



Overview of the Danish Public Support System for Research and Innovation (by Thomas Alslev Christensen)

1. Introduction

The general overview describes the research and innovation support system in Denmark. The overview presents the focus areas of the system and the organisational setup as well as the connections between the national, regional and international research and innovation support systems.

2. What are innovation, research and development?

In Denmark, the definition of innovation, research and development follows the internationally recognised definition of research and innovation applied by OECD and the EU. Research and development is about an open-minded systematic search for new knowledge, with the aim of establishing novel facts, solve new or existing problems, prove new ideas, develop new theories etc. Normally a distinction is made between basic research, applied research and experimental development.

Innovation is seen as the conversion of new and existing knowledge into commercial value or value for society. Innovation can be new services or products, new production processes or organisational changes, new forms of marketing methods etc. Innovation can take place in all types of private and public businesses and organisations. Often, a distinction is made between incremental innovation – i.e. the gradual improvements of existing products, services and processes – and radical innovation, i.e. significant changes like entirely new types of products or services, entirely new production processes etc.

Definition of innovation, research and experimental development

Research and experimental development (R&D) comprise creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society and the use of this stock of knowledge to devise new applications. The term R&D covers three activities: basic research, applied research and experimental development:

- Basic research is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundation of phenomena and observable facts, without any particular application or use in view.
- Applied research is also original investigation undertaken to acquire new knowledge. It is directed towards a specific practical aim or objective.
- Experimental development is systematic work, drawing on existing knowledge gained from research or practical experience directed to producing new materials, products or devices, to installing new processes, systems and services, or to improving substantially those already produced or installed.

Innovation is the implementation of a new or significantly improved product (goods or service), process, marketing method or a significant organisational change. Innovation is the result of deliberate plans and activities aimed at an improvement of the company's products, processes, sales and marketing or organisation. Innovation can be based on new knowledge and technology, but can also be a combination of, or new application possibilities for, existing knowledge and technologies.

Danish Agency for Science,
Technology and Innovation

Bredgade 40
1260 Copenhagen K
Denmark

Phone +45 3544 6200
Fax +45 3544 6201
E-mail fi@fi.dk
Website www.ufm.dk

CVR no. 1991 8440

Responsible
Thomas Alslev Christensen
E-mail tac@fi.dk



3. What is the objective of the Danish research and innovation support system?

The main objective of the Danish R&D support system is to strengthen society's research and innovation capacity. The system should accordingly support the research and innovation capabilities and activities of both the private and public sector and ensure good framework conditions for innovation. Overall aims are:

- Building of new knowledge within research institutions, other knowledge institutions and businesses.
- Dissemination and commercialisation of research results, new technology, organisational and market-related knowledge etc.
- Collaboration between researchers, research and educational institutions, technological institutes, other knowledge institutions and businesses.
- Access to technological, market-related, organisational, business-related and design-based knowledge of high quality.
- International collaboration on development and utilisation of knowledge and technology.
- Development of new knowledge and technology-based industry.
- Market for risk/venture capital for innovative enterprise..
- Research and innovation competences in the private and public sector through highly qualified employees.
- Integration of teaching on innovation and entrepreneurship in educational programmes.
- Use of public procurement to promote research and innovation in businesses.
- Use of public regulation to promote research and innovation in businesses.

It is the ambition that the research and innovation support system, and the institutions, instruments, services etc. forming the system, should be of a high quality and should create noticeable effects in society, particularly in businesses.

Furthermore, it is the ambition that the system underpins foundational and long-term knowledge-building in knowledge institutions, enabling them to be continually at the cutting edge of technology and thus be relevant sparring partners for the private and public sector.

The research and innovation support system should also be able to underpin very diverse research and innovation activities (and not only formal R&D). The system also needs to acknowledge the many different sources and driving forces behind research and innovation (e.g. inputs from knowledge institutions, users, suppliers, employees, public procurement, legislation etc.). The system should be highly flexible and be able to quickly adapt to changing needs in the business community and the rest of society. Also, the system should present itself as cohesive, making it easy to grasp and user friendly.

Last but not least, the research and innovation support system should have a societal rationale and value. The system should support research and innovation activities which would otherwise not be carried out due to a lack of knowledge and competences, too high risks, lacking/weak business economic incentives or difficult access to industrial partners etc. (i.e. correction of market errors).



4. What does the public research and innovation support system look like?

The research and innovation support system consists of the framework conditions, institutions, instruments and services whose purpose it is to promote a high research and innovation capacity in society, and which are funded fully or partially by public authorities (government, regions, municipalities, international organisations).

A number of basic focus areas can be identified in the Danish support system. They are as follows:

- Research in public knowledge institutions
- R&D-based technological service
- Research and innovation networks and clusters
- Research, development and innovation projects
- Research aimed at innovation and needs in society
- Risk/venture capital and facilities for new innovative businesses
- Consultancy and knowledge centres
- Highly qualified employees with good innovation and entrepreneurial skills
- Units and instruments for commercialisation of public research
- Internationalisation instruments in relation to research and innovation support

These basic focus areas would typically be found in a modern research and innovation support system and would accordingly also normally be found in one form or another in other EU or OECD countries' research and innovation support systems.

In the following, we distinguish between core functions and supporting functions. Core functions are initiatives where research and innovation support in the business community and public institutions is a main or significant objective. Supporting functions are initiatives where research and innovation support in the business community and the public sector is a partial or a long-term objective.

The supporting functions will often also form part of other public regulative systems, e.g. the trade support system, the entrepreneur system, the educational system, the environmental consultancy system etc.

Box: Short presentation of the public educational system in Denmark

The public educational system consists of the frameworks, institutions and instruments that seek to promote a high level of education and an extensive offer of qualified people. It consists partly of universities, university colleges, vocational/technical schools, artistic educational programmes, maritime educational programmes, business academies, primary and secondary schools etc.

The table below shows the basic focus areas in the research and innovation support system as well as the specific institutions and instruments that currently constitute the core and supporting functions of the system. See appendix 3 for a short presentation of key councils and programmes and appendix 4 for abbreviations.



Table: Basic focus areas in the Danish research and innovation support system – purpose, core functions and supporting functions

Basic focus area	Purpose	Core functions (responsible authority in parentheses)	Supporting functions
Research in public research institutions	To ensure highly qualified public research in public research institutions.	<p><i>Funds:</i></p> <ul style="list-style-type: none"> • Basic funding for universities (UFM) • Danish National Research Foundation (UFM) • The Danish Council for Independent Research (UFM) • Innovation Foundation Denmark (UFM) <p><i>Institutions:</i></p> <ul style="list-style-type: none"> • 7 universities (UFM) • 3-4 other public research institutions (different ministries) 	<p><i>Funds:</i></p> <ul style="list-style-type: none"> • Sector specific programmes – Food, energy, climate
R&D-based technological service	To build research-based technological competences, acquire knowledge from abroad and actively disseminate and make this available to the Danish private and public sectors in order to promote research and innovation.	<p><i>Funds:</i></p> <ul style="list-style-type: none"> • The Danish Agency for Science, Technology and Innovation (UFM) <p><i>Institutions:</i></p> <ul style="list-style-type: none"> • 9 GTS institutes (UFM) 	
Innovation networks and clusters	To create platforms for matchmaking, knowledge transfer, research and innovation collaboration between private businesses, public institutions and knowledge institutions.	<p><i>Funds:</i></p> <ul style="list-style-type: none"> • Danish Agency for Science, Technology and Innovation (UFM) • Innovation Foundation Denmark (UFM) <p><i>Institutions:</i></p> <ul style="list-style-type: none"> • 4 SPIR (Strategic Platform for Innovation and Research) (UFM) • 22 Innovation networks (UFM) 	<p><i>Funds:</i></p> <ul style="list-style-type: none"> • Green Development- and Demonstration Programme – GUDP (FVM)
Research, development and innovation projects	To promote different forms of research and innovation activities in businesses and public institutions through direct and indirect support for specific projects.	<p><i>Funds:</i></p> <ul style="list-style-type: none"> • Innovation Foundation Denmark (UFM) • The Market Maturity Fund (EVM) • Energy Development and Demonstration Programme - EUDP (KEBMIN) • Green Development and Demonstration Programme - GUDP (FVM) • Environmental- technological Development and Demonstration Programme (MUDP) • Other pools (UM, regions) 	



Basic focus area	Purpose	Core functions (responsible authority in parentheses)	Supporting functions
Research and innovation aimed at needs of society	To further high quality research that creates innovation and value for the business community and society alike.	<p><i>Funds:</i></p> <ul style="list-style-type: none"> • Innovation Foundation Denmark (UFM) • The Market Maturity Fund (EVM) • Funding for research-based public-sector consultancy at universities (FVM, MIM, EVM etc.) • The Danish Council for Independent Research • The Danish National Research Foundation 	<p><i>Funds:</i></p> <p><i>Institutions:</i></p> <ul style="list-style-type: none"> • Universities • Research institutions • Hospitals
Risk/venture capital and facilities for new innovative businesses	To create innovation and growth in new and established companies with growth potential by raising risk/venture capital in the form of loans, owner's shares or investments, and office, knowledge and research facilities.	<p><i>Funds:</i></p> <ul style="list-style-type: none"> • Danish Agency for Science, Technology and Innovation (Innovation Incubator scheme) (UFM) <p><i>Institutions:</i></p> <ul style="list-style-type: none"> • The Growth Foundation (EVM) • 4 Innovation Incubators (UFM) 	<p><i>Institutions:</i></p> <ul style="list-style-type: none"> • Science parks <p><i>Policy:</i></p> <ul style="list-style-type: none"> • University campus strategies
Consultancy and knowledge centres	To provide different kinds of consultancy and guidance that support the research and innovation processes of businesses and public institutions, including guidance on public research and innovation offers.	<p><i>Institutions:</i></p> <ul style="list-style-type: none"> • Danish Patent and Trademark Office (EVM) • Danish Design Centre (EVM) • Regional growth centres (Regions) • Business service centres and similar (Municipalities) 	<p><i>Institutions:</i></p> <ul style="list-style-type: none"> • Danish Standards • Innovation Networks • GTS institutes • Universities and other higher education
Highly qualified employees with good innovation and entrepreneurial skills	To promote the utilisation of R&D competences of highly qualified labour and students and giving employees and students the opportunity to develop their research, and entrepreneurial competences through education.	<p><i>Funds:</i></p> <ul style="list-style-type: none"> • Innovation Foundation Denmark (UFM) <p><i>Institutions:</i></p> <ul style="list-style-type: none"> • The Danish Entrepreneurship Foundation (UFM, EVM) <p><i>Policy:</i></p> <ul style="list-style-type: none"> • Efforts to increase PhD production 	<ul style="list-style-type: none"> • Educational programmes and courses with a focus on research and innovation at education institutions
Internationalisation of research and innovation	To promote international research and innovation activities in Danish enterprise, e.g. via matchmaking and knowledge collaboration with foreign partners, and to inform, advise and in other ways support the possibilities of Danish enterprise within the 7 th Framework Programme of the EU etc.	<p><i>Funds:</i></p> <ul style="list-style-type: none"> • Innovation packages (UM) • EUUpStart (UFM) • 'Innovation Express' for networks and clusters (UFM) • Green Development and Demonstration Programme (FVM) • Innovation Foundation Denmark (EuroStars, AAL, Bonus, Artemis) (UFM) <p><i>Institutions:</i></p> <ul style="list-style-type: none"> • Innovation centres (UM/UFM) • Eurocentre (UFM) • International activities at the 9 GTS institutes (UFM) 	<p><i>Funds:</i></p> <ul style="list-style-type: none"> • National programmes with foreign participation <p><i>Institutions:</i></p> <ul style="list-style-type: none"> • International activities at Danish universities



As shown in the table, the *core functions* and the *supporting functions* include a wide range of offers in relation to businesses' and public institutions' research and innovation activities in the form of access to technological service, competences, knowledge, research and consultancy, network and cluster collaboration, risk/venture capital and physical infrastructure, among others.

The basic focus area: 'research, development and innovation projects' is a collective designation for a number of pools which support projects that businesses and public institutions can apply for or participate in. The pools have varying focuses as they are set up to address different needs in Danish businesses. Some of the pools focus on general collaboration with knowledge institutions on research, development and innovation. Other pools focus on collaboration on specific themes (e.g. green solutions, welfare technology, energy, environment, food etc.) The pools also cover projects at national, international and regional levels. Furthermore, two of the pools focus on enhancing the use of public procurement requiring private research and innovation. It should additionally be noted that a number of the pools can also support different types of activities mentioned under other functions in the table, including e.g. research, networks, education and competences.

A number of basic focus areas include institutions and instruments focusing specifically on enhancing commercialisation of public research and other ways of utilising public research in the business community through public/private interaction. This goes for e.g. technology transfer units at universities, research and innovation networks, and some of the above mentioned pools for research and innovation projects.

Finally, a number of institutions and instruments focus particularly on supporting Danish businesses' international research and innovation activities. This applies e.g. to the established Innovation Centres (in Munich, Silicon Valley and Shanghai) and the special attachés (in Sao Paolo) helping Danish businesses to network internationally, and a number of small programmes like the Innovation Packages and Innovation Express. Regarding the EU's Horizon 2020 programme, the Danish Eurocenter offers advice for Danish companies and institutions planning to apply for EU grants.

Additionally, in order to give Danish enterprise access to international knowledge, many of the national research and innovation programmes/pools for projects are also open to the participation of non-Danish companies, research and knowledge institutions.

Finally, an important focus area is to provide businesses with guidance on the availability of relevant public research and innovation offers. This function is carried out by many players, including local business service centres, regional growth centres, research and innovation networks, GTS institutes, universities, university colleges, business academies and other institutions of higher education and knowledge institutions. In addition, a new website www.vaekstguiden.dk was launched in 2010 with the purpose of providing a combined overview of relevant support possibilities and other offers to primarily enterprises.

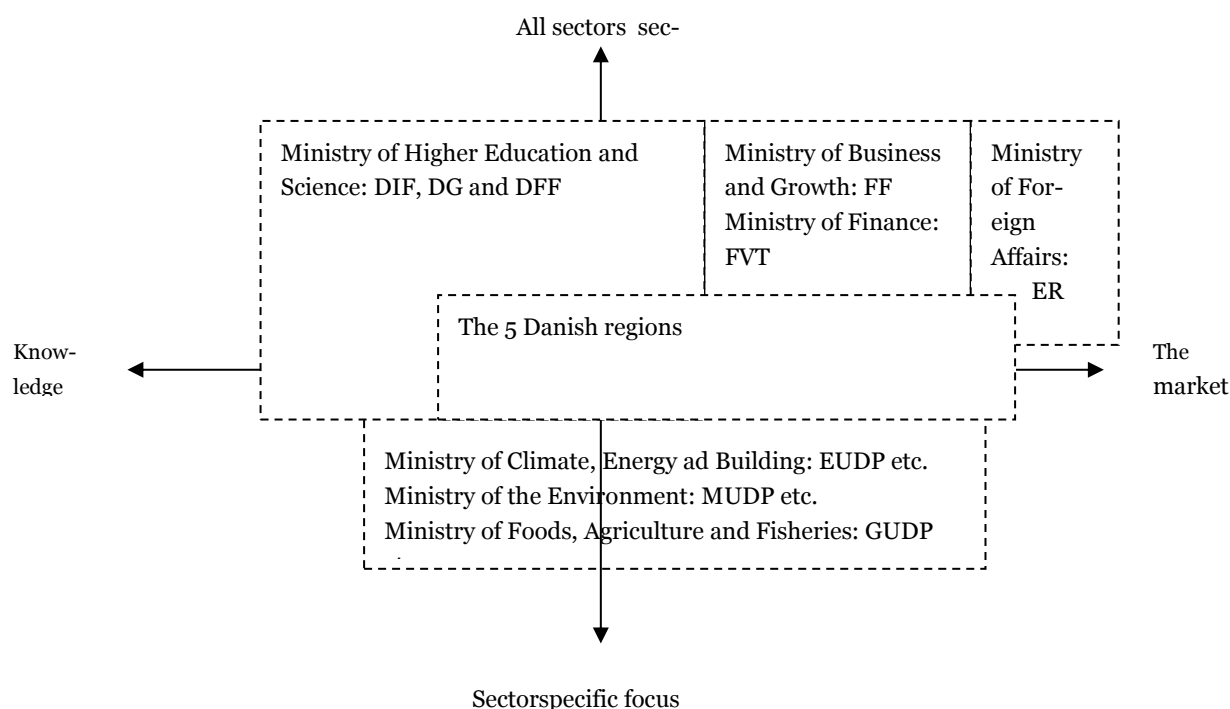


5. International research and innovation programmes

International R&D and innovation programmes with participation by Denmark

Organisation	Programmes
EU	Horizon 2020 Small specific programmes, such as Eurostars, AAL (welfare technology), Artemis (embedded systems) etc.
ESA	European Space Agency. Research programmes and procurement of state-of-the-art technology to be used in the programmes.
ESO	European Southern Observatory, an astronomy programme.
CERN	The European Organisation for Nuclear Research, dealing with high-energy physics
EMBL	The European Molecular Biology Laboratory.
EUREKA	Business-initiated research. As a consequence, topics vary widely.
NMR	NICE, NordForsk. These are Nordic collaboration funds.

6. Division of work between authorities in the R&D and innovation system

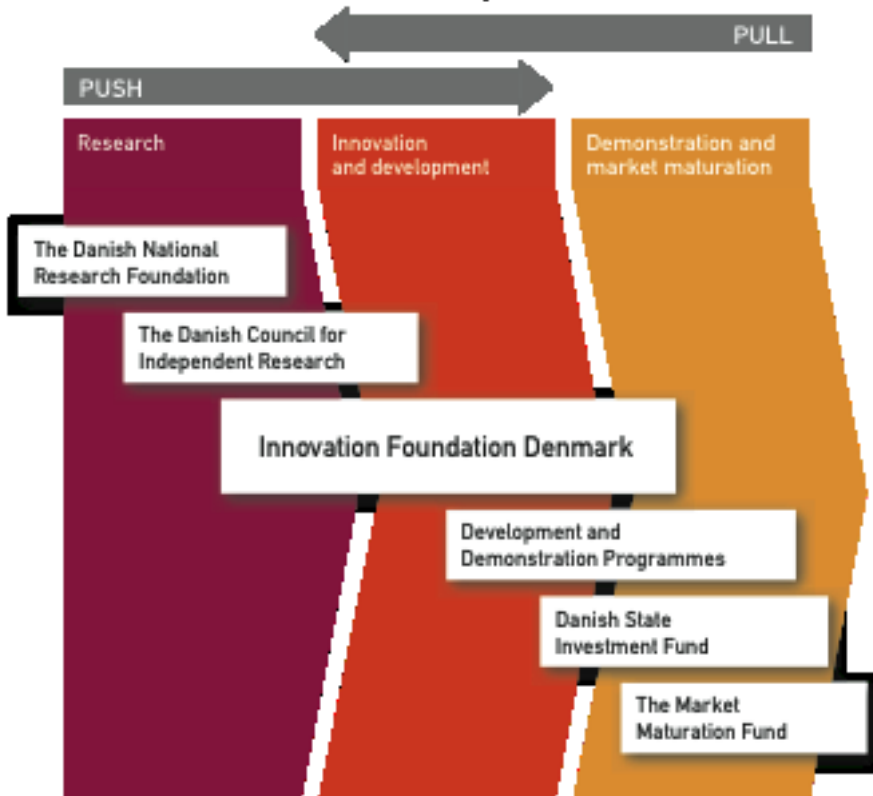


Note: See appendix 3 for presentation of councils. Appendix 4 for abbreviations



7. Division of work between the responsible players and funding bodies

The structure of the Danish Research and Innovation system





Appendix 1: Overview of national public initiatives within innovation, research, development and demonstration

Pools with a national focus

<i>Cross-disciplinary pools</i>	<i>Responsible authority</i>
Research	
The Danish National Research Foundation	UFM
The Danish Council for Independent Research	UFM
The Innovation Foundation Denmark	UFM
Collaboration with knowledge institutions on research and innovation	
The Innovation Foundation Denmark: Research and innovation projects, Partnerships and platforms	UFM
Innovation networks and cluster policy	UFM
Research and innovation via highly qualified people in companies	
The Innovation Foundation Denmark: Knowledge Pilots and Industrial PhD	UFM
Research and innovation in the public sector	
The Business Innovation Fund (welfare solutions)	EVM
The Innovation Foundation Denmark:	UFM
<i>Sector or technology-specific pools</i>	<i>Responsible authority</i>
Energy	
Energy-technological Development and Demonstration Programme (EUDP)	KEBMIN
ElForsk – Efficient use of electricity	KEBMIN
ForskEl – Eco-friendly electricity production	KEBMIN
Environment	
The Business Innovation Fund (green solutions)	EVM
The Technology Pool for Soil and Groundwater Contamination	MIM
Environmental- technological Development and Demonstration Programme (MUDP)	MIM
The Business Scheme (environmental effort)	MIM
The Danish Environmental Protection Agency's Programme for Pesticide Research	MIM
Small-scale forestry experiments	MIM
Foods	
Green Development and Demonstration Programme (GUDP)	FVM



Appendix 2: Funding 2014

Table: Funding of key programmes and councils, 2014

	Danish million Kr.	Euro
Innovation Foundation Denmark	1,592m	214m
Danish Agency for Science, Technology and Development (DASTI)	665m	89m
The Danish National Research Founda- tion (DG)	392m*	53m*
The Danish Council for Independent Research (DFF)	1,252m	168m
Energy-Technological Development and Demonstration Programme (EUDP) and other energy programmes	371.8m	49.8m
Green Development and Demons- tration Programme (GUDP)	2012m	27.0m
Environmental- technological Devel- opment and Demonstration Pro- gramme (MUDP)	55.2m	7.4m
The Business Innovation Fund (FF)	371.8m	49.8m
Total	4,901m	658.7m

* Figure will be updated

Total R&D-expenditure in the Danish private and public sector, 2011

The latest R&D statistics show that the Danish private sector invested almost 5 billion euro in R&D in 2011. This is equivalent to 1.96 per cent of Danish GDP in 2011. The public expenditure on R&D reached 1.02 percent of GDP in 2011.

Research and Development in per cent of GDP by per cent of GDP and time

Unit: Per cent of Gross domestic product (GDP)

	2008	2009	2010	2011
Total	2.78	3.16	3.00	3.04
Enterprise	1.94	2.21	2.01	2.03
Public sector	0.84	0.95	0.99	1.02



Appendix 3: Overview of key funding foundations and councils

The Innovation Foundation Denmark (DIF)

The purpose is to fund the development of knowledge and technology including high technology that leads to strengthening of research and innovative solutions for the benefit of growth and employment in Denmark.

The foundation shall support solutions of concrete societal challenges and increase the research and innovation efforts in Danish business community including in the small and medium sizes enterprises.

The foundation has within its purpose responsibility to provide financial support for strategic and challenge-driven research, technology development and innovation, which helps to increase the share of innovative enterprises, increasing the share of private companies' investment in research and development and increasing the share of highly educated employees in companies.

The foundation shall support

- 1) Better linkages between high quality research and innovation, including cooperation on research, technology and innovation between knowledge institutions and companies
- 2) Danish participation in international cooperation on strategic and challenge-driven research, technology and innovation,
- 3) Maturation of promising research results and inventions for faster dissemination, application and commercialization of the knowledge developed and produced with support from the foundation.

The Danish National Research Foundation (DNRF)

The Danish National Research Foundation is an independent foundation with the objective to strengthen Denmark's research-related development capacity by funding outstanding research at an international level. Support is chiefly given through the establishment of Centres of Excellence, but the Foundation has also launched a number of activities aimed at increasing the internationalisation of Danish research.

The Danish Council for Independent Research (DFRC)

The Danish Council for Independent Research supports concrete research activities within all scientific fields. Activities must be based on the researchers' own initiatives and at the same time should strengthen the quality and internationalisation of Danish research. The Danish Council for Independent Research also provides research-related consulting services within all scientific fields for the Minister of Science, Innovation and Higher Education, the Danish *Folketinget* (Parliament) and the government.

Energy-Technological Development and Demonstration Programme (EUDP)

The Energy-Technological Development and Demonstration Programme supports the development and demonstration of new innovative energy technologies with both commercial potential and a potential to contribute to making Denmark independent of fossil fuels by 2050. Furthermore, the Programme promotes international collaboration on new energy technology.

Green Development and Demonstration Programme (GUDP)



The objective of the Green Development and Demonstration Programme is to support the creation of competitive and sustainable food and non-food production and to contribute to the development of business potential. This includes further development of a market-driven organic sector, growth, employment and health, while at the same time ensuring high standards in the areas of climate, environment and nature, animal welfare, food safety, and health.

The Market Maturity Fund (FF)

The objective of the Business Innovation Fund is to create growth, employment and export, particularly in small and medium-sized enterprises. The Fund supports enterprises' business opportunities within green growth and welfare. It also supports switch-over to new commercial and growth possibilities within economically strained areas.

The Danish Trade Council

The Danish Trade Council assists small and large enterprises in starting up export and expanding activities to new markets. The Trade Council assists enterprises in internationalisation in the widest sense, including market analyses, start-up advice and establishment of contact to business partners and new distribution outlets.

Appendix 4: Abbreviations

Danish abbreviation	Danish full text	English
AAU	Aalborg Universitet	Aalborg University
DFF	Det Frie Forskningsråd	Danish Council for Independent Research
DG	Danmarks Grundforskningsråd	Danish National Research Foundation
ER	Eksportrådet	The Danish Trade Fund
EUDP	Energiteknologisk Udviklings- og Demonstrationsprogram	Energy-Technological Development and Demonstration Programme
EVM	Erhvervs- og Vækstministeriet	Ministry of Business and Growth
UFM	Uddannelses- og Forskningsministeriet	Ministry of Science and Higher Education
FM	Finansministeriet	Ministry of Finance
FVM	Fødevarerministeriet	Ministry of Food, Agriculture and Fisheries
GUDP	Grønt Udviklings- og Demonstrationsprogram	Green Development and Demonstration Programme
KEBMIN	Klima-, Energi- og Bygningsministeriet	Ministry of Climate, Energy and Building
MIM	Miljøministeriet	Ministry of the Environment
UM	Udenrigsministeriet	Ministry of Foreign Affairs