



# Scandinavia



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# Agenda

## 1. Main issues and executive summary Scandinavia

- a. Executive summary: **Scandinavia**
- b. Key recommendations: **Scandinavia**
- c. Scandinavia context specificity :**ranked high in EU patent filings; all of them are among the top 5**

## 2. Tackling the talent gap and the talent crunch in biomanufacturing in Europe

- a. Academic Ecosystem: **World renown academic centres**
- b. Talent policy: **Education and Business collaboration**
- c. Success story: **Fermentation Based Biomanufacturing**
- d. Opportunity: **FUHS – university led investments**

## 3. Research to innovation

- a. Innovation capabilities: **Leaders in Innovation**
- b. Innovation policy: **Strong support of Public investors**
- c. Success stories: **Testa Center**
- d. Opportunities: **Cross-border Collaboration**

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- a. Scandinavian Business ecosystem mapping
- b. Access to Finance: **Countries specifics and SAM invest**
- c. Success stories: **Recipharm**
- d. Opportunities: **Governmental Support**

## 5. Conclusion & recommendations

- a. Supply chain & Logistics :
- b. Conclusion & next steps
- c. EIT Health members and partners' Biomanufacturing radar



Part II

# Main issues and **executive summary**

Scandinavia   



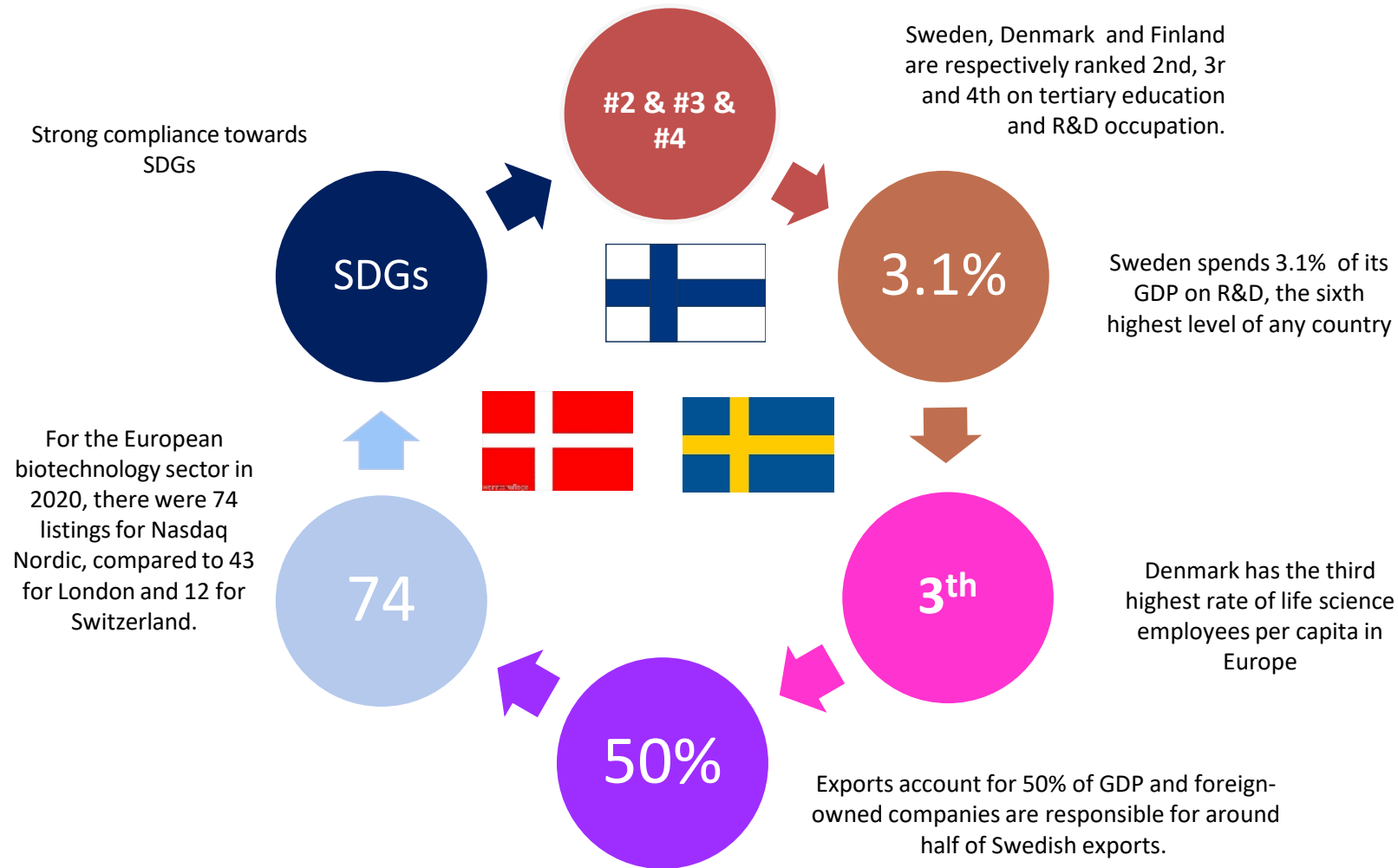
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# Scandinavia

*"The Scandinavian R&D model is characterized by supportive governments, high level of integration between academia and industry"*



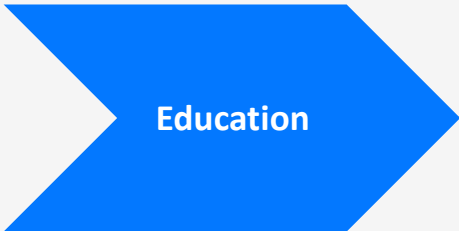
## BioClusters contributing to the report



### Focus

Above average investment in Research and Development, strong Innovation supporter.

# Scandinavia



## Pain points

- Talent development stretch vs future demand
- Upskilling and re-skilling of labor force
- Digitalization in Lifesciences
- Talent chase, and high competition to attract

- Scalability
- Fragmented system
- Gender gap
- Need for more upskilling programmes
- Academic Culture vs entrepreneur culture (i.e scientific excellence vs business results)

- Each country has specific issues:
- Denmark depending too much on the large corporations
- Sweden with high level of start up funding, but issues to keep up on larger funding
- Finland has issues on the early phase of funding

## Success stories

- Fermentation Based Biomanufacturing initiative
- Competence Centre for Advanced BioProduction by Continuous Processing, AdBIOPRO

- Testa Center
- Kuopio Center for Gene and Cell Therapy (KCT)

- AztraZeneca
  - NovoNordisk
  - Cambrex
  - Cytiva
- And their interactions with the smaller actors and Education partners

## Opportunities

- Strong academic- business connection
- International scope
- Attract talent policies
- Strong vocational training programmes through integrated approaches

- Green Manufacturing leadership
- University and business codevelopment policies
- Education rankings towards start-up developments
- Facilities

- Dynamic ecosystem
- International attractiveness
- Stability
- High involvement of public sector
- High level of public-private partnerships

# Contributors to the report



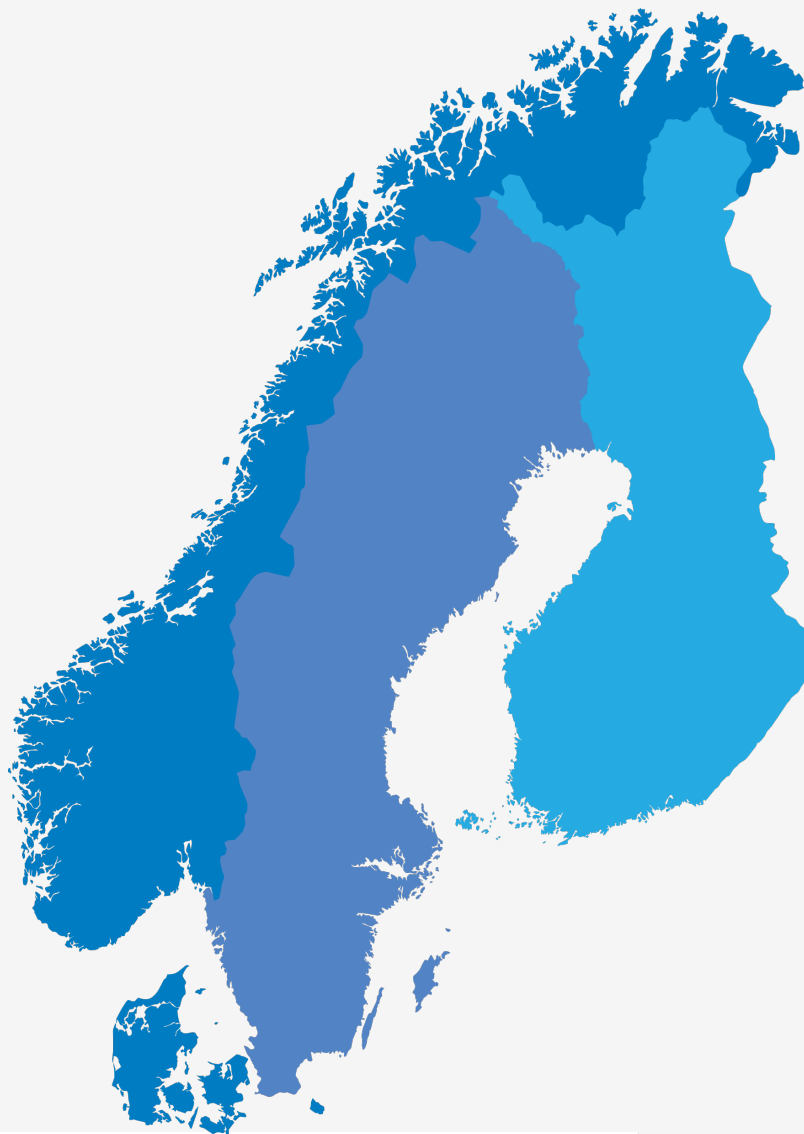
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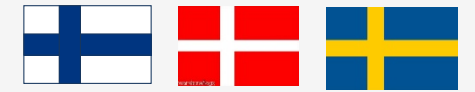
# Scandinavia

## Context specificity



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# Region Specifics – The three reviewed countries



The individual countries in Scandinavia (for this report Denmark, Finland, Sweden) are either relatively small or not as densely populated as other European countries, but their Life Sciences industry (Biotech, Medical Technology, Pharma) is well developed. They have full pipelines with biotech compounds. What can be said for all of them is that **they rank high in EU patent filings; all four of them are among the top 5.** What seems striking, is the number of Biotech companies in comparison to the pharma, which is even considerably far behind medical technology. An indication for innovation?

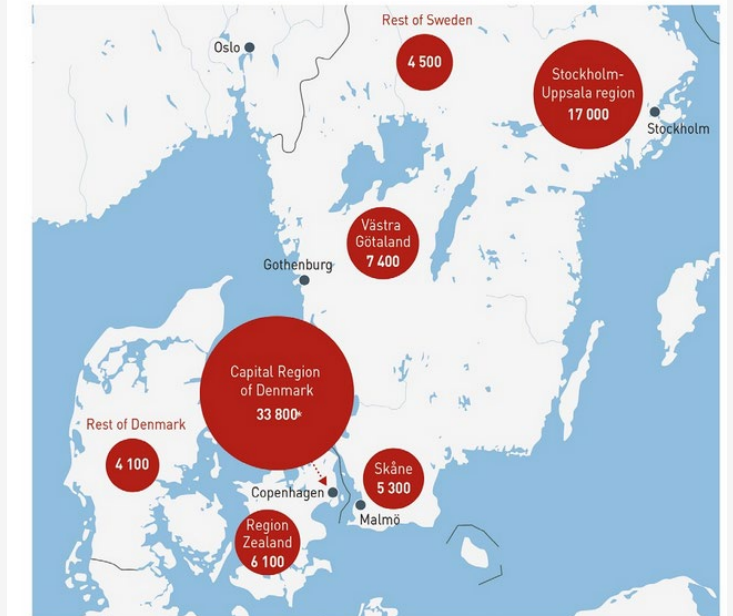
## Regional Characteristics

Life Science clusters formed mainly around the capitals. But they are not only national “phenomena” – **they exist beyond country borders, too.** One very good example is the Medicon Valley, covering Eastern Denmark and Southern Sweden. According to their own information there are around 40 thousand employees working there.

**The three mapped countries have a very strong position in eHealth and availability of patient data.**

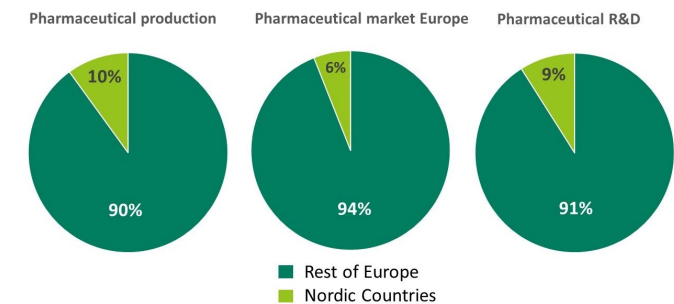
Denmark and Finland for example started their efforts towards this on a national level 20 years ago. Today, electronic health records are the rule in the Nordic countries and so patient information can be exchanged between different stakeholders in the healthcare system and industry, as well as between countries. Still, the industry says that more collaboration on a national and Nordic level is necessary in order to drive a holistic national and Nordic approach to be able to better leverage on future opportunities

EMPLOYMENT IN LIFE SCIENCE BY REGION IN DENMARK AND SWEDEN



Source: Statistics Denmark, Statistics Sweden and information from the biggest life science companies in Denmark.

## A thriving hub for pharma - the Nordics







Part II.A

# Tackling the talent gap and the talent crunch in biomanufacturing in Scandinavia 🎓



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# Scandinavia has world reknown Academic and research centres



Karolinska  
Institutet



UPPSALA  
UNIVERSITET



UNIVERSITY of OULU  
OULUN YLIOPISTO



## Scandic World-class Academic & research centers

The three studied countries give access to:

high-quality education, courses offered in English, gender-equal career paths, and conditions for a good study and social life for students.

## Example of key initiatives:

In Sweden, A special visa for highly qualified people wanting to apply for jobs or start a business will be introduced on 1 January 2021. The aim is to facilitate collaboration with inter-nationally leading research and innovation environments and attract and retain international cutting-edge expertise.



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# Scandinavia talent development policy



## Examples of Educational and Business collaboration in Sweden

### AdBIOPRO



KAROLINSKA



**The Competence Centre for Advanced BioProduction** by Continuous Processing, AdBIOPRO, aims at developing competitive technology for bioproduction, focusing on the imminent paradigm shift towards continuous processes of biopharmaceuticals, and on manufacturing of emerging potent therapeutic products such as recombinant viral vector and cell products.



**Frans Schartaus Handelsinstitut**

#### **PHARMACEUTICAL TECHNICIAN.**

300 HVE credits (1,5 year long, three semesters) The Pharmaceutical Technician programme is carried out in close cooperation with employers and working life.

**Approximately 97% of the students have a job within a six months period after graduation.**

#### **High Involvement of the companies**

**The steering committee consists of representatives** from Octapharma, Pfizer, Sobi, Valneva, Recipharm, Novelmedic, APL, Frans Schartau Business Institute, and student representatives. **The steering committee follows, evaluates and revises the education programme continuously.**



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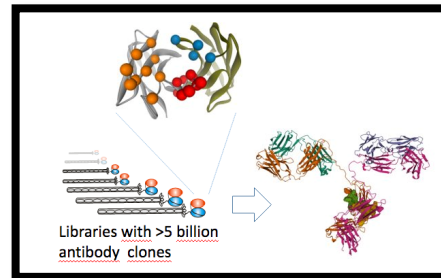


## Department of Life Technologies

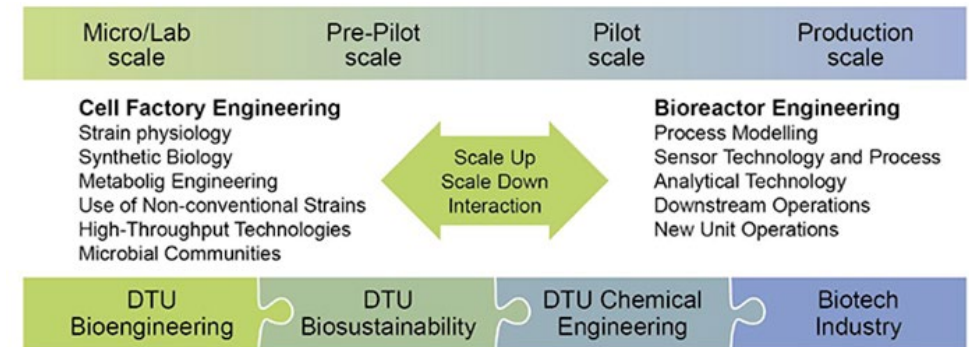
*The Department of Life Technologies is an international and multifaceted educational and research unit that combines various fields of biosciences. Teaching is based on extensive basic research as well as on applied research related to cellular and molecular-level structures and processes. The information is utilized in medicine, food development, analytics and the development of environmentally friendly technologies.*

The Department of Life Technologies is one of the largest teaching and research units at the University of Turku. Professionals of both science and professionals are educated in four mutually supportive fields: biochemistry, biotechnology, food sciences, and molecular plant biology.

- **Synthetic antibody phage libraries**
  - Rapid binder development
  - Fully human antibodies
  - Binders against difficult targets
  - Binders made against >200 targets
- **Engineering for improved properties**
  - High affinity
  - Fine-tuned specificity
  - Reduced interferences in immunoassays
  - In different formats: Full IgGs or antibody fragments
- **Antibody humanization**



## Fermentation Based Biomanufacturing Initiative, Denmark



The Fermentation Based Biomanufacturing initiative offers a comprehensive research-based education and training program in Fermentation Based Biomanufacturing (FBM) at the Technical University of Denmark (DTU).

The FBM education covers all stages of industrial research and development – from discovery and selection of target molecules in micro- and lab-scale, to proof of concept in the pilot facility, and full-scale production with our partners in the industry.





### University Holdings in Sweden – A business approach for High Level Education Entities

FUHS was founded in 2005 and today has all (18) Swedish university holding companies as members. The holding companies, with in many cases innovation offices, incubators and in some cases science parks, are an important platform for commercialization, utilization and innovation linked to the university world. The university holding companies are one of the very few Swedish institutional investors in the early stages. FUHS is a non-profit association and is based in Solna.





Part II.B

# Research to Innovation



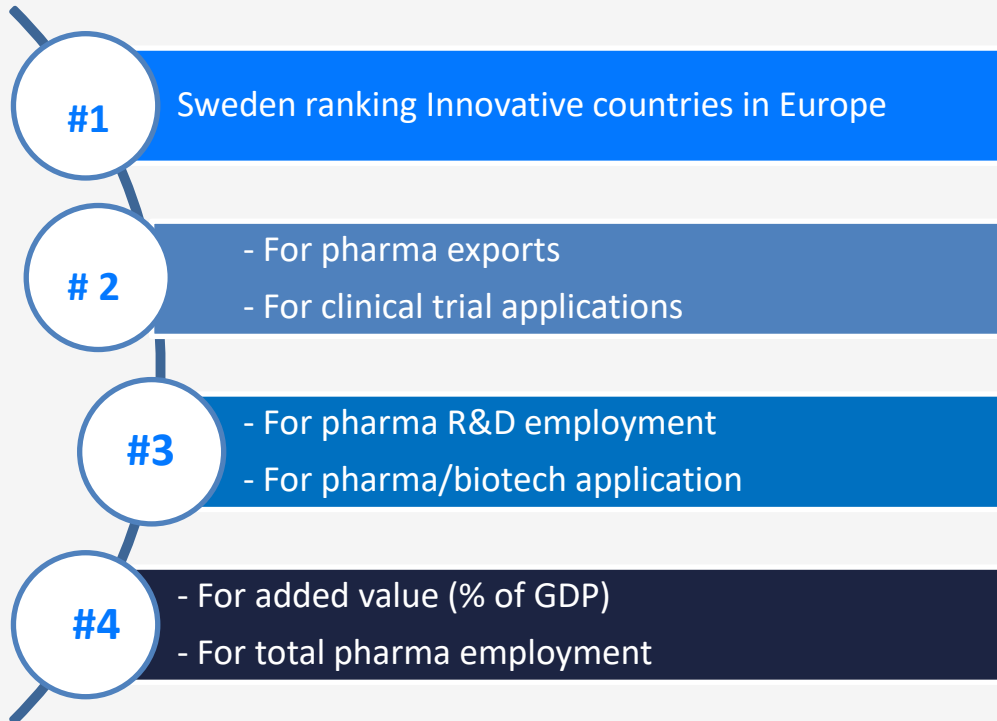
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# Innovation capabilities in Scandinavia



Scandinavia holds the highest ranking in Innovation Scoreboard in Europe, and one of the highest worldwide.



INVESTMENTS €  
2019

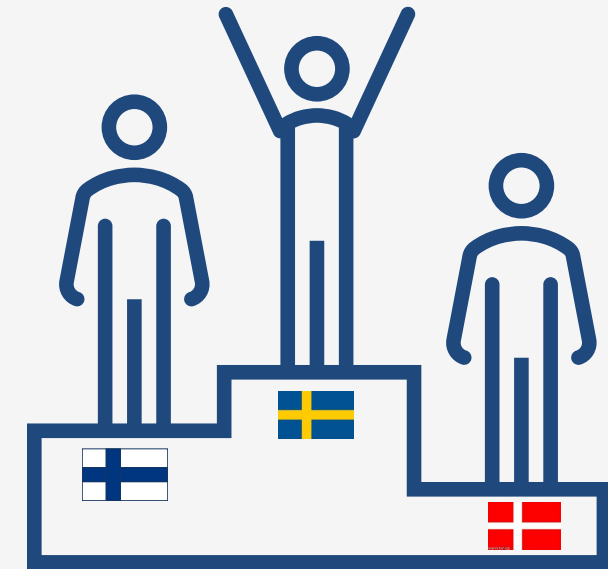
Companies' investment  
in R&D of new vaccines and  
treatments in Sweden



+50% in 5  
years

Performance of EU Member States' innovation systems  
*European innovation scoreboard 2020*

*"In 2019 the life sciences grew by 28% and growth has continued by a further 10% during 2020. Synergy between the local tech and pharma industries could underpin Stockholm's competitiveness in the future and promote further expansion. Exports for the sector are now valued at US\$13.6bn and represent 10% of the total value of Sweden's exports."*





# Innovation policy

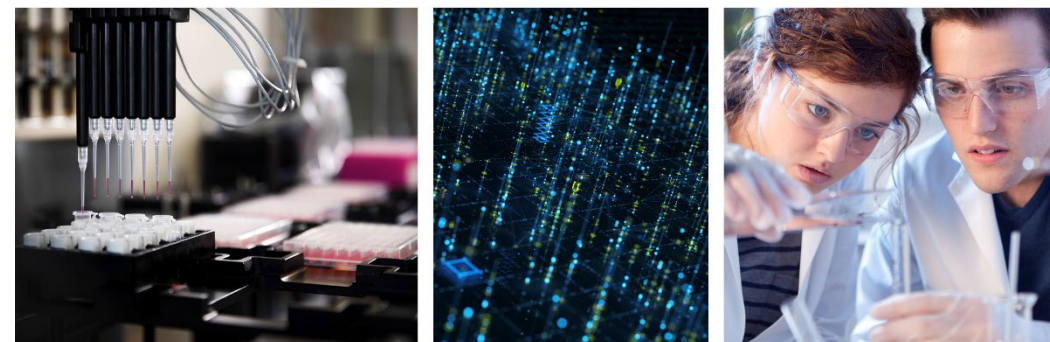
Access to Finance: Strong presence of public investors sector to support the development of innovative technologies in Biomanufacturing



In Sweden, serious governmental efforts have been put to understand, map and promote the Innovation of the Biomanufacturing sector. Through a very comprehensive report, InvestStockholm, the official investment promotion agency of Stockholm, shares a very updated and insightful report on a leader European area in Biomanufacturing:

**InvestStockholm : Stockholm Uppsala : A World Leader in Advanced Therapeutics Manufacturing**

**“The Stockholm ecosystem, with its world-ranked research centres such as the Karolinska, Royal Institute of Technology, KTH, SciLifeLab Stockholm University, Uppsala University, and the Testa Center,” provide a pool of research and engineering talent which helps to put innovation into practice**



***A Public Private driven partnership towards Industry 4.0 and Industrial sustainability in Denmark.***

Helix Lab will provide leverage for developing the Kalundborg bioindustry into an international cluster for industry 4.0 bioproduction and industrial sustainability.

The bioindustry cluster counts international actors such as Novo Nordisk, Novozymes, Equinor, Chr. Hansen and Ørsted, more than 5,000 industry workplaces and one of the largest bioproduction facilities in the world.

A total budget of DKK 120 million will create the framework and content for an education and research programme in Kalundborg that will attract students at the graduate level from Denmark and abroad.



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# Public-Private Partnership: Paving and leading the collaboration



## Testa Center - An innovation hub for biological production, opens for companies in Europe



- Major initiative between the Swedish government and Cytiva to secure the growth of life science industry and its manufacturing capabilities.
- An open non-GMP, production-like facility and test-bed for education, innovation and proof-of-concept experiments on production processes for biological products, e.g. monoclonal antibodies, peptides and proteins.
- Main objective for Testa Center is to bridge the gap from discovery to industrialization, based on:
  - Verifying innovation
  - Accelerate Industrialization
  - Secure Excellence

Testa Center is operated as a non-profit company, owned by Cytiva.

Testa Challenge : An example of **Collaborative Life-Sciences and Bio-process**  
A hackathon organised in 2020 to find and fund innovative solutions that have the potential to meet the future technology needs and challenges within bio-production.

Area of technology include sensors, separation technology, pumps, etc.

## **Kuopio Center for Gene and Cell Therapy (KCT)**



is a research center in Finland performing high-quality basic and translational research. KCT was founded in 2017.

- Collaboration with academic groups all over the world, **access to FinVector's GMP manufacturing facility in Finland** as well as their quality and regulatory teams to ensure a product path from research to patients.
  - FinVector has four GMP production suites authorised by the European Medicines Agency (EMA) for the production of gene therapy products from experimental through all stages of clinical trials and for commercial supply.
- KCT's main therapeutic focuses are cancer and cardiovascular disease, but scope of interest is not fixed. Wider areas, such as neurological dysfunction, for other important therapy approaches.

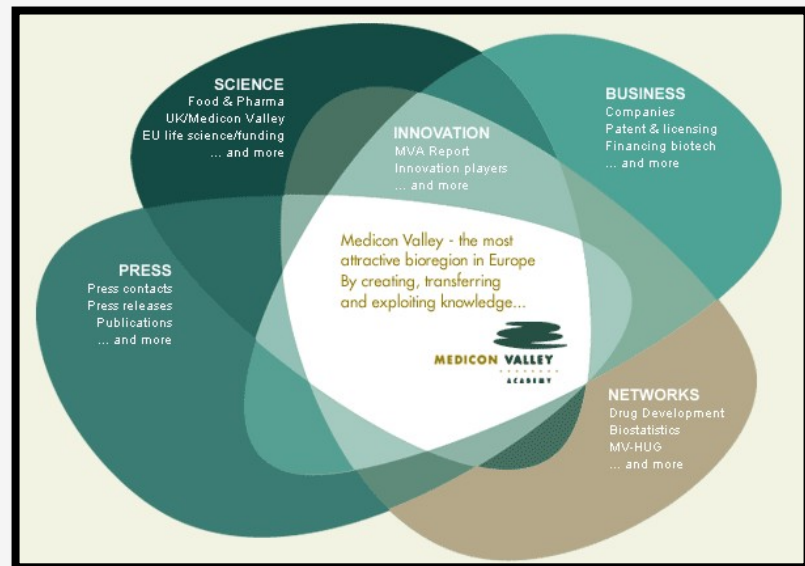
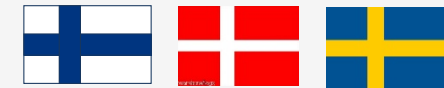
Kuopio Center for Gene and Cell Therapy provides research groups with funding, facilities and opportunities for collaboration with the University of Eastern Finland, the viral-based gene therapy product company FinVector, and Kuopio University Hospital. The research centre is funded by the Swiss Dr Frederik Paulsen Foundation



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# Opportunities— Medicon valley, a cross border R&D collaborative cluster



## UNIVERSITIES, REGIONS AND RESEARCH INSTITUTIONS



**1. REGION ZEALAND\***  
Life science researchers: 550  
of which professors: 30  
of which doctoral students: 140  
Life science students: -



**2. ROSKILDE UNIVERSITY**  
Life science researchers: 55  
of which professors: 6  
of which doctoral students: 19  
Life science students: 459



**3. TECHNICAL UNIVERSITY OF DENMARK (DTU)**  
Life science researchers: 1170  
of which professors: 82  
of which doctoral students: 442  
Life science students: 4 024



**4. UNIVERSITY OF COPENHAGEN**  
Life science researchers: 6 809  
of which professors: 682  
of which doctoral students: 2 673  
Life science students: 15 283



**5. THE NATIONAL INSTITUTE OF PUBLIC HEALTH (NIPH), UNIVERSITY OF SOUTHERN DENMARK**  
Life science researchers: 97  
of which professors: 6  
of which doctoral students: 15  
Life science students: -



**6. REGION HOVEDSTADEN\***  
Life science researchers: 3 748  
of which professors: 231  
of which doctoral students: 813  
Life science students: -



**Source:** The universities and research institutions own numbers. Life science researchers includes professors, associate professors, lecturers, post docs, doctoral students, etc. See footnotes in the Appendix for more information about the figures.  
\* Researchers at the hospitals in the region often conduct research part-time. Some of the researchers at the hospitals and at the Danish Cancer Society also have part-time positions at the universities in the region.  
\*\*The numbers for Lund University are not complete.



**11. REGION SKÅNE\***  
Life science researchers: ca 1 800  
of which professors: 107  
of which doctoral students: 736  
Life science students: -



**12. THE SWEDISH UNIVERSITY OF AGRICULTURAL SCIENCE IN ALNARP**  
Life science researchers: 189  
of which professors: 21  
of which doctoral students: 60  
Life science students: 564



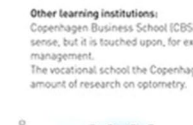
**7. AALBORG UNIVERSITY IN COPENHAGEN**  
Life science researchers: 22  
of which professors: 3  
of which doctoral students: 4  
Life science students: n.a.



**9. DANISH CANCER SOCIETY\***  
Life science researchers: 162  
of which professors: 9  
of which doctoral students: 52  
Life science students: -



**13. LUND UNIVERSITY\*\***  
Life science researchers: 3 533  
of which professors: 189  
of which doctoral students: 1 122  
Life science students: ca 2 780



**8. STATE SERUM INSTITUTE**  
Life science researchers: 150  
of which professors: n.a.  
of which doctoral students: n.a.  
Life science students: -



**10. MALMÖ UNIVERSITY**  
Life science researchers: 120  
of which professors: 30  
of which doctoral students: 86  
Life science students: ca 2 000



**14. KRISTIANSTAD UNIVERSITY**  
Life science researchers: 50  
of which professors: 8  
of which doctoral students: 10  
Life science students: ca 800

**Other learning institutions:**  
Copenhagen Business School (CBS) does not conduct life science research in the traditional sense, but it is touched upon, for example through research in organisation and public management.  
The vocational school the Copenhagen School of Design and Technology conducts a small amount of research on optometry.



**The SciLifeLab Drug Discovery and Development platform (DDD)** offers integrated drug discovery efforts to the Swedish academic research community. SciLifeLab started out in 2010 as a joint effort between four universities: Karolinska Institutet, KTH Royal Institute of Technology, Stockholm University and Uppsala University. It is **funded as a national research infrastructure by the Swedish government**.

*Working with small molecules, human antibodies, and new modality therapeutics, in the following area:*

- ADME of Therapeutics
- Biochemical and Cellular Assay
- Biophysical Screening and Characterization
- Human Antibody Therapeutics
- In Vitro and Systems Pharmacology
- Medicinal Chemistry – Hit2Lead
- Medicinal Chemistry – Lead Identification
- Protein Expression and Characterization
- Target Product Profiling & Drug Safety Assessment

## Main services

- *Industry standard infrastructure*
- *Expertise*
- *Strategic support for technology development*
- *Support the progress of projects towards a preclinical proof-of-concept.*





Part II.C

# Business

# Innovation



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# Scandinavia industrial capacity



- Scandinavia has a diverse ecosystem of industries and research centers active in the Biomanufacturing field
  - Major Pharmaceutical industries developing their own innovative biopharmaceuticals, i.e AZ and their Sodertalje representing 40% of their Worldwide production
  - Very strong incubators ecosystems
  - Stable countries and policy support in technology investments
  - Sweden, country of protein research
  - Denmark, Pharma industry leader

*Strong fundamental scientific research, an amazing ICT sector, and a deep-rooted spirit of entrepreneurship, innovation and collaboration explain why Stockholm is known as the 'Unicorn Factory', **with more start-up companies per capita valued over US\$1 billion than anywhere outside Silicon Valley.***

*"In 2019 the life sciences grew by 28% and growth has continued by a further 10% during 2020. Synergy between the local tech and pharma industries could underpin Stockholm's competitiveness in the future and promote further expansion. **Exports for the sector are now valued at US\$13.6bn and represent 10% of the total value of***

***Sweden's exports."** Invest Stockholm.*



## EXPORTATIONS

2019

Exports of  
medicines and  
vaccines

Denmark 17%  
of total Exports  
from  
lifesciences

### Key facts Denmark

- Denmark is **number two in the world for developing biotechnology** and number one in Europe in number of clinical trials per capita.
- Denmark has the **third highest rate of life science employees per capita in Europe**. With initiatives like a new tax scheme for foreign researchers.



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# Scandinavia has a very strong corporate presence



Pharmaceutical industries developing their own innovative biopharmaceuticals

AstraZeneca

novo nordisk®

Cambrex

valneva

cytiva

ORION

ThermoFisher  
SCIENTIFIC

GALDERMA

novozymes®

And SMEs developing their own innovative biopharmaceuticals

Paras Biopharmaceuticals  
Finland Oy

CuraVac  
Therapeutic Vaccines for Autoimmune Diseases

OCTIMET  
Translational accelerator

BBS  
BIOACTIVE BONE  
SUBSTITUTES

HERANTIS  
PHARMA

AFFIBODY

Biogen

BioLamina  
REVOLUTIONIZING CELL CULTURE

Sprint  
Bioscience

SCANDINAVIAN  
BIOPHARMA



# Strategic service providers such as CDMOs



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## Policy incentives

- Strong national support system for incubators, especially **in Sweden**
- Danish government issuing clear **lifescience strategy** to support growth
- **Finland facilities to support larger loans** for bigger biomanufacturing developments

## Corporate collaborative model

**In Denmark, large companies such as Carlsberg** set the trend around yeast production, leading to new biopharmaceutical developments and investments

## Key Insights from the Industrial Sector

3 main issues for the Biomanufacturers larger actors , and their investments in Biomanufacturing.  
( *Catarina Flyborg, Cytiva– Invest Sweden Official Webinar presentation*)

1. **Logistics, a clear bottleneck** for gene/cell therapies ( I.e Patients are part of the manufacturing process
2. **Need to increase the speed, for which automation is key**
3. **Affordability**



# VC Funds and the current funding ecosystem – The SAMinvest use case



Saminvest AB is a wholly state-owned venture capital company that invests indirectly through privately managed funds using a **‘fund of fund’ structure**.

**In partnership with private stakeholders, Saminvest has established a new venture capital fund focused on Nordic life sciences companies**

**Saminvest is a venture capital company, founded by the Government in 2016.**

Saminvest works actively for the establishment of new venture capital funds with sufficient qualities and long-term ability to develop the Swedish venture capital market, giving innovative and fast-growing companies access to both capital and ownership skills.

**The capital from the subsidiaries Fouriertransform and Inlandsinnovation will finance Saminvest's future investments. In total, Saminvest manages assets of approximately six billion Swedish kronor.**

*“We want to help to get more fund teams up and running, thus helping to renew the private equity market and Swedish economy. Our initiatives will improve growth conditions for innovative companies. This is how we create value and contribute to sustainable growth.”*





## Use case - Recipharm



Private equity firm EQT AB agreed to buy Swedish pharmaceuticals company Recipharm AB for \$2.1 billion, marking the latest in a wave of drug industry acquisitions. Recipharm is a 25-year-old company that specializes in outsourcing contract manufacturing services to help pharmaceutical companies develop new drugs.

The company serves drugmakers by supplying products and services that include active pharmaceutical ingredients, placebos that look like real medicine for clinical trials, and analysis to determine the best way to formulate a drug.

Recipharm has said that a molecule it's developing, Erdosteine, appeared to help Covid patients recover after they were discharged from hospital. The company, whose biggest shareholder is the Swedish state with a roughly 16% stake, has seen its share price gain about 36% this year.

The offer is fully financed by a combination of funds available to Roar BidCo, the vehicle through which EQT is making the bid, by way of an equity commitment letter issued by EQT IX.

Debt financing will be arranged via Goldman Sachs International, GS Mezzanine Partners, Broad Street Danish Credit Partners and GLQC Sarl.



The European Commission has approved, under the EU Merger Regulation, the acquisition of joint control of Recipharm of Sweden by EQT Fund Management of Luxembourg, Zentricity Holding of Sweden and Cajelo Invest of Cyprus.

The Commission assessed the overlaps which arise between the companies' product offers. In particular, the Commission assessed the horizontal overlaps with respect to the CDMO services.

It also assessed the vertical relationships with respect to the provision of CDMO services upstream and the supply of FDPs and care products downstream, as well as in the distribution of chemicals and cosmetic ingredients upstream and in the provision of CDMO services downstream.

The Commission concluded that the proposed transaction would raise no competition concerns, since there would be no change in market dynamics, given the low market shares of all of the companies concerned in all of the markets under consideration. The transaction was examined under the simplified merger review procedure.



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## Use case - SISP-LIFE SCIENCE INCUBATION



A national initiative supporting both incubators and life science start-ups and SMEs.

Sweden's life science incubators are working together to develop common tools and methodologies to support the development of promising companies.

Through working together, they can provide high-quality support for companies and incubators from all over the country and help connect companies with international investors.





# Opportunities – Governmental support to grow the LifeSciences and Biomanufacturing industries



Government Offices of Sweden

## Innovation partnership programme Health and life sciences

The Government's objective is for Sweden to be a leading life sciences nation. Life sciences contribute to improving health and quality of life of the population, ensuring economic prosperity, advancing the country as a leading knowledge nation and achieving the 2030 Agenda for Sustainable Development.

## Partnership group for Health and life sciences

An external advisory partnership group appointed by the Government is associated to the innovation partnership programme. The group consist of representatives from large and small companies, universities and higher education institutions, authorities responsible for health and social care services and civil society.

## One out of the 4 working group is dedicated to :

Precision medicine and advanced therapy medical products

## Swedish Report on Vaccines Manufacturing capacities

*A strong European Partnership with a free international market, with open trade boundaries and without export restrictions gives the best opportunities in order to secure availability to vaccines for Sweden short term and within the frames of the ongoing pandemic. Not the least is Sweden's engagement important in the ongoing dialogues around a European preparedness plan and capacity within the frames of HERA.*



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Part VI

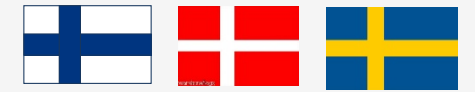
# Conclusions and **next steps** Scandinavia



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# Conclusions & next steps



The success of the Scandinavian R&D model is characterized by a strong integration of university-industry collaboration with heavy participation and support of the governments

- Scandinavian countries are **very attractive towards external and international VCs**
- The three countries in study in the report, Sweden, Denmark and Finland **lead the innovation** in Europe
- They are leader in the **Green transition** of their industries and are showing integration of the **Sustainable Development Goals** in own entrepreneurial and research culture.

## Next steps are:

- To **develop a pro-active strategy for talents** generation to tackle the needs of many fast-growing companies looking for the same profiles
- To **improve and adapt the funding schemes'** available according to each's country's needs the access to finance for the companies.
- To promote **the digitalization of the sector**, in particular working on industry 4.0 and automation processes



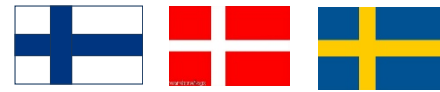
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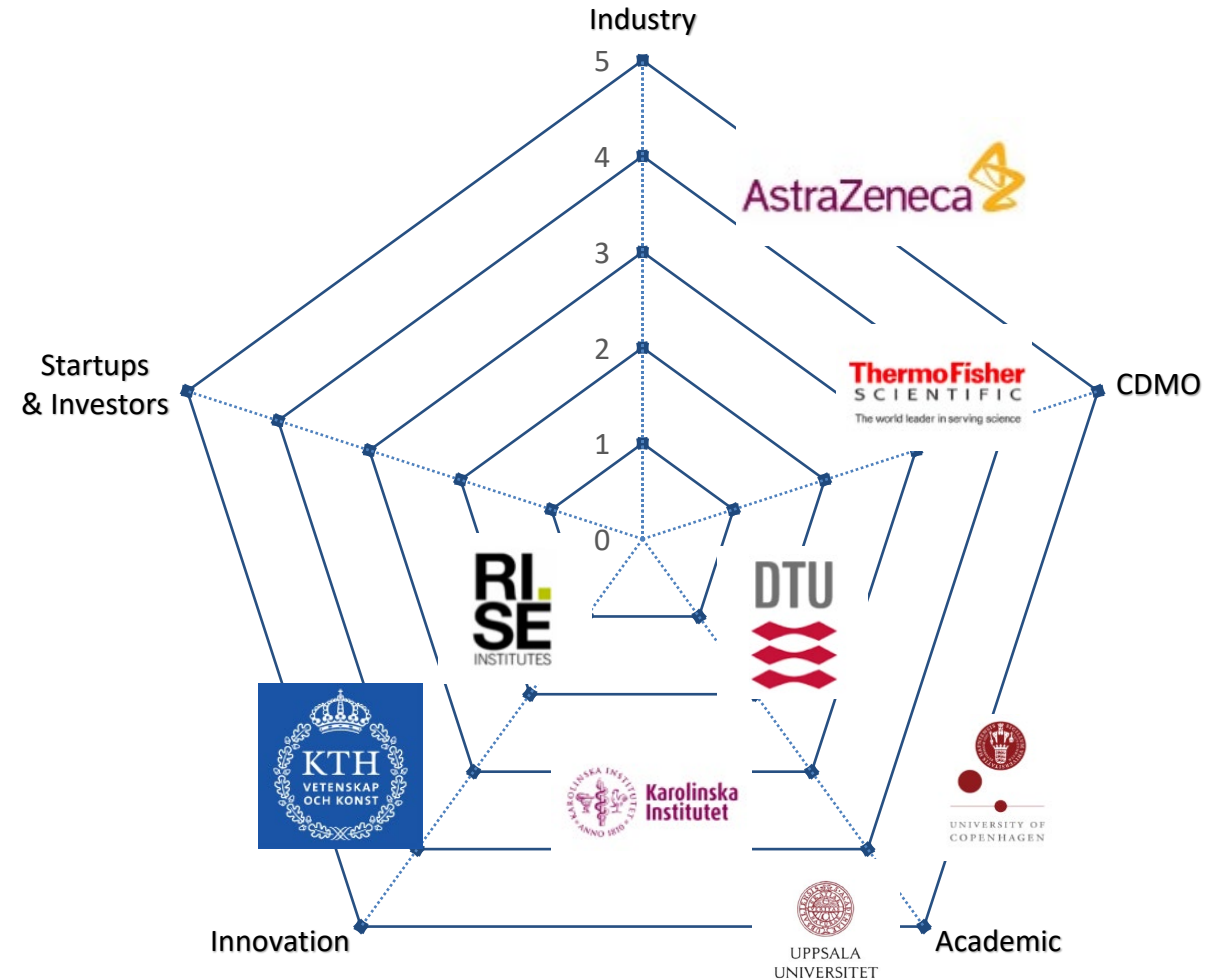
# EIT Health Scandinavia members engagement



1. Industry
2. CDMO
3. Academic
4. Innovation
5. Start-ups & Investors



## Scandinavia EIT partners position radar



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Novo Nordisk Foundation

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**Industry 4.0: The Digital Transformation of Biomanufacturing**

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