

3.2 Significant economic growth of the Baltic Sea Region over the past decade – differences in the impact of the economic and financial crisis

The Baltic Sea Region as an engine of economic growth for Europe; evidence of catch-up processes

The Baltic Sea Region has been an engine of economic growth in Europe over the past decade. In the period 2000 to 2011, per capita GDP grew at a significantly faster rate in the Nordic and Baltic States than the average for the EU. In Poland, Estonia, Latvia and Lithuania, in particular, there is evidence of catch-up processes (Hanell 2009). Yet

the disparity in economic performance within the Baltic Sea Region is only gradually diminishing, and there remains a wealth gap between the various states. While the per capita GDP in Norway stood at EUR 70,500 in 2011, Lithuania only achieved a factor of EUR 9,500 in the same year.



Source: EUROSTAT. – Calculation and design NORD/LB

Economic and financial crisis: strong impact on the Baltic States and Finland

In recent years, the Baltic Sea Region has also been affected by the global financial and currency crises. Virtually every country recorded a marked economic downturn in 2009. The economies of Finland (-7.8%), Estonia (-14.1%), Latvia (-18%) and Lithuania (-15%) were particularly badly hit. The reasons for the steep downturn are attributable in the main to the previous mainly speculative commitment of foreign financial institutions and the subsequent growth, which was predominantly generated by credit finance (SEB 2012). The negative economic effects were less extreme in Germany (-4.7%), Denmark and Sweden (-4.9%), while Norway and Poland were affected by a relatively short period of economic decline which only began in 2010.

Stable economies of Germany and Northern Europe

By 2011 at the latest, GDP in every country of the Baltic Sea Region had risen to above its pre-crisis level (2007). Germany, in particular (GDP growth for 2010: 3.7%, 2011: 3.0%), Sweden (5.3%, 4.3%) and Finland (3.6%, 2.7%) recorded strong economic growth. These highly technology and export-led macro-economies were able to benefit from renewed global demand which had risen since 2010. Even in the face of the current euro crisis and despite the recession in many Western and South European countries, economic development in these countries has remained relatively stable. Beyond this, these states also have more favourable budget positions.

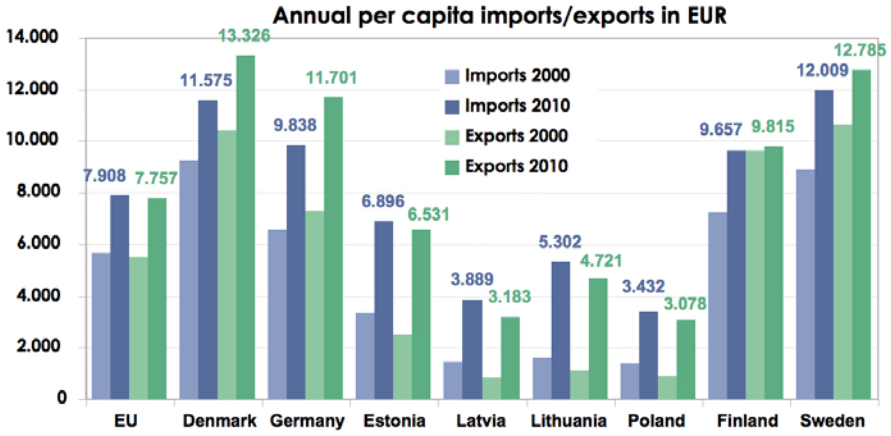
Positive development in Poland

Over the past years, Poland has enjoyed particularly positive development. Economic performance in 2011 was around 27.3% above its level pre-crisis (2007), and in 2010, economic growth stood at 3.9%, rising to 4.3% in 2011. Notwithstanding the relatively high level of unemployment, the domestic economy has also recorded sound growth in recent times, with positive momentum coming, in particular, from investment by the public sector (e.g. in infrastructural projects relating to the 2012 European Football Championships) (SEB 2012).

Recovery on-going in the Baltic Sea Region

Economic recovery is taking longer in the Baltic States. However, extensive restructuring of economic configurations and draconian cost cutting measures have created more favourable conditions for future economic growth. By far the highest economic growth rates in Europe were recorded in 2011 by Estonia (7.5%), Latvia (5.0%) and Lithuania (5.8%), a fact accounted for mainly by the strong growth of exports. In the first two quarters of 2012, the Baltic States also registered GDP growth in a range of 0.3% to 1.0% per quarter (SEB 2012, EUROSTAT 2012).

West and North strong on exports



Source: EUROSTAT. – Calculations and design NORD/LB

Marked catch-up processes evident in Poland and the Baltic Sea Region…

In past years, exports have developed particularly well in the Baltic Sea Region compared with the EU in general. Denmark, Sweden, Germany and Finland are among Europe's top exporters, with annual per capita exports amounting to between EUR 9,800 and EUR 13,300, which is significantly above the average of EUR 7,800 for the EU. In the Baltic States and Poland, exports are on a marked upward trend.

In the period 2000 to 2010, exports increased in Estonia by 154%, in Poland by 242%, in Latvia by 254% and in Lithuania by 308%, while imports rose by between 100% and 211%.

… but there are still inequalities

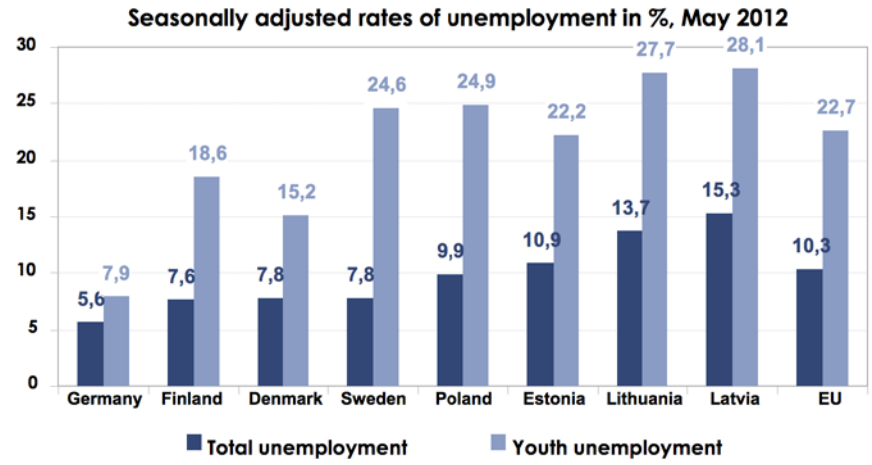
The inequalities in export trade in the Baltic Sea Region continue. In Germany and Denmark, export surpluses have increased in recent years, while in Finland and Sweden, they have diminished. The Baltic States and Poland are continuing to record export deficits.

Major differences in employment rates

The number of employed in the Baltic Sea Region rose significantly in the period between 2000 and 2010. There was a marked upward trend, in particular, in Norway (+10.9%), Poland (+9.9%), Sweden (+7.2%) and Germany (+6.2%), however, in the Baltic States, employment was down slightly. Here, the demographics played a major role in the decline of available employees (including a negative emigration balance).

The employment rate continues to vary greatly within the Baltic Sea Region. While Lithuania (57.8%), Poland and Latvia (59.3% each), and Estonia (61.0%) recorded rates clearly below the EU average of 64.2%, Norway (75.3%), Sweden (72.7%) and Denmark (73.4%) registered the highest rates of employment in Europe, with Germany and Finland coming somewhere in the middle (71.1% and 68.1% respectively) (EUROSTAT 2012).

Unemployment above the average for the EU in the Baltic Sea Region



Source: EUROSTAT. – Calculations and design NORD/LB

Low rates of unemployment in the West and North – high rates in the East

Rising rates of unemployment

There are clear significant links between unemployment, health status and attitudes to health (Mohr & Richter 2008; Paul et al. 2006). In particular, long term unemployment has negative consequences for mental health, and there are some signs of disadvantage in terms of health system and preventive medicine uptake, healthy eating and exercising habits.

In the past years, unemployment has become an increasing problem in the Baltic Sea Region. In the period 2000 to 2010, the rate of unemployment rose markedly in most countries in the region: by 5.0 percentage points in Latvia, 3.3 percentage points in Estonia, 3.1 percentage points in Denmark and 2.8 percentage points in Sweden. Only in Poland and Finland did the rate of unemployment drop down considerably (-6.5 and 1.4 percentage points respectively) (EUROSTAT).

2012: no reduction of unemployment anticipated

The situation on the job markets of the Baltic Sea Region is currently improving slightly. In the past twelve months, the rate of unemployment dropped down significantly in the Baltic States, and slightly in Germany and Finland. However, in the meanwhile, Germany is showing distinct signs of an end to the reduction of unemployment. In the Baltic Sea Region of Mecklenburg-Western Pomerania, unemployment continues to be relatively high (11.0%), while in Denmark, Sweden and Poland the rate of unemployment has risen slightly in the past year.

Escalating problem of youth unemployment

Youth employment is currently a major problem in the Baltic Sea Region. In particular, in Sweden (24.6%), Poland (24.9%), Lithuania (27.2%) and Latvia (28.1%) there is above-average unemployment in the under 25 age group. However, the situation is comparatively positive in Germany (7.9%).

Conclusion: growing markets, but continuing wide social discrepancies

Over the past decade, in a European context, the Baltic Sea Region economies have developed very positively. In many cases, economic growth in the countries bordering the Baltic is above average, so that the sometimes dramatic impact of the 2008/9 economic and financial crisis had been offset by 2011 at the latest. Certainly, the lively export trade in the Baltic Sea Region contributed to the dynamic development of the region. At the same time, many of the economic structural problems of Poland and the entire Baltic area were successfully resolved. The countries of Northern Europe and Germany, and particularly, Poland, which is enjoying very positive growth, are strong on export and innovation, so that consequently, they are enjoying comparatively stable development.

Rising unemployment and especially, youth unemployment poses an increasing risk for the socio-economic development of the Baltic Sea Region. There are clearly evident links between unemployment, health status and attitudes to health.

3.3 The Baltic Sea Region on the way to becoming a knowledge-based economy

Structural change on the way to a knowledge-based economy

In the aftermath of the social and economic transformation taking place since 1989/1990, particularly in the Baltic States and Poland, the Baltic Sea Region – like virtually all European regions – is currently undergoing a period of structural change on the way to a strongly knowledge-based economy (Szydarowski 2009).

Knowledge intensive business sectors are growing faster than those which are not knowledge-led. Again, the level of formal qualifications of employees and the qualifications demanded by employers is also growing. In many cases, expenditure on R&D is on the increase. The importance of networking business and scientific knowledge is increasingly recognised and promoted.

Centrally-resourced knowledge is developing into a decisive factor for location and for the competitive advantage of a region. In the context of today's globalised and technocratic world, the achievement of a scientific and innovative advantage plays a critical role. For this, continuous, open, interactive learning processes, along with new forms of organisation and cooperation are needed at every level of the value creation chain.

And it is not just a matter of tapping into comparatively simply obtainable codified knowledge by use of contemporary information and communication technologies. Indeed, it is the knowledge acquired from **experience and learning processes** and from people and subsequently from direct face-to-face contact which is coming into its own in this context (NORD/LB 2012; Kujath & Zilmer 2010, Brandt 2011).

Interplay of inter and intra-regional knowledge creators, transmitters and users

From a regional economic perspective, the conclusion to be drawn is that expansion, activation and use of regional-specific funds of knowledge are more important than ever before. The best possibly interplay of

- **Knowledge creators** (universities, R&D facilities, company research departments),
- **Knowledge transmitters** (training establishments, knowledge and technology transfer installations, foundations, networks, chambers of commerce, associations, etc.)
- and **knowledge users** (manufacturing companies, consultants, financial service providers, etc.)

is the essential key for future national and regional economic development (Fürst 2011, p.66f). At the same times, this necessitates strategies to attract and retain the increasingly mobile skilled employees who generally prefer to work in the major urban centres of a country to the healthcare sector.

Knowledge-economy indicators

	Rate of employment in %			R&D staff (per1,000 head of population)		State expenditure on R&D (share of GDP in %)		Per capita R&D expenditure	Patents per million head of population
	State-of-the-art/Hi-technology	Science-led services	Scientific/ technical degree						
	2010	2010	2010	2001	2009	2000	2010	2010	2010
EU 27	5.6	38.5	27.5	6	7.3	1.61	1.49	490	109
Denmark	5.3	49.7	30.8	11.2	14.8	1.42	1.68	1302	242
Germany	9.9	40.0	26.5	7.8	9.4	1.76	1.94	853	266
Estonia	3.5	35.3	35.3	5.0	7.4	0.92	1.77	173	39
Finland	5.7	42.2	36.5	13.5	14.9	2.02	2.07	1303	218
Latvia	1.4	34.3	27.8	3.6	4.0	0.49	0.36	48	11
Lithuania	1.9	33.9	35.5	4.3	5.5	0.75	0.42	65	6
Poland	4.6	30.4	25.3	3.2	3.2	0.93	0.92	68	8
Norway	3.5	50.9	35.6	10.7	13.4	1.27	1.69	1099	84
Sweden	4.7	50.7	32.3	12.4	12.4	1.54	1.88	1270	307

Source: EUROSTAT 2012. – Calculations and design NORD/LBLB

Nordic countries as "exemplary" knowledge economies

In the Nordic countries of Sweden, Norway, Denmark and Finland, the transition to a knowledge society or a knowledge economy is particularly advanced. From as early as the 1970s/1980s, educational and training establishments, and R&D systems were modernised and opened to the wider public. **Investment in education and research was increased for the longer term.** The proportion of GDP accounted for by national expenditure on R&D has also risen sharply over the past decades and continues to be well above the average for the EU. At between EUR 1,099 and EUR 1,302, per capita annual expenditure on R&D is also above the EU average (EU: EUR 490) (Eurostat 2012).

Corporate sector is particularly active in R&D

It is not only the universities and state research facilities which are encouraging this dynamic development. Denmark (68.1%), Sweden (68.7%) and Finland (69.6%) are distinguished by **a corporate sector which is responsible for the highest share of total R&D expenditure** in Europe (EU: 61.5%) (EUROSTAT 2012).

High proportion of employed in the knowledge-intensive service sector

Employment in knowledge-intensive sectors is extraordinarily high in the Nordic countries. In the main, high rates of employment in knowledge-based service industries (> 50% in Norway and Sweden) contribute to this (EUROSTAT 2012). At the same time, the number of staff employed in R&D per head of population with a science or technical degree is markedly above the average in Northern Europe.

North European culture of learning, cooperation and innovation

The successful development of knowledge-based economies in the Nordic countries is embedded in a culture of learning, cooperation and innovation which is specific to Northern Europe.

Typical features of the Nordic culture of learning, cooperation and innovation:

- **Basic egalitarian set-up**: e.g. horizontal hierarchies, equal opportunities, striving for consensus, inclusion of as many ethnic groups and social classes as possible in the education and research processes
- **Learning** is fundamentally understood as a social process: a high value is placed on social competence and correspondingly structured learning spaces: accent on work-life balance; strong sense of social responsibility on the part of companies
- Strong international openness and orientation
- High level of openness on the part of the population to **new technologies: optimistic attitudes towards the future**
- The highest density of **research facilities, Science Parks and development hotbeds** in Europe (prominent examples: Kista Science City in Stockholm or Otaniemi Technology Hub near Helsinki)

Source: Schrödl 2007a,b, 2011

This means that the prevailing cultural, institutional, economic and infrastructural conditions in the Nordic countries are particularly advantageous to the further development for a knowledge-intensive health sector.

Germany: strong on technology

In recent years, Germany has consolidated its position as the **leading state-of-the-art/high technology location in Europe**. At 9.9%, the proportion of employees in this sector was markedly above the average for the EU and the Baltic Sea Region in 2010, and the high density of patents underpins this strength.

Less well placed are the knowledge-intensive services, and the number of inhabitants with a science or technical degree, the number of staff employed in R&D activities and the per capita expenditure on R&D continue to fall below their level in the Nordic countries. Conversely, state expenditure on R&D pro rata of GDP has risen significantly in the past decade.

Estonia on the way up

In recent years, Estonia has been able to clearly sharpen its profile as an **innovation-led country**. The proportion of knowledge and technology-intensive sectors has grown significantly, and is approaching the average for the EU. The level of qualification of employees is comparatively high. The number of those employed in R&D and national expenditure on R&D (pro rata of GDP) has rocketed last year to currently exceed the average for the EU. This signifies that Estonia is approaching the level of the Nordic knowledge economies at a faster rate than its Baltic neighbours and Poland.

Weaker development in Poland, Lithuania and Latvia

Poland, Lithuania and Latvia are currently continuing to lag behind in the readjustment of their innovation systems. The proportion of staff working in R&D and national expenditure on R&D and per capita R&D expenditure are well below the average for the EU and in some cases, they are even in decline. The proportion of companies active in R&D and innovation is relatively low. Although these countries are popular for production, they remain **comparatively weak in terms of innovation locations**.

Negligible innovative strength of companies

R&D costs are seldom borne by the corporate sector (Poland: 26.6%; Lithuania: 29.2%; Latvia 37.1%), but by national R&D facilities in Poland (35.6%) and by the universities in Latvia and Lithuania, (40.0% and 53.3%) (EUROSTAT 2012).

Compared with the Nordic countries and Estonia, the prevailing conditions are not yet at their optimum for the further development of a knowledge and technology-based economy.

Baltic Sea Region is particularly technology-friendly

Overall, the Baltic Sea Region is among the most **technology-intensive and techno-friendly areas in Europe**. This applies, in particular, to the Nordic countries and Estonia. For instance, 70% to 90% of all households here already have an internet connection (EU: 64%), of which 90% have broadband (EUROSTAT). The proportion of the population with the conviction that science and technology can make our lives healthier, easier and more comfortable is also disproportionately high in these countries. Scepticism towards science and technology is well below average (European Commission, 2010a).

Less optimistic, where science and technology are concerned, are the populations of Germany, Poland, Lithuania and Latvia.

3.4 Strong geographic and social polarisation as a risk factor

Low population density is the common challenge to health service provision

The Baltic Sea Region is among Europe's particularly thinly populated areas. Only Germany (229 inhabitants/km^2), Denmark (129 inhabitants/km^2) and Poland (122 inhabitants /km^2) have populations which are above the EU average (117 inhabitants/km^2). The Baltic States are sparsely populated (between 31 and 52 inhabitants/km^2), Sweden (23 inhabitants/km^2), Finland (18 inhabitants/km^2) and Norway (16 inhabitants/km^2). In, particular, large areas of Northern Sweden, North Norway and Northern Finland have a population density of fewer than 5 inhabitants/km^2.

Comprehensive and high quality health service provision is consequently difficult in large areas of the Baltic Sea Region. The problems include

- The low number of patients and clients in medical establishment catchment areas,
- The lack of the critical mass needed for comprehensive medical health provision or for the full range of medical specialisations,
- Long distances to and from medical establishments,
- Assurance of complete emergency service cover,
- The low density and lack of physical proximity to skilled staff, R&D and marketing facilities, suppliers and customers in the Life Sciences sector.

The individual countries have already developed concepts (e.g. in the area of tele-medicine) for provision of medical services in peripheral areas. Further intensification of pan-Baltic region research, cooperation and model projects could represent an important step towards meeting the challenges.

Growing geographic economic polarisation

Overall, the geographic and economic polarisation taking place within the Baltic Sea Region is growing. The gulf between towns and cities/conurbations and rural/peripheral areas is increasing (Dutkowski et al. 2009, Schmitt & Neubauer 2009). In particular, the structural change towards becoming a knowledge economy is accelerating the concentration of population and business activities in the major centres (Brandt 2011). These frequently have a particularly high density of potential partners and competitors in the value creation process, and of education, R&D, medical service provision and care facilities. As a rule, they offer more attractive environments for creative and highly qualified individuals, as well as providing better regional and supra-regional accessibility.

Concentration on major centres and conurbations

Distribution of the population across urban areas, intermediary areas and rural areas (share of population in %)

Source: EUROSTAT 2012. – Calculations and design NORD/LB

	Urban areas		Intermediary areas		Rural areas	
	2007	2011	2007	2011	2007	2011
Denmark	21.2	21.8	36.0	36.0	42.9	42.2
Germany	42.4	42.8	40.2	40.1	17.4	17.1
Latvia	48.0	48.9	13.4	13.3	38.6	37.8
Lithuania	25.0	25.9	31.2	31.3	43.7	42.9
Poland	28.3	28.3	33.8	33.9	37.9	37.8
Norway	26.0	26.7	30.7	30.6	43.3	42.7
Sweden	21.0	21.8	56.2	56.1	22.8	22.1

A balance between promoting urban innovation potential and stabilising service provision in peripheral areas

The health and innovation policy of the Baltic Sea Region is presented with the challenge of successfully managing the delicate balance between targeted promotion of urban innovation potential ("strengthening the strengths") and stabilising the standard of living and service provision in the peripheral areas ("redressing the weaknesses"). The increasing linkage of towns and regions within the Baltic Sea Region will surely constitute an important element in this.

Poverty and segregation: the risks of urban development

In some of the countries in the Baltic Sea Region, the proportion of the population threatened by poverty or social alienation continues to remain very high. In Latvia, (38.1%), Lithuania (33.4%) and Poland (27.8%), it was significantly above the EU average (23.4%) in 2010. In Lithuania, Germany and Denmark, the share of households with individuals with very low earning power is also disproportionately high (EUROSTAT 2012).

At the same time, many European towns and cities are registering an increase in segregation tendencies, and in the Baltic Sea Region, these are also leading to an increase in the consolidation of social polarisation within certain geographic urban areas. Many urban areas are now under threat of a socio-economic downward spiral. This increases the risk of habits and attitudes which are damaging to health, and leads to a deterioration in standards of health in those residential areas where there is poverty, or potential poverty (Gentile 2012, Standl 2009, Radzimski 2012).

4. The Baltic Sea Region: a healthy region?

4.1 Continuing high discrepancies in states of health and life expectancy

The Nordic countries have the highest life expectancy rates in Europe: marked increase also in Estonia and Latvia

Over the past few years, life expectancy in the Baltic has risen at well above-average rates and the Nordic countries continue to record the highest life expectancy rates in Europe. The differences in the Baltic Sea Region are diminishing gradually.

During the period 2000 to 2009, life expectancy rose by 1.6 years to 78.8 years right across Europe. In Estonia and Latvia, it has risen over the last decade from a very low starting level, by 4.1 and 2.7 years respectively, to achieve 74.5 and 72.8 years. In all other countries of the Baltic Sea Region, with the exception of Lithuania, the rise was between 1.7 and 2.2 years. The highest life expectancies were recorded in Sweden and Norway (80.7 and 80.3 years respectively) (EUROSTAT 2012).

High level of satisfaction in the Nordic countries, lower level in the Baltic Sea Region and Poland

From the perspective of the population itself, states of health continue to vary greatly within the Baltic Sea Region. There cannot yet be any talk of the Baltic as a macro-region with comprehensive high healthcare satisfaction. In 2009, 68.1% of the EU population described their state of health as good or even very good. Only in the Nordic countries of Sweden (79.5%), Norway (76.5%) and Denmark (72.4%) was the level of satisfaction significantly higher. In Latvia and Lithuania, levels of satisfaction did not even achieve 50% (EUROSTAT 2012).

Mortality data for the Baltic region and the EU

	Mortality in total (per 100,000 head of population), 2008	Mortality (per 1,000 head of population: 2008) resulting from				Suicides (cases per 100,000 head of population), 2008
		Heart attack (men/women)	Stroke (men/women)	Cancer (men/women)	Road accidents	
Denmark	683	98/52	59/47	246/182	5.8	10.6
Germany	582	117/62	42/36	206/133	5.4	9.4
Estonia	894	330/163	97/63	290/136	11.4	16.5
Finland	587	183/88	53/40	172/114	6.9	18.4
Latvia	1,007	397/184	174/123	295/135	15.9	20.9
Lithuania	1,034	449/240	140/110	290/142	16.8	30.7
Norway	549	99/46	45/37	196/137	6.0	10.2
Poland	819	147/69	91/64	284/152	14.6	13.9
Sweden	541	130/64	46/38	172/134	5.0	11.4
EU	696	171/89	82/64	236/136	9.7	12.8

Source: EUROSTAT 2012. – Calculations and design NORD/LBLB

High mortality rates which are only falling slowly in Lithuania and Latvia

Mortality rates are regarded as particularly good indicators to reflect the state of health of the population (OECD 2010, p.30).

Lithuania and Latvia continue to register the highest mortality rates in the EU. In those two countries, deaths per 100,000 head of population were 1,034 and 1,007 in 2008. Between 1994 and 2008, only a slight drop in mortality rates was evident. There was a more pronounced decline in the mortality rate in Poland and Estonia, and Sweden, Norway, Finland and Germany registered particularly low rates.

Consequently, there continues to be a wide discrepancy within the countries of the Baltic Sea Region.

High rates of mortality due to coronaries, strokes, cancer and road accidents in the Baltic region

The high mortality rates of the Baltic States and Poland compared with the EU average are mostly attributable to fatal heart attacks, strokes, cancer and also road accidents.

The high level of mortality from cancer in Denmark (particularly breast and prostate cancer) and from coronaries in Finland is particularly striking.

High rate of suicide in the Baltic and Finland

The suicide rate in the Baltic Sea Region has dropped back significantly over the past decade. In spite of this, suicides in Lithuania, Latvia, Finland and Estonia continue to remain markedly above the average for the EU. The 1990s, in particular, saw a steep rise in the frequency of suicides in the Baltic States, especially among young men. The reasons for this included the fast pace of socio-economic change and the mental and social instability associated with this, as well as the subsequent reduction of care facilities (OECD 2010).

Above-average infant mortality in Poland and the Baltic

In Poland and the Baltic Sea Region, infant mortality is far above the EU average. In 2008, an average of between 4.9 and 6.7 infants per 1,000 births died before reaching their first birthday in Poland, Estonia, Latvia and Lithuania. In Sweden, Finland and Norway, however, the figures were significantly lower (2.5 to 2.7).

High number of cancer cases in Germany, Norway and Denmark

There are marked differences in the number of cancer cases diagnosed. The number per 100,000 head of population among men in Norway (341), Denmark (337) and Germany (331) is distinctly above the average for the EU (298). Denmark and Norway record very high rates of cancer in women. Overall, it is clear that cancer, and therefore cancer research, are among the greatest medical issues and challenges for the future across the entire Baltic Sea Region.

Infectious diseases: a challenge throughout the Baltic Sea Region

More than ever, infectious diseases pose a major medical challenge to the Baltic Sea Region. Their incidence is not limited to individual regions or countries, and preventive measures and treatments must be considered on a trans-border basis. Examples (OECD 2010):

- Norway (112.9 cases per 100,000 head of population; timeframe: 2006-2008), Estonia (26.0), Finland (9.6), Denmark (8.0) and Sweden (7.1) register an above-average number of **whooping cough** cases (EU: 5,7)
- The number of **Hepatitis B cases** in Latvia (7.3 cases per 100,000 head of population; timeframe 2006-2008), Estonia (3.5), Lithuania (2.8) and Norway (2.8) are above the EU average (2.5).

High number of new HIV infections in Eastern Europe

In the Baltic States, in particular, the number of new AIDS cases has been very high for some years. In 2008, Estonia recorded 45.5 new AIDS cases per million inhabitants, Latvia 43.8 and Lithuania 16.3 (EU: 12.7). Here, the incidence of HIV in drug users is a particularly major problem (OECD 2010, p.48).

High frequency of dementia and diabetes across the entire Baltic Sea Region

With increased life expectancy and higher average ages of populations, the number of **dementia** sufferers is continuing to rise in the Baltic Sea Region. The proportion of dementia sufferers pro rata of the population in 2006 was: Sweden (1.8%), Germany (1.7%), Norway, Finland and Denmark (1.5% each), which is already above the average of 1.4% for the EU. The demand for medical research into dementia and for suitable forms of care and treatment continues to grow.

Diabetes remains another major health challenge for the future in the Baltic Sea Region. In many countries of the Baltic Sea Region, the incidence of the condition is disproportionately high. In many cases, unhealthy eating habits, lack of exercise and obesity are to blame as the cause and intensifier of the condition. In Germany and Poland, for instance, the proportion of diabetes sufferers is already running at 8.9% and 7.6% (EU: 6.5%).

4.2 Unhealthy eating habits and lifestyles: the common challenge of obesity

Unhealthy eating habits

There is a clear and evident link between the lifestyle and state of health of an individual. Habits such as unhealthy eating, tobacco and alcohol consumption and lack of exercise increase the risk where certain illnesses, such as diabetes, coronary heart disease and cancer are concerned.

Less fruit eaten in the East and South …

Based on the average annual per capita consumption (2007) of fruit and vegetables, it is obvious that there are marked differences in eating habits across the Baltic Sea Region. Comparatively little **fruit** is eaten in Poland (50 kg per capita per annum), Latvia (61 kg), Estonia (78 kg), Germany (88 kg) and Lithuania (91 kg) (EU: 105 kg), whereas consumption of **vegetables** is relatively low in Norway (78 kg per capita per annum), Finland (79 kg) and Sweden (88 kg) (EU: 116 kg). Accordingly, "healthy eating" is an issue of future relevance for the Baltic Sea Region.

Not many vegetables eaten in the North

Above-average tobacco and alcohol consumption in the Eastern areas of the Baltic Sea Region

There is incontrovertible evidence of the link between tobacco consumption and the incidence of lung cancer, just as there is a proven connection between alcohol and liver disease (OECD 2010).

The proportion of adults who smoke on a daily basis is significantly higher in the Eastern Baltic than in the Northern part of the region. In an EU comparison, the proportion of smokers in Latvia (27.9%), Lithuania (26.5%), Poland (26.3%) and Estonia (26.2%) was relatively high in 2008. In the period 2005 to 2006, the number of young smokers recorded was particularly high in Latvia, Germany, Finland and Estonia.

In 2008, the average per capita alcohol consumption in Estonia (14.0 litres/annum), Lithuania (12.5 litres/annum) and Denmark (10.9 litres/annum) was particularly high. Similarly, per capita alcohol consumption in the Nordic countries of Norway, Sweden and Finland has risen significantly over recent decades, from a relatively low starting level. The number of cases of youth inebriation is disproportionately high in Denmark, Finland and the Baltic States.

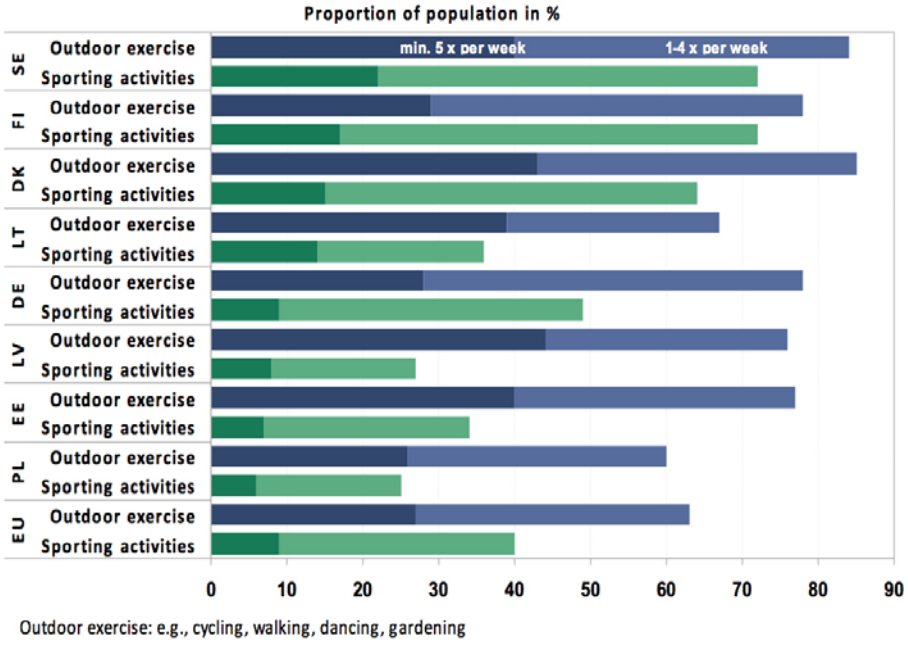
EU anti-alcohol and drug abuse programmes

Over the past few years, explicitly trans-border anti-alcohol and drug abuse programmes supported by the EU and the EU strategy for the Baltic have attempted to prevent alcohol and drug abuse, particularly in young people.

Sporty Scandinavians: outdoor fitness in the Baltic

In an EU comparison, the populations of the Baltic Sea Region are relatively active and sporty. This applies, in particular, to Sweden, Finland and Denmark. In the Nordic countries, more than half the population engage in sporting activities at least once a week. Compared with the rest of Europe, the proportion of the population engaging in physical exercise outdoors at least five times per week is highest in Latvia, Estonia, Lithuania, Denmark and Sweden, and here, activities such as cycling, walking, dancing and gardening are included (Eurobarometer Special 72.3, 2010). Only the Polish population is marked out by its below-average sporting activities and exercise.

Sport and exercise habits of the populations of the Baltic Sea Region



Source: European Commission. – Calculations and design NORD/LB

The Baltic as a sporting region

Marked increase in obesity and overweight across the whole of the Baltic Sea Region

The high proportion of people actively engaging in sporting activities and exercise indicates that there is great potential for the Baltic as an active, healthy and networked sporting region.

Overweight and obesity increase the risk of disease, especially the illnesses known as **"civilization diseases"** (e.g. diabetes, coronary heart disease, certain forms of cancer). Notwithstanding systematic and comprehensive surveys on the subject, the Baltic Sea Region is characterised by the following features:

- The proportion of overweight people (body mass index > 25) has increased in virtually every country of the Baltic Sea Region in recent years.
- The proportion of overweight people is relatively high in Germany, Poland and Lithuania (men: 56-66%; women: 48-52%). In these countries, the incidence of obesity is also high (BMI > 30).
- Obesity is less common in the Nordic countries of Estonia and Latvia.
- Overweight in children and young people is also on an upward trend, with all the countries of the Baltic Sea Region (especially, Sweden and Finland) affected (WHO 2012).

5. Developmental convergence of healthcare systems

5.1 Tax-financed healthcare systems in Northern Europe and Latvia – healthcare systems financed by social security contributions in Germany, Poland and Estonia

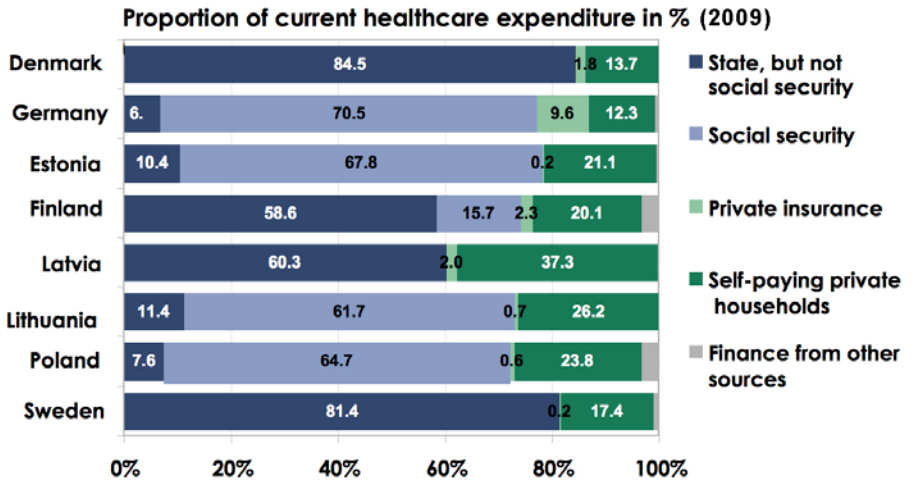
Free and high-calibre healthcare as a basic European right

The social charter of the European Union emphasises the entitlement of every citizen to free access to comprehensive and high calibre healthcare, irrespective of income and state of health. As a general rule, healthcare is financed by the public sector in Europe (taxes, social security contributions), and in 2009, it covered healthcare expenditure across the spectrum of 72% in Poland to 84% in Denmark, with Latvia the only exception. In 2008, public sector finance accounted for just 60%, with the private sector covering almost 40%.

No general trend towards a rise in private-sector healthcare provision

In the period 2003-2009, the Baltic Sea Region did not reflect a general trend towards a rise in private-sector healthcare provision. Since the economic and financial crisis of 2008/2009, private health insurances and top-up insurances are becoming increasingly important, in particular in Poland and the Baltic States.

Healthcare expenditure per source of funding



Source: EUROSTAT 2012. – Calculations and design NORD/LB

"Beveridge" healthcare systems in the Nordic countries and Latvia…

… and "Bismarck" healthcare systems in Germany, Poland and Estonia

Healthcare system of the Nordic countries

In general, the healthcare systems of the Baltic Sea Region can be allocated to two categories, according to their funding and care provision structures (Schmid 2010, Görtz 2012):

- **"Beveridge" systems** are state financed from taxes and give free access to healthcare networks to every citizen, irrespective of employment. The healthcare systems of Nordic countries such as Latvia are included in this category.
- **"Bismarck" systems** are those where healthcare provision is funded from the social security contributions of the insured (employees) and their employers. Along with Germany, this form of financing applies to Estonia and Poland.

The healthcare systems of the Nordic countries reflect a distinct commonality in their responsibility and funding methods, their outpatient and inpatient healthcare and their contributions to treatment and drugs.

Common features of healthcare systems of the Nordic countries

- **Responsibility and funding:** municipalities and health regions (Norway, Finland) and provincial authorities (Sweden, Denmark) organise their healthcare provision relatively autonomously. Income taxes levied by the municipal and provincial authorities on the one hand, and state subsidies and equalisation payments on the other, play an important role.
- **Additional funding:** in Norway, the national insurance fund (75% contribution-financed) is of additional importance, as are private top-up insurances (for dental treatment and drugs) in Denmark.
- **Inpatient care:** hospitals are generally state or community financed. Hospital treatment is usually free. For some years now, patients have been able to choose their hospitals, at least in some cases. Waiting times are well above average.
- **Outpatient care:** particularly in Sweden and Finland, the central pillars are medical centres (with several GPs, nurses, physiotherapists, dentists, psychologists, some consultants, health advisors and preventive medical help) while in Norway, there are large community surgeries. Single-doctor surgeries are rare. An above-average number of doctors work mainly in the public health sector. The system is dominated by the **GP model** (patient's own GP as initial contact, then referral to consultant. Outpatient consultant treatment then mainly takes place in hospitals.
- **Top-up contributions to treatment and drugs:** in some cases, these are considerable and are frequently above the level for Germany. However, there are set upper limits for those with chronic conditions and low incomes.

Source: Matz 2010. – Design NORD/LB

High proportion of self-payers in Latvia

In terms of its basic structure, Latvia has similarities with the Nordic countries (e.g., the importance of medical centres). However, at more than 37%, the proportion of self-paying private households is above average. Self-payments also cover all dental services and virtually all drugs (Matz 2010).

Health insurances in Germany, Poland and Estonia

Health insurances in Germany, Poland and Estonia are organised along disparate lines and this applies particularly to the number of insurances and the ratio of statutory national insurances to private insurances.

Characteristics of health insurance systems in Germany, Poland and Estonia

Germany	Poland	Estonia
• Statutory and private health insurances operate **alongside each other (GKV and PKV).** All employees are obliged to participate **in the GKV mandatory insurance**; there are currently 145 statutory health insurances. • **Free choice of insurance** from a certain level of annual income, which is at least EUR 50,850 and for self-employed persons and civil servants. • The German government determines the **level of contributions** to the GKV (2012: 15.5%, of which employees pay 8.2% and employers contribute 7.3%). • **Health fund:** contribution receipts and supplementary tax funding go into the health fund, out of which the health insurances receive a basic flat fee for their members, the level of which is adjusted in line with morbidity-led actuarial calculations.	• **National health fund** (Narodowy Fundusz Zdrowiam, NFZ) tasked with ensuring healthcare provision for the insured. This is implemented in the form of agreements concluded with service providers. • The **Ministry of Health** decides on the NFZ benefit package. It issues health plans and details the type and scope of healthcare services for the 16 regional units of the national heath fund. • All employed Polish citizens **must be insured** and pay a **contribution at the rate of** 8.5% (employees only). Almost 24% of healthcare costs are born by **private households.**	• Together **with 17 regional health insurances,** the Estonian **Health Insurance Fund** is responsible for the Estonian state health insurance system. The central planning and financial equalisation between the various areas is carried out by the Health Insurance Fund. • Because of the **mandatory obligation**, 95% of Estonians are insured with the insurance responsible for their particular area. The **contribution rates** are around 13% of gross income. More than 21% of health costs are paid for by **private households**.

Source: Matz 2010. – Design NORD/LB

Combination system in Lithuania

The Lithuanian healthcare system is financed by tax revenues as well as social security contributions. The State Patient Fund, which is split into five operational units, represents the state health insurance. While 34% of income is payable to the social security authorities, just 3% goes to the health insurances. The state contributes more than half the total health insurance budget out of its tax revenue. At more than 26% of the total

Healthcare in Poland and the Baltic States

expenditure on healthcare, self-payments are well above average (Matz 2010).
In all the Baltic States and Poland, too, the GP model applies, with the exception of some specialist groups in Estonia and Poland. In the four countries concerned, outpatient care at medical centres and polyclinics (costly treatments by consultants) plays a central role as the starting point, while in Lithuania, there are additional outpatient centres (community surgeries with a variety of medical specialists) and paramedical centres (facilities with paramedics, midwives and nurses in rural areas), and in Latvia, there are medical assistants in the field.

Most specialist treatment In Lithuania takes place at polyclinics. In Latvia, consultants work in hospital outpatient departments and polyclinics and to increasing degree, as registered practitioners. In Poland, there are three times as many specialists as family doctors/GPs, resulting in an above-average number of referrals.

Inpatient care takes place across the region in smaller A&E and district hospitals, as well as in long-term nursing facilities, whose number is declining. Larger hospitals and specialist hospitals are almost exclusively located in the major towns and cities of the country (Matz 2010, Pauly 2012a,b,c).

5.2 Diminishing differences in healthcare expenditure

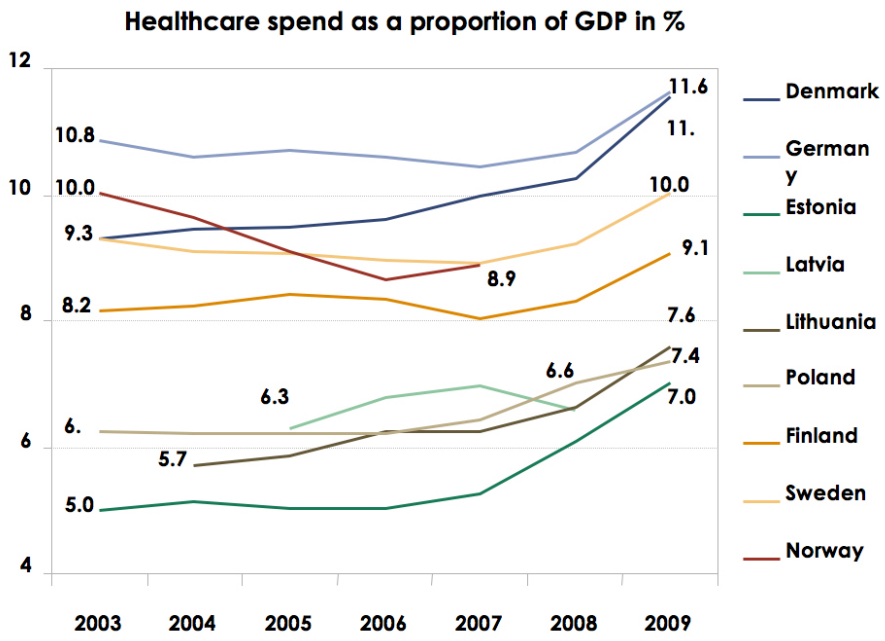
Health as a "luxury item"

There is a clear link between the demand for healthcare services and macro-economic development. In many countries the level of healthcare spending correlates with the level of GDP. However, health is regarded as a "luxury item", so that as income increases, the demand for healthcare is exponential (IKB & Forecast 2011, p.6).

The need to catch-up in Poland and the Baltic region: steep rise in healthcare expenditure

A glance at the Baltic Sea Region confirms these links. The Baltic States and Poland have recorded above-average economic growth rates in the past ten years. At the same time, healthcare expenditure – starting from a very low level – has registered the highest growth rates. In Estonia, annual per capita healthcare expenditure rose by two-thirds in the period between 2003 and 2009, while in Latvia, Lithuania and Poland, it just about doubled. There is a marked need to catch up in these countries which can

Healthcare expenditure in the countries of the Baltic Sea Region



Source: EUROSTAT. – Calculations and design NORD/LB

be serviced, thanks to growing economic power.

Still major disparities within the Baltic Sea Region

In Sweden (+8%), Germany (+19%) and Finland (+29%), the increase in healthcare spending was relatively low, due to its already high basic levels. Even so, there are significant differences between Poland (2009: EUR 599), Lithuania (EUR 601), Estonia (EUR 725) and Latvia (2008: EUR 670) on the one hand, and Finland (2009: EUR 2,936), Sweden (EUR 3,136), Germany (EUR 3,399), Denmark (EUR 4,644) and Norway (2007: EUR 5,343) on the other (EUROSTAT 2012).

The future is likely to bring steep increases in healthcare expenditure …

Per capita healthcare expenditure as a proportion of GDP is also set to rise steeply in the entire Baltic Sea Region over the coming years. Rising incomes, technological progress and the demographic shift are the main engines of growth in the Baltic Sea Region, in particular.

…but a disparity in the growth dynamic

Countries whose healthcare expenditure reaches a share of 9.5% of GDP will be more inclined towards a policy of cost cutting. On the basis of an already high level, both healthcare expenditure and the demand for healthcare services are set to grow more slowly and this will affect Germany, in particular, as well as Denmark and Sweden to some degree (IKB & Forecast for 2011, p.6; Görtz 2012).

Countries spending less on healthcare are generally characterised by a more expansive healthcare policy and here, the demand for healthcare services and the amount spent on healthcare are likely to rise by an above-average level. The Baltic States, Poland and Finland belong to this group of countries.

High density of healthcare provision and expenditure in Germany

In Germany, healthcare expenditure reached 11.6% of GDP in 2009. The German healthcare system is regarded as relatively inefficient, especially because of its high administrative and insurance costs and the above-average spending on drugs. At the same time, the density of healthcare provision is very high (i.e. Germany is particularly high up on the international service provision index) (Beske et al. 2005).

Cost reduction and low growth of expenditure in Germany

Efforts to reduce costs are being intensified in the short and medium term in Germany. The anticipated result is a fast reduction of over-capacities and intensified relocation of specialist medical services to hospitals or medical centres, along with further concentration in the hospital sector (establishment of chains, closure of facilities, takeovers, privatisation, supra-sector forms of healthcare provision) and more stringent control of approval and procurement regulations for drugs. As a result of its size and despite its slower growth dynamic, Germany remains an interesting healthcare market.

Up to 2007: low and sinking healthcare expenditure in Sweden, Norway and Finland

In Sweden, Norway and Finland, expenditure on healthcare as a proportion of GDP has meanwhile dropped, in some cases quite significantly, in the period between 2003 and 2007, although since the economic and financial crisis of 2008/2009, there has been a marked increase.

Tax-financed healthcare systems such as those in the Nordic countries are regarded as quite efficient. Health expenditure is relatively low. In principle, however, the trend here is towards under-provision and rationing, because the influence of the state budgeting is greater than in contribution-financed systems, and tends to favour a more rigid budget policy.

Problem: protracted waiting times

Yet the density of healthcare provision is below-average in some areas and this is evident in all the Nordic countries in, say, protracted waiting times for outpatient and particularly, inpatient treatment.

Definite growth potential, especially in Finland

Especially in Finland, where the proportion of healthcare spending remains relatively low, the demand for healthcare services and consequently, the level of healthcare expenditure, are bound to grow considerably in the coming years (IKB & Forecast 2011). Even in Sweden and Norway, the increasingly geriatric populations and a sustained growth in populations will generate a steep increase in the demand for healthcare services.

Healthcare systems in Poland and the Baltic region on course for growth…

The marked growth of healthcare expenditure and in the demand for healthcare services is likely to continue in the short and medium term in Poland and the Baltic Sea Region. However, the different healthcare systems are taking different paths. The level of per capita self-payments is already very high. Private service providers who fre-

…but taking different paths

Relatively high level of dissatisfaction in Latvia, Lithuania and Poland

quently offer a higher service quality and shorter waiting times, and private insurances, are on an upward trend. The quantity and quality of public sector service provision and finance is stagnating, or is concentrated around a few major centres (GTAI 2012b).

Added to this is the relatively high level of dissatisfaction on the part of the populations of Poland, Lithuania and Latvia. Across the EU, around 70% of the population still rate medical services in their country as good or even very good, and in Finland and Sweden, the figure is at least 90%. In Lithuania (40%), Latvia (37%) and Poland (30%), the satisfaction levels are clearly below this (European Commission 2010b). Beyond this, the proportion of individuals in these countries whose requirement for medical consultations or treatment has, by their own admission, remained unfulfilled, is disproportionately high (Latvia: 14%) (EUROSTAT 2012).

5.3 Future challenges confronting healthcare systems

The future challenges confronting the healthcare systems of the Baltic Sea Region countries are, in particular:

- the **reduction of waiting periods** and **waiting lists** for surgery and treatment (exception: Germany),
- the **funding of healthcare expenditure**, particularly with respect to the demographic shift and advances in technology,
- the **optimisation of inpatient and outpatient services** from the perspective of meeting the demand, e.g. elimination of existing differences in healthcare provision between urban and rural areas
- and finally, **raising the level of satisfaction with healthcare systems** by means of simple, transparent structures, equality of access conditions and a high calibre portfolio of healthcare services for all.

In the light of the EU strategy for the Baltic Sea Region, solutions which are exclusively market oriented do not seem to be on the agenda here.

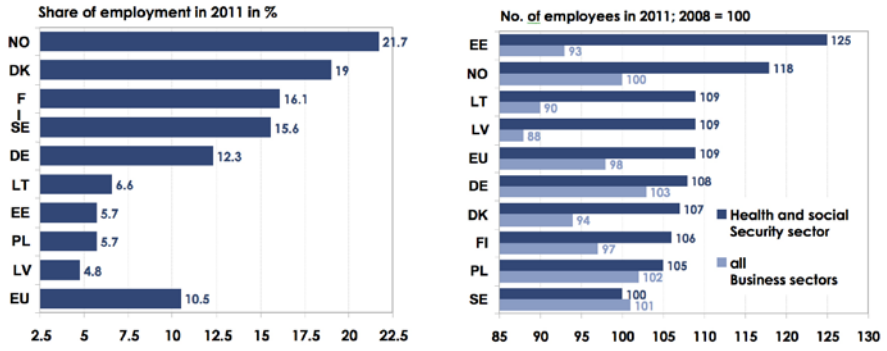
6. Above-average growth of the healthcare sector in the Baltic Sea Region

6.1 Steep increase in healthcare sector employment

High proportion of employment in Northern Europe; low proportion in the Baltic region and Poland

There is a marked link between the economic power of the individual countries and the importance of the healthcare sector for employment policy. In 2011, the proportion of individuals employed by the health and social services sector in the countries with stronger economies and higher incomes of Norway, Denmark, Finland, Sweden and Germany was significantly above the average for the EU, while in Poland and the Baltic Sea Region, the figure is relatively low as yet.

Health sector employment share and growth



Source: EUROSTAT. – Calculations and design NORD/LB

Positive growth since the economic and financial crisis

Employment development in the health and social services sector has been more positive over the entire Baltic Sea Region (with the exception of Sweden) than the job market as a whole. This applies, in particular, to the Baltic States, Finland and Denmark, where employment declined overall, but grew significantly in the healthcare and social services sector in the period 2008 to 2011. The highest growth was registered in Norway and Estonia.

Health and social services as stabilising sectors during the crisis

Overall, it is evident that during the 2008/2009 economic and financial crisis, the health and social services sector emerged as a major stabilising factor for both regional and national economic development.

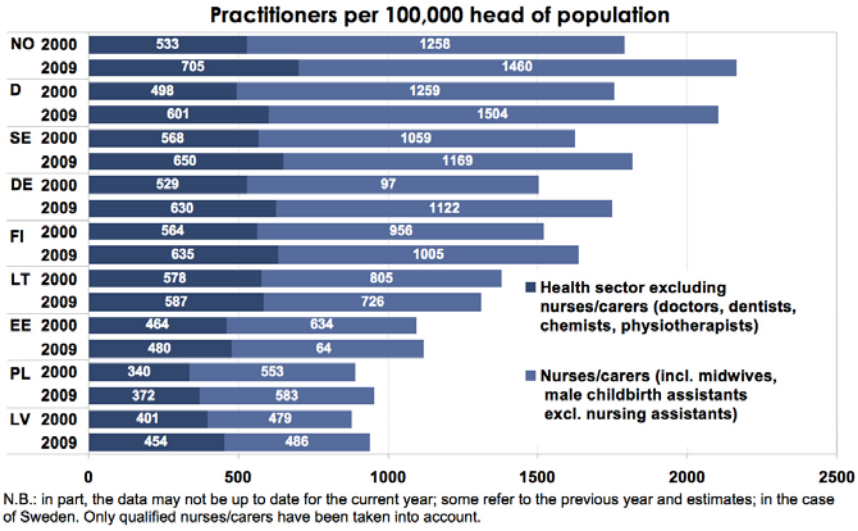
Particularly strong growth in Norway, Denmark and Germany; decline in Lithuania

A closer look at the professions comprising the health sector reflects a similar picture: with the exception of in Lithuania, the number of practitioners in the health sector has risen in the entire Baltic Sea Region over the past ten years. The highest absolute and relative growth was reported by Norway, Denmark, Germany and Sweden, where the number of staff employed in the health sector is the highest per 100,000 head of population.

Varying levels of qualification and quality standards

There are huge differences within the Baltic Sea Region where nurses and care workers, as well as midwives and male childbirth assistants are concerned. In Norway and Denmark, three times as many staff are employed in this area per 100,000 head of population. The level of qualification of nurses/care workers is also very disparate. While in Germany, Denmark and Finland, the number of qualified nurses/carers has remained virtually constant in recent years, in Norway, it made significant gains and in Latvia, it declined markedly. In the Baltic States, the number of care assistants is well above average. Overall, across the Baltic Sea Region, it is evident that there are varying levels of qualification and quality standards.

High proportion of care workers in the Baltic Sea Region



Source: EUROSTAT. – Calculations and design NORD/LB

High and rising average ages in Germany, Latvia and Lithuania…

…threatened by a lack of doctors

In terms of the ageing working population of the health sector, the countries of the Baltic Sea Region are developing along disparate lines. This is clearly evident from the example of the age structures for doctors:

In Germany, Latvia, Lithuania and Finland, the average age of doctors rose markedly last year. Between 2000 and 2009, the number of doctors aged 45 and under dropped, for example, from 38% to 29% in Germany, and in the period 2002 to 2009, from 42% to 35% in Latvia. At the same time, the number of doctors aged 55+ in these countries rose. In the coming years, these countries will see a major proportion of doctors going into retirement. A **significant rise in demand for qualified staff** is anticipated, which, if it cannot be met (e.g., by replacements for GP surgeries), is likely to result in the threat of a **lack of doctors** and subsequently, erosion of **comprehensive healthcare provision across the region**.

Young doctors in the Nordic countries

The age structures of doctors are relatively stable in Denmark and Sweden. In Norway, the average age of doctors has fallen in recent years. The proportion of young medics aged 35 and under rose in Norway in the period 2002 to 2009 from 21% to 25%. Working conditions in the Nordic countries are generally regarded as comparatively attractive. Among other aspects, this is due to the favourable conditions at the universities, relatively good earnings prospects and a good work/family balance.

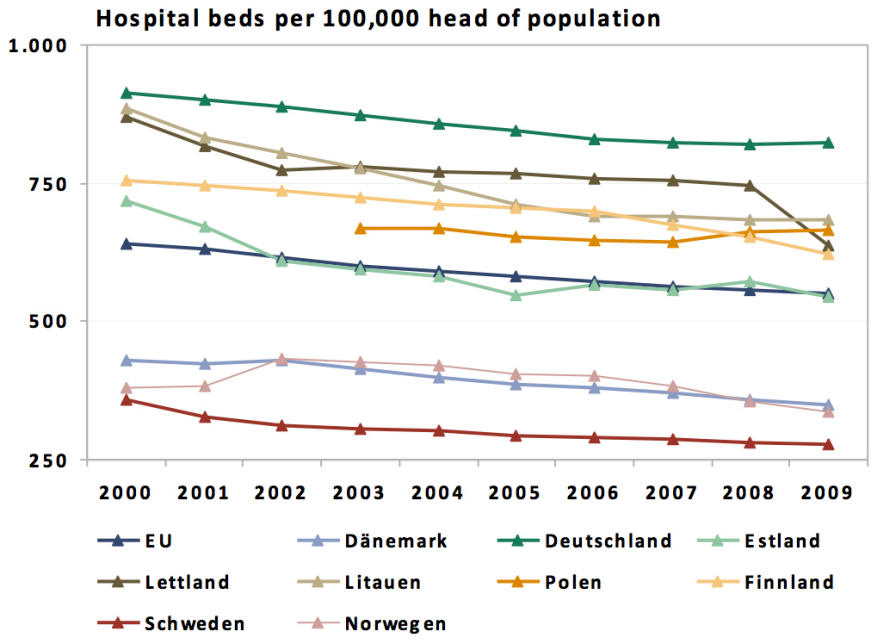
6.2 The hospital sector at the crossroads of modernisation and increased efficiency

Highest hospital bed density is in Germany, lowest in Scandinavia

Reduction of over capacities here, reduction of service bottlenecks there

The European hospital sector is confronted by some major challenges for its future. In the first instance, the regulatory framework conditions are changing and competition between hospital operators is becoming increasingly fierce. On the other, up-to-date technical equipment is needed by hospitals to ensure the quality of the treatments they offer, plus, there is also a need for a comprehensive service covering the entire geographic area. For some years, Germany has recorded one of the highest densities of per capita hospital bed numbers in Europe, and in some areas, this has meant overcapacities. Equally high bed capacities are available in Latvia, Lithuania and Finland, where bed uptake over the past decade has markedly dropped in some areas. Comparatively low bed densities, but higher uptakes are registered by Norway, Denmark and Sweden.

Baltic Sea Region: further reduction of hospital bed capacities



Source: EUROSTAT. – Calculations and design NORD/LB

Long waiting periods for treatment and optimisation of the available hospitals have presented these countries with a major challenge.

Massive structural change in Poland and the Baltic Sea Region

The hospital sector is undergoing huge structural changes at the present time in Poland and the Baltic States. Conversion of hospital structures is taking place under framework conditions which include frequent obsolescence of the existing buildings, a high level of indebtedness within the sector and at the same time, relatively low public funding on health and the prevailing regional and technical inequalities in the provision of medical services (such as under-supply in some areas, but over capacities in others).

Privatisation…

…hospital closures,

…reduction of bed capacities …

Increasingly, and this is well supported from the political side, public funding is supplemented by private investment (e.g. by medical technology companies, which build complete hospitals) and the hospitals are then transferred to and run by private operators (Forecast & IKB 2011). In the period from 2004 to 2010, the number of public sector hospitals in Poland declined from 644 to 509, while in the same timeframe, the number of private hospitals rose from 146 to 286 (Central Statistical Office of Poland 2012). The proportion attributable to the private sector has consequently doubled from 18% to 36% within a period of six years.

…geographic concentration of specialist medical services

Along with a marked trend toward privatisation, there are also evident signs of concentration. Over the past few years, hospitals in some locations were handed over, while others were closed. For instance, since 1991, the number of hospitals in Estonia has dropped from 120 to 59. In tandem with this, there has also been a steep reduction in bed capacity (Pauly 2012b). Between 1995 and 2009, the number of hospital beds per 1,000 head of population fell from 11.1 to 6.4 in Latvia, from 10.9 to 6.8 in Lithuania and from 8.3 to 5.4 in Estonia (Eurostat 2012). Specialist medical services are increasingly concentrated in a few major hospitals (Pauly 2012b,d). New, up-to-date, specialised medical centres operated by private chains (e.g. Lux-Med or Enel-Med in Poland) are concentrating on the few growth areas of these countries (Steinacher 2011).

Growth area: private health spa and rehab facilities

An important growth area in Poland and the Baltic States is health tourism, involving health spa and rehabilitation facilities. In 2009, Estonia alone already had 14 health resorts, offering more than 3,500 beds and accommodating 214,000 guests, of which 54.7% came from abroad (Pauly 2012b, Repetzki 2011).

National funding for health has been cut in some areas …

As a result of the economic and financial crisis, the Baltic States, in particular, made stringent cuts in their healthcare budgets. In spite of the upswing of the past two years,

public funding for the sector has dropped back further in some areas (2012: Lithuania -4.4%, Latvia -7.7%). Under these circumstances, EU development funding is an increasingly major factor in investment in the Estonian, Latvian and Lithuanian healthcare sectors. In the current development period of 2007 to 2013, the EU has already made funding of EUR 180 million (Estonia) and EUR 268 million (Lithuania) available. A major proportion of this was used to modernise hospitals (GTAI 2012a). To a degree, the future modernisation of the sector is consequently contingent on the structural political orientation of the next development period, which is 2014-2020.

…and EU development funding is becoming increasingly important

Slow structural change in Germany and Northern Europe

Falling hospital bed capacity …

…and falling number of days spent in hospital

The structural change in Germany and the North European countries is taking place at a far slower pace than in the Eastern Baltic Sea Region. Hospital case numbers are rising slightly, depending on demographic factors (e.g. Germany 2000-2008: +14%; Norway 2000-2009: + 8%), but in some instances, development is retrograde (e.g. Finland 2000-2009: -16%). The average hospital stay is also dropping down in many instances, and here, Germany (2008: 9.8 days) and Finland (2009: 12,2 days) are continuing to record very high average values, with far lower numbers in Denmark (2007: 5.3 days), Norway (2009: 6.2 days) and Sweden (2010: 4.6 days) (EUROSTAT 2012). Compared with the Baltic States, bed capacities are falling at a significantly slower rate.

Growing privatisation and concentration processes, including in Germany

The German hospital sector remains under a great deal of pressure in terms of costs and income. A growing number of regional and national chains are emerging alongside the communal service providers in the form of private operators and associations active in the increasingly important private German not-for-profit sector. This shift has involved closures, takeovers, privatisation, the development of supra-sectorial forms of healthcare provision (outpatient/inpatient, rehab, nursing care) and brought in its wake the growing recourse to private funding to ease the investment bottleneck in the sector (Forecast & IKB 2011).

Public sector still strong in Northern Europe

In the Nordic countries, the proportion of beds of the public sector service providers was significantly above 90% in 2009 in some areas (Eurostat 2012). Private hospital operators continue to play only a minor role. Communities and regions (including health regions) remain the decisive players in the arena. In the case of larger scale hospital building projects (e.g. new university hospital built by the Karolinska Institute) PPP solutions remain very rare as yet. As in all tax-financed systems, long waiting lists, even for simple surgical procedures, present a major ongoing problem. The short and long term adjustments needed to resolve the problem of bed numbers are almost exclusively taken on by the public sector. As a general rule, governments make extensive funding available for hospital development purposes. In Norway, for example, funding is not necessarily provided solely for new building projects, but also for extensions and conversions (Forecast & IKB 2011).

Conclusion: varying strategies and a demand for investment which is generally high

Overall, it is evident that the countries of the Baltic Sea Region are pursuing different strategies for the restructuring of their hospital sector. In Germany, Poland and the Baltic States, private players are markedly gaining in importance in the operation and modernisation of hospitals. In some cases, the changes taking place are quite draconian (exception: Germany). In the Nordic countries, the communities and regions quite clearly continue to dominate as the driving force. At the same time, there is still a high demand for modernisation and expansion in all these countries. Throughout demographic shifts are at the root of falling case numbers and a rising demand for nursing and care facilities.

Excellent market opportunities for medical technology across the whole of the Baltic Sea Region

Future extensive investment in the hospital sector will open up huge market opportunities for medical technology across the entire Baltic Sea Region. In every country, there are plans for extensive new builds and conversions of university hospitals and those located in the major centres of the countries, and equipment updating projects are also in the pipeline.

6.3 Poland and the Baltic Sea Region's need to catch up in terms of technical medical equipment and treatment methods

High level of technical medical equipment in Germany and the Nordic countries

Despite the lack of standardised data, differences in medical technology equipment are apparent within the Baltic Sea Region: hospitals and outpatient facilities in Germany and the Nordic States are generally better equipped than their counterparts in Poland and the Baltic Sea Region. For instance, in 2009, Finland and Denmark had 1.7 and 1.5 MRI units per 100,000 head of population, while in Poland and Lithuania, the figures were only 0.4 and 0.5.

While the density of gamma camera scanning equipment was relatively high in Denmark (1.7 per 100,000 head of population), in the Baltic States, it was just 0.2 for each country. The number of angiography units is very high in Finland (2.3 per 100,000 head of population), while in Latvia, for example, it is comparatively low (0.4) (OECD 2010).

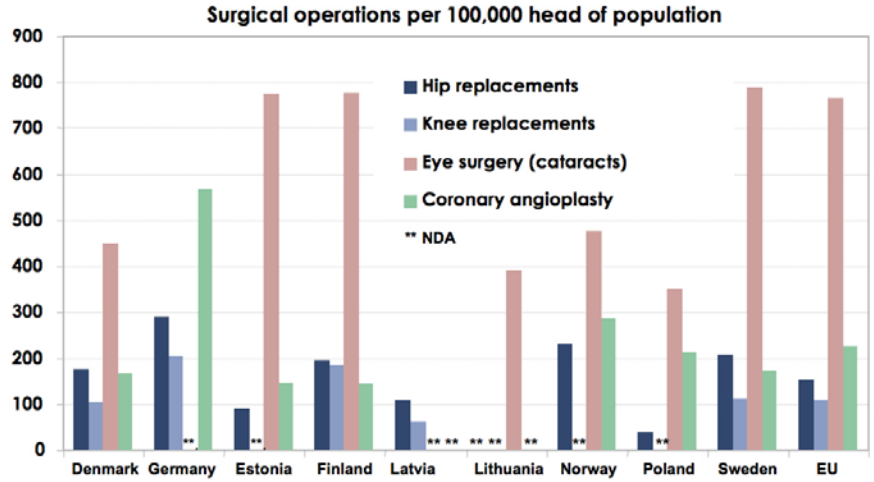
Catch-up need in Poland and the Baltic States …

In Poland and the Baltic States in particular, the demand for technical medical equipment is rising. The reasons for this include stringent EU technical and hygiene standards, which must be complied with in every country of the Baltic Sea Region. There is an above-average demand for equipment in the lowest price bracket, and also for used equipment (Steinacher 2011, Pauly 2012d). In particular, there will be a wave of modernisation of the technical medical equipment in the growing number of privatised healthcare facilities.

…and ongoing high demand in Sweden, Norway and Finland

In Germany and Northern Europe, making the most efficient use of equipment is likely to play a major role in the future. Beyond this, in Norway, Sweden and Finland in particular, the building and modernisation of hospitals should create a very high demand for technical medical equipment. This applies especially for innovative quality products at competitive prices, which are easy to operate and well designed (e.g. in the surgical equipment and instruments, diagnostic equipment, monitoring systems and telemedicine segments) (Tippelt 2011, 2012b, Pauly 2011).

Major discrepancies in the number of surgical interventions per head of population



Source: EUROSTAT. – Design NORD/LB

Germany has the highest number of surgical operations

In many areas, Germany has the highest number of surgical operations in Europe and the Baltic Sea Region. For example, the number of hip and knee replacements and coronary angioplasty per head of population is more than twice as high as the average for the EU. Conversely, there are a strikingly lower number of surgical operations in the Nordic countries. In many cases, similar prevailing conditions in Germany and the Nordic countries (e.g., in terms of life expectancy and state of health) tend to the conclusion that the high incidence of surgery in Germany can be explained mainly by factors relating to the demography and to health policy.

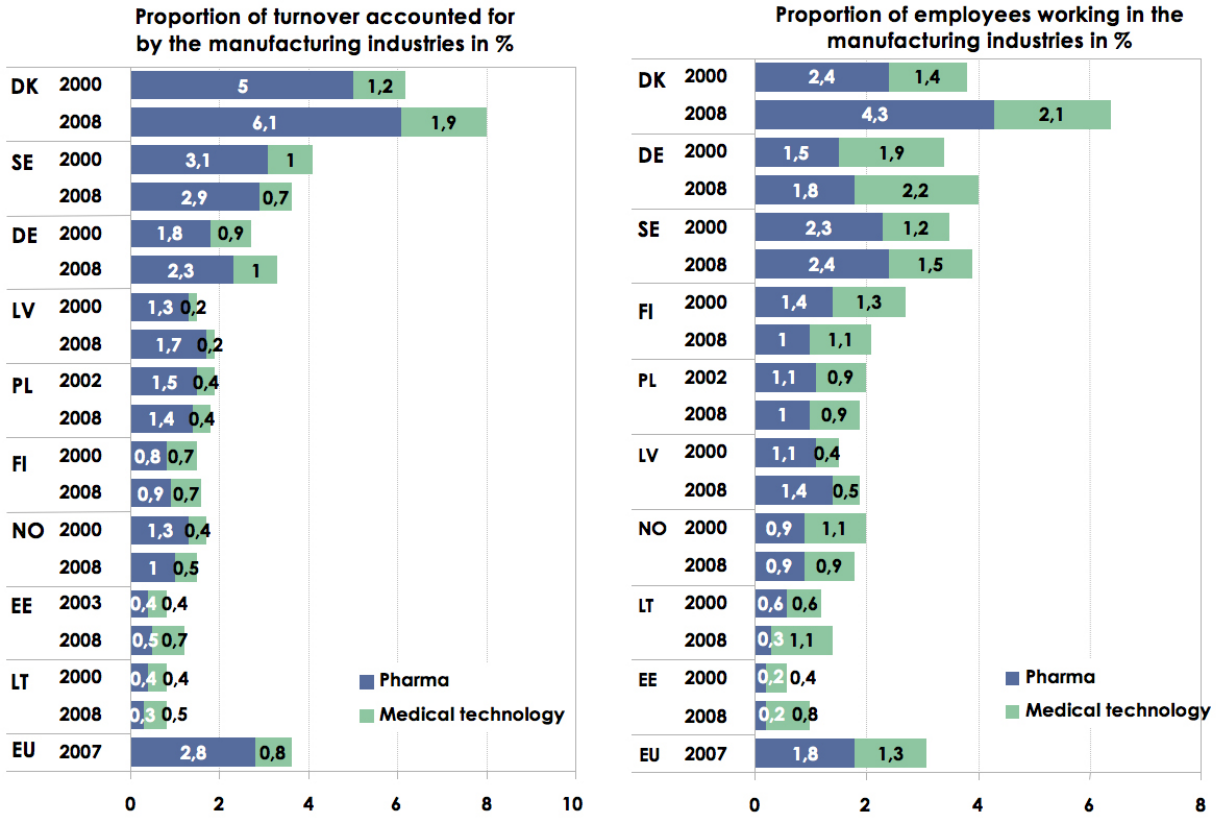
Rise in modern methods of treatment in Poland and the Baltic Sea Region

The frequency of hip and knee operations, which is significantly below the average for the EU, in the Baltic States and Poland testify to the sometimes lower medical standards in these countries. Overall, a clear rise in modern treatment methods can be anticipated. Investigations in Latvia show that here alone, the number of adult cancer patients rose from 53,000 to 63,000 in the period between 2003 and 2010. The number of diabetes cases has also risen from 58,500 to 72,700 in the period 2007 to 2010.

Trend towards outpatient facilities and treatment

There is a general trend across the whole of the Baltic Sea Region towards outpatient facilities and treatment. Measured as a figure per head of population, the availability of technical medical equipment has risen exponentially in outpatient facilities. In every country, the proportion of surgical procedures carried out at outpatient facilities has risen in recent years.

6.4 Denmark, Germany and Sweden: European leaders in biotechnology, pharmaceuticals and medical technology



Source: EUROSTAT. – Calculations and figs NORD/LB

Healthcare industry as one of Denmark's core sectors recording dynamic growth

With around 25,000 employees, the health industry (pharmaceuticals and manufacture of technical medical equipment) is one of the most important core segments of Denmark's processing industries. The share of total employment accounted for by the health industry rose significantly in the period 2000 to 2008 from 0.69% to 0.89% to achieve the highest value in the Baltic Sea Region. In 2008, 8% of the total sales recorded by the manufacturing industry were generated by the health sector, of which 6.1% was accounted for by the pharmaceutical industry.

Denmark among the top five biotechnology countries in Europe

Denmark is among the top biotechnology countries in Europe (biotechnologie.de 2010; Ernst & Young 2008). Up until the economic and financial crisis of 2008/2009, Denmark registered the highest per capita biotech venture capital investment in the whole of Europe, although in recent years, the boom has subsided a little. In 2008/2009, the biotech sector numbered 82 companies, whose core areas were frequently in medical

(known as "red") technology, such as the development of new treatments, manufacturing start-ups, drug delivery and gene and protein analysis. Of particular importance are pharmaceuticals companies Novo Nordisk, Leo Pharma and Lundbeck, which themselves invest in start-ups and research foundations to some degree (biotechnologie.de 2010).

High level of willingness on the part of the Danish private sector to invest in basic research

Denmark's biotechnology and pharmaceutical companies are characterised by an above-average willingness to invest in basic research. The geographic centres of the sector are greater Copenhagen, and the Aarhus region.

Although Copenhagen has dropped back slightly as a location (falling rate of start-ups, less investment in research), the country continues to be at the forefront of Europe, particularly because of its copious biotech materials research projects in the pipeline.

Germany: a major medical technology location

Germany's health industry employs 285,000 (2008), of which 156,000 are attributable to medical technology. In the period 2000-2008, the proportion of the sector out of total employment rose from 0.71% to 0.75%. The proportion accounted for by the health industry of sales recorded by the manufacturing industries increased from 2.7% to 3.4%.

A share of sales of approx. 30% makes Germany the biggest EU producer in the medical technology segment. With more than 15% of global trade, Germany comes just behind the USA as the world's second biggest medical technology supplier. The sector is dominated by SMEs and is at the same time, extraordinarily innovative (Forecast & IKB 2011). North German centres are Hamburg, Berlin and Schleswig-Holstein.

Top biotech locations in Northern Germany

Germany's biotech sector has developed at a rate well above the average in recent years. In the period between 2005 and 2011, the number of companies directly involved in biotechnology rose by 11% to 552, with employment in the sector up by 10% to 16,300. Sales also increased by 49% to EUR 2.62 billion. The strongest segment in Germany is very definitely red (medical) biotechnology (share: 45%). Berlin is one of the major biotech locations in Germany and Europe (Rakau 2011).

Sweden: Strong pharmaceuticals industry and marked rise in medical technology

In a sector comparison, sales and employment in Sweden's health industry has grown at a rate well above the average over the past ten years. This applies, in particular, to medical technology (11,700 employees; 2000 to 2008: an increase of 23% in employees and 61% in sales). With around 19,000 employees (2008), the pharmaceutical industry was even stronger.

Strong concentration in medical technology

The Swedish medical technology sector features a high level of concentration. Around half the total turnover is attributable to just two companies: Gambro, a group specialising in dialysis and liver transplant treatments, and Getinge, infection management and intensive care medicine specialists. The geographic centres are Stockholm, Göteborg and Malmö/Lund (Tippelt 2011).

On the one hand, there are liberal framework conditions …

Sweden's biotech sector is concentrated in the main on the pharmaceutical segment and on medical applications. Framework conditions which are particularly liberal, for example, in relation to stem cell generation and use, have boosted the positive development of the company. Of key importance are the pharmaceutical giants, AstraZeneca and Pfizer along with a variety of specialist knowledge and research-intensive SMEs. The main regional locations are centred around Stockholm/Uppsala, where half of all biotech companies are based, Malmö/Lund and Göteborg, and to a lesser extent, Umeå and Linköping (biotechnologie.de 2007a).

…but on the other, a lack of capital in Sweden's biotech sector

In the past decade, Swedish biotechnology has suffered from lack of venture capital at times. The problem was at its most serious for companies and an early stage of their development, and this inhibited sectorial growth and caused the relocation of research and production to places like Scotland, for example (biotechnologie.de 2007a).

Stagnation in Finland and Poland

In an EU comparison, the healthcare industry in Poland and Finland is of average importance. The proportion of employees dropped back from 0.48% to 0.37% in Finland and from 0.35% to 0.31% in Poland in the period from 2000 to 2008. In the same period, the share of total turnover attributable to manufacturing fell slightly to 1.6% in Finland and 1.9% in Poland. Across the EU, the figure for 2007 stood at 3.8%.

Finland's biotech in the middle of the league table

Finland's biotech sector comprises between 60 and 120 companies, putting it in the middle of the European league table. Key geographic locations are Helsinki, Turku, Tampere, Kupio and Oulu, and the main areas of activity are biotechnology and diagnostics, drug discovery and food. Based on the strength of the chemical sector, the development of hormones and enzymes plays an important role. The major engine of growth in the sector, for instance, is the pharmaceutical company Orion (biotechnologie.de 2006). The medical technology segment comprises around 200 companies employing staff of approx. 7,000. Finland's strengths lie, in particular, in IT medical technology, which alone has 60 companies (Tippelt 2010c).

Poland's biotech sector: teething troubles at first, but positive prospects

The Polish biotech sector is still in its infancy. R&D investment is comparatively low, however, the public sector accounts for the lion's share of it (Beuzekom & Arundel 2009: p.30f). The sector is already strong in agrobiotechnology, food biotechnology, environmental biotechnology, diagnostics and R&D, and training specialist biotech staff. Major investments have also recently been made in the area of regenerative medicine (e.g. Euroimplant). Poland's technical infrastructure remains weak as yet, as are its funding possibilities (Steinacher 2010, EuropaBio 2009), so that there has not been a major national biotech boom. Major centres of the healthcare industry are Kraków, Wroclaw and Warsaw.

Polish pharmaceutical group, Polpharma, expanding fast

Pharmaceutical company, Polpharma, has currently emerged as a major player in the European pharmaceutical sector. The company is already the market leader on the Polish market and is continuing to expand its position, particularly in Eastern Europe (GTAI 2011).

Strong position in haematological diagnostics

In 2011, approx. 7,900 companies were registered in Poland as producers of medical instruments and supplies. The main products are surgical instruments, orthopaedic supplies and implants. The Polish medical technology sector is particularly strong in haematological diagnostics (Steinacher 2011).

Norway: slow growth

Norway's health industry is growing at a comparatively slow rate. The marked increase in the number of companies in the pharmaceutical industry (2000: 13; 2008: 35) and medical technology (2000: 198; 2008: 395) has not yet been reflected in levels of employment and sales. The number of employees in 2008 was just 5,400, representing 0.22% of total employment. The proportion of manufacturing sector sales attributable to the health sector even dropped back in the period from 2000 to 2008 from 1.7% to 1.5%.

Norway's biotechnology sector still at an early stage of its development …

Norway's biotech sector is still at an early stage of its development. The Norwegian government has only been supporting the development of biotech companies since the end of the 1990s. The Norwegian Bioindustry Association (NBA) now has around 100 biotech member companies, of whom virtually all were established since 2000 and have fewer than 50 staff. (biotechnologie.de 2011).

…but the outlook is promising

Oslo is the centre of the Norwegian biotech industry. Companies involved in cancer research and treatment have based themselves in the immediate vicinity of the Oslo Radium-Klininkum. A considerable number of companies have settled in the North Norwegian region of Nordland and are processing marine substances. In certain instances, Norway has even more products in the development pipeline than Sweden. However, most of the clinical studies still take place abroad, since Norway does not have enough skilled personnel and also, the financial incentives for hospitals to participate are inadequate (biotechnologie.de 2011).

Latvia has an industrial base for the pharmaceutical and biotech industries

With around 2,700 employees, Latvia counts as a minor location for the Baltic Sea Region healthcare industry. Nevertheless, in the period from 2000 to 2008, the number of personnel employed rose by 400, while its proportion pro rata of overall employment stagnated at 0.25%. Contrary to its neighbours, Estonia and Latvia, at 1.9%, the sector's share of manufacturing industry sales is relatively high. The pharmaceutical industry, in particular, has been able to improve its position.

Compared to its neighbours, Estonia and Lithuania, Latvia's biotechnology and pharmaceutical sectors have a stronger showing. The segment is almost exclusively located in Riga. In recent years, Latvia has proved itself to be a cheap production base for pharmaceuticals (particularly, generic drugs) (biotechnologie.de 2007b).

Despite growth, the health industry remains of minor importance to Lithuania and Estonia

In Lithuania and Estonia, the health industry remains of minor importance. The number of employees working in the pharmaceutical industry has remained markedly below 1,000 and in Lithuania it has been strongly retrogressive over the past decade. The number of companies has stagnated, while sales have grown comparatively slowly. Conversely, the number of companies engaged in medical technology doubled. At the same time, in the period from 2001 and 2008, the number of employed increased from 538 to 1,021 in Estonia and from 1,515 to 2,663 in Lithuania. Medical technology sales rose significantly. The major manufacturers in Lithuania are Intersurgical UAB (breathing apparatus) and Viltechmeda UAB (infusions and injection pumps) (Pauly 2012c).

Lack of capital, skilled personnel and infrastructure in the Baltic Sea Region

The biotech sector remains under-represented in both countries. In Estonia, it is concentrated geographically on Tartu (70%) and Tallinn (30%) and in Lithuania, on Vilnius. Genome research, in particular (the genome database in Estonia) is of major importance to Estonia, while Lithuania is strong in green (environmental) and white (industrial) biotechnologies. As in the case of Latvia, Lithuania and Estonia are suffering from a lack of investment and venture capital, as well as a lack of skilled personnel in some areas, added to which, the infrastructure and R&D environments are not very attractive. Low salaries are less of a competitive advantage in this instance, and indeed, they are responsible for a surge in the departure of skilled personnel (biotechnologie.de 2007b).

6.5 Finnish predominance in sports' technology

Niche market in sports' services and technologies

Sport is one of the peripheral areas of the healthcare sector which overlaps the leisure and tourism industries. The manufacture of sports' equipment also has much in common with machine building, fine mechanics, medicine and medical technology, electro-technology and sensor technology. In the context of a society which is aging, but more active and sportier, the importance of health-oriented sports' services and technologies will be growing in the future at a rate well above the average.

Companies, turnover, employment in the sports' technology sector

	No. of companies		Sales in EUR million		Employees	
	2000	2008	2002	2008	2002	2008
Denmark	40	43	62.6	46.3	426	279
Germany	334	276	807.3	579.8	6,789	4,567
Estonia	14	16	4.1	17.6	329	443
Finland	153	163	155.1	161.9	1,175	1,165
Latvia	6	18	0.1	1.5	20	65
Lithuania	15	37	0.6	7.3	73	152
Norway	22	52	124.8	131.2	932	607
Poland	339	308	33.0	70.9	1,689	2,026
Sweden	243	294	171.9	135.1	1106	832

Source: EUROSTAT. – Design NORD/LB.

Positive development in Finland, Poland and the Baltic Sea Region

In Germany and Denmark, sales and employee numbers developed negatively. In Norway and Sweden, the number of companies, as well as the turnover has risen, while the number of employees has not increased. In the Baltic States, the number of companies, the sales volume and the number of employees – coming from a particularly low initial level – is growing continually. Pro rata of its population, Finland has a relatively high concentration of sports' technology companies, while in the period 2002 to 2008, Poland recorded a marked rise in sales and employee numbers.

7. The healthcare sector in the context of the innovation system of the Baltic Sea Region

Healthcare: an innovative interdisciplinary sector

Healthcare as an interdisciplinary sector cannot be entirely captured and described by the usual economic sector definitions. Its current macro and regional economic importance can therefore only be estimated to a certain extent. The framework conditions described above, such as the demographic shift, the rising health awareness of the population or the switch to a knowledge society and economy expect that in the coming years, the health sector will become more important across the whole of the Baltic Sea Region.

Knowledge and networking: the key to future development

There is growth potential, particularly at the interfaces of science and the economy, of R&D and its applications and of technological progress and healthcare provision and services. To exploit this potential, specific regional funds of knowledge and constellations of the players involved, learning cultures and infrastructures and a political framework which promotes innovation are equally important as supra-regional accessibility, the capability to absorb knowledge, supra-regional networking and marketing. Of particular interest are the originators of health sector knowledge, those that transmit this knowledge and those that apply it in the Baltic Sea Region, and here, it is their interplay which is decisive for the future capacity of innovation within the sector across the macro-region.

Healthcare institutions of the innovation system of the Baltic Sea Region

The important healthcare sector institutions of the innovation system of the Baltic Sea Region are described and their future potential evaluated, below. They include

- university hospitals as healthcare sector hubs,
- colleges focusing on Life Sciences and health sciences
- healthcare clusters, networks and science parks.

In conclusion, using patent statistics by way of example, the competitiveness of the Baltic as a prime location for healthcare will be assessed.

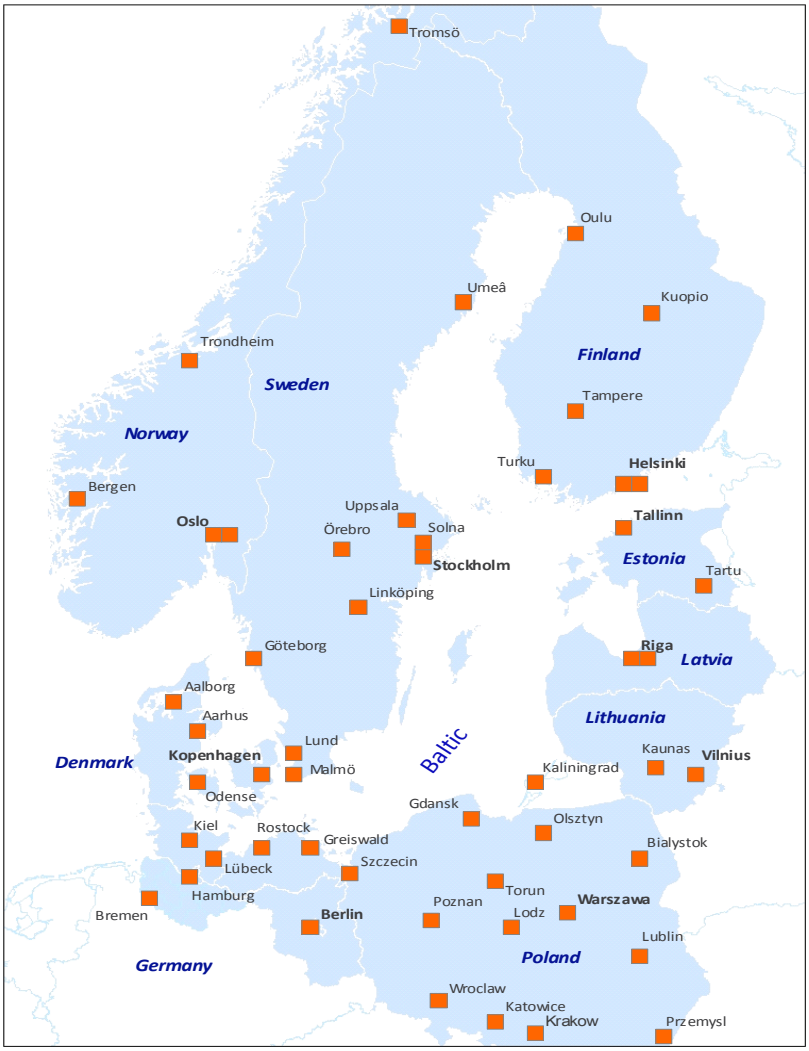
7.1 State-of-the-art university hospitals as central hubs of the healthcare sector

Hubs for education and research, as well as for top quality medical services

University hospitals constitute the central hubs of the healthcare sector in the Baltic Sea Region. On the one hand, they represent the major medical training, research and development locations of a region, or even a country, and on the other, they are the locations offering top quality medical services. They offer a broad spectrum of medical healthcare and have the necessary critical size to offer specialised services and to acquire supra-regional reputations.

Beyond this, the university hospitals generally represent core concentrations of the healthcare sector. R&D institutes, outpatient facilities and healthcare service providers, Life Science companies (e.g. medical technology and pharmaceutical groups), technology transfer and institutions promoting set-ups frequently base themselves in their geographical vicinity.

University hospitals in the Baltic Sea Region (selected)



Source: ScanBalt 2012, BaSIC 2012, SPICA 2012. – Design and graphics NORD/LB

More than 50 university hospitals in the Baltic Sea Region

There are approx. 50 university hospitals in the Baltic Sea Region. The major university hospitals are concentrated in the larger towns and cities of the Baltic Sea Region, including the capitals, Warsaw, Berlin, Copenhagen, Oslo, Stockholm, Helsinki, Tallinn, Riga and Vilnius. Among the leading European and Baltic Sea Region hospitals highlighting the particular importance of the university hospitals are the Charité (Berlin) and the Karolinska Institute (Stockholm).

Charité (Berlin)

The Charité is based over a number of locations in and around Berlin. It has more than 3,200 beds and an annual turnover of around EUR 1.2 billion. With approximately 13,000 staff, it is Berlin's second most important employer. The Charité has around 3,700 scientists, of which 222 are professors, approx. 7,000 students, 2 centres of excellence, 9 specialist research areas (functioning as the overall management), 5 specialist research areas (in which it holds a participation), 11 research groups, several graduate colleges and 4 major development foundations. In 2011, the Charité raised outside funding of EUR158 million and received EUR 184 million in state subsidies for research and teaching.

The Karolinska Institute (Stockholm)

The Karolinska Institute (KI) in Stockholm also has a number of locations spread across the town. It has 1,600 beds, around 14,500 staff and an annual budget of approx. EUR 1.2 billion. The KI trains 600 graduate doctors and 2,100 nurses and care assistants, with a further 700 studying biomedicine, physiotherapy and ergotherapy. In the past three years, around 15,000 scientific papers were published and outside funding of approx. EUR 235 million was raised.

University hospitals in Sweden

Town	Population	Region	Beds	Staff	Annual budge (SEK bn)	Catchment area (in million head of population)
Umeå	80,000	North Sweden	712	5,700	n.a.	0.9
Uppsala	140,000	Central Sweden	1,100	8,100	4.0	1.9
Örebro	107,000	Central Sweden	560	3,600	3.4	1.9
Stockholm	868,000	Stockholm area	1,600	14,500	14.2	2.0
Linköping	104,000	East Sweden	600	5,500	4.4	n.a.
Göteborg	517,000	West Sweden	2,300	17,000	n.a.	1.7
Malmö/Lund	383,000	South Sweden	1,750.	12,500	10.0	1.7

Source: Research, design and graphics NORD/LB

High regional economic importance

The regional economic importance of the university hospitals is high. In medium sized and smaller centres, these hospitals are generally among the major employers in the area. Examples of these are the Swedish towns of Umeå, Uppsala, Örebro and Linköping, all with populations below 150,000, but who all have university hospitals employing between 3,600 and 8,100 staff. In 2011, the university hospital in Rostock employed a staff of 3,100 and recorded a turnover amounting to EUR 265 million, making it the state of Mecklenburg Western-Pomerania's third biggest employer.

Along with the **direct economic impact** of the hospitals (employment and value created by the hospital activities), these institutions also generate extensive **indirect benefits** (input, income and investment effects).

University hospitals in peripheral regions

In Northern Europe's peripheral regions (such as North Sweden, North Finland, North Norway), the university hospitals hold positions of outstanding importance. Because of their huge catchment areas, compared with the rest of the thinly populated hinterland, they have the best infrastructures, as well as better regional and supra-regional accessibility. The population as a whole benefits from this, and this applies equally to the research and training institutions and companies from all industrial sectors located there.

Hospitals as the engine of urban and regional development

A good example is the university hospital of Umeå in North Sweden, which serves about 0.9 million inhabitants in an area of around 235,000 km² (Germany: 357,000 km²). The fast pace of development of Umeå – now North Sweden's major town – in the past decades (population 1960: 32,000; population 2010: 80,000) is attributable mainly to the establishment and ongoing expansion of the university hospital.

With the completion of the high-speed railway linking Umeå with Stockholm, a new main railway station was built directly by the hospital, so that all regional and supra-regional high-speed trains give direct access to the hospital. Over the past decades, new hotels, shopping centres and a top class residential district to house healthcare staff have sprung up, along with research, technology transfer and set-up development institutions (Schrödl 2007).

Extensive investment in the hospital sector providing dynamic momentum

In the context of what is currently Europe's biggest new hospital building programme embarked on by the Karolinska Institute in Stockholm, an entirely new urban district will be created, with science parks, 36,000 new jobs, 5,000 homes and transport infrastructures (totalling investment in excess of EUR 500 million). The aim is to make the university hospital the key focus and pivot for regional nursing care, research and training. A project with a similar order of magnitude of investment is currently being carried out in Riga. (Pauly, T. 2012a; Tippelt 2010a).

7.2 Life Sciences in the Baltic Sea Region: a wealth of diversity from Tromsø to Kraków

More than 60 towns and cities have colleges focusing on Life Sciences

More than 60 towns and cities of the Baltic Sea Region already have faculties and study courses with a Life Sciences focus. A glance at the map shows that virtually every area of the Baltic Sea Region has institutions of this type, giving the entire Baltic Sea Region a head start in healthcare sector knowledge production.

Around 25 universities focus on medical technology, with around 35 specialising in pharmacology and more than 71 on biotechnology and a further ten on Life Sciences in general.

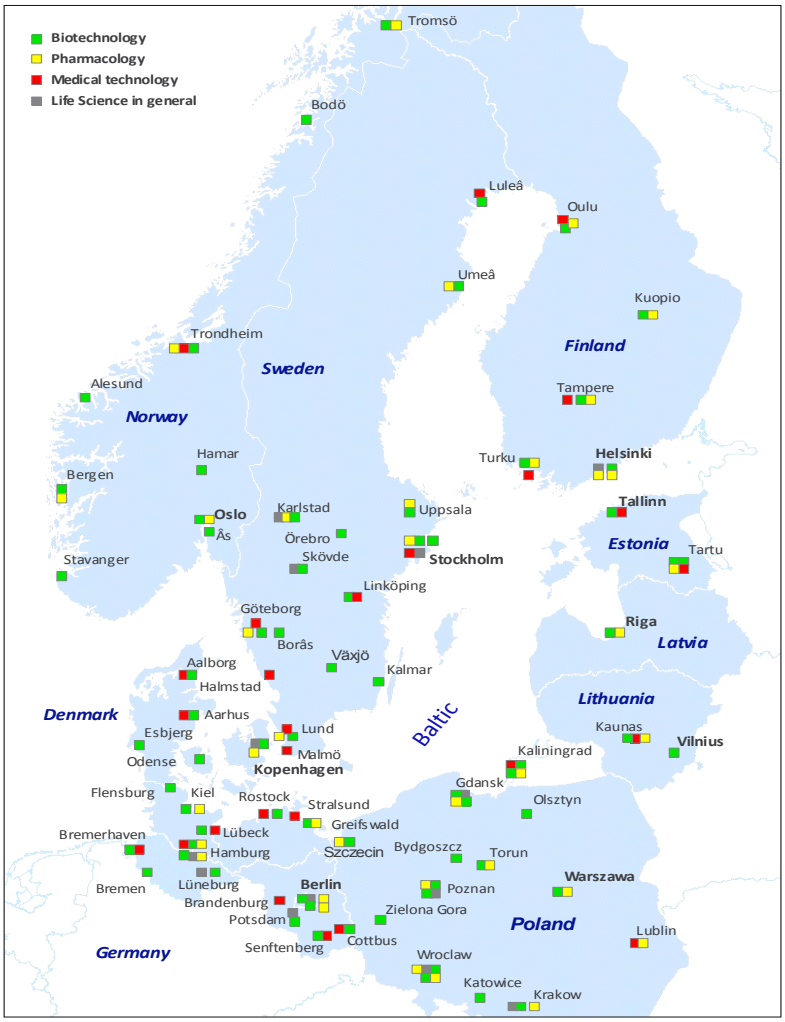
Particularly high density in Sweden

Sweden enjoys a particularly high density of universities with the above specialisms – pro rata of population numbers (15 universities). In the southern half of the country, there is a particularly close network of institutions. Many of the major research and training facilities in the area of biotechnology are based in and around Stockholm/Uppsala, Göteborg, Malmö/Lund, Umeå and Linköping.

Major centres in Norway, Finland and Denmark

Over the past decades, the number of universities in Norway, Finland and Denmark has been continually rising. In many relatively young universities with a strong regional orientation, the accent in recent years has been on expanding the research and teaching offering, especially in the area of biotechnology. In addition, these countries now have several major Life Science centres, whose importance extends beyond the region. In Finland, these are Helsinki, Turku, Tampere and Oulu, and in Norway, Oslo, Bergen, Trondheim, Tromsø and in Denmark, Copenhagen, Århus and Aalborg. While in Finland, medical technology with a focus on research and study courses is relatively well established, in Norway and Denmark, the accent is more on biotechnology and pharmacology.

Universities focusing on Life Sciences (selected)



Source: ScanBalt 2012, BaSIC 2012, SPICA 2012. – Design and graphics NORD/LB

Not many universities in the Baltic States

There are only five universities In Lithuania, Latvia and Estonia as yet with a focus on pharmacology, biotechnology and medical technology. New research establishments have been developed and established in all three countries in recent years, mainly in the area of biotechnology, and an example here is Tartu in Estonia.

Poland: Life Science locations on the increase

Poland has at least 15 colleges offering a focus on biotechnology, with 9 concentrating on pharmacology and just one on medical technology. Major centres are, in particular, Gdansk, Poznan, Wroclaw, Kraków, Lodz and Warsaw (BioConValley 2006).

Concentration on Berlin/ Potsdam, Hamburg and the Baltic coast

North Germany has many universities focusing on Life Sciences, with a particularly high density in the major urban centres of Hamburg and the Baltic coast.

7.3 The high density of universities specialising in health sciences across the entire Baltic Sea Region

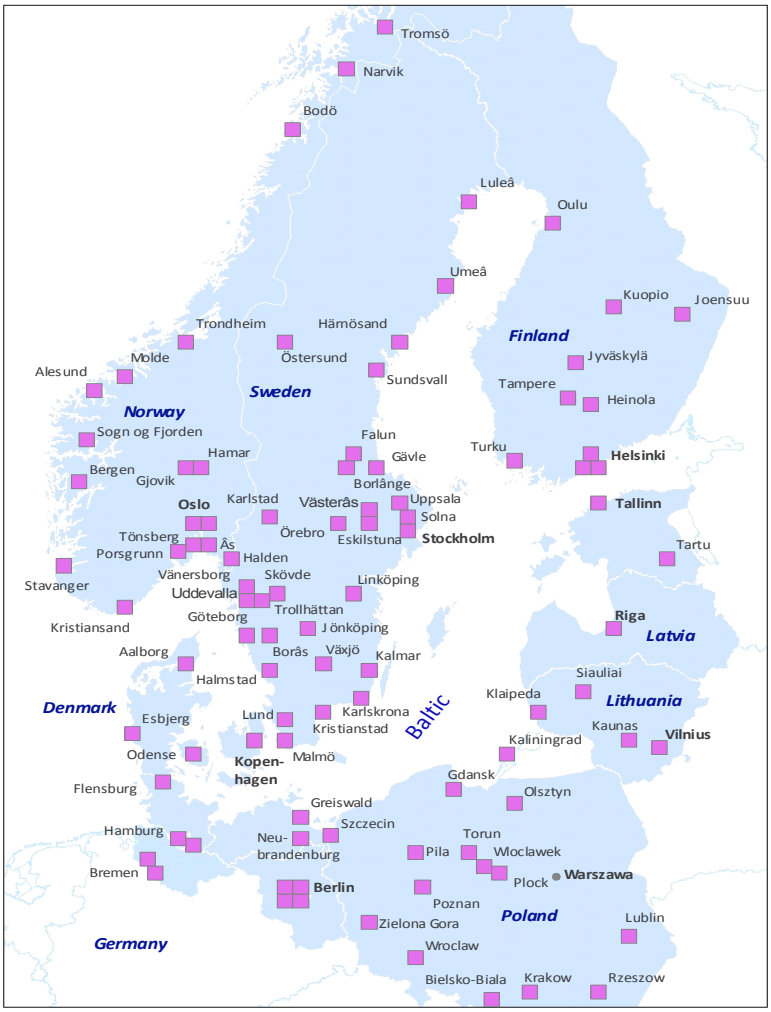
Healthcare: an interdisciplinary sector

As an interdisciplinary sector, healthcare has a number of overlapping interfaces with other service, research and training areas. In addition to medicine, pharmacology, biotechnology and bioengineering, many Baltic Sea Region universities also have healthcare-related courses and university research establishments which have been amalgamated under the term health sciences in the text below.

Northern Europe: a particularly close network

It is noteworthy, that the Nordic countries have a particularly close network of health science establishments. This means that even the most sparsely populated regions of Northern Europe have access to health science training and research at universities. The framework conditions of the health sector are also improving in this area.

University locations with a focus on health sciences (selected)



Source: ScanBalt 2012, BaSIC 2012, SPICA 2012. – Design and graphics NORD/LB

Upward trend in research and academic training in the areas of health economics, public health and healthcare management

Increasingly, questions relating to the viability of retaining and maintaining and even further expanding healthcare establishments and systems, are gaining in importance across the entire Baltic Sea Region. This goes in tandem with more intensive research and academic training, particularly in the areas of health economics, public health, nursing care and healthcare management:

- The field of health economics concentrates on the medical effectiveness and viability of the healthcare system, the quality of healthcare provision and the fair and equitable use of healthcare commodities.
- Public health examines the state of health of entire groups of population and their interaction with the environment, their attitudes and the medical healthcare provision system. Issues relating to prevention and epidemiology are of prime importance here.
- Nursing and healthcare management deals with the economic aspects of the building and operation of healthcare facilities.

The 'academisation' of many healthcare professions in Northern Europe

The Nordic countries are distinguished by an increasing 'academisation' of many of the healthcare professions. Conversely, in Germany, nurses, carers, geriatric carers and physiotherapists are trained at universities. Areas such as speech therapy, which are key areas of German educational training, have their own autonomous departments at the universities.

Nordic strengths: prevention, exercise and sport

Denmark, Norway, Sweden and Finland are currently building a reputation for themselves in preventive medicine, exercise and sport. Research and training in areas such as health, stress, stress management, leadership, health in the workplace, sports' technologies and their marketing, wellness and healthy eating are widespread in these countries.

7.4 At least 50 healthcare sector clusters and networks

Cluster development: contingent on the market …

A cluster is defined as the geographic concentration of related companies, specialist suppliers and service providers, and companies in associated sectors and supporting organisations (including universities, chambers of commerce, associations, etc.), which are both competitors as well as cooperating partners (Porter 1998, p.197f). The interaction of players making up a cluster takes the form of

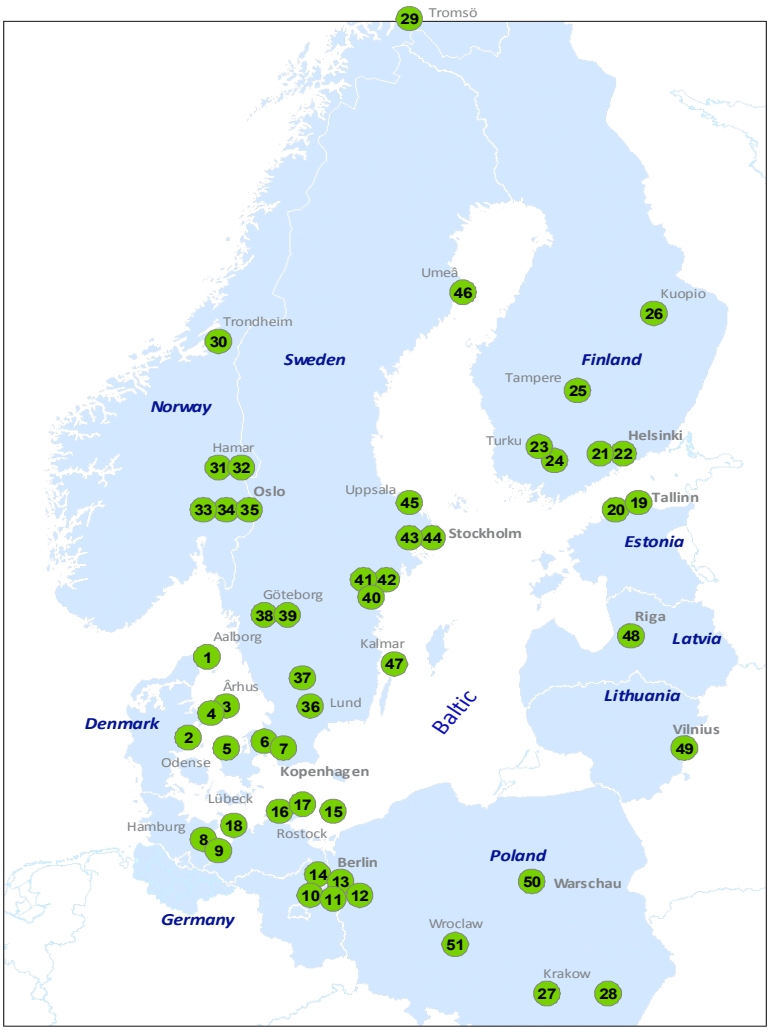
- a vertical relationship between producers, suppliers and customers all along the value creation chain (e.g. the development, production and marketing of drugs) and
- a horizontal relationship (with competitors) (Bathelt & Glückler 2003, p. 212f).

These relationships are contingent on trust between the players involved, where implicit knowledge and joint learning processes, social capital as well as communication and coordination between the market and the hierarchy play a central role.

… and political control

Over recent decades, the establishment of clusters has entered the consciousness of national and regional economic policy and development. This development is the result of a conviction that the building of cluster structures might generate an increase in the innovative capacity and consequently, the competitiveness of a sector or a region. In particular, positive growth effects were anticipated from cluster formation in Life Sciences, an area enjoying a boom for some years now, although these expectations have not yet been fulfilled.

Health sector clusters and networks (selected)



Source: ScanBalt 2012, BaSIC 2012, SPICA 2012. – Design and graphics NORD/LB

Healthcare sector clusters in the Baltic Sea Region (selected)

1	Bio Med Community	18	MedRegio	35	Medtech Oslo
2	Green Network	19	Estonian Biotechnology	36	Medicon Valley
3	BioMedico Forum	20	Competence C . Cancer Research	37	Hölsoteknikalliansen
4	Biocenter East Jütland	21	Culminatum Ltd Oy	38	MedCoast Scandinavia
5	TCM Denmark	22	SymBio	39	GöteborgBIO
6	BioLogue	23	HealthBIO	40	Livets Nya Verktyg
7	Medicon Valley	24	Bio Turku	41	BioMedley.com
8	Norgenta / Bay to Bio	25	Finn-Medi Research	42	NIMED Center of Excellence
9	Biokatalyse2021 Cluster	26	Health and Wellbeing	43	Biotech Valley
10	Pflanzen Genomanalyse (GABI)	27	LifeScience Cluster Krakow	44	Stockholm-Uppsala Life Science
11	RiNA (RNA network)	28	Medycyna Polska	45	Uppsala BIO
12	BioTOP Berlin-Brandenburg	29	Biotech North	46	BIOtech Umeå
13	DiagnostikNet-BB	30	medtech trondheim	47	Kalmar Bioscience
14	Congenital Heart Defects	31	Hedmark Bioinn	48	Latvian Biotechnology Associaton
15	BioCon Valley	32	BIOINN	49	Lithuanian Biotechnology Ass.
16	KBR – Biomaterials Rostock	33	Oslo Cancer Cluster	50	Biotech Med
17	CELISCA	34	MedCoast Skandinavia	51	Nutri Biomed

North European countries lead the way in cluster development …

…Poland and the Baltic States lagging behind

Many clusters in their infancy or at an early stage of development, consequently, the development potential for the future is high

In every country of the Baltic Sea Region there are health sector clusters and networks of varying density and stage of maturity. The cluster formation process is particularly advanced in Northern Europe. In Medicon Valley (Denmark/Sweden) and Medcoast Scandinavia (Sweden/Norway), there are two groups forming supra-country clusters.

Less advanced is the cluster formation in Poland and the Baltic States, where the low number of healthcare sector companies and institutes make development more difficult in certain areas.

Investigations show that many clusters in the Baltic Sea Region are still

- in their infancy ("Scientific fountains"; large number of research projects, research personnel and scientific publications) or
- at an early stage of their development ("Co-location clusters"; large number of Life Science university graduates, patent applications, venture capital investments and start-ups), so that consequently, the development potential for the future is very promising.

The spread of more mature Life Science clusters ("Mode 3" clusters; high numbers of employees, SME start-ups and international companies, good accessibility, high rates of sales growth) are mainly concentrated on Germany and the Nordic countries.

Life Science cluster life cycles in the Baltic Sea Region

		Cluster lifecycles		
		Scientific Fountains	**Co-location clusters**	**Mode 3 clusters**
Critical driving force	R&D input	high	medium	low
	Venture capital	low	high	medium
	Human Resources	high	high	medium
	Biotech staff	low	medium	high
	Economic output	low	medium	high
Stage in the value creation chain		new business screening	development	test, production, sales
Examples of clusters in the Baltic region		• BioTeam South • Kalmar BioScience • Latvia Biotech Cluster • North Poland Biotech Cluster	• BioCon Valley • BioTurku • Estonian Biotech Cluster • Lithuania Biotech Cluster	• MedCoast Scandinavia • Medicon Valley • Stockholm-Uppsala Life Science

Source: ScanBalt & BioCon Valley 2006. – Design and graphics NORD/LB

Metropolitan areas and major conurbations at an advantage

The highest densities of clusters in the Baltic Sea Region are located in Berlin/Brandenburg, the Öresund region (Copenhagen/Malmö), Oslo, Stockholm/Uppsala and Southern Finland. Based on their generally advantageous factor and demand conditions, their high density of supporting and associated sectors and their industry-specific institutions, the metropolitan areas and major conurbations have natural advantages for cluster development. In a comparison with other sectors, for the knowledge-intensive pharmaceutical industry, biotechnology and medical technology segments, proximity to universities and research establishments and the availability of highly qualified personnel play a particularly important role. Highly qualified staff also prefer an urban living environment (Brandt 2008, 2011; Brunken & Schrödl 2011).

Leading European Life Science clusters

Some of the Baltic Sea Region health clusters are among the most extensive and successful in the whole of Europe. Medicon Valley extends across the entire Eastern Danish island of Seeland to the Skåne area in Southern Sweden. Stockholm-Uppsala Life Science and BioTOP Berlin/Brandenburg cover the capital city metropolitan areas of Sweden and Germany.

Leading Life Science clusters in the Baltic Sea Region

Medicon Valley	Stockholm-Uppsala Life Science	BioTOP Berlin/Brandenburg
• Population of the region: approx. 3.5 million • Moe than 500 healthcare companies and research establishments • Of which, at least 250 involved in medical technology, 140 in biotechnology and 25 in pharmaceuticals • 32 hospitals, of which 11 attached to universities • 5 universities with Life Science focus. Approx. 45,000 Life Science students, approx. 7,000 Life Science graduates per annum, approx. 2,600 Life Science doctoral students • Medical technology: more than EUR 5 billion sales and 18,000 employees • 6 Science Parks and set-up institutions focusing on Life Sciences in each • Key focus includes medical disposables, hearing aids, electronic equipment, neurosciences, cancer, diabetes, allergy research	• Population of the region: approx. 2.5 million • More than 750 healthcare companies and research establishments • Of which, at least 170 involved in medical technology, 208 in biotechnology and 41 in pharmaceuticals • 6 universities with Life Science focus, 12 research establishments, more than 5 hospitals, 13 sector-related public institutions, several technology parks and set-up institutions • Focus includes protein research and development, neurosciences, cancer research. Regenerative medicine, research into infectious diseases, inflammations and auto-immune conditions	• Population of the region: approx. 5 million • More than 500 healthcare companies and research establishments • Of which, at least 180 biotechnology, 270 medical technology and 22 pharmaceutical companies and 13 contract research organisations • 15,000 employed in Life Sciences • Approx. 10 universities with focus on Life Sciences; approx. 3,000 Life Science graduates per annum; approx. 20 non-university Life Science research establishments, 14 sector-specific organisations and associations • 12 sector-specific networks, 6 bio parks and 2 technology parks with biotech focus • Focus includes genomics/proteomics, oncology, regenerative medicine, molecular diagnostics, bioanalytics, telemedicine, minimal invasive surgery and implants

Source: LIFE SCIENCE without borders 2012, Stockholm-Uppsala Life Science 2012, ZAB 2012. – Design NORD/LB

Successful clusters at peripheral locations, e.g. Tromsø, Umeå, Kuopio and Greifswald

In the past years, a growing number of innovative clusters with what are known as **triple helix structures** (close network of players from the economics, science and public sectors) have emerged around the peripheral university and hospital locations of Germany and Northern Europe. The following are some of the successful examples:

- Biotech North in Tromsø, Northern Norway (specialising in marine biotechnology among other areas)
- Biotech Umeå in Northern Sweden (specialist areas include green biotechnology, diagnostics, research into infectious diseases, metabolic and nervous diseases
- The Health and Wellbeing cluster, which has centres in Kuopio and Oulu (specialist areas include wellness, ambient assisted living, sports' technology, healthy eating)
- BioCon Valley in Greifswald and Rostock.

New trans-border networks, such as Eco4Life

Overall, there has been a noticeable increase in networking activities across the entire Baltic Sea Region. Eco4Life is one example of the growing trans-border cooperation between healthcare sector universities, research establishments and companies in Mecklenburg Western-Pomerania (BioCon Valley®), Poland (Pomeranian Medical University Szczecin) and Lithuania (Klaipeda University). The main areas of cooperation up to now have included health tourism, as well as bioeconomy and diabetes (BioCon Valley ® 2012).

ScanBalt: the "network of networks"

In ScanBalt, the Baltic Sea Region has had a trans-border, communal Life Science network independent of any government, comprising members coming from business, politics and science for over ten years. The network has far in excess of 50 members from every country in the Baltic Sea Region. The ScanBalt BioRegion includes more than 2,540 Life Science companies, in excess of 1,000 research establishments and institutions, as well as almost 250 hospitals and clinics (ScanBalt 2012).

The aim of the institution is to position the Baltic Sea Region as one of the most competitive regions in the healthcare industry. Given the current landscape of escalating global competition and the increasing concentration evident in the sector, this gives existing and in some cases, still very small healthcare sector clusters and initia-

tives in the Baltic the opportunity of supra-regional networking and of positioning themselves internationally in conjunction with the other members of the network.

ScanBalt as the central institution of the Baltic Sea Health Region

ScanBalt is aiming to assist innovation potential right across the Baltic Sea Region, and to promote and coordinate Baltic regional projects and regional competencies, events and activities beyond the region and to represent the combined interests of the healthcare sector and the Baltic Sea Region externally. This makes ScanBalt the central institution of the future development of a Baltic Sea Health Region.

7.5 More than 75 healthcare sector Science Parks

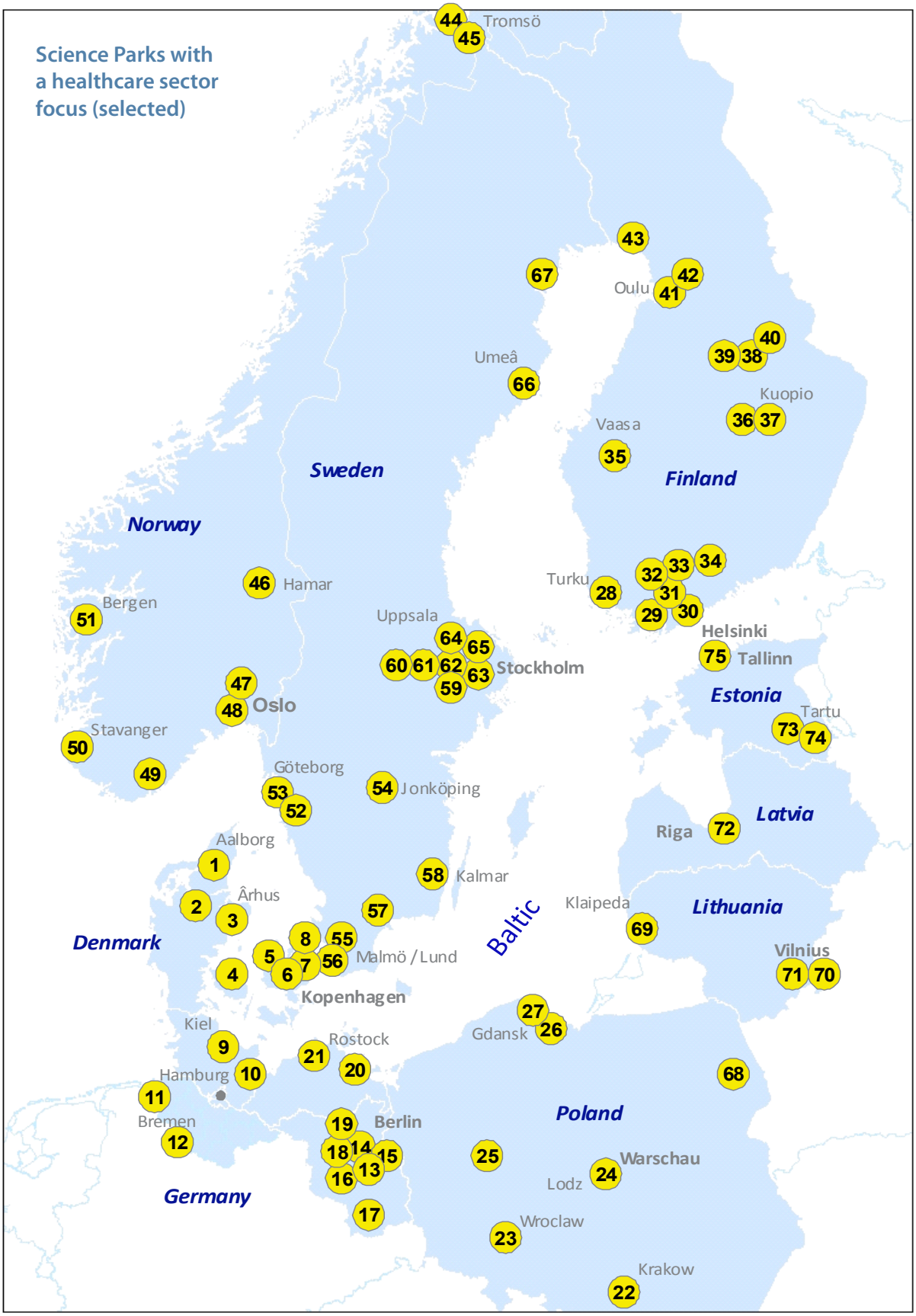
Science Parks as concentrated cores of the healthcare sector in the Baltic Sea Region

Science Parks and technology parks, set-up development centres and incubators (called Science Parks in the following text) have a disproportionately high importance for Life Sciences (Brunken & Schrödl 2011). At their best, they offer this particularly knowledge-intensive and young sector the following (Bathelt & Glückler 2003, p.206):

- Geographic proximity to universities, sector-specific research and service facilities or fast-growing companies,
- A good availability of highly qualified staff and highly specialised funds of knowledge,
- Convenient communication, learning and research environments and high calibre technical infrastructures for common use,
- Venture capital, reasonable space, suitable premises, consultancy, communication and marketing services for set-ups (including spin-offs) and companies/institutions settling there
- Good access to research and business partners and a high quality of urban lifestyle in the surrounding environment.

The highest density of Science Parks in the world

The Baltic Sea Region has the highest density of Science Parks in the world (applies to Finland, Denmark and Norway). In Northern Europe, virtually every university and centre with a population of more than 25,000 to 50,000 now has facilities of this type. Kista Science City in Stockholm and Otaniemi Technology Hub in Helsinki/Espoo are currently among the major world and European Science Parks (Schrödl 2011).



Source: ScanBalt 2012, BaSIC 2012, SPICA 2012. – Design and graphics NORD/LB

Science Parks focusing on the healthcare sector (selected)

Dänemark		**Norway**	
1	Novi SciencePark	44	NorInnova Technology Transfer AS
2	Agro Business Park	45	BBC Barents BioCenter
3	Incuba Science Park Ltd.	46	Hedmark Kunnskapspark AS
4	International Science Park Fyn Odense	47	Forskningsparken AS
5	Forskerparken CAT (Resaerch Park CAT)	48	Biosparken Âas
6	Symbion Science Park	49	Conventure AS
7	COBIS Copenhagen Bio Science Park	50	Ipark AS
8	Scion-DTU a/s	51	Sarsia Development AS
Germany		**Sweden**	
9	Wissenschaftszentrum Kiel GmbH	52	Chalmers Innovation
10	Wissenschafts- and Technologiepark Lübeck GmbH	53	Sahlgrenska Science Park
11	Bio Nord – Biotechnologiestandort Bremerhaven	54	Science Park Jönköping
12	Bremer Innovations-and Technologiezentrum	55	Ideon Research Park
13	berlinbiotechpark	56	Medeon Science Park
14	Biotechpark Berlin-Buch	57	Krinova Science Park
15	Wista-Management GmbH Berlin Adlershof	58	Kalmar Science Park
16	Biotech Campus Potsdam	59	Flemingsberg Science
17	Biotechnologie Luckenwalde	60	Västeras Science Park
18	Wissenschaftspark Potsdam – Golm	61	Stockholm Science City
19	Biotechbogen Henningsdorf	62	Karolinska Institutet Science Park AB
20	Biotechnikum Greifswald	63	Novum BioCity
21	Technology Park Warnemünde	64	Silverdal Science Park
Poland		65	Kista Science City AB
22	Jagiellonian Centre of Innovation Ltd	66	Uminova Science Park
23	Wroclaw Medical Science and Technology Park	67	Solander Science Park
24	Lodz Regional Science-Technology Park	**Lithuania**	
25	Nickel Technology Park Pozna	69	Klapeida Science and Technology Park
26	Pomeranian Science & Technology Park	70	Sunrise Valley
27	Gdansk Science Technology Park	71	North Town Technology Park
68	Bia□ystok Science and Technology Park (BPN-T)	**Latvia**	
Finland		72	Latvian Technology Park
28	Turku Science Park	**Estonia**	
29	Culminatum Innovation Oy	73	Tartu Science Park
30	Helsinki Business and Science Park Ltd.	74	Tartu Biotechnology Park
31	Vantaa Innovation Institute Ltd.	75	Tehnopol – Talli Technology Park
32	Agropolis Ltd.		
33	Technology Centre Innopark Ltd		
34	Lahti Region Centre of Expertise		
35	Foodwest Ltd.		
36	Kuopio Innovation Ltd.		
37	Business Oulu Ltd.		
38	Technopolis Plc.		
39	Kuopio Technology Centre Teknia Ltd		
40	Kajaani Technology Centre Ltd.		
41	Measurepolis Development Oy		
42	Snowpolis Oy		
43	Digipolis Ltd.		

More than 75 Science Parks

More than 75 of the Science Parks in the Baltic Sea Region focus on areas in the health, pharmaceutical, biotechnology and medical technology sectors. Across the Baltic, many of the Life Science centres are particularly concentrated on the areas around Berlin/Brandenburg, Öresund, Stockholm/Uppsala and Southern Finland.

High number of specialist biotechnology parks

Biotechnology parks specialise in research, development and set-ups in the biotechnology sector. They offer the sector particularly good support for development. Well-known examples are Medeon in Malmö and Ideon in Lund, the Novum Research Park in Stockholm/Huddinge, Bioparken Ås near Oslo, the Tartu Biotechnology Park in Estonia, and the berlinbiotechpark, the BiotechCampus Potsdam, the Biotechnology Centre Henningsdorf and the Biotechnologiepark Luckenwalde in Germany's metropolitan capital city region, along with the Biotechnikum in Greifswald.

7.6 Particularly high intensity of R&D and density of patent applications in Denmark, Germany and Sweden, with Estonia on the way to catching up

Research-intensive pharmaceutical companies in Denmark, Germany and Sweden

The above chapters illustrate that the entire Baltic Sea Region now has a comprehensive network of innovation infrastructures (universities, clusters and networks).

However, there remains a qualitative gulf between the well-developed major centres of Northern Germany and Northern Europe on the one hand, and the still very small, but growing centres in Poland and the Baltic States.

Pan-Baltic region networking and cooperations can reduce the differences

The research and innovation intensity typical of the Life Sciences sector – pro rata of per capita R&D expenditure – continues to be far higher in Denmark, Germany and Sweden than in Poland and the Baltic States. In particular, the growing interlinking of corporate and scientific locations in all the areas of the Baltic Sea Region promises the permanent elimination of the prevailing differences.

Healthcare research expenditure

	R&D expenditure in the corporate sector by business sector, EUR/per capita, 2008/2009				
	All business sectors	Pharma-ceutical industry	Radiation and electro-medical equipment	Medical technology	Public health
Denmark	847	145	18	8	n.a.
Germany	552	48	6	5	n.a.
Estonia	66	n.a.	n.a.	1	1
Finland	799	21	n.a.	n.a.	n.a.
Latvia	14	2	n.a.	n.a.	0,1
Lithuania	16	1	n.a.	n.a.	1
Norway	516	11	n.a.	2	n.a.
Poland	16	1	n.a.	0.1	0.2
Sweden	800	65	n.a.	n.a.	n.a.

Source: EUROSTAT. – Design NORD/LB

Highest density of patent applications in Denmark, Germany and Sweden

Innovation success can be measured among other factors by the number of patent applications in a particular sector or region. Since patent applications are regularly submitted in the biotechnology sector across Europe, it is possible to compare the countries and the major centres comprising the Baltic Sea Region.

Over the past decade, Denmark, Germany and Sweden have made the most biotechnology patent applications throughout the entire Baltic Sea Region. However, Finland, and in some areas, Norway, also have an above per capita EU average number of patent applications in the biotechnology sector.

Estonia on the way up, Poland on course for growth

In spite of some marked fluctuations, there has been enormous growth in Poland and Estonia, in particular, and these two countries are well on the way to becoming innovative biotechnology locations. Estonia has now virtually achieved the EU average in terms of patent applications.

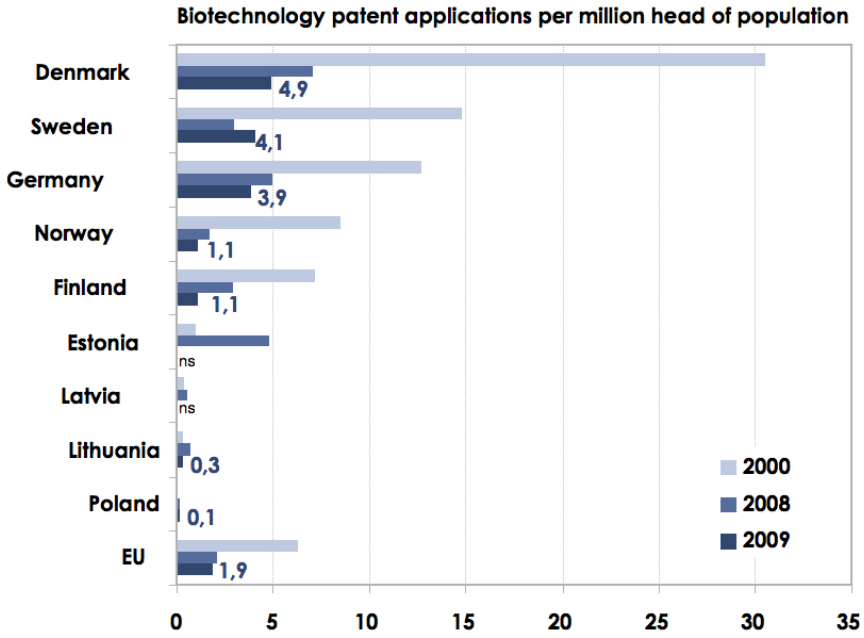
Öresund region, Århus, Berlin/Brandenburg and Southern Finland still in the lead

At regional level, it is clear that with 50.5 biotech patent applications per million head of population, the Copenhagen area took the European lead in 2008. Also achieving above-average numbers were Århus (15.3), Berlin (13.7), Helsinki (13.2), Turku (11.9) and Malmö (11.0). While the major biotechnology centres in the Western and Northern areas of the Baltic Sea Region suffered some decline in patent applications in 2009, regions including Tallinn, Riga, Vilnius and Lublin were able to maintain or even improve their position (EUROSTAT 2012).

Marked decline in Northern Europe and Germany since 2008/2009

Since 2008, a marked decline in patent applications has been evident almost everywhere, and this applies, in particular, to Denmark, Sweden, Finland, Norway and Germany. This is attributable to factors which include the more stringent patent application regulations right across Europe, the economic and financial crisis and consequent curtailment of research and innovation expenditure, as well as a lack of venture capital and the transfer of many R&D activities from the biotech to the pharmaceutical sector (better application and marketing potential). Biotechnology research expenditure which has meanwhile recorded a significant rise signals a short and medium term increase in the number of patent applications (Ernst & Young 2012).

Biotechnology patent applications in the Baltic Sea Region



Source: EUROSTAT. – Design NORD/LB

8. Innovation as a driver for a competitive and knowledge based health economy

8.1 Barriers for Innovation in health economy

Lack of education in entrepreneurship skills

In a study in the scope of the BSHR HealthPort project Kuura et. al. showed that bioscience based innovation courses are underrepresented in relation to other technology innovation courses. In Denmark there is competence to apply their current educational framework to bioscience innovation, whereas in Finland, Sweden, Germany and Netherlands Health Care and Bioscience Venture Creation and Management programs already exist. In Estonia and Poland, the bioscience knowledge base is the lowest and more practical courses are needed. In Lithuania strong base for Clinical verification exists, but other areas are missing. [Kuura 2012]

Lack of capital for early stage financing

Compared to the US there is a smaller pool of active venture capitalists investing in health and life sciences. This is particularly crucial for start-ups that need capital in an early stage.

Lack or early idea evaluation

There is a lack of mechanisms for early evaluation of ideas. Many ideas may seem innovative from a scientific point of view. However, to become an innovation the idea has to fit into the regulatory framework as well as survive the rigorous test of Health Technology Assessment procedures.

Lack of knowledge about regulation, certification and procurement

Knowledge about regulation, certification and procurement is not necessary among the skills of young entrepreneurs or people creating a start-up company

Lack of an infrastructure for innovation dissemination and marketing

Dissemination of innovations is essential to finally have success on the market. In a transnational context this is even more demanding. There is a lack of an infrastructure or network that allows small start-up companies to find their potential customers on the demand side.

8.2 Cross-sectoral gaps for innovation

Closing the gaps

Meyer et al. (2011) describe three innovation gaps: the technology discovery gap, the commercialisation gap and the venture launch gap. Coupled with the successful development and implementation of solutions that address these gaps is the education that teaches the necessary knowledge and skills. Kuura et. al. (2012b) describe an educational platform for entrepreneurship development that covers the above mentioned capacity building.

Early evaluation of ideas

From an ecosystems perspective not every invention contributes to the final objective to create smart, sustainable and inclusive solutions that generate improved health outcomes. Systematic innovation management is needed starting with early idea evaluation to filter out the most promising ideas. A rigorous evaluation from a holistic viewpoint in an early phase can save a lot of money time and frustration if there are major barriers or strong arguments that count against the further development of the idea under investigation. Methods to accomplish this have been tested in the scope of the HealthPort project and elsewhere and comprise ideas competitions, interdisciplinary expert teams, the use of innovation coaches or dedicated Innovation management platforms. In the HealthPort project a process for selecting and supporting innovative life science business ideas has been developed [Kuura 2013]. Experience and methodologies form the field of Health Technology Assessment (HTA) could also provide a valuable contribution for evaluating proposed solutions in an early stage. If there is a positive outcome from such an early evaluation it would also be easier to raise capital for the further development of the idea.

Definition of Health Technology Assessment (HTA)

Health technology assessment (HTA) is a multidisciplinary activity that systematically examines the safety, clinical efficacy and effectiveness, cost, cost-effectiveness, organisational implications, social consequences, legal and ethical considerations of the application of a health technology – usually a drug, medical device or clinical/surgical procedure [Taylor 2009].

8.3 The role of the public sector in innovation management

Due to the large part of spending in the health care sector (up to 85% of the health care costs in the Nordic countries is spent by the public sector), the public sector can be seen as a potential driver for innovation and entrepreneurship [Norden 2010].

Public Procurement

The public sector demands a large share of products and service which together represent around 16% of the GDP in Europe [EC 2005]. In the Nordic countries 80 to 85 per cent of health spending is funded by public sources. Thus public agencies have been described as "big market players" having "powerful means to stimulate private investment in research and innovation" [Norden 2011]. Consequently, the public sector commands a strong purchasing power which, if managed accordingly, could promote innovation. Public procurement of innovation is intended to support the demand side of innovation.

Public Procurement of Innovations (PPI)

Public procurement of innovation is one tool available to the public sector to improve innovative activity in Europe. Increased innovation is a central part of the Lisbon strategy to make EU the most dynamic and competitive knowledge-based economy in the world.

When a public organisation places an order for a product that does not exist at the time ordered, it is public procurement of innovation. This means that the public sector actively demands innovative products, which can contribute to increasing business' investments in research and innovation within life science industries. According to this definition, public procurement of innovation occurs when a public organisation places an order for a product that does not currently exist, but can be developed within a reasonable period of time. This means that innovation activity is needed before delivery can take place. An in depth overview of public procurement of innovation can be found in [Rolfstam, 2008].

Pre-commercial Procurement (PCP)

Pre-commercial procurement (PCP) is procurement of (expected) research results where no product development is involved. It is often called innovation procurement and receives increasing attention by the European Commission. PCP is a matter of R&D funding, i.e. a supply-side policy instrument in relation to innovation.

In 2009, VINNOVA, the Swedish Innovation Agency, issued a report that came to the conclusion that policy makers should further explore ways to increase the use of public procurement of innovation in health care [Lundvall 2009].

8.4 New funding mechanisms – Innovation capital

Financial resources are vital for turning ideas into successful innovations. With respect to financing we can distinguish 4 different demands for funding.

- Short term, early idea verification
- midterm product development (prototype)
- long term product development and market access
- infrastructure for collaborative innovation

In these four items different forms of financing prevail. Especially for the first phase there is a lack of capital and adequate forms. Once an idea is verified to some extend and a market analysis shows potential, this is interesting for venture capital. However, this form of financing only works in case of sufficient money available in venture capital funds. In times of financial crisis this is not always the case.

Crowdfunding for Life Sciences and Health

An emerging new mechanism for raising innovation capital is crowdfunding. Crowdfunding has been developed over the last couple of years and in 2011 Europe raised around € 300 million, considering all types of crowdfunding. At the end of 2011, there were around 200 crowdfunding platforms active in Europe. Their number is expected to increase by 50% by the end of 2012 [De Buysere 2012]. The objective of the European Crowdfunding Network [ECN 2013] is to build a pan-European crowdfunding ecosystem. In the US specialised crowdfunding platforms for health care e.g. Health Tech Hatch (https://www.healthtechhatch.com) or MedStartr (http://www.medstart.com) have been started in 2012. The different forms of crowdfunding could be a valuable contribution to fill the financing gap and could play an important role in the future alongside with more traditional models like venture capital or equity-based financing. Crowdfunding would further be an excellent mechanism to connect future end-users and customers with the developer or producer of a solution. During a rowdfunding campaign the idea-holder gets valuable feedback about the demand of the product and may get early feedback from potential customers. In a future Open Innovation Platform for health and life sciences crowdfunding should be build into this platform and form part of the systematic innovation management procedure.

Definition of Crowdfunding

"Crowdfunding can be defined as a collective effort of many individuals who network and pool their resources to support efforts initiated by other people or organizations. This is usually done via or with help of the Internet. Individual projects and businesses are financed with small contributions from a large number of individuals, allowing innovators, entrepreneurs and business owners to utilise their social networks to raise capita." [De Buysere 2012]

Accelerace Life – A Nordic-Baltic accelerator for life science startups

The Baltic Sea Region is on top in research concerning life sciences and medtech. However, there is a lack of translating these good research results into products and services. A high barrier for sturtups is the lack of entrepreneurial skills and access to capital in the early stage. The Accelerace Life model is a potential instrument to address these issues and provide support and financing for life science startups in the early phase. "The model is based on Accelerace Denmark's long-term experience and methodology. This cross-border acceleration initiative with shared methodology, networks, expertise and resources enables consideration of the region as a de-facto larger ecosystem with unique benefits for all stakeholders participating in the acceleration process. The most remarkable benefits definitely include a wider spectrum for soft funding, sharing of experience and the possibility to test prototypes in at least four different markets at the same time more easily and cost-efficiently." [Piispanen 2013]

8.5 Regulation and Certification

The need for collaboration in conducting clinical trials

Regulation and Certification is another important field to address in an ecosystems approach. Clinical trials and verification are mandatory to prove efficacy and safety of drugs, medical interventions and devices, diagnostics and e-health applications. Due to complex regulatory, organizational and experience requirements, demanding a disproportionate operational and financial effort, many SMEs, start-ups or investigators often cannot afford clinical research to the necessarily extent. Thus, turning the clinical trial and verification topic into the most relevant bottleneck in medical technology transfer and dampening innovation. The need for a common approach of this innovation inhibitor was already recognized in particular regions of the Baltic Sea Area: NordForsk, an organization under the Nordic Council of Ministers and providing funding for Nordic research cooperation, kicked-off the Nordic Trial Alliance in 2013 [Nordic Trial Alliance 2013], to come up with joint solutions for NO, SE, DK, FI, IS. In Northern Germany, a strategic approach to overcome the obstacle for medical technology transfer was drawn by the master plan Health Economy 2020 on behalf of the federal govern-

ment Mecklenburg-Vorpommern: An incubator for clinical trials is intended to bundle resources from this region and the adjoining Polish Baltic Sea region, developing a business model for a Baltic ClinTrial Service Cluster.

8.6 Innovation dissemination

Innovation dissemination is an important step to introduce innovative products and services in the market. Access paths to health care providers are varying according to the different health care systems and national regulations. Joint marketing, branding and dissemination of innovative products will benefit SMEs in transnational business.

Communication & Collaboration Platform

A collaboration & communication infrastructure is vital for the innovation ecosystem idea. Many platforms are already available in the ICT sector. The main task would be to adapt, configure and maintain such a platform. A technical platform alone will not boost collaboration. The moderation and management of such an instrument would also be of utmost importance. For a macro region this could only be financed from a common budget. The Innovation Ecosystem will be a valuable contribution to foster Innovation in the Baltic Sea Region and could therefore be part of the strategy for the BSR, the EUSBSR.

Although today knowledge is available anywhere at any time, many problems in healthcare need collaborative action among diverse stakeholders. This often requires process or organizational innovation; it needs local or regional action for implementation. A communication & collaboration platform should not only allow for collaboration in product development and problem solving but also for implementing a solution on a regional or macro regional level. It also requires collaboration across different sectors e.g. companies, health care providers, physicians, administration, regulators and patient representatives. This infrastructure could either be implemented through funding or a public-private-partnership.

External barriers to collaboration

In the Nordic countries there is a consensus about the potential of public private collaboration on health innovation. In the study presented in [Norden, 2010, p.47] the following external barriers to collaboration are mentioned:

- Lack of flexibility in laws and regulations
- Resistance of users to change
- Lack of incentives when project includes many partners
- Contractual rules hinder collaboration with suppliers
- Lack of competences at public partner
- Lack of competences at other private partner
- Lack of main suppliers' capability to provide innovative solutions
- Lack of market for the solution

8.7 Opportunities for Innovation to drive the health economy in the BSR

Innovation

Innovation has become one of the most powerful levers for smart and sustainable growth. Regions around the globe have recognized the potential of developing innovation and entrepreneurship clusters and their contribution to regional development and economical growth. The transmission of information and innovation in horizontal and vertical relationships is one important success factor for cluster development [Porter, 1998]. Innovation within clusters has not only a direct positive impact on local entrepreneurship performance but contributes as well to meet the challenges for a sustainable future development of organizations and regions.

Definition of Innovation

Innovation has been defined from different organisations and angles. According to UNESCO Institute for Statistics **innovation "..is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or**

external relations" [UNESCO, 2005]. The OECD further differentiates (see box) between product innovation, process innovation, marketing innovation and organizational innovation. Both definitions describe innovation not as "one-point" event or action within product or process development but as a steady, continuous process of development, adaptation and implementation.

Innovation in health and life sciences

Health and life Sciences are regarded as highly innovative areas. Having an impact not only on specific diseases the fast progress within health and life sciences affects human wellbeing and life style, industrial and regional development as well as the future sustainability of whole health care systems. Already now EU health care sector spending ranges from 5-11% of regional GDP facing further increase due to demographic development and cost increase e.g. in drug & technology development. Innovation in health and life sciences will play a more and more pivotal role in the future: On one side innovation in health economy will contribute to more effective and qualitative health care and thus directly improve the health status of the individual patients and the society. On the other side it will provide opportunities for industry, especially SMEs, to participate in stable and growing markets and thus contribute to economic growth. In times of financial crisis the health economy market remained a stable factor in economy and even provided modest growth rates.

Definition of Health Economy

Provision and commercialization of goods and services, in order to support the maintenance and restoration of health.

Definition of Innovation in Health Care

"Healthcare innovation can be defined as the introduction of a new concept, idea, service, process, or product aimed at improving treatment, diagnosis, education, outreach, prevention and research, and with the long term goals of improving quality, safety, outcomes, efficiency and costs" [Omachonu et.al., 2010]

Innovation to solve societal challenges

Innovation in Health and life sciences shall tackle the challenges of an ageing society and the burden of non-communicable diseases (NCDs) which have become the greatest cause of preventable mortality and morbidity in the WHO European Region [WHO Europe]. NCDs are estimated to cost $47 trillion by 2030 at a global scale. A holistic approach is needed to initiate behavioral change and to develop new innovative health management procedures. Innovation in health economy is thus a mandatory field for policy development and a key instrument for tackling the grand societal challenges of the 21st century.

Innovation in health and life sciences is complex

However, innovation in health and life sciences with subsequent market success is getting more and more complex, cost intensive and rare. This is due to several factors where the development of pharmaceutical industry may be considered as example. The first wave of pharma development was characterized by simple implementation of modern hygiene practices and procedures in health care. The second wave was based on the detection and development of breakthrough drugs and medical devices. Success rate in finding new drugs is steadily decreasing. Nowadays the third wave can be observed with information technology entering large sectors of medical services and application (telemedicine, data mining). This goes along with the change of consumers' behavior and their growing health awareness. Both factors will not only lead to tremendous changes for a whole industry but also for the overall health care systems.

Fragmentation of the sectors involved

This development takes place in a complex surrounding where the area of health, health care and health economy is split into sectors which function almost completely separate and independent: health care providers, enterprises, research institutions, regulatory and financing institutions and the political environment. Large hurdles exist in all regions of the world between these sectors with respect to e.g. insurmountable gaps in reimbursement or financing modalities, completely different organizational, administrative and regulatory surroundings or even irreconcilable cultural barriers.

Collaboration as a critical tool for global competitiveness

Historically cooperation between the Nordic countries is very strong, especially in the health care sector [Magnussen 2009]. The Northern Dimension Partnership in Public Health and Social Well-being (NDPHS) as an example is a cooperative effort of

ten governments, the European Commission and eight international organisations and provides a forum for concerted action to tackle challenges to health and social well-being in the Northern Dimension area.

Common response to common challenges through joint efforts

"The main social well-being and health related challenges that the European countries are currently facing are the same: an ageing society, poverty, social exclusion and health inequalities, the increasing burden of non-communicable diseases and new health threats. Consequently, **it is only logical to coordinate the responses to common challenges, to (i) pool the resources and expertise, and (ii) exchange ideas and knowledge on effective and less effective solutions – all this to bridge gaps and speed up innovation processes, to avoid duplication of efforts and limited resources, and, finally, to allow for well-informed policy and decision making."** [NDPHS 2011]

Social Innovation

Horizon2020 puts an emphasis on innovation but also on solving societal challenges like e.g. the ageing society. This is where another dimension of innovation comes into play which can be described as **Social Innovation**. Social innovations have a focus on values – they are explicitly oriented towards 'societal goals' which are understood to be worthy. Porter and Kramer (2011) argue that firms should enter into shared value creation that involves creating economic value in a way that also creates value for society by addressing its needs and challenges. Porter and Kramer describe shared value as "…policies and operating practices that enhance the competitiveness of a company while simultaneously advancing the economic and social conditions in the communities in which it operates" [Porter and Kramer 2011].

Focus on values and user needs!

Porter and Kramer further state that: "A big part of the problem lies with companies themselves, which remain in an outdated approach to value creation that has emerged over the past few decades. They continue to view value creation narrowly, optimizing short term financial performance in a bubble while missing the most important customer needs and ignoring the broader influences that determine their longer-term-success" [Porter and Kramer 2011, p.4].

Changing behaviours represents the single biggest opportunity to improve health outcomes

"Changing behaviours represents the single biggest opportunity to improve health outcomes" [Ernst & Young 2012a] is the main message of the Global Life Sciences Report 2012 from Ernst & Young. This report foresees behavioural change as the next big wave. Collaborative Innovation and Holistic Open Learning Networks (HOLNs) are the major theme of the Global Biotechnology Report 2012 [Ernst & Young 2012b] and Collaboration is the major topic of the Healthcare Provider industry report 2012 [Ernst & Young 2012c]. The European Science Foundation has issued a science position paper about harmonising health and social care delivery and informatics support to ensure holistic health care [Rigby 2013]. This position paper promotes a citizen-centric health and social care system to gain synergistic effects and to tackle the challenges of demographic ageing and non-communicable diseases. All this work suggests that product innovation is not sufficient to improve health outcomes but has to go hand in hand with organisational and social innovation.

8.8 An ecosystems approach to innovation

Ecosystems metaphor

For innovation to take place it requires a certain "innovation friendly environment". Recently the metaphor of an "innovation ecosystem" has been coined to model the complex network of entities and relationships in an innovation system and to highlight the aspect that in an ecosystem an individual player alone does not succeed and to acknowledge the interconnectedness and interdependency of all stakeholders. In the biological counterpart the ecosystem is characterized by one or more equilibrium states, where a relatively stable set of conditions exist to maintain a population or nutrient exchange at desirable levels. In an ecosystem one player cannot be successful on

its own. In a successful innovation system for health this is also the case. The ecosystem is a complex network of researchers, funders, entrepreneurs, legislators and end users. If one of the parts is not taken care of adequately the innovation might be in danger of not succeeding. The High Level Group on Innovation Policy Management (HLG) commissioned by the EU council concluded that Europe needs a radical new innovation ecosystem to achieve the necessary boost in innovation performance.

High Level Group on Innovation Policy Management

"A radical change in innovation policy seems indispensable, from fragmentation to coordination, from narrow science and technology orientation to an all-encompassing, holistic and coherent strategy involving several policy areas, from a diffuse to a highly focussed division of labour between all the players and stakeholders involved. This is what the HLG calls the Innovation Ecosystem Approach." [HLG 2013].

Business Ecosystems

The metaphor of an ecosystem has already been used in business. A business ecosystem can be defined as: "An economic community supported by a foundation of interacting organizations and individuals—the organisms of the business world. The economic community produces goods and services of value to customers, who are themselves members of the ecosystem. The member organisms also include suppliers, lead producers, competitors, and other stakeholders. Over time, they co-evolve their capabilities and roles, and tend to align themselves with the directions set by one or more central companies. Those companies holding leadership roles may change over time, but the function of ecosystem leader is valued by the community because it enables members to move toward shared visions to align their investments, and to find mutually supportive roles." [Moore 1996]

Open innovation ecosystem

Open innovation represents a shift from the traditional model where 100% of a company's innovation originates from within, to a more open model where both internal and external ideas are combined to create a more collaborative advantage. The term "open innovation" was coined by Dr. Henry Chesbrough in 2003 as a paradigm that assumes firms should use external and internal ideas to support a firm's innovation goals, as well as internal and external paths to market in order to advance their technology. Opening up innovation will help engage a large pool of innovative minds in the process of solving major healthcare challenges by alignment of business and scientific objectives, sharing of intellectual property, and the high risk and time horizon for converting basic science into clinical outcomes. Related concepts are user-driven innovation or employee-driven innovation. In the Nordic countries these concepts have been tested out and implemented in the clinical world in the last couple of years. One of the project partners is founder of the Ideas Clinic at the Aalborg University Hospital. The Ideas Clinic uses Open Innovation Management tools to systematically manage the hospital intern process of clinical innovation. The Ideas Clinic at Aalborg University Hospital was established in 2009 as a regional initiative, in order to utilize ideas from primarily the employees for commercial purposes. Shortly after a cooperation between Oslo (Norway) and Sahlgrenska (Sweden) university hospitals was formed into an innovation programme named KASK Innovation [KASK 2012], with the Ideas Clinic as programme manager, where the three hospitals in common addressed a number of issues within employee driven and open innovation, as well as establishing an eco-system for exchange of ideas etc..The Idea Clinic is today the region of Northern Denmarks primary innovation organization covering both the healthcare sector as well as other areas within the region. The Ideas Clinic has in 2012 been awarded a number of national and international prizes and is recognized as Best and Next Practices within innovation and healthcare.

8.9 The HealthPort innovation ecosystem

The HealthPort Innovation ecosystem

In the scope of the HealthPort project an innovation ecosystem for health economy in the Baltic Sea Region has been developed [Blank et. al., 2013]. The main motivation behind the Innovation Ecosystem model is the notion that successful transformation of ideas into commercialised products and services requires a holistic approach that addresses all segments of the complete value chain.

At the core of the innovation ecosystem is the product idea. This should be clearly **demand driven and user focused**. All the important fields that should be considered are arranged around the "product idea" in a circular manner signifying that they should be addressed in common and in an iterative fashion. Apart from the 5 action fields addressed in this model there are 5 areas for supportive actions that should be part of the ecosystem: **culture, communication, infrastructure, collaboration and dissemination**.

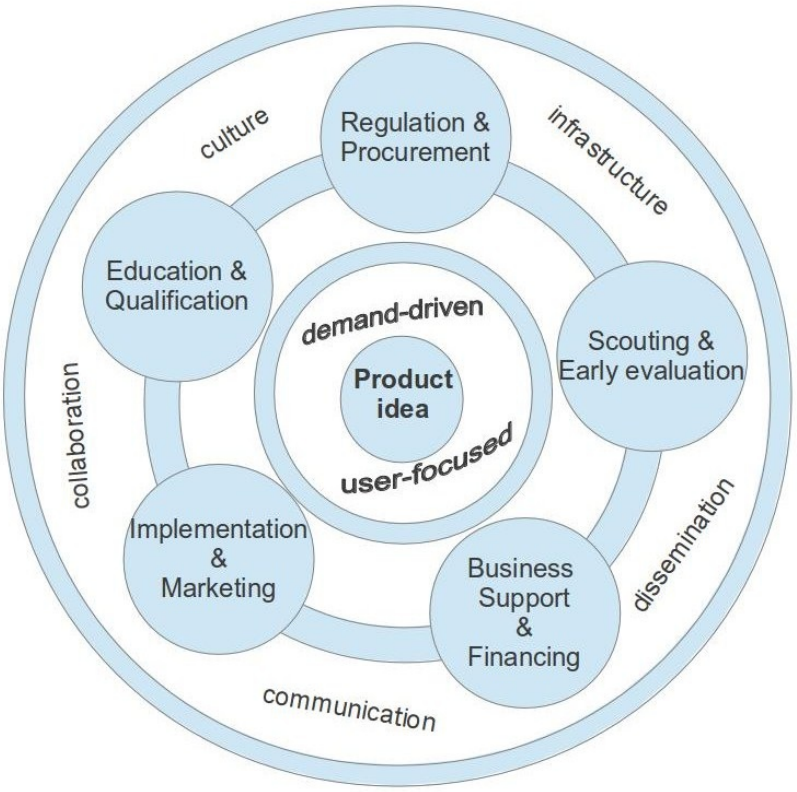


Figure: Innovation Ecosystem for Health Economy

8.10 Other initiatives promoting open innovation and collaborative approaches in health care

Open Innovation Strategy and Policy Group (OISPG) and iNNOVAHEALTH

Other initiatives think along the same lines and support the idea of an Open Innovation ecosystems approach for healthcare in Europe. On the EU Level the Open Innovation Strategy and Policy Group (OISPG) has produced a number of studies in the field of Open Innovation in services [OISPG 2013]. Health services, as the largest service industry in the EU may profit most from this new development. Another initiative that promotes the idea of an Open innovation ecosystem is an industry experts group that met at the iNNOVAHEALTH Conference in Larnaca, Cyprus in October 2012. [iNNOVAHEALTH 2012]

Public Sector Innovation (PSI)

In a time of economic crisis governments are looking for radical solutions to protect services while cutting costs dramatically. This will also affect health care delivery and will provide additional challenges for creating business models for companies active in health economy. However, this also opens the opportunity to provide new or improved solutions to cut down costs. [European Commission , 2013]

The learning health system

Given the critical importance of the health sector for human wellbeing and also for a considerable part of economics it could be expected that health systems undergo a continuous process of reviewing and improving its activities and processes. However, reality sharply contrasts with this assumption where the sector is fragmented into different islands of information and organisation. To tackle the current and future challenges of chronic illness and an ageing society it is imperative that the health sector adopts the learning organisational model already proven successful in other sectors. "Indeed, given the increasing performance and economic pressure on every national health system, such an approach can be seen as essential" [Friedman and Rigby 2013].

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