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Nordic R&I cooperation: Achievements and Challenges

NORDERA
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Report 1
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NordForsk and Nordic Innovation Centre



NORDERA

Preface

This report is a formal deliverable under Work Package 2 and 3 (Report on formalized and non-formalised R&I cooperation) of the NORDERA project (Lessons Learnt from Nordic Coordination in the Context of ERA). NORDERA is an ERA-NET Support Action coordinated by NordForsk with the Nordic Innovation Centre (NICE) the Institute for Prospective Technological Studies of the European Commission's Joint Research Centre (JRC-IPTS) in Seville as partners. By studying the Nordic region's experience with research and innovation cooperation, the NORDERA project supports ongoing coordination of national research programmes, thereby encouraging joint programming both in the Nordic region and in the European Union. While this report studies the experiences in the Nordic region and seeks to identify good practices on research and innovation programme coordination, a second report will assess how lessons learnt can be of value for the further development of both the European Research Area (ERA) and the Nordic Research and Innovation Area (NORIA) as an integral part of ERA.

In addition to NordForsk, the Nordic Innovation Centre (NICE) and the Joint Research Centre (JRC)/Institute for Prospective Technological Studies (IPTS) in Seville are partners in the project. This first report has been written by NordForsk and NICE in cooperation. Here, NordForsk has had the main responsibility for covering the research cooperation, while NICE has contributed with the innovation perspective. The second report will be produced by the Joint Research Centre/Institute for Prospective Technological Studies in Seville.

The project has an Advisory Board, which consists of Annette Moth Wiklund, Swedish Research Council (Vetenskapsrådet); Inger Jonsson, Swedish Council for Working Life and Social Research (FAS); Ulf Westerlund and Hans Örjan Nohrstedt, Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning (Formas); Staffan Håkansson, VINNOVA; Satu Huuha-Cissokho, Academy of Finland; Raimo Pakkanen and Ari Ahonen, Finnish Funding Agency for Technology and Innovation (TEKES); Hans M. Borchgrevink and Sverre Sogge, Research Council of Norway; Soley Greta Sveinsdottir Morthens and Thorvald Finnbjörnsson, The Icelandic Centre for Research (RANNIS); Karin Dahl Jørgensen, The Danish Agency for Science, Technology and Innovation; Lise Jørstad, Nordic Energy Research (NEF); Dan Andree, Swedish Ministry of Education and Science; and Fredrik Melander, Nordic Council of Ministers.

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Gunnel Gustafsson, Director of NordForsk

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The main aim of this report is to describe and analyse Nordic¹ research and innovation (R&I) cooperation. While Nordic R&I cooperation has a long tradition, its character has changed over time. In the past, a key difference between Nordic and EU cooperation in this field has been the bottom-up approach of the former and the top-down approach of the latter. This means that the Nordic R&I cooperation was a result of initiatives coming from the research community or the operational level itself and to a large extent taking place on an ad hoc basis. The European cooperation was to a larger extent a result of an intended policy. With the creation of common Nordic coordinating institutions, such as NordForsk and the Nordic Innovation Centre, and the establishment of a European Research Council that opens up for curiosity-driven research, this distinction has become less clear. Several political initiatives have aimed at increasing the visibility of Nordic research cooperation within the international arena in recent years. The goal is to transform the Nordic region into a leading region in terms of research and innovation. An important step in that direction was the launching of the NORIA vision in 2004, which in turn has led to the establishment of new institutions and new initiatives.

In this report, we will study both non-formalized and formalized research and innovation cooperation in the Nordic region. To ensure a comprehensive analysis, we will study such cooperation at three different levels: the *policy level* (mainly between the ministries within the Nordic Council of Ministers); the *agency level* (mainly between the research councils and other national funding agencies within or outside the structures of the Nordic Council of Ministers); and the *research and operational level* (mainly between researchers, companies, institutions, etc.).

The report will address two key questions:

1. *What characterizes Nordic research and innovation cooperation? And what is the added value of this cooperation?*
2. *To what extent has the main ambition of NORIA been achieved? And what have been and are the main challenges?*

1.1 KEY CONCEPTS

We will start by clarifying some key concepts that will be used throughout the report.

Nordic cooperation in research and innovation takes on many different forms. First, we can distinguish between formalized and non-formalized forms of cooperation. By formalized cooperation we mean forms of cooperation that receive funding for “going Nordic” either from the Nordic Council of Ministers itself or some of its underlying Nordic institutions, or from joint committees of national research agencies or others. By non-formalized, we mean all forms of cooperation that do not receive specific funding for cooperating on a Nordic level. This will most often be bottom-up-initiated cooperation at the research/operational level with no specific Nordic funding.

It is also important to have a clear idea of what we mean by *research* and *innovation*. While research is performing a methodical study in order to prove a hypothesis or answer a specific question, innovation is the introduction of a new or significantly improved product (goods or services), process or organization into the market/society. While there exists a general political willingness – both nationally and internationally – to make research more innovation-oriented, there are some cultural and institutional obstacles to overcome in order to make this possible. This is also true at the Nordic level. In addition to differences in the approaches and mindsets that characterize research and innovation, efforts to integrate the two are also challenged by the fact that they are administered by different Councils of Ministers and implemented by different agencies. As we shall see, there do exist initiatives that seek to build bridges between the two, the so-called Top-level Research Initiative (TFI)

¹ The Nordic region consists of Denmark, Norway, Sweden, Iceland and Finland, as well as the three autonomous areas: the Faroe Islands, Greenland and the Åland Islands.

being a concrete example (for further details, see Chapter 3).

1.2 METHODOLOGICAL APPROACH

This study is conducted as a qualitative case study and draws on both primary and secondary sources. The primary sources consist of interviews, as well as official documents and available statistics. During November and December 2009, we conducted 58 interviews with representatives² from the three levels noted above: the policy level, the agency level and the research/operational level (for the interview guides, see Annex I). We interviewed people responsible for or involved in Nordic research and innovation cooperation within the secretariat of the Nordic Council of Ministers (both the council for education and research [MR-U] and the council for business, energy and regional policy [MR-NER] and within the national funding agencies, along with researchers and business representatives. The secondary source for our analysis is the existing literature on Nordic research and innovation cooperation, particularly articles, reports, surveys and evaluations.

We have also applied bibliometric data. However, while co-publication rates provide a useful indicator of Nordic cooperation, much research cooperation does not result in common publications. In addition, innovation cooperation almost never results in international publications that are included in bibliometric studies. In general, the results of cooperation in innovation activities are published via press releases, websites, technical news and business information. Owing to these limitations, we have therefore chosen to base our study mainly on in-depth interviews with key stakeholders in the Nordic R&I system.

It is important to note that there are several ongoing processes within the Nordic system that are of direct relevance to this project. First, we can mention the so-called *governance process*. The Nordic Council of Ministers (through the Committee of Senior Officials for Education & Research Affairs, EK-U) has initiated a project concerning the governance of Nordic research cooperation as part of the Nordic region's contributions towards realizing the 'fifth freedom' (free movement of knowledge) in the European Union.³ The aim of the project is twofold. First, it will gather experiences from the TFI. Second, it will develop common principles and conclusions relating to governance of the planning, establishment and implementation of large research initiatives. As part of the project, Technopolis was commissioned by the Nordic Council of Ministers to develop two reports – one on the experiences of the first Nordic Top-level Research Initiative (Arnold & Eriksson, 2009), and one that maps the different Nordic research and development (R&D) cooperation instruments (Arnold & Carlberg, 2009). A second process of relevance to NORDERA is an initiative taken by the Board of NordForsk to carry out a stakeholder analysis. The aim of this initiative was to gain comprehensive knowledge of what major stakeholders perceive to be the main challenges facing NordForsk as it enters a new strategy period. The stakeholders were also asked to give their opinion on NordForsk's strengths and weaknesses. A third process is the Mid-Term Evaluation on Nordic Innovation Policy 2005–2010 commissioned by the Nordic Innovation Centre (NICe), which analysed the interaction between Nordic innovation policy and NORIA (Andersen, 2009). These studies have served as background material, along with other reports and articles of relevance.

Formalized cooperation is presented through an overview of existing funding instruments (see Chapter 2). In relation to non-formalized cooperation, however, it is not possible to provide a fully comprehensive overview. Accordingly, to provide a useful picture, we have gathered information from

² 48 of the interviews were undertaken face to face and 10 of them per e-mail.

³ As part of the EU's ongoing quest to make itself more competitive, the heads of states decided in March 2008 to create a 'fifth freedom' of knowledge to be added to the four original principles of free movement of persons, capital, services and goods in the European Union.

some of the most important universities within the Nordic countries. Representatives for a selection of the various forms of Nordic R&I cooperation were contacted and interviewed by e-mail (see Annex I).

1.3 THE STRUCTURE OF THE REPORT

The analysis is organized within five chapters. In Chapter 2, we present the historical background of the development of NORIA and an overview of Nordic research and innovation cooperation. Chapter 3 analyses the main achievements of Nordic research cooperation, while Chapter 4 identifies and discusses some of the main challenges to be faced. Finally, Chapter 5 presents some concluding remarks.





2. Towards a Nordic Research and Innovation Area

2.1 NORDIC COOPERATION: A HISTORICAL BACKGROUND

The five Nordic countries are closely linked to each other. Their regional cooperation is based not only upon geography but on a long history of both cohabitation and strife, and even a period of partial monetary union (1873–1914). The long-established nature of the relationships between the Nordic countries probably explains the apparently high level of comfort that Nordic citizens have with belonging to the Nordic cooperation, while the idea of belonging to a European Union is neither comfortable nor self-evident (Arnold et al., 2006: 43). It is on this basis that the Nordic institutionalized cooperation has been established. In fact, the formal cooperation between the Nordic countries is among the oldest and most extensive regional cooperation in the world.

The first step towards a formalized Nordic cooperative process was the establishment of the Nordic Council in 1952 as a forum for Nordic parliamentary cooperation, involving members of parliament from Denmark, Finland, Iceland, Norway and Sweden, as well as from the three autonomous areas: the Faroe Islands, Greenland and the Åland Islands. The Nordic Council takes initiatives and acts in an advisory and supervisory capacity on issues and matters of interest for official Nordic cooperation. One of its first achievements was the establishment of a Nordic passport union in 1957. The Nordic Council of Ministers (NCM) – an equivalent cooperation between the Nordic governments – was established in 1971. When Denmark and Norway voted on membership of the European Community in 1972, one of the goals of the Nordic Council of Ministers was to ensure the continuation of Nordic cooperation even if some of the Nordic countries were to become EC members.⁴ In addition to the passport union, other important achievements include the establishment of a common labour market in 1992, agreements on the right to vote and stand as candidates at local elections, and an agreement on access to higher education.

The guidelines for the Nordic Council and the Nordic Council of Ministers are laid down in the 1962 Helsinki Agreement. According to its terms, the parties shall ‘seek to preserve and further develop cooperation among the countries in legal, cultural, social, and financial fields as well as in matters relating to transport and environmental protection’. The purpose of Nordic cooperation is, on the one hand, to make it attractive to live, work and do business in the Nordic region, and, on the other hand, to strengthen the Nordic countries internationally. This is achieved through Nordic cooperation in many areas, including research, business development, the environment, welfare and culture. The NCM is an intergovernmental organization for collaboration between the five Nordic countries, and it might be seen as an international platform for the Nordic countries for wider international collaboration. One should also bear in mind that the NCM has a different structure and a different way of working than the EU system. In many ways, the EU has a more top-down governance approach than the NCM. This is partly due to differences in culture, but also to size. In addition to the fact that the Nordic cooperation consist of only five countries, it is also characterized by a common history, culture and language, which in turn has led to a high degree of mutual trust.

In 1972, the first budget for common Nordic research funding was established through the Nordic Industrial Fund. During the 1970s, the budget was increased and several Nordic research institutes were established. In the 1980s, common programmes related to materials technology, information technology and other items were conducted under collaborative agreements between national funders and the Nordic funding level. The Nordic research institutes also grew in terms of budgets and

⁴ As Norway’s citizens rejected EC membership in a referendum in 1972, only Denmark joined the EU at that time. In 1995, however, Finland and Sweden also joined the European Union.

numbers in this period. In the 1990s, a number of evaluations recommended that the Nordic research institutes be transformed into programmes or centres of excellence with national anchoring. Proposals of this kind were put forward most recently in the Budget Analysis 2000 (NCM 2000). While the size of the budget remained unchanged from earlier periods, the funding was more flexible and open to new ideas and needs.

2.2 THE DEVELOPMENT OF NORIA

As noted above, a process towards transformation of the Nordic research-funding system was initiated already in the 1990s. The idea of a Nordic Research and Innovation Area (NORIA), presented in 2004, can be viewed as a continuation of that process. It was also inspired by the concept of the European Research Area (ERA) launched by European Commissioner Philippe Busquin in 2000 (European Commission, 2000).⁵ NORIA represents a forward-looking 'vision' for the development of an internal market for research and innovation in the Nordic region and must be understood as an equivalent to ERA, as well as an integrated part of ERA.

The aim of national research and innovation policy has traditionally been to strengthen national competitiveness in an international perspective. The establishment of ERA, the development of the European Union's Framework Programme and the establishment of the European Research Council signalizes the increased importance of cross-border cooperation in the pursuit of excellence in research and development. Following the recommendations set out in the Nordic Research Policy Council's Green Paper of 2002 (NCM, 2002), the Council of Ministers for Education and Research (MR-U) saw the need for a closer Nordic cooperation on R&D. Thus MR-U commissioned a White Paper on closer research collaboration within the Nordic region. The principle recommendation of this document – 'NORIA: White Paper on Nordic Research and Innovation', published in 2004 – was for the establishment of a Nordic Research and Innovation Area (NORIA) (Björkstrand, 2004).

At the same time, the Council of Ministers for Trade and Industry (MR-N, later MR-NER) presented a study of innovation cooperation in the Nordic region (NCM, 2004). This 'Innovation Book' proposed three priority areas on which the Council of Ministers for Trade and Industry should focus: international cooperation at the strategic policy level; cross-border interaction between the 'operative' parts of the innovation system, especially companies and the institutions that support them; and so-called spearhead actions involving highly visible industrial clusters and networks (Arnold et al., 2006: 43). The intention was to delineate the future profile of initiatives in innovation targeted at trade and industry. This would in turn clarify this sector's contribution to a wider bid to make the Nordic countries an internationally prominent innovation and knowledge environment.

Even though the Nordic countries scored highly on important indicators for research and innovation, the White Paper declared that Nordic research lacked critical mass, visibility and attractiveness within a European and international context. It also claimed that groundbreaking innovations most often took place outside the Nordic region. At the beginning of the 21st century, the Nordic countries spent around 3% of their GNP on R&D. According to the White Paper, contact between Nordic researchers and research networks, as well as established collaboration on research projects, research training, courses, etc., was substantial. Still, there were surprisingly few joint actions and common commitments across the Nordic countries. Innovation policies within the Nordic region were first and foremost of a national character, and the Nordic research and innovation collaboration was far from comparable to the European Framework Programmes. The establishment of NORIA would therefore contribute to the further development of the Nordic region into a leading area for research and innovation, thereby giving

⁵ For instance, it comprises objectives very similar to those referred to in the ERA Green Paper: more Nordic Centres of Excellence (NCoE), increased researcher mobility within the Nordic region, more coordination between the Nordic research councils, more research-related networking and more-efficient use of common infrastructure.

it greater influence on future Framework Programmes and the EU's research and innovation policies in general, as well as making it a more attractive partner in terms of international research cooperation. In the field of research and innovation, the NORIA initiative represented increased confidence in Nordic cooperation as something different from, and potentially complementary to, EU-level cooperation.

In the NORIA White Paper, three different models for a reorganization of Nordic research cooperation were put forward: (1) the establishment of a Nordic research fund; (2) the establishment of a Nordic research and innovation council; or (3) the establishment of a two-pillar system with specific organs for basic research and innovation, respectively.

In order to renew and intensify Nordic research and innovation collaboration, the Council of Ministers for Education and Research and the Council of Ministers for Trade and Industry jointly agreed on the third alternative when NORIA was launched towards the end of 2004. Two institutions – the Nordic Innovation Centre (NICE) and NordForsk (established in 2004–2005) – constitute the two key pillars within a triple-helix model.⁶ While the Council of Ministers for Education and Research's White Paper described how NORIA could be organized and stressed the need for close cooperation between research and innovation, many of the policies for the innovation pillar were based on the Council of Ministers for Trade and Industry's 'Innovation Book'.

A 'Ministerial Declaration' on research and business cooperation was signed by the Ministers for Education and Research and the Ministers for Trade and Industry in September 2004. This declaration welcomed the idea that NORIA should be built on a tighter cooperation between research and industry through the two organizations NordForsk and NICE. The declaration represents the only 'formal' agreement on cooperation between the ministers for research and the ministers for industry regarding NORIA.

During the process that led to the establishment of NORIA, it was felt that a closer look at how central elements of Nordic research cooperation and funding were functioning was required. At the time, the Nordic Council of Ministers was financing a whole range of different research institutes, such as the Nordic Institute of Asian Studies (NIAS), the Nordic Institute of Maritime Law, the Nordic Volcanological Center (NORDVULK), the Nordic Institute for Theoretical Physics (NORDITA) and the Nordic Sami Institute (NSI).

In a 2003 report, Dan Brändström (2003) proposed that the relevance and quality of the Nordic research institutions might be secured through closer integration of the Nordic institutions within national research environments. In the same year, the Nordic Council of Ministers decided to downscale its economic financing of these institutions in accordance with the ideas behind the creation of NORIA, while the host countries increased their contributions. It was decided that these organizations would continue to receive some basic financing from the Nordic Council of Ministers, but on the same terms as other projects and programmes financed within NORIA.

In Punkaharju, Finland, in the summer of 2007, the Nordic prime ministers agreed to establish a new globalization agenda for Nordic collaboration. As a result, some 14 globalization projects are now being implemented. The main project – certainly the largest one – is the first Top-level Research Initiative (TFI) within climate, energy and the environment. With a budget of DKK 400 million (EUR 54 million) over five years, this initiative is the largest joint Nordic research programme so far and represents a significant development of the Nordic research and innovation collaboration.

⁶ This model refers to a spiral (versus traditional linear) model of innovation that captures multiple reciprocal relationships among institutional settings (public, private and academic) at different stages in the capitalization of knowledge. These three institutional spheres which formerly operated at arms' length in liberal capitalist societies are increasingly working together, with a spiral pattern of linkages emerging at various stages of the innovation process, to form the so-called "Triple Helix" (Viale and Ghiglione 1998: 3)

2.3 THE INSTITUTIONAL FRAMEWORK OF NORDIC R&I COOPERATION

This section presents the main institutions and cooperative bodies of the Nordic research and innovation cooperation, as well as their goals and the relationships that exist between them. The Nordic research and innovation system is characterized by complexity. In addition, Nordic R&I cooperation takes place within a variety of national institutional frameworks and quite different national R&I systems (see Annex II). Hence, it is not an easy task to present a simple and comprehensive overview of the existing institutions and actors. We have chosen to divide the existing institutions into two categories on the basis of whether they operate within the framework of the Nordic Council of Ministers or outside that structure.

2.3.1 Cooperative Bodies within the Structure of the Nordic Council of Ministers

The Nordic Council and the Nordic Council of Ministers are the main institutions in the formal Nordic R&I cooperation. Decisions taken by the Nordic Council are submitted to the Nordic Council of Ministers and the individual Nordic governments for approval and implementation. There are ten policy councils of ministers, and the cooperation is coordinated by an eleventh council of ministers made up of ministers with responsibility for Nordic cooperation in the member countries.

The Nordic Council consists of five specialist committees. Political cooperation in policy matters takes place mainly in these committees and in the executive body, the Presidium. The *Culture and Education Committee* is responsible for the development of political initiatives within the culture, education, training and research sectors, including matters of language cooperation, new media, competence development and innovation in education. The *Business and Industry Committee* deals with frameworks and parameters for the economy, production and trade.

The Nordic Council of Ministers consists of eleven different councils responsible for different areas of cooperation. Two of them, MR-U and MR-NER, are particularly significant in relation to R&I cooperation:

The Nordic Council of Ministers for Education and Research (MR-U):

MR-U is the Nordic Council of Ministers for Education and Research. The role of MR-U is to help ensure that the Nordic region retains a leading position in the field of knowledge and skills. An important task is to establish a coherent area of free movement of knowledge across national borders. MR-U supports and stimulates specific partnerships within research and education. To a large extent, this activity is carried out through NordForsk.

NordForsk was established as an agency under MR-U in January 2005 following a consolidation of the activities of the former Nordic Research Policy Council (*Nordisk forskningspolitiske råd*) and the Nordic Research Training Academy (NORFA). The national Nordic research councils are directly represented on NordForsk's board and thereby make decisions about the funding which comes partly from the Council of Ministers and partly from their own matching funds. The budget is approximately NOK 110 million (EUR 14 million) a year. In addition to representatives from the five Nordic countries' research councils, the board includes representatives from the Nordic University Association, as well as from trade and industry.

According to NordForsk's statutes, the organization's mission is to strengthen and further develop the Nordic region as one of the most dynamic regions in the world for research and innovation, and thereby to enhance the international competitiveness of the Nordic countries and the living conditions of the populations in the region. NordForsk has three main functions: coordination, funding and policy advice. The objective of NordForsk's coordination activity is to develop the Nordic Research and Innovation Area (NORIA) into an attractive, cutting-edge region for research and innovation. Through a range of different research-funding instruments, NordForsk seeks to create synergies

that supplement existing national investments in research. NordForsk is also the Nordic Council of Minister's advisory body in the area of research.

MR-U and NordForsk provide financial support to a number of institutions and programmes whose work contributes to the achievement of the R&I sector's political objectives within the respective institutions' policy areas. These include the institutions mentioned earlier (see Section 2.2) and programmes such as Nordunet⁷ and Nordbib.⁸ For NordForsk, such support comes in addition to the institution's direct funding of various research activities through its different instruments. In fact, NordForsk has a well-established cooperation with eight different national funding institutions and is currently financing more than 200 projects involving more than 11,000 researchers. NordForsk's primary task is to promote efficient cooperation between the Nordic countries that stimulate to research and researcher education of the highest international quality.

NordForsk supports initiatives within all scientific fields, but one of its criteria is that projects normally should include at least three of the countries or autonomous areas of the Nordic region. In all funding instruments, projects are chosen through open competition and peer-review evaluations. While most instruments are developed for the research level, one instrument has been developed for the agency level: the NORIA-net.

The *NORIA-net* programme was established in 2007 and has been directly inspired by the EU's ERA-NET scheme. A NORIA-net is a network of Nordic national research funders and managers, engaged in coordination activities aimed at joint actions in research funding and research policy. The proposed duration of projects is 1–2 years. The aim of a NORIA-net is to create coordination activities leading to sustainable collaboration and investments within research funding and policy on a Nordic level. The ultimate goal is to establish enduring funding instruments and funding mechanisms coordinated and funded by NordForsk and the national research councils together. Currently NordForsk is funding seven NORIA-nets. Each NORIA-net receives about NOK 1 million (EUR 120,000).

Apart from the NORIA-net programme, NordForsk's instruments are oriented towards the research community. These instruments vary in size and scope. While the Nordic Centres of Excellence are seen by many as the flagship of Nordic research cooperation, the research networks and research training courses are smaller but popular instruments among researchers.

A *Nordic Centre of Excellence* (NCoE) is a network of excellent, already existing, national research teams and units, forming a virtual centre with common objectives and management and a joint research plan. Basic funding of the NCoEs is expected to come from national sources, and Nordic support should thus supplement such national funding. The NCoEs receive annual grants in the range of NOK 3–7 million (EUR 360,000–860,000) for five years (of which NordForsk provides 1/3). The first Centre of Excellence was initiated in 2002 by NOS-N, two years before the establishment of NordForsk.⁹ Today, the NCoE scheme has become one of NordForsk's main instruments, although some of the centres are

7 Nordunet3 is a four-year thematic Internet research programme, sponsoring research into technologies crucial for the implementation and utilization of the next generation of the Internet. It sponsors a number of research projects and aims to strengthen collaboration in Nordic Internet research, as well as the international impact of such research. Nordunet3 is a joint programme of the Joint Committee of the Nordic Natural Science Research Councils (NOS-N), NordForsk, the Nordic Council of Ministers, and NORDUnet A/S. The project started in June 2006 and will run until June 2010.

8 Nordbib is a funding programme for research and development in the area of Open Access to scholarly and scientific information at a Nordic level. There are currently no more grants left in the programme.

9 The first discussions on the NCoE scheme were initiated by NOS-M and the NCM in October 2002. A steering committee and a secretariat were elected in August 2003 for planning and implementation. The final selection of the centres took place in June 2004, and activities started in January 2005. The process took a little more than two years, so there was only a short time for planning. An NCoE in the field of medicine was a matter of 'seizing the opportunity', inspired by the NOS-N initiative, which resulted in the first NCoE (Global Change) (NordForsk, 2008a).

still co-funded by NordForsk and the joint Nordic Committees of the Nordic research councils (NOS) for Humaniora and Social Science (NOS-HS) and Medicine (NOS-M). As of January 2010 there are five such NCoE programmes running: Food, Nutrition and Health; Welfare; Global Change; Molecular Medicine; and HumSam (Humanities & Social Sciences). Within these five programmes, there are in total 16 different centres of excellence.

Networks cover all scientific disciplines and aim at strengthening communication and contacts between research groups in the Nordic and Baltic countries and northwest Russia. In turn, this may enhance mobility and increase the quality of research and research education. NordForsk finances different types of networks, the most important being that of the so-called researcher network. The objective of the researcher network instrument is to bring together prominent research groups in the Nordic and the Baltic countries in order to strengthen and increase the quality of research and research training at the Nordic, European and international levels. The networks should aim to establish joint research training in a given field and consolidate research as a basis for joint European or international projects, or to strengthen a given field of research in order to establish a new Nordic Centre of Excellence. NordForsk offers network grants of up to NOK 300,000 (EUR 40,000) per year for three years for established researchers at universities and other research institutions in the Nordic and Baltic countries.

NordForsk also finances a variety of different *research training courses* and *research schools* within specific research areas. Of these, the most important are the *research training courses*, which, like the research networks, are organized from the bottom up and have regular calls every year. The objective of the research training courses is to offer research training in fields that are difficult for the national research institutions to cover on their own. The courses can be within all scientific areas, but areas in which the Nordic countries have a potential to take on a leading role at the international level are prioritized. The courses can receive grants of a maximum of NOK 400,000 (EUR 50,000). A *Nordic research school* is a fixed-term researcher training cooperation between at least three Nordic countries, functioning as a genuine network or based at one of the participating institutions. The research school can be established within a specific academic field or as a problem-oriented and multi-/interdisciplinary cooperation. The research school can also be connected to a Nordic Centre of Excellence programme. A research school must have sufficient numbers of students and teachers at different levels in their research career. This will ensure the width and depth in the research training that is crucial for securing the necessary quality. Currently, there are three research schools (the Global Change research school, the HUM/SIC research school and the Marine Academy) that are funded by NordForsk. A research school can be granted NOK 1–2 million (EUR 120,000–240,000) per year for five years.

In addition to NCoEs, networks and research training courses, NordForsk also has several specific thematic programmes, a programme that aims to increase the interaction between existing research infrastructures, and a private–public partnership PhD programme.

The *thematic programmes* are designed to advance a certain field of research, raise its scientific standards, and create new scientific knowledge and knowhow. Funding may be allocated to direct collaboration costs, such as coordination costs; fellowships and mobility grants for researchers and PhD students; training for researchers and key staff members; running costs; and joint research activities that will provide added Nordic strength to a project. Currently (as of February 2010), there are four such programmes running: a programme on sustainable freight and logistics; a Nordic–Baltic research and innovation programme on Living Labs; a programme on climate and primary industry; and the Nordic Stem Cell Mobility Programme.¹⁰

10 Another three programmes have recently come to an end: a programme in epidemiology, an Internet research programme (Nordunet 3) and a programme on Open Access and research distribution (Nordbib).

The programme for *Joint Nordic Use of Research Infrastructure* offers network grants for 1–3 years to projects where the importance of joint Nordic planning and use of research infrastructure is evident. Eligible applicants are established researchers at universities and other research institutions in the Nordic and Baltic countries. The grant can be up to NOK 1 million (EUR 120,000) for the whole project period and can be used to cover direct collaboration costs related to joint Nordic use of research infrastructure. Currently (as of January 2010), NordForsk finances 19 projects under this initiative.

The *Nordic Private–Public Partnership (PPP)* PhD programme covers research projects carried out through collaboration between a commercial, a doctoral candidate and a university. The enterprise has to be geographically located in one Nordic country and the university in another. The duration of the project is 3–4 years. The main applicant is the enterprise at which the doctoral candidate will be employed. Funding is allocated for 3–4 years. NordForsk covers up to 50% of the doctoral candidate's salary (about NOK 400,000/EUR 50,000) per year. The other 50% of the salary costs are to be covered by the enterprise. A minimum of ten PPP PhD projects can be granted annually.

The Nordic Council of Ministers for Business, Energy and Regional Policy (MR-NER)

The Nordic countries' cooperation on business, energy and regional policy is designed to encourage continued sustainable growth. The main objective is to create frameworks for an innovative business climate in order to maintain the region's high level of competitiveness without this negatively impacting upon the region's environment, climate or society as a whole. The cooperation is headed by the Nordic Ministers for Business, Energy and Regional policy (MR-NER). The Ministers meet once a year to discuss and initiate cooperation in areas of joint Nordic value. MR-NER supports and funds a number of institutions and committees. The most important are the Nordic Innovation Centre (NICE) and Nordic Energy Research (NER). In addition, there is the Nordic Project Fund (Nopef) and Nordregio.

The *Nordic Innovation Centre (NICE)* is an agency under MR-NER that initiates and finances projects that stimulate innovation in the Nordic region. In addition, NICE works for a borderless Nordic region and a closer cooperation between industry, government authorities and the research community. It aims at increasing the innovation and competitiveness of Nordic industry through enhancing innovation and collaboration across borders. An important task for NICE is to promote an innovative and knowledge-intensive Nordic business sector, partly by building networks and knowledge platforms. Its main cooperation partners are the national innovation agencies, industries and research institutes. The members of its board are drawn from the member-states, but unlike NordForsk board members they do not represent a member-state organization. Rather, they are appointed by virtue of their professional positions. NICE's budget, provided by the Nordic Council of Ministers, is approximately NOK 76 million (EUR 9.5 million).

The Nordic Innovation Centre initiates and finances projects that seek to stimulate innovation and improve the Nordic systems for innovation. Since, taxpayer money cannot go directly to product development in companies, NICE's instruments are aimed at stimulating development and investment of general interest. The various instruments used by NICE differ significantly from those of NordForsk, but they all adhere to the following three main objectives. The first is to establish the Nordic region as a single internal market and a borderless region through the removal of barriers and the stimulation of increased competition. The second is to stimulate innovation through increased cooperation between the various Nordic innovation systems. Finally, the third is to launch and carry out focused thematic innovation calls.

In order to promote a borderless Nordic region, NICE *commissions studies* to highlight problems and issues that hinder the free flow of goods and services in the Nordic region. NICE is also active in Nordic intergovernmental groups and has extensive contacts with ministries and agencies involved in trade issues. Furthermore, NICE stimulates partners to work together on a shared Nordic interest for the

creation of a borderless region. For instance, NICE has a close collaboration with the organization responsible for standardization within the Nordic countries. NICE also takes a proactive stance, seeking to identify 'new' areas that traditionally have been discussed in connection with trade barriers. An example is NICE's work with trade barriers for services. In the selection of projects, emphasis is placed upon a project's relevance for the Nordic region, and on ensuring that results are deeply rooted nationally and focus on the commercial potential. The Nordic Innovation Centre finances up to a maximum of 50% of a project's total eligible costs.

In addition, NICE *finances innovation projects*. Since NICE cannot finance a single company, it supports various consortia or networks of companies, often with research institutes involved. The projects can consist of development, training and network activities, and are expected to have direct and dominating industrial and business involvement. Again, the Nordic Innovation Centre finances up to a maximum of 50% of a project's total eligible costs. NICE takes part in several ERA-NETs and has an active strategy of international calls. The contribution from NICE is based on a 'common pot' principle. In a few calls, experiments with 'common pot' funding have also included countries outside the Nordic region.

NICE is also working to improve the innovation system by *providing policymakers and other agents in the innovation system with knowledge* about trends in innovation policy, benchmarking of best practice and the benefits of Nordic collaboration. This can involve commissioning studies, creating networks, or arranging conferences and workshops. The financing of such projects is dependent on the nature of the activity concerned, but external studies are always based on open competition.

Nordic Energy Research (NEF) is a funding institution for energy research under the MR-NER. Nordic Energy Research started out as the Nordic Energy Research Programme in 1985, before becoming the institution it is today in 1999. The main goal for NEF is to maximize the results of energy-related research and development in the Nordic region and adjacent areas. The organization promotes research and innovation in new energy technologies and systems by fostering competitiveness, cooperation and increased knowledge creation in Nordic research initiatives. NEF comprises representatives of the member-states, drawn from organizations that fund energy research. In 2008, NEF had a budget of approximately NOK 40 million (EUR 5 million). Most of its funds come directly from the member-states, while only about one-quarter of the budget comes from the Nordic Council of Ministers. While NEF is a Nordic institution, it is also a joint programme on energy research (more on this in Chapter 4). NEF provides different forms of research funding with more specific aims related to the energy sector. Grants are available for three different types of project: capacity- and competence-building projects; business development and innovation projects; and integrated capacity and innovation projects.

Capacity- and competence-building projects aim to contribute to consolidation and development of knowledge-based new energy technologies, markets and systems. Activities may comprise combinations of doctoral and post-doctoral grants; visiting scholar grants for senior researchers; research education courses and research grants; workshops, courses and seminars; mobility grants to enable doctoral candidates and young researchers to travel to other Nordic or international institutions; international scientific conferences and other processes aiming at building Nordic centres of excellence within specific technological and scientific areas; and institutionalization of a Nordic Centre of Excellence. NEF has financed up to a maximum of 75% of the total eligible costs of projects. Applicants for capacity- and competence-building project grants can apply to Nordic Energy Research for funds of up to NOK 3 million (EUR 400,000) per year, or up to NOK 12 million (EUR 1.5 million) over four years.

Business development and innovation projects may comprise pre-competitive activities related to the development, innovation and public acceptance of new energy technologies. These may comprise some of the same training and network activities as the capacity- and competence-building projects, but are expected to have direct industrial and business involvement. Here, Nordic Energy Research

has financed up to a maximum of 50% of the total eligible costs of relevant projects. Applicants for business and innovation project grants can apply to Nordic Energy Research for funds of up to NOK 3 million (EUR 400,000) per year, or up to NOK 6 million (EUR 750,000) over two years.

Integrated capacity and innovation projects aim at stimulating a closer integration of fundamental knowledge and pre-competitive market activities. Key activities may include training and education of scientific and development personnel, including courses and workshops; grants for industry doctoral candidates or post-doctoral researchers; mobility grants to enable young researchers and personnel to travel to other Nordic and international institutions or companies; applied research and innovation; analysis of market opportunities for new energy technologies; creation of a common voice in international energy and energy research fora such as the EU Directorate-General for Energy (DG Energy) and Directorate-General for Research (DG Research), the International Energy Agency, the OECD, etc. Nordic Energy Research has financed up to a maximum of 75% of total eligible project costs. Applicants for integrated project grants can apply to Nordic Energy Research for funds of up to NOK 3 million (EUR 400,000) per year, or up to NOK 12 million (EUR 1.5 million) over four years.

The work of Nordic Energy Research has resulted in 16 Nordic R&D projects dedicated to developing new solutions within the fields of energy efficiency, renewable energy, energy markets, the 'hydrogen economy' and the impact of climate change on the energy system.

The *Nordic Project Fund* (Nopef) is another funding institution under MR-NER. Nopef aims to strengthen the international competitiveness of small- and medium-sized Nordic enterprises (SMEs) by providing co-financing for feasibility studies that support export projects and internationalization initiatives of Nordic enterprises. The objective of the fund is to support Nordic cooperation within the framework of Nopef's mandate. To this end, the fund works in cooperation with national, Nordic and international organizations. Nopef's funds amounted to EUR 3.7 million in 2008.

Another institution funded by MR-NER is *Nordregio*, an international centre for research, education and documentation on spatial development, established by the Nordic Council of Ministers in 1997. Nordregio develops and communicates relevant knowledge to authorities within the regional development and planning fields in the Nordic countries. The institute seeks to integrate regional policies and physical planning with the aim of promoting long-term development. Nordregio's activities are partly financed by the Nordic Council of Ministers. This basic funding covers 40–50% of the institute's turnover. The balance comes from contracted work for national and regional authorities and competitive bids to national and European research programmes, such as the EU Seventh Framework Programme for Research and the ESPON 2013 Programme. Nordregio's board is responsible for long-term strategic planning and consists of one member from each of the five Nordic states, one observer from each of the three autonomous territories, and a member elected by the staff of Nordregio. The board is appointed by the Nordic Council of Ministers. Nordregio has a budget of DKK 9 million (EUR 1.2 million).

Cooperative Bodies Under Other Councils of Ministers Than MR-U and MR-NER

Though MR-U and MR-NER are the main councils for matters concerning research and innovation, there are a range of different bodies, organizations and institutions concerned with research and innovation that are funded by other councils of ministers.

The Nordic Council of Ministers for Fisheries and Aquaculture, Agriculture, Food and Forestry (MR-FJLS) gives financial support to the Nordic Forest Research Cooperation Committee (SNS), the Nordic Joint Committee for Agricultural Research (NKJ) and the Nordic Council for Reindeer Husbandry Research (NOR).

The Nordic Council of Ministers for Culture (MR-K) gives financial support to the Nordic Information Centre for Media and Communication Research (NORDICOM). It also finances the Nordic Game Programme, whose mission is to ensure both quality and a distinct Nordic profile in computer games.

The Nordic Council of Ministers for Gender Equality's (MR-JÄM) most important tool for implementing Nordic projects is the Nordic Gender Institute (NIKK). NIKK initiates, coordinates and executes projects that focus on gender equality and policy issues.

The Nordic Council of Ministers for Health and Social Affairs (MR-S) supports the Nordic School of Public Health (NHV), the Nordic Institute of Dental Materials (NIOM), the Nordic Centre for Welfare and Social Issues (NVC) and two databases through NOSOSCO (responsible for the coordination of social statistics in the Nordic countries and for undertaking comparative analyses and descriptions of the scope and the substance of social security measures) and NOMESCO (a permanent statistical committee under the Nordic Council of Ministers with separate funding from the Nordic Committee on Social Policy). The latter is responsible for the coordination of health statistics in the Nordic countries.

2.3.2 Cooperative Bodies Outside the Structure of the Nordic Council of Ministers

As shown in the previous section, the list of research initiated and funded through the structure of the Nordic Council of Ministers is long and the initiatives widespread. In addition, an extensive part of the formalized Nordic R&I cooperation actually takes place outside this structure. This kind of cooperation takes place either through the national research councils or between universities and colleges in the Nordic countries. In this section, we will present an overview of this cooperation, distinguishing between research and innovation cooperation at the agency level (research funding) and at the research institutional/university level (the administrative part of the research level):

Research Cooperation at the Agency Level

With regard to research cooperation, there are in particular three cooperative bodies outside the structure of the NCM that are worth mentioning:

First is *NordHorcs*, a committee composed of the directors of the national research councils in the Nordic countries. The aim of this body is to further develop Nordic research and research policy through the sharing of information, and through agreements and cooperation.

Second, the national research councils established *Joint Committees of the Nordic Research Councils (NOS)* within natural science (NOS-N) in 1967, within medicine (NOS-M) in 1968, and within humanities (NOS-H) and the social sciences (NOS-S) in 1977. NOS-H and NOS-S were merged into NOS-HS in 2003. These committees have one representative from the research and administration sections of each of the research councils. The main task of these bodies is to promote and stimulate cooperation between Nordic researchers – in some cases through financing co-Nordic research projects and project preparation. Even though they operate independently from the formal structure of the NCM, the NOS organizations collaborate closely with the Council and NordForsk.

Third, the *Nordic Cancer Union (NCU)* is a collaborative body for cancer societies in the Nordic countries. The aims of the NCU include increased knowledge and understanding of cancer, more effective prevention strategies, better results from cancer treatment and rehabilitation, and enhanced application of cancer treatment in the Nordic countries.

Fourth is the *Scandinavian Research Council for Criminology (NSFK)*, which was established in 1962 by the ministries of justice of Denmark, Finland, Iceland, Norway and Sweden. The purpose of the Council is to further criminological research within the member countries and to advise Scandinavian governments and the Council on issues related to criminology.

Innovation Cooperation at the Agency Level

In relation to innovation, three different bodies should be noted:

First is the *Nordic Environment Finance Corporation* (NEFCO), an international financial institution established in 1990 by the five Nordic countries: Denmark, Finland, Iceland, Norway and Sweden. Until recently, NEFCO has financed a wide range of environmental projects in Central and Eastern European countries, including Russia, Belarus and Ukraine. To provide the capital necessary to support projects, NEFCO works with a series of different funding bodies. It also administers funds on behalf of other parties who are providing resources to environmental projects. These include, among others, the European Commission and the governments of the Nordic countries.

Second, the *Nordic Investment Bank* (NIB) promotes sustainable economic growth for its member countries. Furthermore, outside the membership area, projects financed by the NIB should be of mutual interest to the country of the borrower and the member countries. The NIB stimulates Nordic innovation but operates in accordance with its own mandate. It is owned by the Nordic and Baltic governments, and it cooperates with and is located together with NEFCO, NOPEF and the NDF, which are all part of Nordic research and innovation strategy.

Third, *Nordic Investment Solutions* (NIS) may be mentioned. This is a leading independent private equity advisory firm based in Stockholm. Since 2003, NIS has created a strong position as an advisor to institutional investors, public authorities and expanding companies. In cooperation with the Nordic Innovation Centre, it has financed a couple of projects to open up the venture market in the Nordic countries for innovative and entrepreneurial companies. Part of this coordination involves a Nordic Forum with key players from the national venture market.

Research Cooperation at the University/Research Institutional Level

At the university and research institutional level, there are several cooperative bodies involved in the promotion of Nordic cooperation within both research and higher education.

First, there is the *Nordic University Cooperation* (NUS), which was established in 1995 as a high-level initiative for university cooperation in the five Nordic countries. The aim of the NUS is to promote cooperation between the universities and the national university organizations of the Nordic countries. The NUS involves rectors and deans of the universities in the Nordic countries.¹¹ Its steering group consists of the leaders and general secretaries of the five national university organizations.

Second, there is the *Nordic Association of University Administrations* (NUAS). The aim of NUAS is to enhance contacts and to establish networks between the Nordic universities at all administrative levels. NUAS cooperates with the Nordic Council of Ministers and other organizations and authorities to promote the Nordic educational community. Various seminars are regularly arranged by 12 planning groups within the association. Annual seminars for university directors are arranged on topical issues within the field of higher education. At the request of the Nordic Council of Ministers, NUAS has conducted a number of surveys on issues related to the Nordic educational community.

Third, there is *NORDTEK*, which is a network between the rectors and deans of the technical universities and colleges in the Nordic countries. The network has 23 members, drawn from all the Nordic countries. The aim of the network is to contribute to improving each member's competitiveness in the international educational and research market and to develop cooperation with the private sector in the Nordic region.

¹¹ 'Finlands universitetsrektorers råd' (Finland), 'rektorkollegiet' (Denmark), 'Sveriges universitets- och högskoleförbund' (Sweden), 'Universiteternes Samarbeidsutvalg' (Iceland) og 'Universitets- og høskolerådet' (Norway).

Finally, there is the *Nordic Forestry, Veterinary and Agricultural University Network* (NOVA), which was established in 1995. The NOVA member institutions are commissioned in their respective countries to build expertise and provide knowledge to society in the fields of agriculture, animal sciences, forestry, veterinary medicine, food sciences, environmental sciences, aquaculture and related biosciences. They contribute to developments within the areas of sustainable use of natural resources, food production, health and welfare, and protection of humans and animals, as well as to enhancing capacities for the use of land, water, plants and animals in sustainable ways. The main task of NOVA is to initiate, administer and promote cooperation between the member institutions in higher education.

2.4 THE NORDIC R&I COOPERATION - BOTH FORMALIZED AND NON-FORMALIZED TYPES OF COOPERATION

As shown above, there are several different funding possibilities at the Nordic level stimulating Nordic R&I cooperation. The cooperation that is a direct result of such funding is what we refer to here as formalized cooperation. Since these budgets are scarce, the number of researchers that receive this kind of funding are limited. Still, bibliometric studies show that there is extensive co-operation between researchers across the Nordic countries. In fact, most of the researchers in the Nordic region participate in one or several networks or other forms of cooperation with their Nordic colleagues. This indicates that an extensive part of this co-operation is taking place without specific funding for this purpose (non-formalized cooperation). Unfortunately, it is not possible to obtain exact figures for this kind of cooperation. Bibliometric studies can, however, give us an indication of the extent of the Nordic regions cross-border research co-operation that includes both formalized cooperation and non-formalized cooperation.

A recent bibliometric study (Gunnarson, 2010) shows that all the Nordic countries, have had a marked increase in international co-authorship during the period 1984–2008, and that the proportion of the publications involving such cooperation has doubled or tripled since the mid-1980s. In 2008, approximately every second paper published by Norwegian, Swedish, Danish or Finnish researchers had co-authors from another country. Iceland stands out as even more internationalized than the other Nordic countries, with a proportion above 70% in 2008. That small countries tend to cooperate more than large countries is clearly visible in the results presented in the report.

The study also shows that Nordic collaboration remains important within a framework of increasing international collaboration. Although the increase in intra-Nordic cooperation between 1982 and 2008 has not been as great as the increase in cooperation with other regions, it is clear that Nordic cooperation in research remains important within a framework of increasing international cooperation in all relations. More than 9% of all Swedish academic international co-publications in the period 2004–2008 were a product of Nordic cooperation, while the other Nordic countries had a Nordic co-publication rate that ranged between 2.4% (for Iceland) and 5.7% (for Denmark) of the country's international co-publications.

According to this bibliometric study, Nordic cooperation has diminished during the last decade in the natural sciences, while it has increased in the life sciences during the same period. Among other things, they find that cultural proximity seems to be a strong factor behind the choice of cooperation partner. The United States is the most common country for Nordic cooperation, usually followed by the United Kingdom, Germany and Sweden. At the regional level, intra-Nordic cooperation has increased between 1982 and 2008, although not quite as much as cooperation with other countries.

Since the formalized cooperation is a direct result of the institutional framework presented in the previous section (2.3), the remaining of this section will focus on cooperation that is non-formalized. As these above mentioned bibliometric figures do not distinguish between formalized and non-

formalized cooperation, we found it necessary to supplement the analysis with qualitative data from interviews with researchers that is co-operating on a cross-Nordic basis without any funding for that purpose. Through these interviews, we discovered that non-formalized research cooperation takes on different forms. There are at least three different categories of non-formalized research cooperation. First, there are various forms of networks. Second, there are associations that are established in order to promote Nordic cooperation within a certain discipline. Third, there are different forms of cooperation related to common research infrastructure.

Various forms of Non-formalized Researcher Networks

Based on our interviews and the information we have collected from the most important universities in the Nordic countries, we can safely conclude that a large number of networks exist with a wide variety of topics and themes.

Researchers come together to create networks for different reasons. Several of our interviewees emphasized that Nordic cooperation is primarily based on a shared culture, geographical area and language. In addition, Nordic researchers often share an interest in the same topics. Climate change and the Nordic welfare model are good examples of research areas that have an obvious Nordic shared set of characteristics and information.

Many researchers mention the importance of Nordic cooperation as a stepping stone. Thus, once a Nordic contact network has been established, the chances of success at the European/international level are much higher. Applying for funds from, for example, the European Commission is arduous and time-consuming. Researchers benefit from network contacts, which increase their chances for success. Nordic network activity can thus be seen as a stepping stone to wider international cooperation, or as leading to spin-off networks.

Through our interviews with researchers from all the Nordic countries, we discovered that such non-formalized networks take on different forms and sizes. We can discern three kinds of research networks. First, there are those whose entire life-span is non-formalized. Second, there are networks that start out as non-formalized entities but turn into formalized networks. Third, there are those that start out as formal networks, but continue as non-formalized networks after their funding has expired. Below are just a few examples of these three types of networks.

Prototype 1: Non-Formalized Networks Without Funding

These networks do not receive any form of funding. They are constituted by researchers who share the same academic interests and who want to cooperate for varying reasons. Owing to the lack of funding, such networks rely heavily upon the efforts of their members. Often, one or more of the driving forces behind these types of networks will establish a website. The main reason for this kind of cooperation remains bottom-up networking, namely, meeting and collaborating with other researchers in the Nordic countries in order to add value to one's own research and produce joint publications. It should be pointed out that coordinators of these networks mention the lack of available money as a drawback and are often on the lookout for funds.

An example of such a network is *NORNAPE* (Nordic Research Network About Parents in Education). This started up in 1993 as an unofficial network of researchers from all of the Nordic countries. The network is a Nordic satellite of the European *ERNAPE* (European Research Network About Parents in Education) and has received no funding other than small and irregular amounts to finance workshops and conferences, which are often held in connection with larger events that offer an opportunity for the network participants to meet. *NORNAPE* builds its identity on being a meeting point for researchers working on the same topics and sharing a similar ideology. In a written interview, one of the network coordinators explained that the reason for Nordic research

collaboration within this field is that the Nordic region has a unique practice and ideology in this area. On these shared grounds, it is easy to collaborate on an informal basis. The coordinators of the network define the network as being central for their research.¹²

Prototype 2: Networks with a Non-Formalized Start

Networks in this category started out in much the same way as those described above. However, at some stage in the life-span of the network, its members or leader have been able to secure funding. This funding is used in different ways. Some networks focus on organizing larger annual conferences, where members meet and larger or spin-off networks are created. Interviewees stressed the importance of a real (in addition to a virtual) meeting place, thus confirming our assumption that culture and personal contacts play a large role in networking. Many of these networks also aim at joint publications or seek to secure funding for joint research projects. We will present two examples here.

First, the *Nordic Network in Political Theory* started out as a non-formalized cooperation between Nordic scholars in 2000. The group later applied for and received funding, which has, according to the coordinator, greatly increased the activity of the network. The initial reason for starting the network on an informal basis was to connect scholars working on political theory across the Nordic countries, so that they might meet on a yearly basis. The network has thus provided a platform for collaboration and led to funding for workshops, a website and other dissemination activities.

Second, the *Nordic Migration Research Network* – previously known as the Nordic Research Network for International Migration and Ethnic Relations (IMER) – is an interdisciplinary network for researchers, departments and institutes, and organizes a number of conferences and other meeting opportunities. It also has a strong outward focus towards the international academic environment, not the least within Europe, where the field is well established. This network has also generated national research associations. The network receives both national funding and an allocation from NordForsk. It started out as a non-formalized group whose aim was to organize annual or biannual conferences, called the Nordic Migration Conferences. These conferences were hosted by different institutions and were a meeting place for Nordic, and eventually also international, actors within the field of migration research. This network is a typical example of how personal contacts and a drive to establish a contact network can result in securing financing for a more formalized network.¹³

Prototype 3: Networks with a Non-Formalized Continuation

In recent years, NordForsk has financed a number of networks, which by definition are therefore formalized. According to a recent survey undertaken by NordForsk, about 90% of the participants in these networks continue to collaborate after the Nordic funding has expired. This indicates that formalized instruments also may stimulate non-formalized cooperation in the long term. This has been confirmed through our interviews. Once a network is in place and regular contact has been established between its members, it will often continue in a non-formalized form without further funding. However, meetings or conferences organized by the network might become rarer owing to lack of funding. Two examples are listed below.

First, the *Nordic Network in Qumran Studies* started up in 2003 with funding from NordForsk. Following five years of formalized cooperation with Nordic funding, the network continues its activities to this day. The network has led to intensive research collaboration between a team of Nordic scholars and doctoral candidates, with co-publications and a number of meetings and yearly conferences. It has thus contributed internationally to the field of theology studies specializing in Dead Sea research. According to the coordinator, the network has also created a sustainable, valuable, international informal network.¹⁴

¹² See www.ernape.net/nornape.htm.

¹³ See www.nordicmigration.saxo.ku.dk.

¹⁴ See www.nnqs.org.

Second, the *Nordic Research Network on Critical Perspectives on Young People, Welfare and Education* (NORDCRIT) was initiated in 2007 by Umeå University, in order to bring together doctoral candidates and researchers. The aim of the network was to build competence in the field of welfare and education and to stimulate joint publications. The Nordic welfare model is an interesting research topic for all of the Nordic countries. The network gives Nordic researchers an opportunity to compare their research and to work together on joint projects. In a written interview, the coordinators mentioned the importance of the network for their research, and a joint publication in an international peer-reviewed journal is under way. The network received an allocation from its host university in its start-up phase. Since then, the network has been driven by its respective coordinators in Finland, Sweden and Norway, and it is not funded by any institution. The coordinators point out that this lack of funding makes it hard for the network to have extensive activities, though the network tries to attract local or national funding on a small scale to organize workshops, etc.

Researcher Associations

An interesting indicator for non-formalized networks is the number of Scandinavian journals that exist. Often, these are linked to some kind of association. A mapping by the Norwegian Institute for Studies in Innovation, Research and Education (NIFU STEP, 2010) identified no less than 163 Scandinavian journals.

A good example is the Nordic International Studies Association (NISA), founded in October 1991 to promote research, advanced study and contact among academics and practitioners in the field of international studies in the Nordic countries. NISA encourages the advancement of knowledge across disciplinary boundaries, analytical approaches, institutions and nations. It also facilitates contacts with international studies research communities outside the Nordic area. Towards these ends, NISA has taken responsibility for the premier scholarly journal in the field: *Cooperation and Conflict*, published by SAGE Publications. NISA arranges Nordic conferences on international studies and training workshops for graduate students, and it is committed to continuing the invaluable networking activities facilitated for many years by the former Nordic Cooperation Committee for International Politics (NORDSAM). NISA is based on individual membership and must draw on member support to achieve its objectives.

Non-Formalized Cooperation in Relation to Research Infrastructure

Several interviewees have mentioned that there exist important cases of Nordic cooperation in relation to infrastructure. Although concrete examples of non-formalized infrastructure cooperation are hard to map, many researcher groups actively engage in cooperating with their colleagues in neighbouring countries. Universities in particular seem keen to set up informal arrangements with their sister institutions to cover loans of equipment and infrastructure. Biobanks across the Nordic countries, for example, are utilized by different researcher groups. The main reason for this kind of non-formalized cooperation is obvious. Infrastructure is becoming increasingly expensive, and it requires funding and maintenance. This makes it imperative for researcher groups to share and coordinate its use. Owing to their cultural and geographical proximity, Nordic countries have a natural tendency to collaborate over infrastructure.

Non-formalized Innovation Cooperation

A large number of non-formalized cross-border innovation associations exist in the Nordic countries, and these are particularly important in the Scandinavian-language area. Because of their non-formalized nature, all of these are small, but they are nonetheless essential for Nordic networking. A few typical examples are worth mentioning.

First, the *Nordic Standardization Cooperation* (INSTA) is a cooperation between the five national organizations responsible for standardization. It has established common standards across the Nordic region. INSTA is used to provide the Nordic countries with a more rapid process of standardization than that of the European Committee for Standardization (CEN). Standardization is essential to ensure fair competition between enterprises in the Nordic region.

Another example is *NORDJUST*, a cooperation between the region's national meteorological institutions. Individual Nordic countries are too small to maintain a complete system for technical calibration of instruments, so this cooperation aims to share the expertise in calibration across the region for both research in measuring and service to industry. This association was initiated by the European ERA-NET Mera.

A third example is *ScanBygg*. This is a cooperation between the national construction organizations in Denmark, Sweden and Norway. The main activity of this cooperation is to hold annual exhibitions that reflect the whole building process from original concept to finished construction – covering the range of constructions from buildings, industrial premises, roads and railways, to bridges, ports and airports.

Finally, there is the *Nordic Venture Network* (NVN), a private club of the 14 leading technology venture capital firms in the Nordic region. NVN was established in 1999 and focuses on strategic relationship-building between its members and key international financial and industrial players. In addition, NVN also acts as a forum for discussion of issues of relevance both to its members and to the major Nordic private equity investors. NVN is sponsored by leading public investors in each Nordic country.

2.5 PRELIMINARY CONCLUSIONS

As shown in this chapter, the Nordic R&I cooperation has a long history and is deeply rooted politically and culturally. A key characteristic of the institutional framework of Nordic R&I is its complexity. It comprises a broad range of actors and institutions on different levels, including governments, politicians, bureaucrats, universities, funding agencies, research institutions and business representatives. Still, it is important to stress that the Nordic level is not a supranational *political* level, but an intergovernmental cooperation built on consensus-based decisions. The cooperation also takes place within the context of quite different R&I systems in the five countries (see Annex II). In different ways, all of the institutions and cooperative bodies within the Nordic cooperation stimulate cross-border R&I collaboration, but with relatively limited amounts of money.

In addition to the formalized Nordic cooperation within or outside the structure of the Nordic Council of Ministers, a large part of the cooperative activities in the Nordic region consist of non-formalized networks and associations. These cooperation structures are often initiated by informal contacts between existing research groups, and while some of them develop into more formalized network activity over time, others remain non-formalized. To a large extent, it is this non-formalized cooperation that provides the basis for all Nordic R&I cooperation. The fact that most researchers find it fruitful to cooperate with their Nordic colleagues in one way or the other, and that such cooperation is often sustainable even without the provision of specific funding for that purpose, indicates that the 'Nordic added value' is not just a politically constructed concept. It is interesting to note that developments in the formalized cooperative structures seem to be inspired by a combination of societal needs, on the one hand, and interests and competences at the research and operational level, on the other.

To conclude, it is possible to argue that both formalized and non-formalized cooperation activities play a substantial role in the Nordic R&I cooperation. In the following chapters, we will take a closer look at the main achievements and the main challenges of this R&I cooperation over the last decade. To what extent has the Nordic R&I cooperation managed to reach the objectives set by both ERA and NORIA?



3. What Has Been Achieved in the Field of Nordic R&I Cooperation?

3.1 NORDIC R&I COOPERATION AND THE ERA OBJECTIVES

As noted in Chapter 2, the idea behind NORIA was to make the Nordic region a leading region in terms of research and innovation. Thus, the aims of NORIA are to a large degree similar to those of ERA. The ERA Green Paper emphasizes six areas that need to be strengthened in order to stimulate R&D cooperation in the European region: providing common priorities and joint programming; developing common research infrastructure; stimulating increased mobility of researchers; encouraging excellence in research; contributing to knowledge-sharing; and securing a broader international cooperation (European Commission, 2007a: 5).

In this chapter, we will take a closer look at what has been achieved within the Nordic R&I cooperation. More precisely, we want to investigate how far the Nordic region has come in attaining some of the goals set by the EU. The following research questions guide the structure of the chapter:

- What are the Nordic experiences when it comes to joint activities such as joint programming and a common pot? (Section 3.2)
- What has been done to increase the amount of common research infrastructure in the Nordic region? (Section 3.3)
- Has the mobility of researchers increased both within and outside the Nordic region? (Section 3.4)
- Is the Nordic R&D cooperation stimulating more excellence in research? (Section 3.5)
- To what degree is there knowledge-sharing between industry and academia in the Nordic region? (Section 3.6)

Finally, Section 3.7 will introduce some of the achievements in Nordic innovation cooperation that do not fit into the objectives set by ERA.

3.2 TOWARDS JOINT PROGRAMMING

In 2008, the European Commission (2008c) released a communication entitled ‘Towards Joint Programming in Research: Working Together to Tackle Common Challenges More Effectively’. This initiative aimed at hindering scattered national research efforts and thereby a fragmentation in research. ‘Joint programming’ was presented as a new approach for making better use of Europe’s limited public R&D funds through enhanced cooperation. The idea was that joint programming could be seen as a way of avoiding fragmentation of research. The communication stated that Europe’s various national research programmes were unable to effectively handle some of the major societal challenges – such as citizens’ security, food safety, quality of human and environmental health, climate change or energy supply – because such programmes were developed and implemented on a national level. Hence, the Commission proposed that the EU member-states develop and implement common Strategic Research Agendas addressing major societal challenges. Joint programming would then be a voluntary process that need not involve all member-states in each specific initiative. Still, the partners involved in any given initiative would need to be able between them to provide the required critical mass of resources. Europe’s citizens would be the main end-beneficiaries of joint programming, since it aimed at addressing major societal challenges (European Commission, 2008c).

In a report entitled ‘Building Nordic Strength Through More Open R&D Funding’, Arnold et al. (2006) argued that the Nordic region was facing the exact same challenges of fragmentation in research and innovation as the rest of Europe. According to the authors, unlike the EU, the Nordic countries had not fully recognized the value of concentrating their research and innovation resources to address the

challenges and opportunities of globalization. They found that the Nordic response to globalization had been rather passive with regard to the level of ambition of political targets, the use of funding instruments and policymaking on R&D.

According to Arnold et al., NORIA could be strengthened at little cost by selective mutual opening of national R&D programmes. This would allow research and innovation funders and performers to build Nordic platforms. In an overall perspective, they argued that the commitment of resources and enthusiasm to such Nordic efforts still remained too low, particularly in comparison with the EU.

In the Nordic countries, there has been an interesting development in the R&I field over the last five years. The countries of the Nordic region have developed significant experience with joint programming, understood as combining and pooling existing and new funding within and outside the structure of the Nordic Council of Ministers. However, it is more doubtful whether the Nordic countries have come far with regard to the development of joint programmes aimed at ‘tackling effectively some of the major societal challenges’ (European Commission, 2008c). The Top-level Research Initiative (TFI) might be such an example, but in general the Nordic examples of joint programming are of a much smaller scale. The examples that we refer to in this chapter are rather examples of common Nordic research programmes with a common pot. It is, in fact, interesting to see that the Nordic countries seem to find it less difficult than their European counterparts to reach an agreement on ‘a common pot with no fair return’ (also known as a real common pot).

3.2.1 The Nordic ‘Top-Up Funding’ Model

The Nordic funding level allocates ‘top-up funding’ for networking, cooperation, researcher education and exchanges, but does not directly support research as such. This means that researchers need to secure basic research funding from other sources at the national level. In general, the NCM/NordForsk allocate one-third of the funding (so-called glue money), while two-thirds are allocated at the national level, through national funding agencies, research councils, etc. This funding model is dependent on existing, significant national research investments. But, the basic idea is that it will help the coordination of larger national investments and create Nordic synergies.

As in the EU, different co-funding models are applied within the Nordic funding system. The main distinction is between what are known as a *common pot* and a *distributed pot*. In projects funded through a distributed pot, each partner in a consortium will be funded by his or her national funding agency. In projects funded through a common pot, all parties contribute to the common budget without regard to the nationality of the participants to be funded. This is why this model often is called a ‘common pot with no fair return’ (or, a real common pot). However, only participants from the countries/regions contributing to the common pot are eligible for funding. Within Nordic research and innovation cooperation, efforts are made to use the common-pot funding model as often as possible.

3.2.2 Examples of ‘Joint Programming’ Within the NCM Structure

In this section, we will present an overview of the most important achievements concerning joint programmes within the structure of the Nordic Council of Ministers. We will start with a presentation of TFI, which is the only example of ‘joint programming’ in the sense that the EU uses that term. Then, we will continue with a presentation of other examples of co-funded programmes that are administered by NordForsk, Nordic Energy Research or the Nordic Innovation Centre, respectively. While these programmes are smaller and sometimes have their equivalent in the EU system, they are still interesting examples since they are based on the principle of a *real common pot*.

Top-Level Research Initiative (TFI)

The most important example of joint programming in the Nordic region is the so-called *Top-level Research initiative* (TFI) on climate, energy and the environment, which was established in 2008.

The process towards this programme was initiated at the highest political level in the Nordic countries – by the Nordic prime ministers, as part of their goal of establishing a new globalization agenda for Nordic collaboration. Thus, at their summer meeting in 2007, the prime ministers called for joint Nordic activities in research and innovation, which has later been referred to as the Globalization Initiative. The proposals presented at this meeting included radical suggestions for joint programming of research, opening national investment funds for cross-border Nordic projects, strengthening innovation infrastructure both within the Nordic countries and across the borders between them, and coordinating Nordic research on energy and the environment. The prime ministers proposed that the ministers responsible for Nordic cooperation should define a new budget of DKK 60 million (EUR 8 million) in 2008, and at the same time establish a special task force for financial matters to look into joint Nordic funding opportunities, and in particular to rearrange existing cooperation budgets. One of the proposals by the prime ministers was the *Top-level Research Initiative* (TFI).

In December 2007, a steering committee was appointed to develop a proposal for the first TFI. In January 2008, a planning group led by Professor Peter Lund, began to design the TFI on climate, environment and energy. This TFI is managed by a programme board consisting of 15 representatives from the Nordic funding organizations, academia and industry, appointed by the Committee of Senior Officials for Education & Research Affairs (EK-U). Together, NordForsk, NICE and NER are providing this first TFI with a secretariat, but NordForsk has the leading role in holding the secretariat together and supporting the programme board. Two programme committees are allocated to each of the three institutions. The TFI on climate, environment and energy is still in an early phase, and seven calls for proposals have been launched as of February 2010. Though it has been hoped that additional TFIs will be developed on other topics, it is too early to say whether this will be the case. As we will come back to in the next chapter, the process towards this first programme has also been challenging (Arnold & Eriksson, 2009).

The first TFI is one of the most ambitious comprehensive regional cooperations in Europe, and a major step for NORIA. Hence, the first TFI can be used as a good and recent example of joint programming involving all five Nordic countries. It can also be seen as a project that may increase the possibility for Nordic countries to apply for and receive funding from the European Commission's Seventh Framework Programme.

According to Arnold & Eriksson (2009), the TFI initiative has had the effect of focusing and structuring Nordic research cooperation to an extent not previously achieved, and it has demonstrated a practical form of governance for such a more focused effort. They argue that it provides a practice that can serve as a platform for Nordic states' participation in future joint programming at the European level. In their report on the establishment of TFI, they single out three positive forces that have enabled the creation of the Top-level Research Initiative:

- The prime ministers' initiative, which generated a useful shock to the system and increased the rate of development of the Nordic cooperation.
- The inclusive process of 'preparation' initiated by the Swedish presidency in response to the proposal finally submitted to the Nordic Council of Ministers.
- Allowing the existing cooperation mechanisms to take over the implementation of the TFI, once this rather radical new idea had been established.

Other Examples of Co-Funded Programmes/Common Pot Within the Nordic Centre (NordForsk, NICE and NEF)

NordForsk coordinates considerable national research investments through modest Nordic top-up funding based on a common pot with no fair return (real common pot). Nordic Centres of Excellence (NCoEs) is a good example of such co-funded programmes, in the sense that the national research funding agencies agree to put a certain amount of money in a common pot and to issue joint calls in areas where the national funding institutions already have national centres of excellence. There are currently three such NCoE programmes: Food, Nutrition and Health; Welfare; and HumSam. In addition to the NCoEs, a few of the thematic programmes (introduced as instruments in Chapter 2) also represent examples of joint programmes with a real common pot (Transport and logistics, LivingLabs, Nordunet3 and Nordbib). As mentioned in chapter 2, one of the aims of the NORIA net scheme is to stimulate to the establishment of joint programmes. Currently, there are two examples where NORIA-nets have led to such co-funded programmes: “The Sustainable Freight and Logistics in a Nordic Context” and “A Nordic–Baltic Research and Innovation Programme on Living Labs”.

NICE has also extensive experience with joint programming with a common pot. The most important examples are the programmes entitled *NordWood* and *NordFood*. Both programmes were started in the 1990s and combined research and innovation. Since 2000, some small joint programmes have been initiated, all based on a common pot. The last example is from 2008, when *NICE* facilitated a call on Sustainable Renovation as a cooperation between the Finnish Funding Agency for Technology and Innovation (TEKES), the Research Council of Norway, the Swedish Research Council Formas, and the Danish Enterprise and Construction Authority (EBST).

Nordic Energy Research (NEF) started out as a joint programme on energy research in 1985 before it was established as an institution in 1999. The Nordic countries contribute with funding to a common pot that in turn is used to support various R&D projects within this research area. For the period 2007–2010, NEF is funding 16 research projects of different types (see chapter 2) in the areas of integration of energy markets; renewable energy; energy efficiency; hydrogen and fuel cells; and consequences of climate change on the energy sector.

3.2.3 Examples of Common Pot and Joint Nordic Calls Outside the NCM Structure

While most of the examples of co-funded programmes with a common pot are to be found within the structure of the Nordic Council of Ministers, there are also some examples of joint research funding that are administered outside the NCM structure.

NOS-HS and the Use of a Common Pot

The *Joint Committee for Nordic Research Councils for the Humanities and the Social Sciences* (NOS-HS) has agreed to put a certain amount of money into a common pot. In contrast to the joint programmes described above, this research funding is bottom-up and thus open for any topic that may contribute to promoting the quality of Nordic research, as well as the development of new and innovative research areas and research efforts within the humanities and social sciences in the Nordic countries. NOS-HS invites proposals for grants for four-year Nordic Collaborative Research Projects (NORDCORP) held in the Nordic countries. It also finances explorative workshops. The proposals must represent at least three Nordic countries. As mentioned above, together with *NordForsk*, NOS-HS also finances the NCoE programme on HumSam. The total annual contribution from the national research councils to NOS-HS is EUR 2.5 million.

Other Research and Innovation Programmes

In addition, there are several small programmes that are jointly funded by different actors in the Nordic countries, often through common pot arrangements. One example is *NORDITE*, a joint R&D programme (2005–2010) within the Information and Communication Technology (ICT) sector and

an established cooperation between Finland (TEKES), Sweden (VINNOVA) and Norway (RCN). There are also two smaller common-pot arrangements associated with the *Nordic Cancer Union* and the *Scandinavian Research Council for Criminology* (NSFK). Both receive funding from the Nordic countries and in turn provide research grants and the like within their specific research areas.

Some of the *Interreg* programmes may also be presented as examples of the common-pot approach in the Nordic region. While *Interreg* is an EU initiative that aims at stimulating interregional cooperation in the European Union,¹⁵ some of its programmes are co-funded by the European Regional Development Fund and a Norwegian equivalent. Projects receive a maximum of 50% funding from *Interreg*, with the remainder coming from national funding from the countries of the region. Funding decisions are made by committees consisting of national and regional representatives from the involved countries. Some examples of *Interreg* programmes in the Nordic region are the *Interreg IV - A Oresund–Kattegat–Skagerrak programme* and the *Interreg IV - A Botnia–Atlantica programme*. These projects focus on stimulating growth-promoting activities in the areas of trade, research and education, as well as in the wider economy in their respective regions.

Even though this report focuses on activities involving a minimum of three Nordic countries, there are examples of important *bilateral cross-border innovation cooperation* that are worth mentioning: the Øresund cooperation, the Norwegian–Swedish Industry Foundation, and the regional programmes, such as the cooperation between Finland and Sweden in the Barents region. These are all examples of bilateral common pots with no fair return.

Nordic Participation in ERA-NETs

The ERA-NET scheme was created to improve the coordination among EU member-states in relation to the design, implementation and evaluation of R&D programmes in areas related to the thematic priorities of the European Commission's Sixth Framework Programme (FP6).¹⁶ It was conceived as a bottom-up approach to foster transnational collaboration in research in Europe, involving programme owners (ministries) and programme managers (mainly research agencies and councils) in 'variable geometry'. The main goal of this instrument is to contribute to restructuring the research landscape in Europe by improving the coordination and mutual opening of national and regional research activities and policies. It aims at establishing long-term cooperation between national programmes, leading eventually to joint transnational programmes. Some 71 ERA-NETs were created within eight thematic areas: Transport, Life Sciences, the Environment, Fundamental Sciences, International Cooperation, Energy, Social Sciences and Humanities, Industrial Technologies, and Small- and Medium-Sized Enterprises.

The Nordic countries were active in a significant number of FP6 ERA-NETs. Finland, Sweden and Norway participated in approximately 50% of the FP6 ERA-NETs, Denmark was involved in slightly less than 40% of the networks, while Iceland participated in only 13% of them. It is interesting to note that many of these ERA-NETs have been rather successful, in the sense that some have also resulted in joint programmes (NORFACE, WoodWisdom-net, SAFEFOODERA, BONUS, BSR-INNOnet, INNER) (for more information, see Annex II).

¹⁵ The EU-initiated *Interreg* programmes are divided into three different strands – A, B and C – according to size and geographical span. There are about 52 *Interreg* IV A programmes across Europe in the current programme period (2007–2013). The programmes differ slightly from each other (depending of regional priorities) and are structured to promote sustainable economic growth, the aim being to improve conditions for growth and sustainable competitiveness based on a given region's existing strengths. The *Interreg* programme started in 1989 and is financed under the European Regional Development Fund (ERDF).

¹⁶ In the Seventh Framework Programme (FP7), ERA-NET has been complemented by the ERA-NET Plus scheme, a new option that allows Community financial support to top up national research funding. The Nordic countries' participation in the FP7 ERA-NETs and ERA-NETs Plus will be analysed in detail in a forthcoming report by the NORDERA project.

Following the ‘Evaluation and Impact Assessment of the ERA-NET Scheme and Related ERA-NETs Action Under the 6FP’, the FP6 ERA-NET scheme can be regarded as a successful catalyst in fostering both cooperation between and coordination of national and regional R&D programmes. The scheme succeeded in attracting a wide range of programme managers and funders across the European Research Area, permitting them to undertake joint activities. It also enabled the exchange and implementation of good practices, along with the funding of joint research projects and joint research programmes (European Commission, 2009).

3.2.4 What Are the Strengths of the Nordic Region in the Creation of Joint Programmes/Common-Pot Arrangements?

Nordic achievements in the context of joint programming are interesting, even though the relevant budgets are relatively modest. With the exception of the TFI, however, the various examples of such joint activities are not equivalent to joint programming according to the European Commission’s definition of that term. Still, it is interesting to note that the Nordic cooperation has resulted in several co-funded programmes and real-common-pot arrangements. Why is it that the Nordic countries have managed to overcome some of the obstacles that have often hindered such activities elsewhere? During our interviews, in response to this question, more or less every single respondent mentioned the word ‘trust’ – both when describing the Nordic R&I cooperation as such and as an explanation for the Nordic achievements in the context of joint programming. Such trust is of course linked to the fact that there is a Nordic cultural community and a certain common identity in the Nordic region. Interviewees also emphasized the fact that the Nordic countries are similar with regard to academic levels and standards, and that this facilitates the process towards creating a joint programme or a common pot.

3.3 RESEARCH INFRASTRUCTURE¹⁷

Research infrastructure has become an increasingly important area of research policy both at the national and at the European level. In fact, research infrastructure is an essential precondition for gaining new scientific insights, and the development of new infrastructure is an important element in science policy. Larger infrastructure is technologically and economically demanding to construct, and its realization is often dependent upon extensive international cooperation. As stated in a report on infrastructure written by an expert group for the European Union in 2008:

The existence of and access to leading research infrastructures is and will remain a key determinant of Europe’s competitiveness in both basic and applied research. Adequate research infrastructures, together with the needed critical mass of research skills are vital for promoting innovation, and offer the conditions required to carry out cutting-edge research and European capacity building. High-quality research infrastructures serve as magnets for talented researchers (European Commission, 2008b: 9).

Thus, the development of world-class research infrastructure is an important part of the ERA vision. Increased international cooperation – particularly through the European Strategy Forum on Research Infrastructures (ESFRI) – has emphasized the need for national strategies in which purely national investments are considered with respect for the timing and cost associated with pan-European and other international research infrastructure projects. Like the rest of Europe, the Nordic countries are also assessing their need for new and improved research infrastructure. Initiatives have been taken to formulate long-term strategies (or roadmaps) for the establishment of such infrastructure. The need for long-term national roadmaps results from the need to prioritize investments as a result of the increasing costs associated with research infrastructure.

¹⁷ By ‘research infrastructure’, we mean research facilities, resources or services of a unique kind. The term covers both single-sited and distributed infrastructure, and comprises major equipment or sets of instruments, e-infrastructure, and knowledge resources (such as collections, archives and databases), including the associated human resources needed to exploit such services.

3.3.1 The Nordic Commitment To Develop Common Research Infrastructure

Nordic cooperation in the area of infrastructure is important for several reasons. First, important research infrastructure requires large investments, and there are thus economic incentives for small countries to cooperate in this field. Second, such investments will, in turn, strengthen the Nordic region's position as an important and attractive research area for a broader international research community. Finally, a high degree of coordination on research infrastructure policies is also vital if the Nordic countries are to have an impact on the ESFRI process. Thus, the Nordic countries have started a process for realizing a closer cooperation in relation to research infrastructure. During the last three years, expert groups, workshops and conferences have been set up to address the issue on a Nordic level; a policy brief on the issue has been produced (NordForsk, 2008b); and networks and research programmes have been established to strengthen the Nordic cooperation on infrastructure.

The NordForsk policy brief from 2008 provides an overview of current policies for research infrastructure in the Nordic countries and Europe, and evaluates the scope for increased Nordic coordination. The main conclusions of the report were that efforts to realize closer Nordic cooperation are well under way, but there is considerable room for improved coordination and joint activities (NordForsk, 2008b).

NordForsk is also funding a NORIA-net on the *Nordic Research Infrastructure Network* (NRIN). This is meant to be a critical tool for expanding the network of Nordic collaboration on research infrastructure policies. An important aim is to create synergies between the individual infrastructure strategies of the Nordic countries. The network's primary objective is to identify barriers and obstacles at a structural and organizational level for the development of Nordic research infrastructure cooperation, and to propose ways of overcoming such problems, thus strengthening the overall Nordic collaboration on research infrastructure.

NordForsk has also implemented a programme entitled *Joint Use of Research Infrastructure*. This programme aims to optimize joint Nordic use of research infrastructure, to increase the interaction between existing sets of infrastructure, and to share best practices. It is also an aim to optimize joint Nordic participation in the planning and implementation of European and international infrastructure projects. A total of 19 infrastructure projects received NordForsk funding in 2007. The infrastructure collaborations include participants from all the Nordic countries, as well as from Russia and the Baltic states. The projects differ regarding focus and scope.

3.3.2 Examples of Nordic Research Infrastructure Inside the NCM Structure

In this section, we will present the most important Nordic achievement with regard to common or shared infrastructure within the structure of the Nordic Council of Ministers. While there should be great potential for such cooperation in the Nordic region, the examples are few. Still, worth mentioning in this connection are the Nordic Optical Telescope (NOT) and an initiative on eScience that is under development.

The *Nordic Optical Telescope* (NOT) is an astronomical telescope located at the Roque de los Muchachos Observatory, La Palma in the Canary Islands. The Nordic Optical Telescope Scientific Association (NOTSA) was founded in 1984 to construct and operate a Nordic telescope for observations at optical and infrared wavelengths. The NOT started in 1988, with regular observations beginning in 1989. Access is provided to astronomers of all nationalities through international time-allocation committees. In December 1983, the Nordic Council of Ministers allocated SEK 8 million (EUR 820,000) to the NOT project. Immediately after this, the four Nordic countries involved (Denmark, Finland, Norway and Sweden) secured the remaining SEK 21 million (EUR 2.16 million) for the project.

A more recent Nordic initiative on common infrastructure is the *eScience* initiative.¹⁸ In 2006, the Nordic Council of Ministers created an ad hoc eScience Work Group tasked with developing proposals for a common Nordic eScience strategy. The Work Group delivered its report in July 2007, emphasizing the need for long-term sustainable collaborations within Nordic eScience infrastructure and proposing new Nordic eScience programmes within research, infrastructure and education. In order to provide direction and funding, the Work Group suggested that a new Nordic strategic eScience committee be established, with members from national research councils and funding bodies. This proposal was implemented when NordForsk funded a NORIA-net on the topic (eNORIA). Subsequently, eNORIA has established an expert group on Grid Infrastructure. This expert group is currently in the finishing stages of preparing a report setting out its proposals for a Nordic strategy on eInfrastructure, along with a written proposal concerning long-term sustainable Nordic collaboration on infrastructure for scientific computing and data (and related grid services) that will succeed the Nordic Data Grid Facility (see below). In addition, eNORIA is also working on an Action Plan to develop eScience into a Nordic flagship coordination area.

3.3.3 Examples of Nordic Research Infrastructure Outside the NCM Structure

In addition to the examples mentioned above, there are also a few joint Nordic initiatives within the area of research infrastructure that are outside the structure of the Nordic Council of Ministers – specifically, Nordunet, the Nordic Data Grid Facility and Nordsim.

First, *NORDUnet* is an example of successful Nordic infrastructure. While it started out with funding from NCM (1985–1991), it is currently organized as a limited company (NORDUnet A/S), owned by the Nordic ministries of education and research or institutions under their control (Lehtisalo, 2005). NORDUnet is a joint collaboration by the five Nordic National Research and Education Networks – those of Denmark (*Forskningsnettet*), Finland (*FUNET*), Iceland (*RHnet*), Norway (*Uninett*) and Sweden (*SUNET*). From the very beginning, the aim was for the NORDUnet network to offer the best data communication service in the world. It linked the Nordic countries and connected them to Europe and the United States using an innovative multi-protocol technique. In choosing to use an Internet protocol that had been developed in the United States but not yet approved by other European countries, NORDUnet took a courageous step. Today NORDUnet monitors and coordinates international network research activities within this field and connects about one million users and 600 research institutions in the Nordic area. It is via NORDUnet that the Nordic National Research and Education Networks (NRENs) have physical access to other research networks around the world.

Second, the *Nordic Data Grid Facility* (NDGF) is another example of Nordic research infrastructure without funding from the NCM. The rationale behind the NDGF is to ensure that researchers in the Nordic countries are able to create and participate in computational challenges of a scope and size that would be out of the reach of national research groups acting alone. The NDGF is a *production grid* facility that leverages existing national computational resources and grid infrastructure. To qualify for support, research groups need to form a virtual organization that provides computer resources for sharing, while the NDGF operates a grid interface for the sharing of these resources. The NDGF has an annual budget of EUR 2 million for the period 2006–2010.

Finally, there is the *Nordsim* laboratory, which is located within the Laboratory for Isotope Geology at the Swedish Museum of Natural History in Stockholm. Nordsim is a Nordic facility, funded jointly by Sweden, Norway, Finland and Denmark. It is based around an advanced mass spectrometer that allows researchers to undertake direct on-site measurement of isotopic and elemental composition in selected micrometer-sized areas of a sample. This micro-analytical capability opens up new exciting possibilities

18 So-called eScience infrastructure includes computer networks, high performance computing and visualization systems, federated databases and network-enabled research instrumentation. It also includes ‘the grid’ – the distributed computing technology that provides access to remote resources and enables collaborations among distributed virtual organizations.

in several fields of geological research, and the instrument has relevance for a wide range of geological problems. For 2009, the total budget for Nordsim was SEK 2.8 million (EUR 290,000). The contributions from the Nordic partners were SEK 1.7 million (EUR 180,000) from the participating Nordic countries.

3.3.4 European Research Infrastructure of Nordic Importance

As we have seen, there are only a few examples of common Nordic infrastructure. However, two European projects include a strong degree of Nordic participation/commitment: the European Spallation Source (ESS) in Lund and the European Incoherent Scatter (EISCAT) in Kiruna, both in Sweden. Though neither of these is solely a Nordic facility, they can be of significant importance for the Nordic region in several ways. First and foremost, these infrastructure items are important and expensive installations, to which the Nordic countries contribute substantially. Second, both are localized in a Nordic country. This will provide Nordic researchers with great opportunities to use these facilities, while it may also contribute to making the Nordic region more attractive for international researchers and thereby stimulate mobility of researchers (more on this below).

The *European Spallation Source* (ESS) is an important research facility for scientific research using the neutron scattering technique that will be built in Lund in southern Sweden. The project involves the design and construction of a next-generation facility for research with neutrons. Neutrons can ‘see’ inside materials: they penetrate deep into matter, revealing ‘where atoms are and what atoms do’. It has been argued that the development of the ESS ‘will have enormous positive consequences for society, industry and technology’, and that it ‘will retain and strengthen Europe’s lead in neutron science in quality and quantity’.¹⁹ ESS Scandinavia has made detailed calculations as to how much it will cost to build the ESS in Lund. The combined cost of construction is estimated at around EUR 1.47 billion. Once the facility goes into operation, its annual operational costs will amount to approximately EUR 100 million. In addition, it is estimated that around EUR 170 million will be required for future dismantling. The project’s costs will be shared between the participating countries in proportion to GNP. It is customary, however, that the host country pays a higher proportion – a so-called site premium – since being host brings with it considerable economic benefits. Thus, the Swedish government has agreed to cover 30% of construction costs and 10% of operational costs.

The *EISCAT (European Incoherent Scatter)* radar makes it possible to study the interaction between the Sun and the Earth as revealed by disturbances in the magnetosphere and the ionized parts of the atmosphere. The EISCAT Headquarters are located in Kiruna, Sweden. One EISCAT transmitter site is located close to the city of Tromsø, Norway, and additional receiver stations are located in Sodankylä, Finland, and Kiruna. In 1996, the EISCAT Scientific Association constructed a second incoherent scatter radar facility, the EISCAT Svalbard Radar (ESR), near Longyearbyen on the island of Spitsbergen, far to the north of the Norwegian mainland. The EISCAT organization is owned and funded by research councils and financing agencies in Finland, Japan, China, Norway, the United Kingdom, Sweden and Germany. The total capital investment and accumulated operating costs now amount to some SEK 275 million (EUR 28.2 million) distributed between the EISCAT Associates. The annual operating budget is about SEK 33 million (EUR 3.4 million).

3.3.5 Nordic Cooperation on Research Infrastructure: An Unexploited Potential

As shown above, there exists political willingness to join forces towards developing and implementing joint research infrastructure in the Nordic countries. Since the Nordic countries are small, there is obvious added value involved in cooperating more closely in this way. Such cooperation has economic benefits, but it also strengthens the Nordic region as an important and attractive research area for a broader international research community. From the interviews we have undertaken, we have also learned that there exists considerable unused potential for improved coordination and joint activities in this area. This was also one of the conclusions in the 2008 policy brief noted earlier (NordForsk, 2008b). One of the reasons why this

¹⁹ See <http://ess-scandinavia.eu/costing/81-licensing>.

potential remains unexploited seems to be that such cooperation often requires very large investments. Still, there seems to be a political will to explore the possibilities for a tighter cooperation on different areas in the Nordic countries. In addition to the ongoing process on eScience, one of the areas that was most frequently highlighted during our interviews was the need to establish a Nordic biobank for medical research.

Denmark holds the chairmanship of the Nordic Council of Ministers. In its sector programme on cooperation in research and education, Denmark has stated that they will address the infrastructure challenge (NCM, 2009). They will implement an analysis of the possibilities for tighter Nordic cooperation on technological infrastructure.

3.4 MOBILITY OF RESEARCHERS AND BROADER INTERNATIONAL COOPERATION

In addition to joint programming and common infrastructure, increased transnational mobility for researchers is also one of the objectives of the European Research Area (ERA). It is stated that:

Researchers should be stimulated by a single labour market with attractive working conditions for both men and women, involving notably the absence of financial or administrative obstacles to trans-national mobility. There should be full opening of academic research positions and national research programmes across Europe, with a strong drive to recruit researchers internationally, and easy movement between disciplines and between the public and private sectors – such mobility becoming a standard feature of a successful research career (European Commission, 2007a: 9).

The same goes for NORIA. In an increasingly internationalized knowledge market, the Nordic region needs to be part of a broader European and international research and innovation cooperation if it is to become a strong and visible region in terms of R&I. The Nordic region is already experiencing a shortage of talent in certain sectors, and this is seen as the greatest bottleneck for any expansion of research and innovation activities in the region. Attracting talent therefore becomes an instrumental part of any research and innovation investment strategy (Rylander & Haselmayer, 2008).

Despite the importance of mobility, there exist very little systematic data regarding mobility of researchers within the Nordic region, between European countries, or even internationally. The EU's High-Level Expert Group on Improving Mobility of Researchers stated in a report from 2001 that 'there is a striking lack of comprehensive statistics about mobility of researchers in the majority of Member States' (European Commission, 2001a: 2). This goes for both ingoing and outgoing mobility, as well as intraregional mobility.

3.4.1 Mobility Within the Nordic Region

Despite the lack of statistical data on the level of mobility within the Nordic region, we know that there are long traditions of intra-Nordic mobility. There are also agreements and mechanisms that facilitate such mobility. In 1954, the Nordic countries entered into a formal agreement on free movement of workers. So far, intra-Nordic migration has contributed positively to processes of economic growth within the region (Pedersen, Røed, & Wadensjö, 2008). In addition, the Nordic region has developed other instruments designed to stimulate increased mobility of researchers, while mobility is a key component in all NordForsk instruments (see Chapter 3). It is also worth mentioning the *Nordplus* Framework programme (a mobility and network programme on education that will run from 2008 to 2011) and *Nordic Masters*, both funded by the Nordic Council of Ministers. While neither of these addresses researcher mobility as such, both contribute to establishing the foundation for such mobility. As shown in Chapter 2, there is much non-formalized research cooperation in the Nordic region, and it is likely that this will result in a degree of mobility.

Mobility in the Øresund region is also worth mentioning in the present context. Though this primarily involves only Sweden and Denmark, it offers an interesting example of how a bridge between two

shorelines – in this case, those of Malmö and Copenhagen – can contribute to growth and development in the local region. With more than 3 million inhabitants, the Øresund region (which includes Sjælland, Lolland, Falster and Bornholm in Denmark, and Skåne in Sweden) is the Nordic region's most populous district. In 2000, a 16-kilometre-long bridge connecting the Danish and Swedish shores was opened. The bridge has made it far easier for people to live on one side of the sea and work on the other, and has increased the degree of mobility between Malmö and Copenhagen.

A study of intra-Nordic mobility has shown that, in the 1990s, Denmark received a net flow from Iceland, Norway and Sweden, while both Finland and Norway received a net flow from Sweden. From 2000, however, this picture changed. Sweden once again became a net receiver of people from Denmark and Norway, while Denmark received a net flow of people from Iceland. The researchers believe that the opening of the Øresund Bridge between Copenhagen and Malmö has been more responsible for this significant shift in the Danish–Swedish flow than cyclical changes in the national economies (Pedersen, Røed, & Wadensjö, 2008).

3.4.2 The Attractiveness of the Nordic Region

Throughout the world, countries are in constant competition with each other to attract the best researchers and the best specialists. In recent years many countries have developed concrete measures to increase researcher mobility. For its part, the EU launched a strategy for increased researcher mobility in 2001 (European Commission, 2001b). The Marie Curie programme, the European Charter for researchers and the code of conduct for the recruitment of researchers from 2005 are important elements of this strategy (European Commission, 2005).

While mobility between the Nordic countries has long traditions and has been facilitated by the existence of a common labour market, we know little about how the Nordic research and innovation area is viewed by foreign researchers. To understand foreign researchers' motivations for moving to a Nordic country, we need to consider the Nordic region in an international perspective. What are the main push and pull factors that might account for the attractiveness of the Nordic region for foreign researchers?

Despite difficult climatic conditions and language barriers, there are several factors that make the Nordic region attractive for foreign researchers. The Nordic countries are renowned for their solid welfare system, their well-regulated labour market and their good working conditions in comparison with other countries both in Europe and in the rest of the world. Furthermore, the Nordic region can also offer facilities and research environments that are attractive for foreign researchers in a number of fields. The Nordic countries are strong in research on the environment, marine biology and polar research, to mention a few areas. Research institutions from about 20 different countries, for example, are currently engaged in research on Svalbard.

3.4.3 Mobility Between Academia and Industry

Mobility refers not only to mobility of researchers across borders, but also to increased mobility of knowledge between academia and industry. While this seems not to be a priority in the Nordic R&I cooperation, there are some instruments that have been developed precisely with this in mind.

Within the Nordic Centre,²⁰ for example, there are a few examples of such programmes. As mentioned in the previous chapter, NordForsk finances the so-called *Private–Public Partnership* PhD programme (PPP PhD), while Nordic Energy Research finances two types of projects of a similar nature: the so-called *Business Development and Innovation Projects* and *Integrated Capacity and Innovation Projects* (see Chapter 2 for further details). The Nordic Innovation Centre has no general direct programme for this purpose, but similar initiatives are sometimes an integrated part of the projects that it supports in the sense that one or more of the company partners have an activity similar to the PPP PhD programme.

²⁰ The Nordic Centre consists of NordForsk, Nordic Energy Research and the Nordic Innovation Centre.

In addition to the examples mentioned above, the office of the Nordic Council of Ministers in Latvia administers a programme known as the *Nordic–Baltic Mobility Programme for Business and Industry* (2009–2013). This programme finances different stakeholders within business and industry to strengthen Nordic-Baltic cooperation and promote economic cooperation, entrepreneurship, regional cluster cooperation and innovation possibilities.

3.4.4 Mobility and the Nordic Region as a Leading R&I Region

As mentioned above, lack of available figures makes it impossible to assess on a statistical basis whether the mobility of researchers within the Nordic region (intraregional, outgoing and incoming) has increased over the past ten years. However, among the individuals we interviewed, there seems to be a general impression that the mobility of researchers has increased as a consequence of globalization. It is clear that mobility is crucial for any effort to turn the Nordic region into a leading R&I region. To attain this goal, the Nordic region has to compete to keep the sharpest brains within the region, to attract the best specialists from outside, and to foster mobility of knowledge between academia and industry. This can be done in many ways, using well-calibrated tools and instruments that stimulate increased mobility. As noted in relation to research infrastructure, securing the placement of important research infrastructure in the Nordic region could render the region more attractive for foreign researchers. During its chairmanship of the NCM, Denmark intends to work to identify and address barriers for researcher mobility in the Nordic region. Through NordForsk, it will explore whether it is worthwhile developing a Nordic researcher career programme that can support the formation of good role models (NCM, 2009).

3.5 EXCELLENCE IN RESEARCH

To create and maintain research environments and research institutions of excellent quality is an important vision both for ERA and for NORIA. In the document ‘ERA Vision 2020’, promoting excellence in research is described as an important part of the knowledge triangle (education, research and innovation) (European Commission, 2008a).

One way of measuring excellence in Nordic research is through research output in the form of peer-reviewed publications. A recent bibliometric study (Schneider, 2010: 9–13) indicates that the total publication activity for the five Nordic countries in the most recent five-year period (2004–2008) was over 152,000 articles. This figure corresponds to almost 3% of the share of world publications. The report shows that, in absolute terms, Nordic countries are above the world average for the period 2004–2008. Another way of measuring excellence is through the number of citations. According to National Science Indicators, “Nordic Researchers are among the Most Productive and Impactful in the World”. In fact, the five Nordic countries rank in the very top league of researchers – both in terms of the number of papers per inhabitant and the number of citations.²¹

The Nordic countries host several outstanding scientists and research groups in many fields of research, but since these ‘hot spots of research’ are scattered throughout a number of countries, the international visibility of this research is not always as high as it deserves to be. Therefore, it is of crucial importance to bring excellent Nordic researchers and research groups together. As mentioned earlier, the existence and development of good research infrastructure is important for creating excellence in research. Increased collaboration between the best research environments in the Nordic countries is another important way of keeping and developing the role of the Nordic countries as one of the most dynamic regions in the world in terms of research and innovation, as well as for developing critical Nordic mass.

3.5.1 What Has Been Done To Create Nordic Excellence in Research?

One can argue that all of the Nordic research funding instruments are promoting excellence, as it is presupposed that successful applicants will meet the highest quality standards. An important aim of all the

21 <http://vtu.dk/nyheder/aktuelle-temaer/2010/ugens-tal/nordiske-forskere-mest-produktive-gennemslagskraftige>

various instruments is to connect excellent researchers across the Nordic borders to create synergies and research that has a Nordic added value, as compared to research conducted nationally. As we saw in the previous chapter, NordForsk finances research training and education within a range of different disciplines, as well as a research summer school. However, the most specific NordForsk instrument for promoting excellence is the Nordic Centre of Excellence (NCoE) programme.

An important aim of the NCoE programme is to promote research of excellent scientific quality and thereby to increase the visibility and attractiveness of Nordic research in a European and global context. The NCoE programme is a highly competitive and very visible way of introducing the best of Nordic science to the European research arena.

3.5.2 Nordic Excellence as a Stepping Stone

There is a widespread perception that Nordic cooperation functions as a stepping stone to wider European or even international cooperation. According to Arnold et al. (2006), for instance, the NCoEs are positive examples of Nordic cooperation that help build critical mass and strengthen the Nordic positions. The NCoEs can qualify participants and place them in an advantageous position in terms of securing future funding through the EU's Framework Programme structure. Experience in Nordic research cooperation can be a significant advantage when competing or collaborating with other European research units in the European Research Area (ERA). This conclusion was also supported by our interviews. Having had experience with these centres, most of the respondents at the research level agreed that experience in Nordic research cooperation could represent a significant advantage when competing or collaborating at the European level. A project leader in one of the NCoEs stated that 'it might be very smart to practise being a coordinator in a Nordic project before you take the big step out in Europe'. Some also argued that these centres would also make the Nordic region more attractive to top researchers and post-doctoral researchers from countries outside the Nordic region, and thereby stimulate incoming mobility.

3.6 KNOWLEDGE-SHARING BETWEEN ACADEMIA AND INDUSTRY

Knowledge-sharing is also one of the objectives mentioned in the ERA Green Paper. The broad-based innovation strategy for the EU set out in that document also highlights the importance of improving the transfer of knowledge between public research institutions and third parties, including industry and civil society organizations (European Commission, 2007A).

Below, we will present some examples of technology transfer from universities, research laboratories, etc. to industrial innovation in the Nordic region.

First, there are several examples of Nordic-funded networks aimed at developing a common web portal for sharing front-end knowledge for use in industry. The *Nordic Laser Materials Processing Knowledge* (NORLAS) project²² is an example of such a network-based collaboration between Nordic research institutes, universities and industry regarding laser materials processing. The project started in November 2001. The processes it deals with – mainly related to metals cutting, welding and surface treatment – are developing rapidly, and the implementation rate into the Nordic industry is very high. One of the reasons for this industrial success is that, over the last three decades, Nordic institutes and universities have supported this industrial development intensively, for example through earlier projects supported by the Nordic Industrial Fund (later NICE). The network is based on a common website platform that provides the central forum for a knowledge 'market place', with links to available information, the research institutes and some industrial companies. The website is updated with a regular flow of technical discussions, research results, and news and information about events like conferences, demonstrations and calls for papers, etc. The input to the website comes mainly from the research institutes, but may also come from industry. The platform has also been developed to involve non-Nordic members. In total, around 400 members are active.

22 See www.norlas.com.

Another example is *Copenmind*.²³ Based in Copenhagen, this aims to be the world's biggest marketplace for partnerships between universities and industry in the area of clean technology, or 'cleantech'. During its first year, Copenmind's mission is to gather researchers from 100 of the world's leading universities, as well as 4,000 representatives from the largest global companies, for a technological summit. In the Bella Center in Copenhagen, a set of exhibitions, workshops and conferences have been set up under one roof. Copenmind is organizing a range of events to facilitate the sharing of knowledge, research and technology between universities and companies from all over the world. Its organizers refer to this as 'intellectual and economic matchmaking'.

Another project, *New Nordic Food*, is also worth mentioning here. The food industry is one of the fastest-growing innovative sectors in the region, with large numbers of new products and services being launched each year. The sector thus has a high priority in the Nordic countries, and New Nordic Food provided both a meeting place for sharing knowledge and a programme for research and innovation. The project was funded by the Nordic Council of Ministers and focused on the preparation of Nordic food from pure and healthy ingredients, including both agricultural and fish products. One of the objectives was to offer people a diet that would help them achieve better health and quality of life. New Nordic Food cultivated the Nordic region's common cuisine and cultural identity, building on qualities found in the Nordic region. At the same time, this ambitious project aimed at strengthening the Nordic region's competitive edge in the increasing international competition in the global food market. The project ran from 2007 to 2009 and was led by a steering group that included representatives from business, government, gastronomy, producers, consumers and the tourist industry.

A final example from the innovation sector is the *Nordic Patent Institute*,²⁴ a Patent Cooperation Treaty (PCT) authority that was formed in cooperation between the patent offices of Iceland, Norway and Denmark. The Institute was established in January 2008 to give users in the contracting states the best possible local framework conditions for operating efficiently. Use of patent protection and patent information has increased dramatically in the knowledge-based economy, and that trend looks set to continue as a result of continued economic growth, particularly in Asia, as well as increased patent awareness among users – not least individual inventors, small- and medium-sized enterprises (SMEs) and research institutions.

In addition to these examples, it is possible to add the *PPP PhD* programme mentioned above and presented in Chapter 2. The programme is administered by NordForsk, and the objective of the three-year mobility programme is also to increase knowledge-sharing between the Nordic countries and to promote cooperation between higher education and trade and industry by creating a platform for long-term research cooperation.

3.7 OTHER EXAMPLES OF SUCCESSFUL NORDIC INNOVATION INITIATIVES

In relation to innovation, there are a number of other achievements worth mentioning. For instance, well-functioning venture capital markets are essential for an innovative economy. NICE has for many years worked to improve the venture capital markets in the Nordic countries. Venture capital funds in the Nordic countries usually consider the Nordic countries as one market, and there are extensive cross-border investments. While obstacles to cross-border investment did exist previously, they have now to a large extent been eliminated. National public seed funds still have restrictions with regard to investments in other countries, but this is about to change in the Nordic region. NICE also funds collaboration between the public seed funds in the Nordic countries – a collaboration that, among other things, aims at increasing the attractiveness of Nordic companies to international investors.

23 See www.copenmind.com.

24 See www.npi.int.

NICe is also implementing tools for increasing the innovative capabilities in companies. This is done on a company-by-company basis and will generate knowledge-sharing between companies and create a unique dataset that will enable improvement in existing innovation programmes, as well as an increased focus on innovation in the companies using the tool.

3.8 PRELIMINARY CONCLUSIONS

As we have seen in this chapter, the Nordic countries can point to some achievements according to all five of the main ERA/NORIA objectives, particularly when the totality of the R&I cooperation (both within and outside the NCM structure) is taken into account, as well as the limited budgets available for these kinds of cooperation.

First, the Nordic cooperation can point to some interesting achievements in relation to the development of joint programming. In fact, the TFI is the most extensive example of joint programming on the Nordic level. If successful, this programme has considerable potential for including other EU member-states, or it can serve as a model for the creation of other large joint programmes on a European level. While this is the only example of joint programming that is comparable to the types of programmes described in the ERA objectives, there are several examples of well-functioning Nordic programmes with real common pot both within and outside the structure of the NCM. It is interesting to note that it seems easier for Nordic partners to enter into joint funding and common-pot agreements than it is for their European counterparts. This is most likely due to the fact that Nordic cooperation has such a long history and is built on a common identity, mutual trust and recognition.

With regard to infrastructure, there is a degree of political willingness to join forces in the Nordic countries. Since the Nordic countries are small, there is obvious added value in cooperating more closely in this area. Securing the placement of important research infrastructures in the Nordic region could also make the region more attractive to foreign researchers. Yet, although there is both political will and obvious reasons for Nordic cooperation in this area, the achievements are few. This is explained by the fact that such cooperation requires very large investments, while Nordic initiatives are not given priority. Still, it is interesting to note that some important initiatives are under development, such as the eScience initiative. In addition, it is interesting to note that two important European research infrastructure projects (the European Spallation Source and EISCAT) are located in the region.

Concerning researcher mobility, lack of statistical data makes it difficult to ascertain whether the mobility of researchers within the Nordic region (internal, outgoing and incoming) has changed over the last ten years. However, among those we interviewed, there seems to be a general impression that the mobility of researchers has increased as a consequence of globalization.

With regard to the ERA/NORIA objective of excellence in research, it is also difficult to say whether this has been achieved. However, the establishment of Nordic Centres of Excellence at least aims at this. There is also a widespread perception that the Nordic cooperation may function as a stepping stone to wider European or even international cooperation. In addition, we have seen that Nordic researchers score rather well in terms of scientific publications (Schneider, 2010).

Finally, we have referred to several examples of Nordic-initiated projects that aim at knowledge-sharing. Interestingly, all the main institutions (NordForsk, Nordic Energy Research and the Nordic Innovation Centre) have projects of this kind.

The objectives of ERA and NORIA are ambitious, and though it is possible to emphasize some achievements in relation to all of them, the overall conclusion must be that there is still a long way to go. Several challenges for the attainment of these objectives will be addressed in the next chapter.



4. What are the main challenges in the Nordic R&I Cooperation?

The most important rationale behind the creation of a Nordic Research and Innovation Area was to make the Nordic region a leading region within research and innovation. However, as we saw in Chapter 3, the Nordic region is far from having attained the goals set out for NORIA. In this chapter, we will take a closer look at the various kinds of obstacles and challenges to be found at different levels in the Nordic R&I system.

4.1 POLICY LEVEL: CHALLENGES REGARDING COORDINATION OF NATIONAL PRIORITIES

As shown in Chapter 2, the Nordic cooperation has long traditions and is based on a common cultural and political identity. The foundation for the Nordic R&I cooperation is the existence in all the Nordic countries of a strong political will to cooperate. Despite this positive attitude towards Nordic cooperation, there are challenges involved in coordinating the national policies in concrete cases and coming up with Nordic solutions that seem better for all of the countries concerned than national, European or even broader international solutions. Since Nordic decisionmaking procedures are characterized by unanimity, the decisionmaking process is often tedious. But unanimity also has its advantages: when decisions are taken unanimously, there is often a strong political commitment to implement them in the individual countries. Another overarching challenge at this level is the limited nature of the relevant budgets.²⁵ This puts some important restraints on what the Nordic institutions can and cannot do. In addition to the consensus model and the limited budgets, there are challenges related to the complexity of the institutional framework, to various national differences within the Nordic region, and to the relationship between the Nordic cooperation and the European cooperation.

4.1.1 A Complex Institutional Framework

As we saw in Chapter 2, one of the first actions that was taken in the context of implementing the NORIA concept was to reduce the levels of institutional complexity within the structure of the NCM. The aim was to cultivate two pillars: research and innovation. As a result, NordForsk and NICE were established, and the number of institutions that were directly funded by the Nordic Council of Ministers was reduced. Nevertheless, there remains a whole range of institutions (both within and outside the structure of the NCM) that contribute to Nordic R&I cooperation in one way or another. Thus, challenges related to the complexity of the institutional framework persist. During our interviews, some respondents suggested that the relationships between the different bodies engaged in promoting Nordic R&I cooperation within and outside the NCM were overly complicated; that the mandates of NordForsk and NICE needed to be clarified; and that sectorization within the Nordic Council of Ministers hindered development towards innovation-based research.

Many Institutions - Little Cooperation

While NordForsk and NICE are presented as the two pillars of NORIA, there is a whole range of other institutions that are also active within the field of Nordic R&I cooperation. An overview of these institutions was presented in Chapter 2. They include various sector institutions that receive some funding from different councils of ministers. Interestingly, NordForsk has a budget of DKK 110 million (EUR 15 million); however, in addition, the Nordic Council of Ministers still spends around DKK 100 million (EUR 13.4 million) on direct research funding to various institutions (NCM, 2010). and projects. One might ask whether such a scattered institutional structure is as efficient as it could be. Would it be more efficient to use the limited resources on fewer institutions? It is interesting to note, however, that some of these cooperative bodies are now investigating the possibility of transferring their secretariats to NordForsk.

²⁵ The NCM has a budget of DKK 900 million (EUR 120 million), of which about DKK 300 million (EUR 40 million) is earmarked for R&I activities.

In addition to this complexity of institutions within the NCM structure, there is a whole range of different institutions, committees and cooperative bodies operating outside that structure. There is surprisingly little cooperation between these bodies and those mentioned above. A couple of exceptions are worth mentioning: the cooperation between NordForsk and NOS-HS in relation to their common NCoEs, and the fact that NOS-N has asked NordForsk to act as its secretariat.

Too Much Sectorization Within the NCM?

As we have seen, NordForsk and NICE, the two main institutions for the implementation of NORIA, are 'owned' by two different councils of ministers (MR-U and MR-NER, respectively). While this organizational division is a consequence of a similar sectorization at the national level – whereby different ministries have responsibility for research and innovation – it does not facilitate one of the main objectives of NORIA, which is to establish a closer cooperation between innovation and research through more research-based innovation.

Some of the respondents from the research side stated that they saw this sectorization as a problem. An important reason for this was that they often saw research results as the main input to innovation. It was argued that sectorization creates an unnecessary distance between NordForsk and NICE. Some also meant that there is a general need for more coordination between the different councils of ministers, since it is not only MR-U and MR-NER that finance research and innovation.

Respondents from the innovation side saw the sectorization as less problematic, and as a way of highlighting the essentials of innovation. They were not suggesting that innovation resulting from research could not be strengthened, but they feared that user-driven innovation could get too little attention. As discussed in Chapter 2, innovation is also a management concept for combining market information, network possibilities and research results. Some of the respondents from the innovation side argued that sectorization plays an important role in giving innovation a justified place within the economy.

4.1.2 National Differences

While the Nordic countries have many similarities, there are also important differences between them that may have consequences for Nordic cooperation. First, the contextual frames for the R&I cooperation, overarching R&I policies and institutional setups are very different in the five countries. In addition, there are linguistic, legal and administrative differences that sometimes complicate joint actions and make the cooperation more challenging.

First, linguistic differences seem to be more challenging than is often believed. This is an important challenge, since the language community has been the basis of the Nordic identity and the foundation for Nordic cooperation. In fact, it is only between the Scandinavian countries (Denmark, Norway and Sweden) that it is possible to talk about a certain language community. But, even here research has shown that the common comprehension has become weaker over the last 30 years (Delsing & Åkesson, 2005). In Finland and Iceland, there are also fewer people that understand Scandinavian languages than before. Although Swedish is an official language in Finland, and many Icelanders speak either Norwegian or Danish, the numbers of individuals who are fluent in these languages are becoming smaller. There is a tendency that only those from the Swedish language areas in Finland, and Icelanders that have spent some years in another Nordic country are comfortable practising Scandinavian languages. As a result, it is increasingly difficult to use 'Scandinavian language' as a common language in the Nordic cooperation. According to a White Paper from the Norwegian Ministry of Culture (2007–2008), as many as 25% of the inhabitants of the Nordic countries have a mother tongue other than Danish, Swedish or Norwegian. But, since the level of English-language skills is relatively high, there is a trend towards using English as the natural working language within the Nordic R&I community. Still, the challenge remains, since the Nordic Council of Ministers has a

policy of using the Scandinavian languages as working languages. The opening of the R&I cooperation for other regions like the Baltic countries makes this even more problematic.

In addition to differences in language, there are also some legal differences that might complicate the establishment of joint programmes and common-pot agreements. For instance, in Sweden it is not clear to what extent public research funding can be used outside the country's borders. On the one hand, funding is supposed to promote Swedish research; on the other, funders are supposed to engage and develop international collaborations. It has been argued that international collaborations would benefit from clearer legislation that would help research-funding agencies in their efforts to establish more extensive and long-term international collaborations. In Sweden's most recent research bill, 'A Boost to Research and Innovation', this issue is further elaborated upon. With the trend towards encouraging international collaborations, opening funding programmes to external collaborators and funding international actors may become a viable option (Mattsson, Eriksson & Åström, 2009).

Finally, as shown in Annex II, the research and innovation systems of the five countries are structured very differently. First, there are variations in the numbers of actors involved and how they are related to each other. In Sweden and Denmark, there are a number of different funding agencies with different tasks and areas of responsibilities, while in Norway there is only one research council responsible for science, strategic priorities and innovation. Second, distances and relationships between the ministry level and the research-funding level also vary across the countries. Finally, the degree to which innovation and research policy is seen as an integral part of the R&D system varies, as does whether a single institution or different institutions are in charge of both research and innovation. In some cases, several bodies share responsibility for areas covering both research and innovation, though in different ways. In Iceland, the link between research and innovation is safeguarded through the Science and Technology Policy Council, which is responsible for science, research and technology policy, in addition to innovation. In Sweden, none of the three research councils Formas, FAS or the Swedish Research Council (VR) deals with innovation, as there is a separate council, VINNOVA, in charge of this. A similar situation is seen in Finland, where an independent institution, TEKES, is responsible for innovation. In Denmark, the system is more comprehensive. R&D policy is defined by the Ministry of Science, Technology and Innovation, but a serious part of the applied innovation is performed under the direction of the Ministry of Economy and Business. In addition, there are several councils that have responsibility for innovation and the commercialization of research results.

Some of our respondents found it difficult to understand the different systems in the different countries regarding when, where and by whom a certain decision was to be made. Accordingly, this can be an obstacle for joint actions, cooperation on joint programmes and co-funding between countries. An important goal for NORIA is to make a closer link between research and innovation. When the Nordic countries differ to such a degree regarding the relationship between research and innovation, as well as who is in charge of what, it can also be difficult to see these two dimensions together at the Nordic level. In spite of these differences, though, there are more similarities between the Nordic countries than between many other European countries.

4.1.3 The Nordic Level: In a Squeeze Between the National and the EU Level

It is often argued that a strong NORIA will contribute positively to ERA. However, it is not clear exactly how this is going to take place. Some of our respondents emphasized that if NORIA is not implemented with this in mind, it could very well risk creating just another research administrative level.

In an increasingly globalized world, all of the Nordic countries have their own EU strategies and will have a tendency to prioritize EU-oriented cooperation over Nordic cooperation. Hence, what is meant by the phrase 'Nordic added value' must become clearer, so that the Nordic countries more easily can find a balance between Nordic cooperation and EU cooperation.

An often-mentioned example of how the Nordic level is not finding its own place in the space between national states and the European level is that of cooperation over infrastructure. There is general agreement that cooperation in this field will provide an obvious Nordic added value. Still, progress in this area is first and foremost to be found at the national and European levels, rather than the Nordic level. In relation to the ESFRI roadmap, there has been little concerted effort to integrate the *Nordic* dimension into strategic policy work at the national level, according to the NordForsk (2008b) policy brief on infrastructure. The policy brief states that there is a risk that lack of coordination will result in differences in the timing and prioritization of infrastructure investments across the Nordic countries, which will potentially limit the ability to create synergies between areas in which the Nordic science community has unique research opportunities and strengths.

In all of the Nordic countries, promoting innovation is given high priority. However, the visibility of the Nordic dimension within national strategies is weak – if it is found at all. The Mid-Term Evaluation on Nordic Innovation Policy 2005–2010 states that the NCM innovation strategy is seldom or never referred to in relevant national document in the Nordic countries (Andersen, 2009). At the same time, the European dimension is emphasized by all of them. MR-NER has taken several initiatives towards Nordic innovation strategies (for instance, in tourism and the development of entrepreneurship in the Arctic area), but it has often been difficult to trigger national funding. The reason for this is that countries tend to give priority to national or EU policies over Nordic cooperation.

Though national innovation policies tend to give less priority to the Nordic dimension, the business sector in the Nordic countries often has a stronger Nordic focus. A survey of Nordic competitiveness from 2007 indicates that companies in the Nordic countries often take a first cross-border step to a neighbouring country (i.e. another Nordic country) before going to other countries (i.e. Europe) (Møller et al., 2007). The fact that the national policy level does not give priority to Nordic cooperation might be a hindrance for the implementation of such initiatives since such cooperation requires additional funding from the public sector.

Many of our respondents pointed to an urgent need for more policy analysis and more strategic thinking at the Nordic level to guide cooperation in the right direction.

4.2 AGENCY LEVEL: CHALLENGES WITH COORDINATION, FUNDING AND RESEARCH STRATEGY

In the previous section, we discussed the main challenges for Nordic R&I cooperation at the policy level. These were linked to a tedious decisionmaking model, limited budgets, the complexity of the institutional framework, national differences, and an unclear relationship between the Nordic and the European funding levels. During our interviews, three main challenges at the agency level were also emphasized. First, some of the respondents emphasized challenges related to the establishment of national matching funds. Second, some argued that the current funding mechanisms are not well adapted to the objectives of NORIA. Finally, lack of clarity with regard to the roles and mandates of NICE and NordForsk was emphasized as an important challenge.

4.2.1 Difficult To Agree on National Matching Funds

The fact that the establishment of joint programmes at the Nordic level requires two-thirds of national funding indicates that these programmes must be in line with the priorities of the national agencies. The bigger the programmes get, the more money is involved, and the more difficult it can be to get the national funders to play along. On the basis of the interviews we conducted, it is possible to emphasize two main obstacles in this context.

First, some respondents argued that there are a number of structural challenges that need to be overcome. As already mentioned, co-funding is sometimes difficult to obtain owing to legal differences and institutional complexity. While in some countries the institutional complexity that exists at this level makes it difficult to establish where key decisions are to be taken, the legal challenges actually prevent agreements on joint funding in some cases. Still, one of the main tasks of NordForsk is to facilitate such joint funding. Many respondents argued that NordForsk should give more priority to this role. It was emphasized by several that NordForsk could facilitate the establishment of joint programmes through a closer cooperation with the national funding institutions, as well as the NOS committees. While the NORIA-net instrument²⁶ has been designed for such a purpose, it was argued that NORIA-nets could have been used even more strategically by NordForsk.

Second, some commented that they had experienced a shift towards a more top-down governed research approach within the formalized Nordic R&I cooperation. If this implies that national funding agencies are not being involved along the way, they see this as a challenge. The TFI experiences have shown how important it is that the national research councils and funding agencies get informed and involved in an early stage. According to Arnold & Eriksson (2009), the first draft proposals for the TFI in 2008 were greeted with serious discussions and negative responses that could have been avoided if the agencies had been included at an earlier stage. The agencies reacted negatively to the tendency within the proposals to allocate some of their R&D spending to the TFI without their having been consulted about this.

4.2.2 The Limits of the Existing Research Funding Instruments

As mentioned in Chapter 2, NordForsk has a portfolio of different funding instruments. Throughout our interviews, it became clear that there are many aspects regarding NordForsk's funding instruments that can be questioned. The most overarching question was related to whether the portfolio is too broad and whether it would be better to narrow it down to fewer instruments. Several of the respondents felt there was a need for a more focused and strategic approach.

Another important question that was addressed concerned the extent to which existing instruments were well adapted to attaining the objectives of NORIA with regard to excellence. Some argued that the funding for the NCoEs is too small to make a difference, and that the money should rather be spent on activities that create a more obvious added value, such as the establishment of Nordic research infrastructure.

The NORIA-net is another instrument that was discussed by several of the respondents. Many of them argued that this instrument has great potential but needs to be used more strategically to serve its purpose.

Finally, some questioned whether the instruments are well adapted to larger programmes, such as the TFI. Further, they argued that it might be better to develop specific instruments that are more in accordance with the content and objectives of the different programmes.

4.2.3 NordForsk and NICE: Unclear Roles and Mandates

As we have seen, NordForsk and NICE operate within a complex institutional landscape. In addition, their roles and mandates are somewhat unclear. Cooperation between the two institutions also needs to be strengthened if the main objectives of NORIA are to be achieved.

NordForsk

Respondents had different perceptions of NordForsk and its main tasks, and there was a degree of uncertainty as to whether NordForsk was primarily an actor (funding agency and policy advisor) or a facilitator (coordinator) for joint Nordic actions. Several of the respondents felt that this vagueness was

²⁶ As in the ERA-NETs, it is the national funding agencies that are the participants in this funding instrument. The NORIA-net instrument has proved to be fruitful, and some NORIA-nets have also resulted in joint programmes (see Chapter 3).

affecting NordForsk's performance negatively, as none of the roles were fulfilled properly. Most of the interviewees argued that Nordic research cooperation would be strengthened if NordForsk managed to cultivate a role as a coordinator and bridge-builder between the national funding agencies and the NCM.

By 'coordinator', respondents were referring to the role NordForsk has in relation to the national funding agencies. NordForsk's budget is limited, and the Nordic funding model presupposes that NordForsk will manage to secure national matching funds from the national funding institutions for Nordic purposes. This requires a close cooperation between NordForsk and the national research councils, based on mutual trust and a common understanding of the institutions' different roles. The NOS committees are also important partners in the sense that they have a close connection to the research level in their respective disciplines. It seems that NordForsk has not managed to live up to expectations of how it might function as a coordinator, and that it has been perceived as an actor – in some cases even a competitor to the national funding institutions.

Several of our respondents saw NordForsk in the role of an important *bridge-builder* between the national funding agencies and the NCM, but felt that NordForsk had failed to adequately fulfil this role. In this context, such a role includes both providing policy advice to the NCM and ensuring that political initiatives coming from the Nordic Council of Ministers are in accordance with national priorities and activities. Respondents emphasized the fact that there seems to be a 'missing link' between the agency level and the policy level in Nordic cooperation. In addition, it was stressed that while the education sector had HØGUT,²⁷ there was no equivalent advisory group for the committee of officials on research (EK-U).²⁸ Before the establishment of NordForsk, the Nordic Council for Research Policy (*Nordisk forskningspolitisk råd*) functioned as an advisory board on these matters. The idea was that NordForsk would take over this role. However, since NordForsk has no formal link to the national ministries, this has not been defined as one of its main tasks. Beyond the contact that NordForsk has with the national research agencies, it has established and identified a policy advisory role towards the Nordic Council of Ministers, particularly the secretariat in Copenhagen (MR-U). It should be noted that there exists an ad hoc group for research within EK-U, which consists of ministry officials and was established in connection with the TFI.²⁹ However, according to the respondents represented in EK-U, the role of this group is not as clear as that of HØGUT.

NICe

NICe was created in 2004 by a merger of the Nordic Industrial Fund (NI) and Nordtest. This also implied a change of focus. While NI funded both research (mainly) and innovation, NICe funds only innovation projects. Not all of the respondents were aware of this change in priority, which thus entailed a certain lack of clarity in perceptions of NICe's role. In addition to funding innovation projects, NICe also has a responsibility for removing cross-border barriers. This might make NICe's mission even more unclear – is it primarily a funding institution or a policy-implementing institution?

As with Nordforsk, there are challenges for NICe regarding the relationship between the national innovation agencies and MR-NER. Some argue that NICe should have a clearer mandate to implement policies coming from MR-NER. However, MR-NER is in many instances not in close contact with the national innovation agencies. For the research side, the link between the national agencies and MR-U is maintained through NordForsk's board. This is not the case for NICe, whose board

27 HØGUT is the advisory group for Nordic cooperation on higher education. Its main task is to strengthen and develop the Nordic educational community. This is done by contributing to political debate on these issues, following up on various Nordic commitments and agreements, and functioning as a forum for exchange of information.

28 Each council of ministers has a committee of officials (EK), made up of representatives from the respective ministries, that follows up on the decisions made by the ministers.

29 The ad hoc group has a mandate until the summer of 2010 and was established in connection with the TFI, but there are reasons to believe that the group will transform itself into a permanent group.

consists of representatives from the business sector and only a few innovation agencies. According to representatives from the national innovation agencies, the fact that the agencies are underrepresented on the board also complicates NICE's role as a coordinator between these agencies. Some respondents stated that NICE should take more responsibility for coordinating innovation activities and creating synergies between the national innovation agencies. In cases where the national agencies do not feel that they have been involved in the development of Nordic innovation strategies, they are often reluctant to co-fund Nordic innovation projects. A working group was established by MR-NER and the national agencies in 2006–2007 to find a solution to this problem. However, its work did not lead to any changes.

Lack of Cooperation Between NordForsk and NICE

In an attempt to link research and innovation more tightly together, NordForsk and NICE have been co-located in Oslo. Still, the two institutions are independent organizations with separate administrations and management, and surprisingly little cooperation. There are several reasons for this last point. First, the lack of cooperation is a direct consequence of the sectorization mentioned above – a sectorization that is not only evident within the Nordic Council of Ministers, where research and innovation are the responsibility of two different councils, but also at the national level, where innovation and research agencies report to different ministries. Finally, there is a more profound reason for the lack of cooperation, which is due to the fact that there are two very different cultures involved. While a small amount of innovation is closely linked to research, for the greater part of this type of activity the gaps are much wider. For instance, NICE's strategy is built on a user-driven innovation concept, which implies that the market, business plans and sharing of resources are as important as research. Nevertheless, some respondents called for more research-based innovation programmes administered by NordForsk and NICE together.

4.3 RESEARCHERS/OPERATIONAL LEVEL: CHALLENGES WITH PROVIDING EXCELLENCE IN RESEARCH

It will not be possible to successfully implement NORIA unless representatives from the research and operational level are included. As a matter of fact, this level is the foundation for any Nordic research and innovation cooperation. To provide excellence in research requires sufficient levels of interest from competent researchers and innovation actors to create real competition between top scientists and experts. The question is whether the Nordic R&I system is designed to achieve this.

4.3.1 Nordic Cooperation and Excellent Research

All of our respondents at the research level emphasized the need for a Nordic funding level as a supplement to both the national and the EU levels. Of course, such a response might be interpreted as a 'politically correct' answer from researchers who have received funding from that level. As one researcher commented, 'there is never too much money for research'. In fact, *where* the funding comes from is to some extent irrelevant from a researcher's perspective. A researcher is (and should be) preoccupied with producing excellent research. But, since all researchers are dependent on funding, the existing Nordic funding mechanisms will sometimes create Nordic cooperation that might otherwise not have taken place.

In some cases, such cooperation will have an obvious added value. For instance, all of our respondents emphasized the need for stronger Nordic cooperation with regard to research infrastructure. In addition, some mentioned that there are a few research areas where the best research community is located only in the Nordic region. Others emphasized that there are scientific areas where there is an interesting complementarity between the Nordic countries that makes Nordic cooperation particularly fruitful.

Still, it is important to note that Nordic research cooperation does not always have an added value. As mentioned above, all of the researchers we interviewed were positive towards a Nordic funding level, but they also argued that it was often the very existence of Nordic funding that made them cooperate on a Nordic level. Some even admitted that if they had other funding opportunities, they would prefer cooperating with experts from other countries over Nordic researchers. In such cases, it can be argued that a broader cooperation perhaps would create more excellence than a Nordic cooperation. At the very least, this shows that it is important to have a clear idea of what kind of research the Nordic level should finance.

4.3.2 The Orientation of the Funding System and Excellent Research

While the funding source might be irrelevant for the performers at this level, the character of the funding system is perceived as important. Most of the interviewed researchers argued that Nordic funding instruments were too ‘top down’ in their orientation. In their view, this was not stimulating excellent research. As they saw it, excellence can only be obtained through bottom-up processes, where researchers themselves can decide the thematic and methodological approach of research. It was argued that too much top-down-initiated research involved a risk that research policy will be guided by shifting trends rather than by the objective of producing excellence in research. While the policy level (and to some extent the agency level too) also has other concerns – such as stimulating *relevant* research or research that can contribute to solving important societal challenges – a researcher is first and foremost preoccupied with his or her research interests. Thus, to achieve the main goals of NORIA, it is important to maintain a good balance between these two approaches.

4.3.3 The Nordic Funding Instruments and Excellent Research

In addition to the funding source and the orientation of the funding system, the *type of instrument* also has consequences for the quality of research. In fact, if excellent research is to be produced in the Nordic region, it is essential to have funding mechanisms that ensure this. Nordic funding is limited to ‘glue money’, a type of funding that comes on top of national basic funding. Such funds primarily cover funding for networking, administration and coordination, not salaries. Some respondents argued that, given these budget restraints, it would be better to focus on smaller-scale instruments, such as bottom-up researcher networks and research training courses, rather than more resource-demanding NCoEs and thematic programmes. Others expressed the opposite point of view. They believed that even though Nordic funding was limited, it was only through the NCoE instrument that it was possible to contribute to excellence in research at the Nordic level. In their views, the NCoE scheme provided an important supplement to national funding, since it built on existing centres at the national level, created critical mass, and thereby might also function as a stepping stone to broader European and international research cooperation. In a written interview in the magazine *Forskningspolitikk*, Hans Christian Stenseth, a renowned professor and the leader of the NCoE EcoClim, put it like this:

The model of merging Nordic research groups is promising, but a lot remains to be done. The funding must be of another magnitude to attain the expected effect. Still, it is easier to create critical mass that gives international gravity through cooperation. We have a lot to learn from each other in the Nordic region, and at the same time we can more easily attract international expertise. Increased visibility in Europe, and globally, is exactly the aim of the Nordic model (Ramberg, 2005).³⁰

4.3.4 Challenges for Innovation Stimulation

Since companies are not always willing to take financial risks themselves, innovation is in many cases dependent on national or international funding. As for the research level, it is less important where this funding comes from.

³⁰ The citation was translated from Norwegian to English by the editors of this report.

A crucial difference between research and innovation, however, is that the outcome of a successful innovation project is a commercially successful product/service. In many instances, a company with a potential commercial success is reluctant to share its knowledge with other partners. This is true both for research-based innovations and for other types of innovations. Therefore, there is a need for a system of revenue-sharing among partners/owners. In cases where several companies are involved, this is typically done by creating a new commercial vehicle. NICE only provide grants to consortia of at least three partners (from three different countries), and this constitutes a difficulty for commercial innovation projects. In order to meet these challenges, NICE's projects mainly focus on creating common platforms for product development and knowledge-sharing, instead of supporting a particular product.

Furthermore, some of the respondents at the operational level (companies) argued that it was difficult to distinguish between product development and innovation. They argue that while NICE is expecting some kind of commercial success from the projects, the funding that is provided cannot be used for product development.

4.4. DIFFERENT PERSPECTIVES ON DIFFERENT LEVELS

As shown in previous sections, a number of different types of challenges exist on different levels within the R&I system. The different levels also have different perspectives concerning the main purpose of the Nordic cooperation and where to find the Nordic added value. There are also different views on what is the best way to reach the goals of the cooperation, a top-down or a bottom-up approach? The existence of such a range of perspectives among the main stakeholders represents perhaps the main challenge for a successful implementation of NORIA. In this section, we will first discuss the different perceptions of the concept of Nordic added value before continuing with a discussion of the different perspectives concerning implementation.

4.4.1 Different Interpretations of 'Nordic Added Value'

Research

One important question is to what degree the different stakeholders at different levels have the same understanding of the main goals they want to reach by cooperating on a Nordic level. In other words, what are their interpretations of the concept 'Nordic added value'? If the stakeholders have different goals for the cooperation, it is also difficult to agree on the means to reach them. One way of identifying the differences in goal perception is to show how the concept of Nordic added value is understood differently at different levels.

The whole idea of having a Nordic funding level for research and innovation is that it should support joint Nordic efforts in areas where there is a so-called Nordic added value, meaning that the Nordic level contributes to results that the countries could not achieve by acting individually. As Dan Andr e (2008: 49) puts it,

No one is interested in having a forced collaboration based only on the fact that we are Nordic countries. There must be some real benefits or added value from such collaboration. Otherwise the collaboration could easily become an obstacle.

For several reasons, 'Nordic added value' is not an easy concept. First of all, it is difficult to measure scientifically the degree to which a project or programme has a Nordic added value, as we will never know whether something similar would turn up without being funded by Nordic money. Second, even when there are good and obvious reasons for 'going Nordic', one might always ask whether the results might have been even better had the cooperation been broader. Maybe the real experts in the field are located in the UK or Germany? Third, the concept does not have a clear-cut definition in everyday use by different stakeholders in the area of R&I.

In a report from the Nordic Council and the Nordic Council of Ministers, Nordic added value was defined in a comprehensive and manifold way as

activities that otherwise could be undertaken at the national level, but where concretely positive effects are achieved through common Nordic solutions, demonstrating and developing Nordic solidarity and increasing Nordic capabilities and competitiveness (quoted in Arnold et al. 2006: 41).

How this definition would be operationalized, however, remains somewhat unclear.

According to the respondents in our interviews, the term has come to mean a whole lot of different things. Respondents at the different levels often emphasized similar aspects, particularly the need to focus on areas where the Nordic countries have: unique competence (welfare, education, health, the Arctic region, climate change, energy, Nordic history and language) or complementary competence (e.g. energy); a potential for creating critical mass and thereby excellence; a potential to increase the visibility or attractiveness of Nordic research vis à vis the European or the broader international research community; and a potential for using the Nordic level as a stepping stone to European or the broader international research community.

The policy, agency and research/operational levels seem to agree on the research areas where a Nordic added value might be found. Still, they provide different explanations for why this is the case.

On the policy level, the willingness to cooperate often springs from an interest in achieving particular political goals aimed at *solving important societal problems*. The TFI can serve as a recent example. The TFI was part of a larger globalization initiative, where the grand political goal was to make a concerted effort at the Nordic level on climate, energy and the environment. However, the decision to establish the TFI did not necessarily rest on an obvious Nordic added value in the sense that the initiative could not be implemented on a national or European level. Indeed, there were several discussions on this matter in the initial phases of the process. However, it might be argued that the TFI had a Nordic added value in the sense of making the Nordic region *visible and more competitive* within a European and international context.

It is our impression that representatives from the agency level have a more instrumental approach to Nordic R&I cooperation, as they to a larger extent justified cooperation using either *economic* or *research-based* arguments. In the interviews, they often emphasized the need to cooperate on a Nordic level for financial reasons – for example, on the creation of common research infrastructure. It was also argued by some that it might be relevant to have a division of labour among the Nordic countries in some areas. In addition, representatives from the agency level mentioned the need to cooperate more closely in order to develop common procedures for research administration, such as a common system for peer review.

Researchers seemed to have a somewhat different approach, in the sense that cooperation was most often motivated by individual needs. As shown in Chapter 2, researchers do cooperate on all sorts of different thematic issues, both with and without funding. The researchers we interviewed indicated clearly that they found it fruitful to cooperate on a Nordic level for many different reasons (like those mentioned above), and there are reasons to believe that the researchers that cooperate without funding also see an added value in so doing. Still, some of our respondents at this level also argued that they cooperated with researchers from other Nordic countries because it is easier (cultural community). Some argued that researchers are instrumental, in the sense that they always adopt a cost–benefit approach to whom they cooperate with. In fact, in some of our interviews, researchers that had received funding revealed that, had it not been for the Nordic funding, they would have preferred to cooperate

more closely with non-Nordic colleagues. The Nordic cooperation in which they were participating at the time of the interview was stimulated by the funding from NordForsk, not the need to cooperate on a Nordic level in itself. According to some, the main issue for a researcher is to get research funding, and it matters less whether the funding is national, Nordic or European.

As we have shown above, there are different interpretations of the concept 'Nordic added value'. This is particularly a challenge when there are conflicting interpretations, or if it turns out that Nordic added value could actually refer to almost anything. As noted earlier, joint programmes need anchoring at the national funding level. In the case of the TFI, politicians decided on the kinds of societal challenges that would be addressed at the Nordic level. There were numerous discussions on where the Nordic added value lay. However, if stakeholders at the agency level do not understand or agree on why these problems need to be addressed at the Nordic level, it may be difficult to free national funding for such purposes. When researchers apply for funding from NordForsk, one criterion is that they have defined in what way the research output will provide a Nordic added value. If this concept can be defined in many different ways and come to mean almost anything, such a criterion is of little value. For this criterion to have any substance, there needs to be a clearer understanding of what it means across the different levels in the R&I system. Otherwise, the legitimacy of the Nordic R&I cooperation may be negatively affected in the longer run.

Innovation

With regard to innovation, it is the creation of *commercial* value that is essential. Hence, the question of Nordic added value becomes a question of whether a Nordic perspective creates more commercial value than national or international perspectives – or at least creates this value more rapidly than would have been achieved nationally. In its nature, innovation has a more pragmatic 'Nordic added value' character. The political system wants to stimulate entrepreneurship and willingness to invest and take risks, which should make the region's economies more innovative. Traditionally, innovation policy has on one hand focused on creating innovative environments and encouraging individuals (and companies) to be innovative, for example through networks. On the other hand, innovation agencies provide funding for projects that will enable companies to develop innovative products and services. As mentioned above, these types of projects usually take place within a single company, which may not be eager to share with others. This may preclude the possibility of Nordic (and other international) innovation collaboration.

One way of addressing this issue is to work on the creation of innovative environments – that is, improving the innovation system. As mentioned elsewhere, this can be done through networking, dissemination and technology transfers from universities to groups of companies. In relation to such an approach, though, people very quickly ask: Why Nordic? In many cases, better contacts may exist outside the Nordic area. Alternatively, products and services may have already been developed outside the Nordic region and may be ready to be introduced into the market. There is no easy way of using the pragmatic 'Nordic added value' in relation to innovation. Instead of searching for a Nordic added value, NICE is supporting projects with an extra Nordic dimension. The Nordic food sector provides a good illustration. All of the Nordic countries have a net export of food, high-quality research and a well-developed food industry. In this field there is a great potential for a Nordic added value of working together. However, it is difficult to measure the added value of a Nordic project or programme to any exact degree, as we will never know whether something similar might have turned up without Nordic funding.

4.4.2 Top-Down Versus Bottom-Up Approaches

Closely linked to the concept of added value are the differences in approaches to R&I funding mechanisms – that is, differences of opinion on whether these should be dominated by bottom-up or top-down approaches. It is important to note, however, that the Nordic research cooperation – including non-formalized and formalized cooperation – is often described as being bottom-up, especially in comparison to European research cooperation. As shown in Chapter 2, this is due to the fact that a

substantial part of the Nordic R&I cooperation actually takes place independently of the funding from the NCM. In fact, most of the Nordic R&I cooperation takes place on a non-formalized basis, without specific funding being received for engaging in Nordic cooperation.

When we look at the R&I cooperation that is funded through the Nordic Council of Ministers and its underlying institutions, it becomes clear that representatives from the different levels of the system adopt different approaches. At the risk of over-simplifying, one might say that researchers often want more bottom-up approaches, as they feel they have little influence over the thematic focus or content of the programmes being decided at the Nordic level. When we look at the funding mechanisms within the Council structure, we find this cooperation is to a large extent governed through top-down decisions of a political nature, and the funding is mostly channelled through common pots and joint programmes. Representatives from the policy level within the Nordic R&I system make political decisions concerning what kinds of issues should receive investment at the Nordic level. While the agency level often has limited influence on these policy decisions, it is at that level that discussions and decisions on how the political decisions are to be implemented take place. Sometimes, there are diverging views between the policy and agency levels that make this division of labour complicated.

In some cases, a top-down approach is decisive for the outcome. Though the TFI process has been the subject of considerable criticism (Arnold & Eriksson, 2009), there is general agreement that such a programme would not have been realized had it not been for the political decision taken by the prime ministers. Another example is the development of common infrastructure, which is another important goal for NORIA. Since the development of research infrastructure is expensive, it is impossible for the agencies to take decisions on such investments in the absence of political will and political decisions.

While the TFI was established to fulfil the ambition of encouraging excellence in research within the Nordic region, some of our respondents questioned whether it is possible to provide excellence through such a top-down approach. Some argued that excellence presupposes bottom-up processes and more curiosity-driven research than programmes such as the TFI open up for. This leads to a question of a more general kind: Is it possible to attain overarching political goals and at the same time safeguard the development of excellent research? There are no definitive answers to this question and, as shown here, different approaches at different levels can represent an obstacle for the attainment of goals.

It is interesting that the EU, which is often characterized as having a top-down-dominated R&I policy, emphasizes the need for a balance between the two approaches. While the EU Framework Programmes must be characterized as top-down, the European Research Council (ERC) stimulates curiosity-driven research through a bottom-up approach. In a summary report from a workshop on the future of ERA held in Alcalá de Henares, Spain, in March 2009, the bottom-up approach of the ERC is described as 'the best way to secure the development of a diverse research expertise' (Conference Proceedings, 2009). Within the Nordic research collaboration, only a few of NordForsk's instruments (such as the researcher networks and the researcher training course) and the NOS-HS grants can be said to have a genuinely bottom-up character.

Whether there is a need for more bottom-up funding or more strategic top-down processes within the Nordic R&I cooperation is an ongoing discussion. The NOS committees and researchers often see NordForsk as being too top-down oriented. Other respondents, both from the ministries and from the research councils, argue that the bottom-up perspective is taken care of nationally, and that the role of NordForsk is to stimulate more top-down strategic programmes to create Nordic added value in specific research areas. To ensure that this happens in the best way, it has been argued that NordForsk must play a more pro-active role towards the political level, as well as having more direct contact with the funding level nationally.

It is a challenge for the Nordic R&I system to balance between the top-down and the bottom-up perspective. The establishment of larger joint programmes necessarily includes a somewhat strategic

and political perspective, and decreased possibilities for bottom-up processes. Different countries may have national research policies with quite different profiles, and there is considerable variation in the degree to which the bottom-up or the top-down perspective is predominant nationally. Some of the respondents expressed a fear that countries with a pronounced bottom-up perspective in their national R&I policy will resist going into Nordic joint programmes of a more strategic character.

4.5 PRELIMINARY CONCLUSIONS

In this chapter we have focused on the different challenges facing the Nordic R&I cooperation. We find there are a number of different sorts of barriers at different levels of the research and innovation system.

At the policy level, the main challenges are related to the complex – and perhaps not so efficient – institutional framework. There are many different institutions on the R&I scene. They often have unclear roles. There is little communication between them. And they cooperate only to a limited extent. Linguistic, legal and administrative differences between the countries also represent a challenge for the cooperation.

At the agency level, the challenges are first and foremost linked to problems regarding coordination of national matching funds, the adaptation of the instrument portfolio according to future challenges, and the relationship between NORIA's two main pillars: NICE and NordForsk.

At the researcher/operational level, the challenges are linked to particular aspects of the Nordic funding system and how these can act as hindrances for the development of more excellence in research.

There is also considerable variation in what interviewees at the different levels read into the concept 'Nordic added value'. Furthermore, different views are found at the policy, agency and researcher/operational levels regarding what is the most appropriate approach to research funding – a top-down approach or a bottom-up approach? As shown in this chapter, these differences across the levels can represent significant challenges in themselves.

Non-research-based innovation is placed high on the agenda in most Nordic countries. Yet, a Nordic collaboration in this field has not yet found its form. An important challenge is the differences in understandings of innovation among actors in the Nordic countries, both within and between the countries.

NORIA is still far from being a reality, and several challenges exist for efforts to achieve the goals set out for it. However, it is important to bear in mind that NORIA is a recent concept, while Nordic R&I has a longer history. The vision of NORIA was launched in 2004, and it is not unusual that some time is required before an idea, a concept and a set of goals are internalized in stakeholders' ways of thinking and acting. In any case, it is only when barriers and challenges have been identified that it is possible to do something about them.



5. Concluding Remarks

The aim of this report has been to describe and analyse Nordic cooperation in relation to research and innovation. This has been done through a presentation of the main characteristics of both the formalized and the non-formalized aspects of the Nordic cooperation, and through an analysis of the main achievements and challenges. Chapter 2 presented an overview of the formalized cooperation that takes place both within and outside the structure of the Nordic Council of Ministers, as well as different types of non-formalized Nordic R&I cooperation among researchers and universities. While Chapter 3 discussed some of the main achievements of the Nordic R&I cooperation according to the objectives set for ERA and NORIA, Chapter 4 highlighted some of the challenges that this cooperation faces. In this final chapter, we will summarize the main findings and attempt to answer the two questions raised in Chapter 1:

- *What characterizes Nordic research and innovation cooperation and what is the added value of this cooperation?*
- *To what extent has the main ambition of NORIA been achieved and what are the main challenges?*

5.1 THE MAIN CHARACTERISTICS OF NORDIC R&I COOPERATION

In this section, we will summarize the main characteristics of the Nordic R&I cooperation.

First, the Nordic R&I cooperation has long traditions and is based on a strong political will to cooperate. The cooperation also takes place within an established, although complex, political and institutional framework. Under the umbrella of the Nordic Council of Ministers (NCM), a range of different Nordic institutions and organizations fulfil different roles and needs within the Nordic R&I cooperation. In addition, several institutions outside the NCM structure are also involved in promoting Nordic cooperation in this field. In fact, a large part of the formalized Nordic research cooperation is funded by various committees and institutions that have been established within a variety of different disciplines.

In spite of the institutional complexity, the Nordic R&I cooperation is characterized by low levels of bureaucracy and hierarchy, particularly in comparison with the EU. In general, the Nordic R&I system is more bottom-up oriented than the EU system. This follows naturally from the fact that there are fewer countries involved in the Nordic cooperation and they are more similar to each other, which results in a somewhat easier competition for the researchers. The researchers interviewed for this study all felt that it was a lot easier to take part in Nordic-funded projects than in EU projects. They experienced less bureaucracy, a higher probability of getting applications approved, and less controversy between the partners involved in the projects.

But, while the competition is lower, the amount of money available is also smaller. In fact, the formalized cooperation within the NCM structure operates within a relatively limited budget (around EUR 20 million a year), which places certain restraints on the cooperation.

Another important characteristic of the Nordic R&I cooperation is that it is built on *trust*. Most of our respondents referred to this when describing and explaining the Nordic cooperation. This 'Nordic trust' is most likely a result of the Nordic countries being part of a common cultural community.

Finally, a significant part of the Nordic R&I cooperation can be characterized as non-formalized. The main characteristics of this aspect of the cooperation is that it is initiated from the bottom up by the research/operational level without any funding being made available to facilitate such cooperation. In fact, several examples of such non-formalized research and innovation cooperation between researchers, groups of researchers, companies and institutions can be found within most disciplines and branches in the Nordic region. This indicates that researchers find it both important and fruitful to cooperate on a whole range of different topics, and that 'Nordic added value' actually does exist.

5.2 NORDIC EXPERIENCES IN THE R&I ARENA: WEAKNESSES AND STRENGTHS

As we have seen in the previous chapters, the objectives of NORIA are to a large extent similar to those of ERA. While important achievements can be identified, the Nordic region still has a long way to go in order to fulfil these goals.

First of all, the concept of NORIA has not been internalized into everyday patterns of thinking and talking within the ministries and research councils. NICE's mid-term evaluation shows that the term 'NORIA' almost never appears in the Nordic countries' policy-strategy documents for innovation and only to some extent in the similar documents for research (Andersen 2009). Second, it is questionable whether stakeholders at the policy and agency levels actually are familiar with the objectives of NORIA.

As indicated in the previous chapter, there are also several challenges regarding the attainment of those objectives. At the policy level, the main challenges are related to the complex framework of institutions with unclear roles. Linguistic, legal and administrative differences between the countries also represent significant challenges that will need to be addressed if the objectives of NORIA are to be achieved. At the agency level, the challenges are first and foremost linked to problems regarding coordination of national matching funds, the adaptation of the instrument portfolio according to future challenges, and the relationship between NORIA's two main pillars. It can be argued that the idea of linking research and innovation closer together through NordForsk and NICE has not been carried through. There are also grounds to question whether the current Nordic funding system is designed to fulfil the NORIA vision.

Notwithstanding these challenges, over recent years the Nordic countries have gained some valuable experience with successful common-pot arrangements and various funding instruments and programmes. In fact, the whole formalized Nordic cooperation can in itself be understood as a common pot with no fair return. However, there are also a few examples of well-functioning 'joint programmes', understood in the sense that three or more Nordic countries have co-funded R&I programmes based on the principle of real common pot. The TFI is the most ambitious and the latest example of a joint Nordic programme. It is too early to give a verdict on whether the TFI in itself can be said to be a success or not. Still, the fact that the Nordic countries have managed to establish a large, costly and comprehensive programme on climate, energy and the environment in a rather short time is interesting. This is explained by the fact that the programme was initiated by the prime ministers, which gave the process massive political weight and the national funding agencies less possibility for withdrawal. Moreover, the programme was built from scratch, and it may be easier to establish new programmes rather than trying to merge already existing programmes and initiatives.

Even though the TFI is the only programme that is somewhat in line with the EU definition of 'joint programming', there are, as we have seen, several examples of co-funded programmes with a common pot within the Nordic R&I cooperation. A key factor is that the Nordic funding model is built on voluntary participation. While the Nordic funding model is based on two-thirds funding from the national states and one-third top-up funding from the Nordic level, the different national research councils can always choose whether they want to participate in a co-funded programme. Currently, however, a Nordic co-funded programme requires the participation of a minimum of three Nordic states in order to become a reality.

5.3 NORDIC R&I COOPERATION AND THE REALIZATION OF ERA

It is important to stress that Nordic R&I cooperation is not a substitute for cooperation at the European level. Rather, it may contribute to building Nordic strength *within* the European cooperation and thereby also strengthen ERA. The Nordic R&I cooperation is first and foremost engaged in research and innovation on a *Nordic* level that can create some kind of Nordic added value. According to Dan Andree

(2009), it is typical that instruments at the Nordic level have strengthening the Nordic countries as their main goal and that they stimulate Nordic cooperation as such. Still, Andree also argues that these Nordic instruments in general will have much more impact on the implementation of ERA than most national instruments. As this report has shown, there are several examples of Nordic instruments and programmes that can be seen as having the potential to make the Nordic region stronger, more attractive and more visible internationally. This is important not only for the Nordic region as such, as a reinforced and enhanced Nordic R&I cooperation may in turn strengthen ERA, as well as broader international R&I cooperation.

One example of a programme that can contribute to making the Nordic region stronger in this context is the NCoE scheme. This is an effective way of introducing the best of Nordic science to the European research arena, since experience of Nordic research cooperation can be a significant advantage when researchers are competing or collaborating with other European research units within ERA. The TFI programme may also be seen as an opportunity for a stronger connection between NORIA and ERA. In fact, this programme has a great potential for including also other EU member-states. Moreover, through the TFI process, valuable experience has been gathered in relation to how to establish joint programmes, which might also be of value for the EU.

Bearing in mind that NORIA is an integral part of ERA and the wider international research community, one might ask whether the Nordic funding model (which presupposes participation from a minimum of three Nordic countries) is sustainable in the future. In fact, it can be argued that this model actually represents a hindrance for common actions, and that it would be more fruitful to take the Nordic cooperation one step further and view the Nordic region as a whole. In focusing more on the Nordic region as a unity, the number of countries involved would be less important than the result of the cooperation. It is possible to imagine that Nordic strength may result from one or two Nordic countries participating in a European or international programme.

5.4 LOOKING FORWARD

This report has sought to present the Nordic R&I cooperation with all its strengths and weaknesses. It is intended to feed into the next NORDERA report, which will view this cooperation in relation to ERA and try to identify best practices and lessons learned. Based on the main findings and conclusions from this report, key questions in the next report will include:

- *How can Nordic cooperation contribute to the implementation of ERA?*
- *What are the synergies between Nordic cooperation and European cooperation?*

References

- Andersen, J. B. (2009). *Mid-Term Evaluation of Nordic Innovation Policy 2005–2010*. Oslo: Nordic Innovation Centre.
- Andrée, D. (2008). *The Nordic Research and Innovation Area (NORIA) and synergies with the European Research Area (ERA)*. TemaNord No.597. Copenhagen: Nordic Council of Ministers
- Arnold, E. & Carlberg, M. (2009). *Mapping Nordic R&D Cooperation Instruments – Report to the Nordic Council of Ministers: Education and Research*. Oslo: Technopolis.
- Arnold, E. & Eriksson, M.-L. (2009). *Experience from the First Nordic Top Level Research Initiative (Toppforskninginitiativ)*. Oslo: Technopolis.
- Arnold, E., Eriksson, A., Faugert, S. & Jansson, T. (2006). *Building Nordic Strength Through More Open R&D Funding: Study 3*, TemaNord No. 576. Copenhagen: Nordic Council of Ministers.
- Björkstrand, G. (2004). *NORIA. Vitbok om nordisk forskning och innovation. Huvudrapport*, TemaNord No. 542. Copenhagen: Nordic Council of Ministers.
- Brändström, D. (2003). *En nordisk dimension i nationale forskningsmiljøer. Nordiske forskningsinstitutioner under nationalt ansvar*, unpublished paper.
- Conference Proceedings. (2009). *New Worlds - New solutions Research and Innovation as a basis for developing Europe in a global context*. The Swedish EU Presidency Conference, Lund 7-8 July.
- Delsing, L.-O. & Åkesson, K. L. (2005). *Håller språket ihop Norden? En forskningsrapport om ungdomars förståelse av danska, svenska och norska*, TemaNord No. 573. Copenhagen: Nordic Council of Ministers.
- European Commission (2000). *Towards a European Research Area*, Communication to the Council No. COM 6. Brussels: European Commission.
- European Commission (2001a). *High-Level Expert Group on Improving Mobility of Researchers: Final Report*. Brussels: Directorate-General for Research.
- European Commission (2001b). *A Mobility Strategy for the European Research Area*, Communication No. COM 331. Brussels: European Commission.
- European Commission (2005). *The European Charter for Researchers: The Code of Conduct for the Recruitment of Researchers*. Brussels: Directorate-General for Research. EUR 21620.
- European Commission (2007a). *The European Research Area: New Perspectives* (Green Paper). Brussels: Directorate-General for Research.
- European Commission (2007b). *Improving Knowledge Transfer Between Research Institutions and Industry Across Europe: Embracing Open Innovation – Implementing the Lisbon Agenda*, Communication No. COM(2007) 182. Brussels: European Commission.
- European Commission (2008a). '2020 Vision For The European Research Area'. Brussels: European Commission.
- European Commission (2008b). *Developing World Class Research Infrastructure for the European Research Area*, Report of the ERA Expert Group. Brussels: European Commission.
- European Commission (2008c). *Towards Joint Programming in Research: Working Together To Tackle Common Challenges More Effectively*, Communication No. COM 468. Brussels: European Commission.
- European Commission (2009). *FP6 ERA-NETs Study: Impact Assessment of the ERA-NET Scheme Under the Sixth Framework Programme*, No. EUR23909 EN (June 2009). Brussels: Directorate-General for Research (Report prepared by Matrix Insight and the Rambøll Group).
- Gunnarsson, M. (2010) *International Research Cooperation in the Nordic Countries (a publication from the NORIA-net "The use of bibliometrics in research policy and evaluation activities)"* Stockholm: The Swedish Research Council.
- Klitkou, A. (2009). 'Analysis of Policy Mixes To Foster R&D Investment and To Contribute to the ERA Denmark', *ERAWATCH Country Report* No. EUR 23976EN/12. Seville: Joint Research Centre/Institute for Prospective Technological Studies.
- Lehtisalo, K. (2005). *The History of NORDUnet: Twenty-Five Years of Networking Cooperation in the Nordic Countries*. Kastrup: NORDUNET (http://www.nordu.net/history/TheHistoryOfNordunet_simple.pdf).

- Mattsson, P., Eriksson, M. L. & Åström, T. (2009). 'Analysis of Policy Mixes To Foster R&D Investment and To Contribute to the ERA. Sweden', *ERAWATCH Country Report* No. EUR 23976EN/28. Seville: Joint Research Centre/Institute for Prospective Technological Studies.
- Ministry of Culture (2007–2008). *St.meld. nr. 35 (2007–2008) Mål og mening. Ein heilskapleg norsk språkpolitikk*. Oslo: Norwegian ministry of culture. Oslo: Ministry of Culture.
- Møller, K., Mahncke, H., Mikkelsen, O. A. & Jensen, O. B. (2007). *Nordisk Konkurrencekraft – barrierer for erhvervsmæssig synergi*. Oslo: Nordic Innovation Centre.
- NC/NCM (1995). *Nordiskt samarbete i en ny tid. Det nordiska samarbetet i ljuset av folkomröstningarna om EU-medlemskap för Finland, Norge och Sverige*. Copenhagen: Nordic Council/Nordic Council of Ministers
- NCM (2000). *Budgetanalyse 2000 - det nordiske budget*. Copenhagen: Nordic Council of Ministers.
- NCM (2002). *Norden som en internationellt framstående forsknings- och näringsregion* (Green Paper). Copenhagen: Nordiska forskningspolitiska rådet.
- NCM (2004). *Innovationsboken. Nordisk styrka, nationell nytta och global excellence: Förslag till nordisk innovationspolitiskt samarbetsprogram 2005–2010*. Copenhagen: Nordic Council of Ministers.
- NCM (2009). *Sektorprogram: Uddannelse- og forskningssamarbejdet. Det danske formandskab for Nordisk Ministerråd 2010*. Copenhagen: Nordic Council of Ministers.
- NCM (2010). *Planer och budget 2010*. Copenhagen: Nordic Council of Ministers.
- NordForsk (2008a). *Conference Report from the NORIA Symposium on NCoE Experiences*. Kristiansand: Oxford Research AS.
- NordForsk (2008b). *Improving Research Capabilities: An Evaluation of the Possibilities for Increased Nordic Cooperation on Research Infrastructure* (NordForsk Policy Brief, prepared by NIFU STEP). Oslo: NordForsk.
- Pedersen, P. J., Røed, M. & Wadensjö, E. (2008). *The Common Nordic Labour Market at 50*, TemaNord No. 506. Copenhagen: Nordic Council of Ministers.
- Ramberg, I. (2005). 'Nordisk spissforskning – en god ide', *FORSKNINGSPolitikk* No 3. Oslo: NIFU STEP.
- Rylander, A. & Haselmayer, S. (2008). *Branding the Nordic Research and Innovation: Promoting the Nordic Region as an Attractive Destination for Global Investments in Research and Innovation*, Policy Brief No. 6. Oslo: NordForsk
- Schneider, J. W. (2010). *Bibliometric Research Performace Indicators for the Nordic Countries* (a publication from the NORIA-net 'The Use of Bibliometrics in Research Policy and Evaluation Activities'). Copenhagen: Royal School of Library & Information Science.
- Scordato, L., & Kallerud, E. (2009). 'Analysis of Policy Mixes To Foster R&D Investment and To Contribute to the ERA. Norway'. *ERAWATCH Country Report* No. EUR 23976EN/24. Seville: Joint Research Centre – Institute for Prospective Technological Studies.
- Viale, R. & Ghiglione, B. (1998). 'The Triple Helix model: a tool for the study of European regional socio-economic systems'. *The IPTS Report* 29. Seville: IPTS.
- Viljamaa, K. & Lemola, T. (2009). *Analysis of Policy Mixes To Foster R&D Investment and To Contribute to the ERA. Finland*. *ERAWATCH Country Report* No. EUR 23976EN/14. Seville: Joint Research Centre/Institute for Prospective Technological Studies.

Annex I: Interview Guides

The following interview guides were applied for the policy level, the agency level and the research level, respectively:

POLICY LEVEL: NATIONAL MINISTRIES AND THE NCM

A . What is Nordic research cooperation?

- **Nordic:** What would you say characterizes Nordic cooperation on research and innovation?
 - How does Nordic research cooperation differ from other regional research cooperation (e.g. Mediterranean) within Europe?
- **Added value:** An important aim of Nordic cooperation is Nordic ‘added value’ – What do you read into this concept?
- **Top-down/bottom-up:** Nordic research cooperation has traditionally been characterized as a type of ‘bottom-up’ cooperation. The TFI has led to more top-down cooperation also in the Nordic region. What do you think of this development?

B. Why go Nordic?

- What is the main reason behind the willingness to strengthen Nordic cooperation within research and innovation?
 - To promote excellence in research
 - To increase influence in the EU
 - To increase Nordic research cooperation as such
 - Other....
- What are the criteria for *successful* Nordic research cooperation?
 - Harmonization of national R&I policies
 - To develop sustainable programmes such as NCoE (joint programming, joint funding, etc.)
 - Results in research (scientific publications, innovation, broad dissemination)
 - Other....
- What are the advantages and disadvantages of Nordic cooperation compared with either national or wider European/international cooperation?

C. When go Nordic?

- Could you mention some specific research areas/thematic issues where the ‘Nordic added value’ would be more significant than others?
- What do you/your institution do to identify specific areas where Nordic cooperation will make a difference or have added value?

D. What has been achieved?

- How does Nordic R &I cooperation score on the objectives set by ERA?:
 - More mobility of researchers?
 - Development of common research infrastructure? (Examples....)
 - More excellence in research? (Examples....)
 - Knowledge-sharing (research–industry and dissemination)
 - Common priorities (joint programming....)
 - Broader international cooperation (Nordic cooperation as a stepping stone ... global agenda)

- What have been the main challenges/obstacles?
 - Legal differences
 - IPR (Intellectual property rights)
 - Different administrative practice
 - Other....
- What exactly has been done to overcome these obstacles?

E. Nordic cooperation and ERA

- What can ERA learn from Nordic cooperation? Or, in what way can Nordic cooperation learn from ERA?
 - How can Nordic cooperation contribute to the implementation of ERA?
- Do you think there are aspects of the TFI that can be/should be used or replicated in ERA/ another region?
 - *Other programmes/instruments you mean should be replicated?*
- What can be done on a policy level to profile Nordic research and innovation in the EU/ERA?

PROGRAMME LEVEL: NATIONAL FUNDING AGENCIES

A. What is Nordic cooperation?

- **Added value:** An important aim of Nordic cooperation is the Nordic ‘added value’ – What do you understand with the concept ‘Nordic added value’?
- **Top-down/bottom-Up:** Nordic research cooperation has traditionally been characterized as a type of ‘bottom-up’ cooperation. The TFI has led to more top-down cooperation also in the Nordic region. How do you perceive this development?
- **Inside/outside:** Is most of the cooperation between agencies organized by the NCM? How? Why?
- **NordForsk:** How do you see NordForsk’s role in the Nordic cooperation?
- **Challenges:** What have been the main challenges for Nordic cooperation between the different national funding agencies?
 - Legal differences
 - IPR (Intellectual property rights)
 - Different administrative practices
 - Other....
- What exactly has been done to overcome these obstacles?

B. Experiences with Nordic cooperation

- **Joint programming:** Can you give us concrete examples where Nordic cooperation has led to joint programming?
- **Common pot/distributed pot:** Experiences....
 - Successes/Challenges?
- **Instruments:** Would you say that the existing Nordic funding instruments are suitable? Too many? Too big? Too small? Too few?
- **NORIA-net:** What is your experience with your participation in various NORIA-nets (vs. ERA-NET)?

C. What has been achieved?

- How does Nordic R &I cooperation score on the objectives set by ERA?:
 - More mobility of researchers?
 - Development of common research infrastructure? (Examples....)

- More excellence in research? (Examples....)
- Knowledge sharing (research-industry and dissemination)
- Common priorities (joint programming....)
- Broader international cooperation (the Nordic cooperation as a stepping stone ... global agenda)

D. The Nordic cooperation and ERA

- **Stepping stone:** Has the participation in Nordic activities made you better equipped to take part in EU activities?
- **Lessons learned:** Do you think the EU/ERA can learn anything specific from the Nordic research cooperation? What?
 - What lessons can the EU learn from the Nordic procedures for project selection, management and evaluation currently deployed in joint research programmes?
- **Visibility:** What can be done on a policy level to profile Nordic research and innovation in the EU/ERA?

E. Examples of bottom-up initiated Nordic research and innovation cooperation

- Do you know of any such networks? Explain

PROJECT LEVEL: RESEARCHERS/PROJECT LEADERS

Project data:

Name of project:

Partners involved:

Date start:

Date end:

Type of funding:

- How did the project start and why?
 - Bottom-up?
 - Top-down?
- How is the project funded?
- An important aim of Nordic cooperation is Nordic 'added value'. What do you understand with the concept 'Nordic added value'?
 - What is the benefit of Nordic cooperation on this very project?
 - In your view, what are the advantages and disadvantages of Nordic cooperation compared to wider European and other international cooperation?
 - In your view, is there a need for a Nordic funding level in addition to national and European funding? Why/Why not?
- How would you evaluate the project? To what extent has it been successful? Has it led to:
 - excellence in research
 - the building of Nordic networks
 - increased researcher mobility/career opportunities
 - European/ international cooperation
 - Other....
- Is there, in your view, a need for different funding instruments at the Nordic or the European level? Why/Why not?

- What are your experiences with participating in Nordic versus European projects/networks?
 - application procedures
 - bureaucracy/paperwork
 - professionalism
 - professional advantage/learning aspects
- Are there any areas of research you can think of which are more suited for Nordic cooperation than others? If so, Which?
- Do you participate in/know of any Nordic research cooperation that is bottom-up organized/initiated from the research community itself without funding from the NCM or any other joint Nordic funding instruments.
 - What is the aim of this bottom-up constellation?
 - What were the reasons for establishing this cooperation
 - lack of funding possibilities
 - to be better equipped for funding
 - results in research
 - critical mass
 - Nordic cooperation as a training ground....
- Do you know of any examples where such bottom-up initiated networks/cooperations between researchers have led to a more formalized cooperation with Nordic funding at a later stage.
- According to you, what are the most important criteria for *successful* Nordic research cooperation?
- Has Nordic research cooperation improved your abilities/chances to take part in European/international research projects/networks. If so, in what way?

PROJECT LEVEL: NON-FORMAL COOPERATION

1. When and why did the cooperation start?
2. Do you receive funding for cooperating?
 - a. If yes, what kind of funding?
3. Was the cooperation initiated independent of funding?
4. Why is there a need for Nordic cooperation on this topic?
5. How many partners/countries are involved in the cooperation?
6. How do you cooperate?
 - a. How often and in what forms do you meet?
 - b. What are the results of this cooperation?
7. Do you participate in other forms of Nordic cooperation?
 - a. If yes, what kind of cooperation?
8. How important is this cooperation for your research
9. Has this cooperation resulted in broader European or international cooperation?
 - a. If yes, what kind of cooperation?

Annex II: The Research and Innovation System in the Nordic Countries

Cooperation between the countries takes place within the context of rather different R&I systems in the five countries.

In *Finland*, the research system is organized on three levels. First, the government is supported by a high-level advisory body (the Research and Innovation Council), which is led by the prime minister. The Council is responsible for the strategic development and coordination of Finnish research and innovation policies. Second, the key ministries concerned with research policy are the Ministry of Education and the Ministry of Employment and the Economy. While there is a historically developed sectoral division of labour between the two ministries concerning science and technology policy, cross-sectoral cooperation has increased in issues related to science and innovation during the past few years (Viljamaa & Lemola, 2009). In Finland, the approach has been to treat innovation policy and research policy as different facets of the same policy entity. Moreover, technology policy has developed towards a more broad-based innovation policy that also encompasses issues of research policy, service innovation, etc. The third level consists of the R&D funding agencies, the Academy of Finland (AKA), the Finnish National Fund for R/D and Innovation (SITRA), and the Finnish Funding Agency for Technology and Innovation (TEKES) (Viljamaa & Lemola, 2009).

In *Norway*, the Ministry of Research and Education has the main responsibility for coordinating the overall research and innovation policy, and is the largest source of government research funds. Several other ministries have large research portfolios, and each ministry is responsible for research related to its own sector in society. The ministries with the largest research portfolios are also standing members of the Government's Research Board (*Regjeringens forskningsutvalg*), which coordinates overall R&D policy under the lead of the Minister of Research and Higher Education. The Board has limited authority, and the highly sectorized funding structure of research generates challenges regarding the coordination of research assignments. The Research Council of Norway (RCN) is organized under the Ministry of Research and Higher Education, and is the only operational research and innovation policy agency in Norway. In addition to funding research and innovation, the RCN has a mandate to advise the government about research policy and to create communication and coordination arenas for actors within research, industry and government (Scordato & Kallerud, 2009). The support of research is a key part of Norwegian innovation policy. The RCN has an innovation division that funds research-based innovation projects that engage industry. Innovations that are not research-based are the responsibility of Innovation Norway. Innovation Norway has a broad range of programmes for facilitating innovations and innovative companies. Beside innovation projects, Innovation Norway organizes programmes for entrepreneurs and regional development.

In contrast to Finland and Norway, *Sweden* has a scattered governance system. While policy formulation is carried out largely at the ministerial level, different agencies are responsible for the design and implementation of individual policy instruments. The government ensures policy coordination at the ministry level. At the agency level, policy implementation is in principle dispersed and coordination is carried out informally and on an ad hoc basis. No formal and obligatory forums for coordination exist in the area of research and innovation policy and operations, and the lack of comprehensive coordination at this level is a recognized weakness. The main agency supporting R&D is the Swedish Research Council (VR), funded by the Ministry of Education and Research. Its main responsibilities include funding of research across the fields of the natural and social sciences, medicine and education. The funding is oriented mainly towards individual researchers, but research groups and institutions have received increasing funding in recent years. The Swedish Council for Working Life and Social Science (FAS), supported by the Ministry of Health and Social Affairs, is responsible for funding research on welfare, the

labour market, health and social services. The Swedish Council for Environment, Agricultural Sciences and Spatial Planning (Formas) supports research on ecological, conservation, natural resources-related and construction issues (Mattsson et al., 2009). It is a trend in Sweden to see research and innovation together. The latest research bill from 2008/2009 is called 'A Boost to Research and Innovation'. When transformed into more concrete policy issues, many of the most acute challenges for Swedish research policy are related to innovation policy, which in Sweden is often difficult to distinguish from research policy. In Sweden, many programmes and activities that in other countries are classified as innovation policy are to be found within the well-developed entrepreneurship policy.

The *Danish* research policy definitely addresses research as part of the innovation process. Research is regarded as a driver of innovation. This is reflected in the comprehensive research and innovation system. The Ministry of Science, Technology and Innovation is coordinating the research and innovation policy together with the Danish Agency for Science, Technology and Innovation. The main current research governance system can be said to be divided into two subsystems: one *advisory* function and one *funding* function. The Danish Council for Research Policy is offering *general advice* to Parliament and Government. Two bodies are offering both *advice in specific scientific matters and funding research projects*. These two are The Danish Councils for Independent Research (the umbrella organization for five research councils, which supports research-projects based on researchers' initiatives and ideas) and The Danish Council for Strategic Research. The Danish National Research Foundation and The Danish National Advanced Technology Foundation are both *funding* research. The latter is oriented towards commercialization of research results. This is also true for The Council for Technology and Innovation. Besides this, there are the R&D instruments of some of the sectoral ministries, such as the R&D programme of the Ministry of Food, Agriculture and Fisheries, and the Energy Technology Development and Demonstration Programme under the Ministry of Climate and Energy. The Danish Enterprise and Construction Authority (part of Ministry of Business and Trade) is responsible for developing good conditions for businesses in Denmark. It has several programmes for improving the innovativeness of Danish industry (Klitkou, 2009).

In *Iceland*, the Science and Technology Policy Council (STPC) is the key strategic body at the core of the R&D policy system. The role of the STPC is to define the strategic orientations for both science and technology policy. Iceland has a 'Science and Technology Policy' that covers science, research and technology policy, but also deals with the promotion of innovation. The Council is organized into two committees – the Science Committee and the Technology Committee – which prepare the decisions of the Council. There is an overlap between members of these two committees aimed at fostering synergies. Each minister with responsibility for R&D activities takes decisions with respect to R&D institutions and funds under his or her control. The main instruments for funding research in Iceland are block grants to universities and research institutions, on the one hand, and competitive funding programmes, on the other. There are no R&D tax incentives in Iceland. At the operational level, the Icelandic Centre for Research, RANNIS, which reports to the Ministry of Education, Science and Culture, is an important agent for the implementation of policy. It provides technical support to the Council and its committees, as well as to the funding bodies, and it manages and follows up on the implementation of most research programmes.

Annex III: Nordic Participation in ERA-NETs on Joint Programming

Below are some examples of ERA-NETs with strong Nordic participation that have resulted in some form of joint or co-funded programmes.

WoodWisdom-net

In 1998, TEKES, the Academy of Finland and Finland's Ministry of Agriculture and Forestry joined forces to establish a Finnish programme entitled 'Wood Wisdom: A Finnish Forest Cluster Research Programme'. A combination of research and innovation instruments led to significant success. In 2003, a cross-national cooperation with Sweden renewed and enlarged the programme. From Sweden, Formas and VINNOVA joined forces with the Finnish partners. The benefits of cross-border cooperation represented a first step towards initiating an ERA-NET on wood material science and engineering, WoodWisdom-Net, in 2004. While the Finnish partner coordinated the ERA net, half of the partners were from other Nordic countries.

Besides other activities, among the main goals for 2009–12 are the launching of two new calls under the WoodWisdom-Net Research Programme. These are the 2nd Call (2009) related to applied research and industrial development, with a focus on wood and fibre-based products; and the 3rd Call (2010), focusing on consortia combining basic and applied research, with a broad scope covering new and innovative production in forest-based value chains and promoting the participation of researchers from outside the EU.

SAFEFOODERA

In the Nordic countries, two programmes NORDFOOD I and II ran from 1995 to 2002 as joint programmes. The funders were the national research agencies and Nordisk Industrifond (later merged into NICE). The programmes ended in 2002. Facilitation was performed by the Nordic Industrial Fund (NI). As a continuation of these programmes the steering committee 'went European' and established the CSA project ProForSafe with participants from all of the Nordic countries and a number of other European countries. The final report concluded that Europe needed an ERA-NET in food-safety research. The next step was a proposal for SAFEFOODERA. This Nordic platform on food safety was extended into a European setting through the establishment of SAFEFOODERA 2004–2007, a leading European network coordinated by NICE. Some 18 countries participated, and in total 25 partners. The primary objective was to establish a European platform for protecting consumers against health risks from the consumption of food through a coordinated action. What started as a bottom-up movement with its base in a purely Nordic collaboration has grown into a Europe-wide collaboration involving more than 30 countries.

In the middle of 2004, the Nordic Innovation Centre (NICE) launched four food safety-related projects within the focus area 'Processing for Food Safety' as a preparatory exercise for the later European call in SAFEFOODERA. In order to ensure the competitiveness of the Nordic food industry, and the safety of the Nordic consumer, open dialogue and cooperation between authorities, researchers, consumers and industry are essential in innovation for the industry.

SAFEFOODERA has experimented in making common-pot calls at the European level. In both calls performed within the ERA-NET, parts of the calls have been common pot. Negotiations before publishing the calls have been complicated by the different legal restraints facing the different countries, but the running of the projects have been easier.

NORFACE

NORFACE – *New Opportunities for Research Funding Cooperation in Europe* – is a partnership between 12 research councils to increase cooperation in research and research policy in Europe. The 12 partners involved are the research councils for the social sciences of Estonia, Denmark, Finland, Germany, Iceland, Ireland, the

Netherlands, Norway, Portugal, Slovenia, Sweden and the UK. Canada and Austria participate in NORFACE as associate partners. The partnership is built on a history of less formal cooperation and joint activities between the Nordic and UK research councils. NORFACE formalizes this existing working relationship and provides a framework and a vision for a durable multinational strategic partnership in research funding and practice. NORFACE has a Finnish coordinator and all of the Nordic countries participate.

BONUS

The history of BONUS dates back to the year 2003, when ERA-NETs started. At that time, there was no large-scale cooperation between Baltic Sea research funding organizations, only bi- or trilateral cooperation activities between different countries. The ERA-NET instrument of the EU's Sixth Framework Programme was considered an appropriate tool for developing and broadening the Baltic Sea research funding cooperation.

The coordinator is the Academy of Finland and there are several partners from other Nordic countries. In 2005, BONUS ERA-NET was invited to Article 169 negotiations.³¹ In order for Article 169 to be implemented, a dedicated legal structure was required. *BONUS Baltic Organisations Network for Funding Science EEIG*, BONUS EEIG in short, was established for this purpose in the spring of 2007. The secretariat of BONUS EEIG was established in Helsinki. Along with running the everyday administration of BONUS EEIG, the secretariat also takes care of the coordination of BONUS ERA-NET and management of the BONUS-169 Joint Baltic Sea Research Programme. The project brought together the key research funding organizations of all EU member-states around the Baltic Sea and Russia. It took the form of a consortium with 14 partners: 11 funding agencies, 1 research institute and 2 international organizations.

The goal was to form a network and partnership of key agencies funding research with the aim of deepening understanding of conditions for science-based management of environmental issues in the Baltic Sea. BONUS ERA-NET operated in close connection with key scientific and management actors.

BONUS ERA-NET did not offer funding for networking by scientists or research projects. Instead, it made the national research funding organizations cooperate by building a Joint Baltic Sea Research Programme to fund research. The aim is that the Joint Baltic Sea Research Programme will be implemented under Article 169 of the Treaty of the European Community. There were altogether 14 partners in the BONUS ERA-NET.

ERA-SME, EUROPOLAR, HERA, HY-CO, IMERA are other examples of ERA-NETs in FP6 with participation from all Nordic countries.

BSR-INNOnet

The BSR-INNOnet project is part of the PRO INNO Europe initiative of EU Directorate General for Enterprise and Industry. The BSR-INNOnet project aims to create links between innovation policymakers, implementing agencies and analysts in the Baltic Sea Region. The aim is to help make the Baltic Sea region a frontrunner in creating environments for policymakers and practitioners to establish joint activities. NICE acts as coordinator for the BSR-INNOnet. The BSR-INNOnet project will run for three years, but it aims to create links between innovation policymakers, implementing agencies and analysts that will last much longer. It will take advantage of geographical proximity and policy learning synergies to develop a joint conceptual framework, as well as to create a critical mass for joint innovation frameworks and programmes in the Baltic Sea Region.

³¹ Article 169 of the EC Treaty enables the Community to participate in research programmes undertaken jointly by several Member States, including participation in the structures created for the execution of national programmes. The actions supported may cover subjects not directly linked to the ten themes of the FP7 'Cooperation' Specific Programme, in as far as they have a sufficient EU added value. They will also be used to enhance the complementarity and synergy between FP7 and activities carried out under intergovernmental structures such as EUREKA and COST.

INNER

Northern European Innovative Energy Research (N-INNER) is a joint programme between the Academy of Finland, the Research Council of Norway, the Swedish Energy Agency, the Danish Council for Strategic Research, Projektträger Jülich, Orkustofnun and Nordic Energy Research. It was developed through participation in the so-called INNER ERA-NET. N-INNER aims at supporting doctoral studies and post-doctoral research careers in the energy field, and to increase Nordic and German networking and multidisciplinary cooperation among researchers. The key objectives of the research programme are to produce new and innovative scientific knowledge on sustainable, clean and efficient energy technologies and systems, and to develop and sustain capabilities in these fields.

