ERAWATCH COUNTRY REPORTS 2010: Norway

ERAWATCH Network – NIFU

Lisa Scordato
Acknowledgements and further information:

This analytical country report is one of a series of annual ERAWATCH reports which are produced for EU Member and Countries Associated to the EU Seventh Research Framework Programme (FP7). ERAWATCH is a joint initiative of the European Commission’s Directorate General for Research and Innovation and Joint Research Centre.

The analytical framework and the structure of the reports have been developed by the Institute for Prospective Technological Studies of the Joint Research Centre (JRC-IPTS) with contributions from Directorate General for Research and Innovation and the ERAWATCH Network. The report has been produced by the ERAWATCH Network in the framework of the specific contract, ERAWATCH Research Inventory and Analytical Country Reports 2010 and 2011, commissioned by JRC-IPTS.

In particular, it has benefited from comments and suggestions of Paul Cunningham, who reviewed the draft report. The contributions and comments of Nida Kamil Özbolat from JRC-IPTS and DG-RTD are also gratefully acknowledged.

The report is only published in electronic format and available on the ERAWATCH website. Comments on this report are welcome and should be addressed to jrc-ipts-erawatch-helpdesk@ec.europa.eu.

The opinions expressed are those of the authors only and should not be considered as representative of the European Commission’s official position.
Executive Summary

Norway is a small country with a population of 4,937,000 inhabitants in 2011 corresponding to 1 per cent of the EU27 population. Norway, together with Iceland and Lichtenstein, participates in the European Union’s single market via the European Economic Area (EEA) agreement which entered into force 1 January 1994. This makes Norway an integrated member of the EU internal market, including the EU Framework Programmes for Research and Technology (FPs).

The Norwegian economy has been particularly resilient during the financial crisis with a relatively shallow recession and moderate increase in unemployment.

Norway’s total R&D costs in 2009 were €5.3b (NOK41.9b). The R&D expenditure as a percentage of the gross domestic product (GDP) had a minor decrease from 1.65 in 2007 to 1.64% in 2008 (NIFU 2010). EU average in 2007 was around 1.8%.

Norwegian business enterprises reported a total of €2.4b (NOK18.2b) in R&D expenditure in 2009, 46% of the total R&D costs (Statistics Norway). This represents no change to 2008.

The business sector is the largest R&D actor, contributing 46% of total R&D expenditure in Norway in 2008. The business sector’s share of total R&D expenditure has remained unchanged since 2004. The Higher education sector follows immediately after with 32% of the expenditures. R&D expenditure in the institute sector was 22% of total spending. Among the R&D performing sectors, public sector expenditures reached the highest increase (5.5%) between 2007 and 2008 (constant prices). The increase was below 4% in the private sector and 5% in the higher education sector.

The eight universities perform the largest part (about 80%) of research in the HEI sector. On 1 January 2011 Bodø University College became the University of Nordland, adding up to the seven previous universities in Norway (please see Table 2).

Both the research strategy and the (first) innovation strategy clearly emphasise the importance of investing in climate and energy related research and innovation. The increased policy attention towards the challenge of climate change has resulted in a number of initiatives and R&D budgets are mobilised to address these issues.

The following table gives a short assessment of the interaction between different policies relevant for the knowledge triangle.
Knowledge Triangle

Effectiveness of knowledge triangle policies

<table>
<thead>
<tr>
<th>Research policy</th>
<th>Recent policy changes</th>
<th>Assessment of strengths and weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Establishment of Regional research funds;</td>
<td>+ High increases in public funding of research over the last years (except in 2010);</td>
</tr>
<tr>
<td></td>
<td>Increase in funding for polar research in the state budget;</td>
<td>+ Balance between selective (centres.) and general research funds;</td>
</tr>
<tr>
<td></td>
<td>Establishment of a new centre of expertise in Education;</td>
<td>+ Consolidated research council organisation.</td>
</tr>
<tr>
<td></td>
<td>Increased earmarked funding for basic research;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Establishment of three new centres for environmentally friendly research within the social sciences;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reorganisation of the Research Council of Norway.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Innovation policy</th>
<th>Recent policy changes</th>
<th>Assessment of strengths and weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>New SME strategy underway Reorganisation and slimming of Innovation Norway.</td>
<td>- Weak emphasis on innovation in industry policy;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ Strong emphasis on innovation in the health and energy sectors.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Education policy</th>
<th>Recent policy changes</th>
<th>Assessment of strengths and weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>New university established 1st January 2011;</td>
<td>+ Stronger emphasis on performance and effectiveness in funding of higher education;</td>
</tr>
<tr>
<td></td>
<td>Prolonged Government financial support for cooperation to restructure the HEI system.</td>
<td>- Slow restructuring of the HEI sector.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other policies</th>
<th>Recent policy changes</th>
<th>Assessment of strengths and weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High increase in funds for energy and climate research.</td>
<td>+ Strong political support for climate/energy R&amp;D. Increase in sectoral funding and effective reorganisation of (applied) health research.</td>
</tr>
</tbody>
</table>

European Research Area

Norway participates in a range of international collaborative efforts concerning education and research. Internationalisation of Norwegian research has been a top priority in research policy over the last two decades. The EU Framework Programmes are the most important international research programmes in which Norway takes part.

The Norwegian research infrastructure (RI) roadmap corresponds closely to similar national roadmaps that have been, or are being, drawn up in many other European countries. The roadmap will be updated after each major announcement of funding for research infrastructure, the first time in mid-2011.

The following table gives a short assessment of the national policies or measures that support the strategic ERA objectives.
### Assessment of the national policies/ measures supporting the strategic ERA objectives (derived from ERA 2020 Vision)

<table>
<thead>
<tr>
<th>ERA objectives</th>
<th>Main national policy changes</th>
<th>Assessment of strengths and weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 <strong>Ensure an adequate supply of human resources for research and an open, attractive and competitive single European labour market for male and female researchers</strong></td>
<td>- Government strategy to reduce the number of temporary contracts in the higher education sector.</td>
<td>+ Good salary terms for PhD students, + Establishment of internationally attractive centres of excellence; - Low salaries for researchers.</td>
</tr>
<tr>
<td>2 <strong>Increase public support for research</strong></td>
<td>0.2% real terms decrease in total R&amp;D expenditure from 2008 to 2009.</td>
<td>Lack of long term planning for public R&amp;D expenditures affects predictability of research investments.</td>
</tr>
<tr>
<td>3 <strong>Increase European coordination and integration of research funding</strong></td>
<td>Participation in joint programming initiatives (JPI) (healthy oceans) and a large number of ERA NETs.</td>
<td>+ Pro-active policies for participation in new EU/ERA policy developments; Norway contributed financially more for the FPs than is returned to Norwegian participants. Hence there is a potential for increased participation in the EU FP; + Strong engagement of the Research Council of Norway in European research initiatives.</td>
</tr>
<tr>
<td>4 <strong>Enhance research capacity across Europe</strong></td>
<td>Government white paper (Report nr. 30 to the Storting 2008-2009) on research policy emphasises the need to strengthen internationalisation; New biotechnology strategy gets underway.</td>
<td>+ Increased funding on priority areas (health, climate/energy).</td>
</tr>
<tr>
<td>5 <strong>Develop world-class research infrastructures (including e-infrastructures) and ensure access to them</strong></td>
<td>The roadmap on RI gives an overview of Norwegian participation in RI projects which are part of the ESFRI process; In October 2010 the Norwegian Social Science Data Services AS (NSD) in Bergen was chosen as host to the database cooperation project Council of European Social Science Data Archives.</td>
<td>+ Strong alignment of research infrastructure policies with large European RI projects.</td>
</tr>
<tr>
<td>6 <strong>Strengthen research institutions, including notably universities</strong></td>
<td>A New university established first January 2011; Government financial support for formal HEI cooperation in 2010 and 2011.</td>
<td>- Hesitant long-term structural reform policies for the HEI sector; + New incentives in funding policies (performance, centres) for promoting excellence in HEI research.</td>
</tr>
<tr>
<td>ERA objectives</td>
<td>Main national policy changes</td>
<td>Assessment of strengths and weaknesses</td>
</tr>
<tr>
<td>----------------</td>
<td>----------------------------</td>
<td>----------------------------------------</td>
</tr>
</tbody>
</table>
| 7 Improve framework conditions for private investment in R&D | • The strengthening of private R&D spending is the aim of the R&D tax incentive scheme introduced in 2001. This is the main regulation contributing to improving framework conditions for private R&D investments. | - Private expenditures on R&D are still low in international comparisons; criticism has been directed to the government budget for 2011 for not providing sufficient framework conditions for private investments in R&D.  
• Persistent low private sector R&D spending. |
| 8 Promote public-private cooperation and knowledge transfer | • The regional research funds launched in early 2010 have the aim to improve cross sectoral cooperation and boost research in the regions. | • + Norway has a higher than OECD average level of R&D cooperation between private companies and research institutes. |
| 9 Enhance knowledge circulation across Europe and beyond | • Launching of a new India-Norway joint programme in 2010;  
• Launching of the joint programming initiative (JPI) for clean seas and oceans;  
• No changes relevant to EU. | • + Several bilateral agreements on research collaboration;  
• + Long experience from institutionalised cooperation in research with Nordic countries;  
• + The Nordic top level research initiative on energy and climate is an important policy measure to enhance knowledge circulation in the Nordic region and beyond. |
<p>| 10 Strengthen international cooperation in science and technology and the role and attractiveness of European research in the world | • Evaluation of the Norwegian Centres of Excellence (CoE) published in 2010 shows the scheme has positive effects on internationalisation of research and researcher recruitment. | • + The CoE scheme successfully strengthens internationalisation of research and promotes recruitment of researchers. |
| 11 Jointly design and coordinate policies across policy levels and policy areas, notably within the knowledge triangle | • Internal reorganisation of the Research Council of Norway in 2011; evaluation of the RCN has been announced and will be carried out in the present mandate period. | • - The strong sector based research funding system is a barrier against horizontal policymaking. |
| 12 Develop and sustain excellence and overall quality of European research | • Since the Quality Reform from 2003 funding of both teaching and research in HEIs has progressively become more performance based. A policy measure aiming at improving quality and excellence is the performance based system for institutional core funding introduced in 2009. | • + Performance based funding of HEIs has boosted high quality research publishing. |</p>
<table>
<thead>
<tr>
<th>ERA objectives</th>
<th>Main national policy changes</th>
<th>Assessment of strengths and weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>13 Promote structural change and specialisation towards a more knowledge-intensive economy</td>
<td>• Official policy (emphasised the importance of supporting renewable energy; especially wind energy) research and CCS. In 2010 the government announced that it would delay the decision to finance the Mongstad CCS project after the life of the present Parliament; • Introduction of a green electricity certificate system based on collaboration with Sweden to be implemented in 2012.</td>
<td>• Corporatist policy-making processes benefit established firms and industrial sectors • There is a general lack of incentives for development of and investment in new renewable energy in Norway.</td>
</tr>
<tr>
<td>14 Mobilise research to address major societal challenges and contribute to sustainable development</td>
<td>• The present white paper on research policy (Report to the Storting no.30 2008-2009) emphasises strongly the need for research to meet global challenges related to the environment, climate change, oceans, food safety and energy; Eight Centres for environmentally friendly energy research were established in 2009. Three new centres have been selected in February 2011 within the social sciences.</td>
<td>• A challenge for Norwegian policy makers consists in combining profitable petroleum related activities with meeting ambitious environmental goals; related knowledge developed in the off shore and oil industry activities are exploited to foster technologies for off shore wind energy technologies and CCS.</td>
</tr>
<tr>
<td>15 Build mutual trust between science and society and strengthen scientific evidence for policy making</td>
<td>• There is an extensive use of evaluations of R&amp;D policy measures and programmes. Proposals for new reforms are often subject to hearings involving stakeholders from different sectors and interest groups.</td>
<td>• There is a fairly extensive use and openness of both evaluations and indicators in the policy-making process. Reports are openly published, and have become subject to extensive policy awareness and debate. Evaluations are typically done by international peer panels. Active institutions for enhance public awareness and debate on controversial issues (biotechnology, ethics, and technology assessment).</td>
</tr>
</tbody>
</table>
# TABLE OF CONTENTS

Executive Summary .................................................................................................................. 3  

1 Introduction .......................................................................................................................... 10  

2 Performance of the national research and innovation system and assessment of recent policy changes ................................................................. 10  
  2.1 Structure of the national research and innovation system and its governance .................................................................................................................... 10  
  2.2 Resource mobilisation ...................................................................................................... 14  
  2.2.1 Resource provision for research activities ................................................................ 15  
  2.2.2 Evolution of national policy mix geared towards the national R&D investment targets ........................................................................................................... 16  
  2.2.3 Providing qualified human resources ........................................................................ 19  
  2.3 Knowledge demand ......................................................................................................... 20  
  2.4 Knowledge production ..................................................................................................... 22  
  2.4.1 Quality and excellence of knowledge production ...................................................... 22  
  2.4.2 Policy aiming at improving the quality and excellence of knowledge production ................................................................................................................... 23  
  2.5 Knowledge circulation .................................................................................................... 23  
  2.5.1 Knowledge circulation between the universities, PROs and business sectors ......... 24  
  2.5.2 Cross-border knowledge circulation ........................................................................ 24  
  2.5.3 Main societal challenges ......................................................................................... 24  
  2.6 Overall assessment ........................................................................................................ 25  

3 Interactions between national policies and the European Research Area .......... 26  
  3.1 Towards a European labour market for researchers ..................................................... 26  
  3.1.1 Stocks and mobility flows of researchers ................................................................ 26  
  3.1.2 Providing attractive employment and working conditions .................................... 27  
  3.1.3 Open recruitment and portability of grants ............................................................... 28  
  3.1.4 Meeting the social security and supplementary pension needs of mobile researchers .......................................................................................................... 28  
  3.1.5 Enhancing the training, skills and experience of European researchers ................. 28  
  3.2 Research infrastructures ................................................................................................. 29  
  3.2.1 National Research Infrastructures roadmap ........................................................... 29  
  3.2.2 National participation in the ESFRI roadmap. Updates 2009-2010 ....................... 30  
  3.3 Strengthening research institutions ............................................................................... 31  
  3.3.1 Quality of National Higher Education System ...................................................... 31  
  3.3.2 Academic autonomy ............................................................................................... 32  
  3.3.3 Academic funding ................................................................................................... 32  
  3.4 Knowledge transfer ........................................................................................................ 33  
  3.4.1 Intellectual Property Policies ................................................................................ 33  
  3.4.2 Other policy measures aiming to promote public-private knowledge transfer ......... 33
3.5 Cooperation, coordination and opening up national research programmes within ERA

3.5.1 National participation in intergovernmental organisations and schemes

3.5.2 Bi- and multilateral agreements with other ERA countries

3.5.3 Other instruments of cooperation and coordination between national R&D programmes

3.5.4 Opening up of national R&D programmes

3.6 International science and technology cooperation

3.6.1 International cooperation

3.6.2 Mobility schemes for researchers from third countries

4 Conclusions

4.1 Effectiveness of the knowledge triangle

4.2 ERA 2020 objectives - a summary

References

List of Abbreviations
1 Introduction

The main objective of the ERAWATCH Analytical Country Reports 2010 is to characterise and assess the evolution of the national policy mixes in the perspective of the Lisbon goals and of the 2020, post-Lisbon Strategy. The assessment will focus on the national R&D investments targets, the efficiency and effectiveness of national policies and investments into R&D, the articulation between research, education and innovation, and on the realisation and better governance of ERA. In doing this, the 15 objectives of the ERA 2020 are articulated.

The report builds on the 2009 report streamlining the structure and updating the 2009 policy assessment in the domains of human resource mobilisation, knowledge demand, knowledge production and science-industry knowledge circulation. The information related to the four ERA pillars covered in the 2009 report is also updated and it is extended in order to cover all six ERA pillars and address the corresponding objectives derived from ERA 2020 Vision.

Given the latest developments, the 2010 Country Report has a stronger focus on the link between research and innovation, reflecting the increased focus of innovation in the policy agenda. The report is not aimed to cover innovation per se, but rather the 'interlinkage' between research and innovation, in terms of their wider governance and policy mix.

2 Performance of the national research and innovation system and assessment of recent policy changes

The aim of this chapter is to assess the performance of the national research system, the 'interlinkages' between research and innovation systems, in terms of their wider governance and policy and the changes that have occurred in 2009 and 2010 in national policy mixes in the perspective of the Lisbon goals. The analysis builds upon elements in the ERAWATCH Country Report 2009, by updating and extending the 2009 policy assessment in the domains of resource mobilisation, knowledge demand, knowledge production and science-industry knowledge circulation. Each section identifies the main societal challenges addressed by the national research and innovation system and assesses the policy measures that address these challenges. The relevant objectives derived from ERA 2020 Vision are articulated in the assessment.

2.1 Structure of the national research and innovation system and its governance

This section gives the main characteristics of the structure of the national research and innovation systems, in terms of their wider governance.

Norway is a small country with a population of 4,937,000 inhabitants in 2011 corresponding to 1 per cent of the EU27 population. Norway, together with Iceland and Lichtenstein, participates in the European Union’s single market via the European Economic Area (EEA) agreement which entered into force 1 January 1994.
This makes Norway an integrated member of the EU internal market, including the EU Framework Programmes for Research and Technology (FPs).

The oil and gas activity puts Norway in an exceptional position in relation to other countries. A fifth of general government revenues in 2009 were generated from the petroleum activity (Statistics Norway). The global financial crisis hit Norway's economy less severely than many other EU and OECD countries. The Norwegian economy has been particularly resilient during the financial crisis with a relatively shallow recession and moderate increase in unemployment (OECD, 2010) (see Table 1).

Norway's total R&D costs in 2009 were €5.3b (NOK41.9b). The R&D expenditure as a percentage of the gross domestic product (GDP) had a minor decrease from 1.65 in 2007 to 1.64% in 2008. EU average in 2007 was around 1.8% (NIFU 2010).

Norwegian business enterprises reported a total of €2.4b (NOK18.2b) in R&D expenditure in 2009, 46% of the total R&D costs (NIFU 2010). This represents no change to 2008. In addition, enterprises with 5-9 employees spent almost €192m (NOK1.5b) on R&D activity. In the university and university college sector, a total of €1.7b (NOK13b) was spent on R&D and €1.2b (NOK9.3b) in the research institute sector.

In addition to internal R&D, industry bought R&D services totalling almost €691.2m (NOK5.4b) in 2008 (Statistics Norway).

Table 1: Key figures for Norway

| Population in 2011 | 4,937,000 |
| GDP per capita in 2009 | €57,000 |
| Total R&D costs (2008) | 1.62% of GDP |
| Share of private sector R&D (2008) | 53.8% of GERD |
| Share of public sector R&D (2008) | 46.2% of GERD |

Main actors and institutions in research and innovation governance

At government level, the Ministry of Research and Education has the main responsibility for coordinating the overall research 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. In addition to the Ministry of Research and Education, the main ministries funding research are: the Ministry of Trade and Industry, the Ministry of Health and Care Services, the Ministry of Oil and Energy, Ministry of the Environment, the Ministry of Agriculture and Food and the Ministry of Fisheries and Coastal Affairs. The ministries with the largest research portfolios are also standing members of the Government's Research Board, which coordinates overall R&D policy under the lead of the Minister of Research and Higher Education. The Board has limited authority, and the strongly sectorised funding structure for research generates challenges regarding the coordination of research assignments (OECD 2008).

The Research Council of Norway (RCN) is the only operational research policy agency in Norway. In addition to funding research, RCN has the mandate to advise the government about research policy and to create communication and coordination arenas for actors of research, industry and government. In 2010, the Research Council of Norway's total budget amounted to approximately €896m (NOK7b) (RCN
financial statement, 2010). The Ministry of Education and Research and the Ministry of Trade and Industry are the most important contributors to the budget.

Beginning in January 2011, the Research Council was reorganised from three to four divisions. The Division for Science continues and has overall responsibility for the Research Council’s role in ensuring that Norway maintains an “effective, smoothly functioning” research system. The division will serve as liaison to the Norwegian research system at large and also retains its current responsibility for basic research and the infrastructure initiative. The Division for Innovation has assumed more responsibility for research within and for trade and industry. The various large-scale technology initiatives and efforts targeted at key areas of industry have been consolidated under this division. Two new departments will ensure better organisation of energy, climate and environmental research. On 1 November 2010, the Department for Energy and Petroleum and the Department for Climate and the Environment were established under the Division for Strategic Priorities. In connection with the administrative re-organisation, the Executive Board of the Research Council has also concluded that the Council’s system of governance should be re-organised. The Executive Board has recommended the establishment of four research boards to replace the current three.

An evaluation of the Research Council of Norway will be carried out within the current parliamentary period, i.e. by autumn 2013. Start-up is planned for early 2011.

Innovation Norway and SIVA are the main public institutions that provide support for innovation, and are in part of their portfolio involved in industrial R&D. Innovation Norway is owned by the Ministry of Trade and Industry and provides programmes and services with the objective of promoting innovation at regional and national level, in mainly small and medium size companies. SIVA (the Company for Industrial Growth) is involved in the provision of science parks, incubators and services to developing companies and venture capital to mainly start-up firms.

An important organisation for policy advice is the Norwegian Association of Higher Education Institutions. Other actors which provide policy advice are the Confederation of Norwegian Business and Industry (NHO), the Norwegian Confederation of Trade Unions (LO) and Tekna, the Norwegian Society of Chartered Technical and Scientific Professionals.

As part of the Nordic cooperation under the auspices of the Nordic Council and the Nordic Council of Ministers, Norway also benefits from Nordic level research and innovation governance. Under the Nordic Council of Ministers there are two main bodies set up at the Nordic level related to research and innovation: NordForsk and the Nordic Innovation Centre (NICe). The Nordic cooperation is also “non-formalised” through numerous bi-lateral and multi-lateral initiatives between research councils and agencies in the Nordic countries. The Nordic budget available for this cooperation is a common pot with no fair return and is calculated according to a sliding scale based on national GDP (Rieker et al., 2010).

Figure 1 below depicts the main actors and institutions, as well as funding flows within the Norwegian research system.

---

1 The Nordic countries comprise Denmark, the Faroe Islands, Greenland, Finland, Åland, Iceland, Sweden and Norway.
The institutional role of regions in research governance

Norway is a unitary state divided into 19 county administrations (Fylke). The county councils together with the municipalities form the regional governance system in Norway. The government and the parliament (Storting) are politically responsible for formulating objectives and establishing the framework for Norwegian research activities. Initiatives have however been taken by some country authorities to develop research and innovation policies of their own. The Regional Research Funds established in 2010 incorporate the strategic priorities of the authorities of the respective counties included under each individual fund.

Main research performer groups

The business sector is the largest R&D actor, contributing 46% of total R&D expenditure in Norway in 2008. This share has remained unchanged since 2004. The Higher education sector follows immediately after with 32% of the expenditures. R&D expenditure in the institute sector was 22% of total spending. Among the R&D performing sectors, public sector expenditures reached the highest increase (5.5%)
between 2007 and 2008 (constant prices). The increase was below 4% in the industrial sector and 5% in the higher education sector (NIFU, 2010).

The eight universities perform the largest part (about 80%) of research in the HEI sector. A large part of the funding for HEI research is the core funding channelled directly from the Ministry of Education and Research, but funds are also provided from project funding through the RCN.

On 1 January 2011 Bodø University College became the University of Nordland, adding up to the seven previous universities in Norway. Bodø University College was established in 1994 out of the reorganization of the three Bodø colleges: Nordland Regional College (1971), Nordland Centre of Higher Education (1985), Bodø College of Education (1950) and Nordland College of Nursing (1920). The new college had 2,967 students and a staff of 307. Today the figures have grown to more than 5,000 students and 500 staff (see Table 2).

Table 2: Universities in Norway

<table>
<thead>
<tr>
<th>Institution</th>
<th>Control</th>
<th>Year of foundation</th>
<th>Students in 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>University of Oslo</td>
<td>Public</td>
<td>1811</td>
<td>25,668</td>
</tr>
<tr>
<td>University of Bergen</td>
<td>Public</td>
<td>1948</td>
<td>12,785</td>
</tr>
<tr>
<td>University of Tromsø</td>
<td>Public</td>
<td>1972</td>
<td>7,728</td>
</tr>
<tr>
<td>Norwegian University of Science and Technology (NTNU)</td>
<td>Public</td>
<td>1996</td>
<td>18,909</td>
</tr>
<tr>
<td>University of Stavanger</td>
<td>Public</td>
<td>1994</td>
<td>7,375</td>
</tr>
<tr>
<td>Norwegian University of Life Sciences</td>
<td>Public</td>
<td>1859</td>
<td>2,851</td>
</tr>
<tr>
<td>University of Agder</td>
<td>Public</td>
<td>1994</td>
<td>7,651</td>
</tr>
<tr>
<td>University of Nordland</td>
<td>Public</td>
<td>2011</td>
<td>5,000 (in 2011)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>82,967</strong></td>
</tr>
</tbody>
</table>

In addition to the eight universities, there are 26 university colleges, where approximately 10% of the HEI R&D is performed. A smaller amount (about 6%) of research is performed in the five public university institutions, specialising in veterinary medicine, architecture, physical education and sports, music and economics and business administration.

There are relatively few large R&D intensive companies in Norway. The largest private R&D performer in Norway is the state owned petroleum company, Statoil. Other large private R&D performers are Telenor (telecom services), Orkla (general industrials), Kongsberg (aerospace and defence), DnBNor (banking) and Tandberg (telecom equipment).

2.2 Resource mobilisation

Since 2000, Europe has made evident progress towards ERA but at the same time it is clear that Europe's overall position in research has not improved, especially regarding R&D intensity, which remains too low. The lower R&D spending in the EU is mainly a result of lower levels of private investment. Europe needs to focus on the impact and composition of research spending and to improve the conditions for private sector R&D investments.

---

2 The Norwegian institute sector comprises government sector and research institutes serving enterprises
This section assesses the progress towards national R&D targets, with particular focus on private R&D and of recent policy measures and governance changes and the status of key existing measures, taking into account recent government budget data. The need for adequate human resources for R&D has been identified as a key challenge since the launch of the Lisbon Strategy in 2000. Hence, the assessment includes also the human resources for R&D. Main assessment criteria are the degree of compliance with national targets and the coherence of policy objectives and policy instruments.

2.2.1 Resource provision for research activities

The aim of this section is to paint a picture of national public research funding and the various funding modes and mechanisms prevalent in Norway. Norway’s multiannual R&D strategies are defined in periodical (every three to four years) white papers or in so called Reports to the Storting (Norwegian Parliament). The latest Report was published in April 2009 and bears the emblematic title Climate for research (Report no. 30 to the Storting, 2008-2009). These strategies define the Norwegian government’s priorities and goals for research. The thematic and horizontal priorities addressed in the strategy are the following:

- meeting global challenges, with a particular emphasis on the environment, climate change, oceans, food safety and energy research;
- better health, levelling social differences in health, and developing high quality health services;
- addressing social challenges and provide research based practise in the relevant professions;
- knowledge based industry in all regions;
- industry oriented research within the areas food, marine, maritime, tourism, energy, environment, biotechnology, ICT, and new materials/nanotechnology;
- high quality research;
- a well-functioning research system;
- increased internationalisation of research;
- efficient use of research funding and results.

Financial resources for research are set on a yearly basis in the National budgets, presented to the Parliament in the autumn. For this reason there is little room for long term predictability of research funding.

The 3% Barcelona target was officially adopted by the Norwegian government in 2005. Five years later the 2% target of private R&D investments has not been reached and BERD continues to be low in international standards. The adoption of the 3% target has been frequently debated and it has been recognised that it is unrealistic and that there is a need for more appropriate targets for public and private R&D expenditures.

As a means to increase private research spending a tax incentive scheme (SkatteFUNN) was introduced in 2001. Despite its success, especially for small companies, the scheme has however not succeeded in increasing the private share of R&D considerably.
The following table shows Norway’s gross expenditure on R&D vis-à-vis the EU27 and the OECD over the period 1998-2008. The data indicate that the current level of gross expenditure on R&D in Norway is since 2002 below the EU27 average and substantially below the OECD average.

### Table 3: Norway’s gross expenditure on R&D, 1998-2008

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>OECD</td>
<td>2.13%</td>
<td>2.21%</td>
<td>2.22%</td>
<td>2.19%</td>
<td>2.26%</td>
<td>2.29%</td>
</tr>
<tr>
<td>EU27</td>
<td>1.67%</td>
<td>1.74%</td>
<td>1.76%</td>
<td>1.73%</td>
<td>1.76%</td>
<td>1.77%</td>
</tr>
<tr>
<td>GERD/GDP Norway</td>
<td>:</td>
<td>:</td>
<td>1.66%</td>
<td>1.59%</td>
<td>1.52%</td>
<td>1.62%</td>
</tr>
</tbody>
</table>

Core funding constitutes a relatively large part of the funding of research within HEIs. The ratio between core funding and competitive funding has remained largely constant. However, changes in the structure of core funds indicate a move towards more performance- and strategy-based core research funding by HEIs.

The funding of R&D by research institutes both in the government and business sectors is, to an increasing extent, distributed via the funding of commissioned research and research-based services, while the share of core funding has decreased. A common overall framework for governmental core funding of institutes has been in place since 1993, and was amended on several key points early in 2009.

The RCN is the major source for "bottom-up", responsive-mode funding of basic research. A large part of the projects initiated by ministries and serving their needs is also organised by and funded through RCN. The main funding instruments are managed by the RCN. Some of the most important research programmes are the Centre of Excellence scheme, the Large-scale Programmes, Centres for research based innovation and the User-driven research based innovation scheme (BIA). These programmes have all been established to enhance excellence, competitiveness and critical mass, all modelled on foreign examples and forerunners, and in line with general international trends.

### 2.2.2 Evolution of national policy mix geared towards the national R&D investment targets

Statistics on research and development (R&D) expenditure show a low increase in Norwegian R&D in 2009. The total intramural R&D expenditure amounted to €5.5b (NOK42.8b) in 2009. This is an increase of €205m (NOK1.6b) compared to 2008. However, the constant price increase was only 0.4%. The increase took place in the higher education and the institute sectors, and to about the same extent in these two sectors. Contrarily, in the industrial sector there was a 3% decrease in real value from 2008. While there was approximately zero growth in the industrial sector, in current prices, there was a moderate increase in the two other sectors between 2008 and 2009 (NIFU STEP, 2010).

The following table shows the evolution of business R&D expenditure in Norway vis-à-vis the EU27 and the OECD over the period 2002-2008. The data indicate that the current BERD intensity is since 2002 significantly below the EU27 and OECD average.
Table 4: Evolution of Business R&D expenditure in Norway, 2002-2008

<table>
<thead>
<tr>
<th></th>
<th>2002</th>
<th>2004</th>
<th>2006</th>
<th>2008*</th>
</tr>
</thead>
<tbody>
<tr>
<td>OECD</td>
<td>1.50%</td>
<td>1.48%</td>
<td>1.56%</td>
<td>1.59%</td>
</tr>
<tr>
<td>EU27</td>
<td>1.11%</td>
<td>1.09%</td>
<td>1.11%</td>
<td>1.12%</td>
</tr>
<tr>
<td>BERD/GDP Norway</td>
<td>0.95%</td>
<td>0.87%</td>
<td>0.82%</td>
<td>0.87%</td>
</tr>
</tbody>
</table>

In the National Budget for 2011 the government proposes to allocate €3.1b (NOK24.3b) in public investments to research and development, equivalent to a nominal increase of €70.4m (NOK550m) over the final budget 2010. It is also being proposed to inject €384m (NOK3b) of additional capital into the Fund for Research and Innovation. Some of the most salient proposals refer to the following areas (Ministry of Finance, 2011):

- The government proposes providing €7.6m (NOK60m) to the open competitive arena for outstanding research (basic research) through The Research Council of Norway;
- In 2009 and 2010 the government proposed earmarking some of the return on capital of the Fund for Research and Innovation for research infrastructure. In 2011 this will provide €36m (NOK280m) for research equipment;
- The government is providing a boost to research in the education sector. In 2011 the Ministry of Education and Research will allocate €8.3m (NOK65m) to research in the field and the establishment of a new centre of expertise for education from 1 January;
- There will be a €5.8m (NOK45m) increase in funding for polar research:

The proposed National budget has been criticised by several stakeholders, including the RCN, the NHO, Abelia, Tekna and Norsk Industri. They state that the government’s proposed research budget represents a missed opportunity to restructure the Norwegian economy towards other knowledge based activities, and hence to sustain growth beyond peak oil and gas production. The disappointment is directed to the envisaged expenditure for research as the proposed budget represents a real terms decrease in public expenditures. The proposed increase of additional capital to the Research and Innovation Fund would represent the weakest capital growth to the Fund for many years. Criticism is also directed to the lack of initiatives that stimulate research in businesses.

**Stimulating greater R&D investment in R&D performing firms**

Research and innovation in businesses is publicly supported though targeted programmes run by the RCN.

Specific, industry-oriented programmes have been established to address areas which hold unique challenges and show great potential for strengthening national advantages. Such programmes, including the large-scale programmes targeting industry, have been designed to meet national challenges in designated areas of industry and technology.

**BIA (programme for user driven research based innovation)**

This programme focuses exclusively on research-based innovation, without being confined to particular thematic areas or branches of industry. Applicants are not assessed on the basis of pre-determined thematic priorities, but compete for funding
on the basis of how well their proposed projects can contribute to research-based innovation and value creation. BIA complements the Research Council’s other instruments for funding industry-oriented research. As a consequence, the programme is directed primarily toward the innovation challenges of companies with R&D strategies which do not qualify for funding from the existing specific programmes (including the Research Council’s large-scale programmes) or whose aims can only to a minor extent be achieved through the SkatteFUNN tax deduction scheme.

**CRIls (Centres for Research-based Innovation)**

CRIls are designed to promote innovation by supporting long-term research projects which are conducted in a close collaboration between research communities and research-intensive private enterprises.

**Innovation-oriented procurement policies**

The OFU and IFU programmes (Public and Industrial Research and Development Contracts) have been in place since 1968 and are currently operated by Innovation Norway. The aim of the programmes is to stimulate innovative firms and improve the quality and efficiency of public services through the acquisition of new technologies or solutions by promoting co-operation between a company and a public institution acting as customer. It is a flagship programme and has proved to be a successful public procurement tool, which the government intends to strengthen further (see White Paper on innovation, December 2008).

In the proposed national budget for 2011 the government emphasises the importance of environmentally friendly public procurement. The government proposes to increase the resources dedicated to environmentally friendly public procurement with €512,000 (NOK4m) to up to a total of €2.3m (NOK18m) for 2011. The Agency for Public Management and eGovernment (Difi) is responsible to follow up the governments public procurement plan at a national level.

**Other policies that affect R&D investment**

As part of the broader industrial and innovation policy framework, a number of measures and programmes of relevance to innovative start-ups have been implemented. Briefly, it is possible to distinguish between national innovation networks that provide infrastructures for innovative start-ups, and specific programmes which provide direct support for innovative start-ups.

The national innovation network comprises more than 80 units spread across the country, and includes science parks located on the main university campuses, knowledge parks³ (a ‘light’ version of science parks) located close to the state university colleges, and business gardens which are smaller facilities located in peripheral parts of the country. As a main rule, the science parks and knowledge parks also operate incubator facilities. Although all units should have a role in facilitating innovative start-ups, in practice, it is mainly the science parks and knowledge parks (in total 25 units) that do this through their incubator activities.

The petroleum sector is a strong player in national R&D policy in Norway. Building up Norwegian petroleum expertise has been an important element in its petroleum policy, and from an initial dependence on foreign companies, a well-developed and competitive national industry has been developed. This includes oil companies,

---

³ To learn more about the knowledge parks please visit the webpages of SIVA- The Industrial Development Corporation of Norway [www.siva.no](http://www.siva.no)
supplier industry and research institutions. To a large extent, the oil and gas industry also drives innovation and technological development in other Norwegian industry sectors. Technologies for CO$_2$ capture and storage have been explored and used for several years in Norway and are a key area in Norwegian energy policy.

In the proposed national budget for 2011 the government emphasises the importance of strengthening climate and environment research. In terms of resources the government envisages an increase of NOK300m for research on renewable energy resources and CO$_2$ capture and storage. The government also wishes to strengthen polar research through increased funding by €5.8m (NOK45m) to a new polar research programme.

2.2.3 Providing qualified human resources

Norway is among the OECD countries with the highest educational level in the population and the number of employees with higher education qualifications in both the private and the public sector is increasing considerably. The share of the population (aged 30-34) having completed tertiary education was 47% in 2009 compared to EU27 average of 32.3%. HERST as a share of total labour force increased from 48.8% in 2006 to 51.3% in 2009. The EU27 average for the same indicator in 2009 was 40.1% (Eurostat).

However, the number of new S&E graduates is far below the EU average, and past declines in this indicator continue, albeit at a lower rate, in the EIS for 2007. The share (28% in 2007) is particularly low amongst female S&E graduates, which is the lowest amongst the Nordic countries and substantially lower compared to other OECD countries. The government has focused on this challenge for a number of years and the issue is pervasive in policy debates and documents. Students’ interest for S&T subjects and careers, in particular at the secondary level, has apparently increased as a consequence of campaigns and the general attention paid to the issue. Several measures target the position of scientific and technological subjects in secondary education, as parts of a “Strategy for a Joint Promotion of Mathematics, Science and Technology” which has been in operation and continually updated since 2002.

Table 5: Human resources in science and technology (HRST) as share of the economically active population in the age group 25-64

<table>
<thead>
<tr>
<th></th>
<th>2009</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>EU27</td>
<td>40.1%</td>
<td>39.6%</td>
</tr>
<tr>
<td>Norway</td>
<td>51.3%</td>
<td>50.1%</td>
</tr>
</tbody>
</table>

Source: Eurostat

Norway has traditionally well-developed policies for life-long learning. The Competence Reform from 2002 gives all adults who need it a statutory right to primary and lower secondary education, and people born before 1978 are given the right to upper secondary education and training if they have not completed this level of education earlier. The Norwegian Agency for Lifelong Learning (Vox) is an agency of the Ministry of Education and Research. The Agency works to improve basic skills in the adult population in the areas of reading, writing, arithmetic and the use of ICT. From 2001 adults over 25 years were also given the right to admission to universities and university colleges based on formal, non-formal and informal qualifications. The government’s policy for life-long learning, Report No.44 to the Storting (2008-2009), stresses the need for a more highly educated labour force. Among others the
strategy focuses on an increased number of study places (the government proposes creating 2,200 new places at higher education institutions in autumn 2011) and on establishing a number of centres of excellence in teaching.

During recent years a growing interest and awareness may be seen amongst policymakers in Norway that it is important to foster individuals’ creative and innovative abilities for future economic growth and value creation in the country. As in many other countries in Europe, focus has increasingly been placed on the importance of entrepreneurship and innovation skills for value creation. Since early 1990 the Ministry of Education has stimulated entrepreneurship education at all levels of the educational system. An inter-ministerial strategy for entrepreneurship in education 2004-2008 was subsequently published as a joint endeavour by the Ministries of Education and Research, Trade and Industry, and Local Government and Regional Development.4

2.3 Knowledge demand
This section focuses on structure of knowledge demand drivers and analysis of recent policy changes.

The thematic priorities (energy and environment; health, food; marine/maritime research) are to a large extent funded by sector ministries.

The technology priorities (ICT, biotechnology; nanotechnology) are mainly funded by the large research ministries, i.e. the Ministry for Research and Education and Ministry for Trade and Industry.

All priorities encompass both general programmes and specific projects/items. The main strategic programmes related to the priorities are so-called “Large programmes” under the Division of Strategic Division of the Research Council of Norway. In addition to direct funding from various ministries, these strategic programmes are to a large extent funded from the proceeds of the Fund for Research and Innovation.

The Research Council of Norway (RCN) is the major source for "bottom-up", responsive-mode funding of basic research.

In the proposed National budget for 2011 the government proposes to expand the open competitive arena for outstanding research (FRIPRO), with an increase of €7.7m (NOK60m) in funding for basic research in 2011. Allocations to independent projects make up in excess of 15% of the Research Council's overall annual budget.

The table below shows the allocation of Government Budget Allocations or Outlays for R&D (GBAORD) by socio-economic objectives in 2009. As in many other countries a large share of government allocations is directed to General University Funds (GUF) objectives. After GUF the areas of Health, Agriculture and Industrial production and technology are prioritised.

---

4 For a detailed account of initiatives supporting creativity and entrepreneurship see the INNO-Policy TrendChart Report for Norway 2007.
Table 6: GBAORD by socio-economic objectives for Norway in 2009

<table>
<thead>
<tr>
<th>Socio-economic objectives</th>
<th>Millions of euro</th>
<th>Percentage of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>General advancement of knowledge: R&amp;D</td>
<td>770,148</td>
<td>34.2%</td>
</tr>
<tr>
<td>financed from General university funds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health</td>
<td>334,529</td>
<td>14.9%</td>
</tr>
<tr>
<td>Agriculture</td>
<td>165,506</td>
<td>7.4%</td>
</tr>
<tr>
<td>Industrial production and technology</td>
<td>161,805</td>
<td>7.2%</td>
</tr>
<tr>
<td>Political and social systems, structures and processes</td>
<td>113,282</td>
<td>5%</td>
</tr>
<tr>
<td>Defence</td>
<td>104,837</td>
<td>4.7%</td>
</tr>
<tr>
<td>Energy</td>
<td>77,752</td>
<td>3.5%</td>
</tr>
<tr>
<td>Transportation, telecommunication and other infrastructure</td>
<td>55,581</td>
<td>2.5%</td>
</tr>
<tr>
<td>Environment</td>
<td>54,745</td>
<td>2.4%</td>
</tr>
<tr>
<td>Exploration and exploitation of space</td>
<td>51,193</td>
<td>2.3%</td>
</tr>
<tr>
<td>Exploration and exploitation of the earth</td>
<td>49,989</td>
<td>1.9%</td>
</tr>
<tr>
<td>Culture, recreation, religion and mass media</td>
<td>18,115</td>
<td>0.8%</td>
</tr>
<tr>
<td>Education</td>
<td>16,522</td>
<td>0.7%</td>
</tr>
</tbody>
</table>

Source: Eurostat

Both the research strategy and the (first) innovation strategy clearly emphasise the importance of investing in climate and energy related research and innovation. The increased policy attention towards the challenge of climate change has resulted in a number of initiatives and R&D budgets are mobilised to address these issues. Energi21 is Norway’s national strategy for energy R&D and has, since its inception in 2008, the objective to coordinate the efforts of different stakeholders in the public and private energy sector.

Eight Centres for Environment-friendly Energy Research (CEER) were established in early 2009. The Centres seek to develop expertise and promote innovation through a focus on long-term research in selected areas of environment-friendly energy, transport and CO₂ management in close cooperation between prominent research communities and users. In early 2011 three new CEER centres were selected within the social sciences.

The 2008 white paper on innovation emphasizes the importance of developing new energy technologies, where CCS and off-shore wind energy are identified as of particularly high strategic significance.

In general, global health related research is devoted little attention in Norway. The Norwegian government allocates approximately €37.1m (NOK290m) a year to global health research. Only 5% of the health related research funding in Norway is allocated to health problems affecting 90% of the global disease burden. Measured in number of projects the highest attention is devoted to HIV/ADIS and tuberculosis (Norwegian Directorate of Health, 2008). The Global Health programme (GLOBVAC) started up in 2005. The programme is financed by the Ministry of Health and the Ministry of Foreign Affairs, and currently has a budget of approximately €1.9m (NOK15m) yearly.

As the most industrialized countries in the Western hemisphere, Norway is faced with a rapidly aging population. Health research is a highly prioritised area in Norway (see
Table 6). Research programmes on health and aging exist under the programme portfolio of the RCN. Research on aging is mostly being performed by universities.

**2.4 Knowledge production**

The production of scientific and technological knowledge is the core function that a research system must fulfil. While different aspects may be included in the analysis of this function, the assessment provided in this section focuses on the following dimensions: quality of the knowledge production, the exploitability of the knowledge creation and policy measures aiming to improve the knowledge creation.

**2.4.1 Quality and excellence of knowledge production**

When assessing the strengths and potentials of the Norwegian research system it is important to take into account the economic profile of Norway, which has been shaped by the dominant role played by natural resources such as oil and gas, fish and minerals in the Norwegian economy. The development of petroleum related industrial activities in engineering and services have had a particularly strong imprint on the economic and R&D specialisation patterns of Norway.

In terms of resource mobilisation, a key strength is the establishment of the Research Fund from the proceeds of the Pension Fund (state income from petroleum activities). The Fund has to some extent contributed to provide larger funding to cross sectoral and thematic research priorities. A weakness that remains, despite reforms targeting the strategic and performance levels of the research system is the entrenched sectorised system at the governmental level of R&D funding and policy making.

When considering research input Norway has a relatively low share of R&D spending measured as share of GDP. The R&D intensity (GERD/GDP) in 2008 was below the EU27 average at 1.62% (see Table 3).

It is widely recognised by policymakers in Norway that research infrastructures such as large scale equipment facilities, scientific databases, infrastructure are essential for the research sector’s capacity to conduct excellent research. Substantial investments for research infrastructure have been committed during the last few years. The estimated investment needs for the period 2008-2017 amount to €1.4b (NOK11b) (excluding operating costs). Norway’s national strategy for research infrastructure, *Tools for Research*, was published in 2008. The strategy was followed up by the government’s initiative to set aside earmarked funding for research infrastructure from the Fund for Research and Innovation. The National Financing Initiative for Research Infrastructure was launched, and a funding announcement for an initial €64m (NOK500m) was issued in 2009 (Slipersæter, 2008).

The quality of knowledge production by the Norwegian science base is improving and may be counted as one of the strengths of the Norwegian research system. Research quality has been and continues to be a core issue for R&D policy makers.

The analysis of publication activity shows a significant increase in the number of scientific articles published by Norwegian researchers in the last ten years. The number of articles published by Norwegian researchers has increased by as much as 74% during the past decade, 1999-2008 (NIFU STEP). Similarly to other Nordic countries’ publication profile, clinical medicine is one of the largest research fields in
Norway. Other important disciplinary fields are biomedicine, agriculture and geosciences (Schneider, 2010).

The research profile of Norway indicates a strong emphasis on geosciences, biology and agricultural research. Nordic countries, including Norway belong to the world’s most cited countries. Since the mid-1990s Norway has seen the largest rise in impact with a current level around 9% above the world average. In 2004, Norway implemented a new funding model for higher education institutions. The funding of these institutions is now based partially on the measurement of their scientific and scholarly publishing. It is likely that the model has contributed to part of the increase by impacting incentives, although the actual contribution of this effect is difficult to establish (Schneider, 2010).

2.4.2 Policy aiming at improving the quality and excellence of knowledge production

Centres of Excellence, Centres of research-driven innovation and Centres of Expertise have all been established to enhance excellence, competitiveness and critical mass, all modelled on foreign examples and forerunners, and in line with general international trends.

The establishment of a scheme for Centres of Excellence (CoE) has been introduced to sustain the quality of research. The Norwegian Centres of Excellence (CoE) scheme was established in 2002/03 with the aim of promoting cutting edge basic research through long-term, generous funding, strengthening internationalisation of Norwegian research and promoting researcher recruitment. Currently, the scheme comprises 21 centres. An evaluation of the CoE published in 2010 shows that the scheme is successful in terms of promoting researcher recruitment and strengthening the internationalisation of Norwegian research. There is also an increase in national and interdisciplinary collaboration. Moreover, the evaluation points out that the CoE have generated significant value added for the research groups and the institutions involved. The universities, for example, report that the CoE have inspired more targeted strategic prioritisation and organisation of research activities. The scheme has also been accompanied by a stronger focus on research management, which is seen as another positive factor (Langfeldt et al., 2010).

There is a fairly extensive use and openness of both evaluations and indicators in the policy-making process. Reports are openly published, and have become subject to extensive policy awareness and debate. Evaluations are typically done by international peer panels.

A further policy measure aiming at improving quality and excellence is the performance based system for institutional core funding introduced in 2009.

2.5 Knowledge circulation

Tackling the challenges that European society faces in the 21st century will require a multi-disciplinary approach and coordinated efforts. Many debates and conferences, e.g. the Lund Declaration recognise that such complex issues cannot be solved by single institutions, technology sectors or MS acting alone. Hence strong interactions within the "knowledge triangle" (education, research and innovation) should be promoted at all levels. Moreover, in the context of increasing globalisation, cross-border flows of knowledge are becoming increasingly important. This section
provides an assessment of the actions at national level aiming to allow an efficient flow of knowledge between different R&D actors and across borders.

2.5.1 Knowledge circulation between the universities, PROs and business sectors

In Norway, the proportion of firms co-operating with the public research infrastructure, especially research institutes, is at a very high level and above the OECD average. The proportion of Higher Education Expenditure on R&D (HERD) funded by industry is similar to that in the USA and just below the OECD average. In 2007, industry funded approximately about €60m (NOK472.2m), 11% of the research in Norwegian universities and also provided 22% of the institute sector’s income (NIFU STEP R&D statistics).

In the last decade, Norway has seen an extensive effort to establish different arrangements specifically in order to strengthening the links between industry and the knowledge infrastructure. The RCN’s major instruments are the user driven profile programmes and the Centres for Research based Innovation (CRI) and the Centres of Expertise programme.

Since the commercialisation act was introduced in 2003, universities and university colleges have been increasingly setting up technology transfer offices (TTOs) and using science parks and incubators to link up with industry. The role of incubators is increasingly growing in importance.

Another important measure is the industry PhD scheme, established in 2008. The goal of the scheme is to increase research activities in companies and strengthen knowledge exchange between industry and academia. Despite the large interest for the scheme in the Norwegian research communities, the government has announced cuts to the scheme in its budget proposal for 2011.

More than 40% of the Norwegian firms that perform R&D reported cooperating with other firms in 2007. Contractors and research institutes were the most important collaborator type (NIFU STEP).

2.5.2 Cross-border knowledge circulation

During past years several new policy measures have been put in place to reinforce international cooperation. Research collaboration between national and foreign research organisations is supported by bilateral cooperation agreements with third countries. The most important once are with the USA and Canada, China, India and South Africa (see chapter 3.6.1). Individual mobility of researchers is supported by the Marie Curie programme under the EU FPs. The RCN offers top up financing to Norwegian researchers that have qualified for Marie Curie grants.

More than half of all Norwegian articles in international scientific journals in 2008 were co-authored by foreigners. International collaboration has increased, and there has been a marked increase in co-authorship with other countries in recent years (NIFU STEP).

2.5.3 Main societal challenges

The programmes described above are often linked to thematic priorities for cooperation which have been defined as strategic in a Norwegian policy context, such as environment and climate change, sustainable energy and health. The latest
Report to the Storting, *Climate for research* (Report nr. 30, 2008-2009) addresses the need to meeting global challenges, with particular emphasis on the environment, climate change, oceans, food safety and energy research.

In line with these priorities a joint programming initiative (JPI) was launched in 2010 between Norwegian, Belgian and Spanish research funding agencies. The JPI has been initiated to meet the grand challenges regarding European seas and Oceans (see also chapter 3.5.3).

Environment, climate change and energy are prioritised areas in the Nordic Top-level research initiative, the largest joint Nordic research and innovation initiative to date.

### 2.6 Overall assessment

**Table 7: Summary of main policy related opportunities and risks**

<table>
<thead>
<tr>
<th>Domain</th>
<th>Main policy opportunities</th>
<th>Main policy-related risks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resource mobilisation</td>
<td>• The newly established Regional research funds;</td>
<td>• - Too weak distribution of research funds.</td>
</tr>
<tr>
<td></td>
<td>• Earmarked return on capital of the Research and Innovation Fund for infrastructure.</td>
<td>• - Decreasing interest on capital in the Research and Innovation Fund.</td>
</tr>
<tr>
<td>Knowledge demand</td>
<td>• Increase in funding to basic research.</td>
<td>• - Expected tightening of budget policies may damage funding for basic research.</td>
</tr>
<tr>
<td>Knowledge production</td>
<td>• New centres for environmentally friendly research within the social sciences;</td>
<td>• - Path dependency related to already strong fields</td>
</tr>
<tr>
<td></td>
<td>• New centre for environmental technology.</td>
<td>• - Persistent low responsive-mode funding.</td>
</tr>
<tr>
<td>Knowledge circulation</td>
<td>• New centres for excellent for teaching in HEIs.</td>
<td>• - Increasing competition between universities, PROs for competitive funds.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• - Lack of industry interest for industrial PhD scheme.</td>
</tr>
</tbody>
</table>

**Table 8: Main barriers to R&D investments and respective policy opportunities and risks**

<table>
<thead>
<tr>
<th>Barriers to R&amp;D investment</th>
<th>Opportunities and Risks generated by the policy mix</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low business R&amp;D expenditure due to structural barriers (few large R&amp;D intensive firms, high share of industries with low R&amp;D intensity, small share of R&amp;D intensive industries).</td>
<td>• + Opportunities for growth of R&amp;D intensive firms, particularly in services; stronger focus on new innovative firms. Strengthen the R&amp;D tax credit scheme (SkatteFUNN). • - Risks of R&amp;D cuts in large firms with high R&amp;D activity.</td>
</tr>
<tr>
<td>The strong sector based research funding system generates challenges regarding the coordination of research assignments.</td>
<td>• + Opportunities for strong R&amp;D-focussed policies within sectors (e.g., energy, health, defence). • + Opportunities exist for stronger coordination (in particular, energy/environment, presently on the agenda). • - Unexploited opportunities for coordinated implementation by the Research Council, including through collaboration with Innovation Norway and SIVA.</td>
</tr>
</tbody>
</table>
Barriers to R&D investment | Opportunities and Risks generated by the policy mix
---|---
Insufficient political and public support of R&D as political priority. | • + Opportunities for linking R&D to new priorities (clean energy, Carbon Capture and Storage (CCS), health).
| • - Risks of persistent/increasing political short-termism.
Relatively low absorption capacity of business enterprise sector. | • + Opportunities in insufficiently recognised and targeted potential for increasing R&D in traditional industrial sectors. Strengthen the capability of research institutes to cooperate with firms.

3 Interactions between national policies and the European Research Area

3.1 Towards a European labour market for researchers

The Communication Better careers and more mobility: A European Partnership for Researchers proposed by EC in May 2008 aims to accelerate progress in four key areas:

- Open recruitment and portability of grants;
- Meeting the social security and supplementary pension needs of mobile researchers;
- Providing attractive employment and working conditions;
- Enhancing the training, skills and experience of researchers

The Commission has also launched concrete initiatives, such as dedicated information services for researchers, in particular through the activities grouped under the name of EURAXESS – Researchers in Motion. Based on the assessment of the national situation in the four key dimensions detailed above, this section will conclude if national policy efforts are supporting a balanced ‘brain circulation’, with outward mobility levels matching inward mobility levels. High levels of outward mobility coupled with low levels of inward mobility often signal an unattractive national labour market for researchers and unsuitable research infrastructures. This may trigger, despite the policy efforts supporting the mobility the ‘brain drain’ rather than brain circulation.

3.1.1 Stocks and mobility flows of researchers

Limited data are available on the numbers and flows of researchers into and out of Norway. The share of foreign doctoral graduates has increased, from 10% in the early 1990s to 20-25% in the last five years. The total number of doctoral degrees awarded to non-nationals was 293 out on a total of 1,184 in 2009. The share of foreign doctoral graduates is highest in the natural and technological science and in agriculture (NIFU STEP 2010).

In 2008, approximately 63,000 persons (headcounts) were involved in R&D in Norway. Of these 44,000 were researchers, 19,000 technicians or other employees

---

5 The MORE project only includes EU27 countries.
with at least five years of higher education. The number of R&D personnel increased with in total 3000 persons, or with 5% from 2007 (NIFU STEP 2010).

As is shown in Table 9 the share of researchers of the total active population is substantially higher in Norway compared to the EU27. This is true also when considering the different sectors.

Table 9: Total number of researchers by sector of performance, as percentage of active population- number in head count in 2007

<table>
<thead>
<tr>
<th></th>
<th>Business enterprise</th>
<th>Government</th>
<th>HEI</th>
<th>All sectors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EU27</strong></td>
<td>0.32</td>
<td>0.1</td>
<td>0.48</td>
<td>0.91</td>
</tr>
<tr>
<td><strong>Norway</strong></td>
<td>0.66</td>
<td>0.22</td>
<td>0.79</td>
<td>1.67</td>
</tr>
</tbody>
</table>

Source: Eurostat

At the end of November 2008 the unemployment rate for Norwegian employees with a higher education (five years or more) was 0.7%. For employees with lower levels of education the unemployment rate was 0.8%. Although the last financial crisis has led to increased unemployment among the more highly educated, the unemployment rate remains relatively low (NIFU STEP).

### 3.1.2 Providing attractive employment and working conditions

Providing attractive employment and working conditions for researchers is a priority area in Norway.

The current white paper on research policies focuses on a number of objectives and actions including increasing the number of doctoral grants, improving the quality of the doctoral training, increasing the share of grantees who finish their doctoral studies within the prescribed time frame, reducing the share of short time temporary researcher positions and emphasizing the institutions' responsibility for career advice and opportunities, including individual career plans.

In Norway, institutions are free to offer senior researcher positions to end-of career researchers to allow them to pursue and develop their individual research career and make their original position such as professorships available for up and coming researchers.

In total, 11 Norwegian institutions have signed the European Charter for Researchers at the end of 2010. These include six universities, four university colleges and three public research and education bodies, including the Research Council of Norway.

In Norway, proactive policies and practices aiming at achieving adequate (40%) gender representation in selection and funding bodies are in place. All higher education institutions have action plans for gender balance. A national "Women in Science" committee and website was established in 2004 and an annual national quality award to institution with the best gender equality initiatives was established in 2007. The latest white paper (2008-2009) on research policies is focusing on how to improve the gender balance at all researcher levels and in all scientific fields including those with low female participation, such as in natural science and technology (SGHRM, 2009). Career breaks, such as parental leave do not in general penalise researchers. After parental leave the restoration to the same position is guaranteed by law.

A problem that has received considerable attention from policymakers recently is the issue of high numbers of temporarily employed staff in the higher education sector.
The share of temporary contracts in the HEI sector is double that of the country average. The share of research and teaching staff with temporary contracts in the public sector was 19.8% in 2009. The corresponding figure for administrative positions was 17.8%. The share is particularly high amongst female staff. The official aim of the government is to reduce the number of temporary positions in the HEI sector. As part of this work, the Ministry of Education and Research appointed a working group with the mandate to examine measures that can help achieve this goal. The working group's report was delivered to the Ministry November 2010 and has been sent out on hearing until 20th February 2011.

### 3.1.3 Open recruitment and portability of grants

As to “portability of individual grants awarded by national funding agencies”, there is still room for action by Norwegian policymakers. Nevertheless, an example of good practice is the portability of grants between the United Kingdom and Norway and Norway and Austria. On the portability of grants, Norway is amongst those countries having signed EUROHORC’s letter of intent “Money follows researchers” (SGHRM, 2009).

As to access to information, Norway has posted information on the transferability of social security and supplementary pension rights on its national websites and on EURAXESS. There are no barriers to for non-nationals in competitions for permanent research and academic positions.

Norway has not implemented the EU recommendations on a Scientific Visa. However, from 1st January 2010 a new Immigration Act came into force in Norway. The new Act simplifies registration procedures for EU/EEA/EFTA nationals and makes it easier for skilled workers from countries outside the EU/EEA/EFTA to apply for employment in Norway.

### 3.1.4 Meeting the social security and supplementary pension needs of mobile researchers

As to providing adequate social security coverage for all publicly funded researchers receiving stipends and fellowships, the situation in Norway is very good. In Norway publicly funded researchers including PhD students have employment contracts and receive adequate social coverage. In Norway the PhD students from third countries which receive grants over the budget for development cooperation however have status as students and social coverage as students.

### 3.1.5 Enhancing the training, skills and experience of European researchers

Enhancing the training skills and experience of researchers is a priority in Norway. The government white paper emphasized the need for strengthening the leadership and research administration skills of researchers.

Doctoral programmes are offered by all university-level institutions, some state university colleges and a few private institutions. PhD courses are increasingly being offered in English.

As part of the Quality Reform of Higher Education in Norway introduced in 2003, the number of doctoral titles (previously 14) has been reduced to just two. Research courses now lead to a PhD, corresponding to the Anglo-American degree system.
Since 2004, the Norwegian Centre for International Cooperation in Higher Education (SIU) under the Norwegian Ministry of Education and Research has promoted and facilitated cooperation, common accreditation standards and standardisation of degrees, mobility and the lowering of cultural barriers hampering student and researcher mobility.

Further, the Norwegian ENIC-NARIC centre NOKUT (the Norwegian Agency for Quality Assurance in Education) considers applications for general recognition of foreign qualifications. The agency is also responsible for providing foreign institutions and partners with information about the Norwegian educational system and the procedures for recognition of foreign higher education qualifications.

To increase training and skills in industry PhD fellows are awarded by the RCN under the user-driven innovation programmes. The Industrial Ph.D. scheme gives companies the opportunity to enhance their research expertise without having to participate in a more comprehensive project (User-driven Innovation Project or Knowledge-building Project with User Involvement). About €7.7m (NOK60m) has been set aside for the Industrial Ph.D scheme in 2010 (Ministry of Finance, 2010).

3.2 Research infrastructures

Research infrastructures (RIs) are a key instrument in the creation of new knowledge and, by implication, innovation, in bringing together a wide diversity of stakeholders, helping to create a new research environment in which researchers have shared access to scientific facilities. Recently, most EU countries have begun to identify their future national RI needs, budgets and priorities in the so called National Roadmaps for Research Infrastructures. These strategic documents also set out a strategic view on how to guarantee and maintain access to research facilities. Although some countries invest heavily in RIs, none can provide all the required state-of-the-art facilities on a national basis. Several large RIs have already been created in Europe. While optimising the use and development of existing RIs remains important, new infrastructures are needed to respond to the latest research needs and challenges. European Strategic Forum for Research Infrastructures (ESFRI) was established in April 2002 to support a coherent approach to policy-making on RIs in Europe and to act as an incubator for international negotiations on concrete initiatives. This section assesses the research infrastructures national landscape, focusing on the national RI roadmap and national participation in ESFRI.

3.2.1 National Research Infrastructures roadmap

The government white paper on research, Climate for Research, assigns the Research Council the responsibility for drawing up a Norwegian roadmap for investment in research infrastructure. The Roadmap is to present national and international large-scale projects in which the Research Council recommends investing in the near future – within a realistic budget framework. The white paper stipulates that research infrastructure investments to be included on the Roadmap must be selected on the basis of stringent criteria in terms of quality as well as relevance and benefit to society.

The Norwegian Roadmap corresponds closely to similar national roadmaps that have been, or are being, drawn up in many other European countries. The Norwegian Roadmap is a direct follow-up of the Government white paper on research, Climate
for Research, and is closely linked to the National Financing Initiative for Research Infrastructure which had its first call for proposals in 2009.

The roadmap will be updated after each major announcement of funding for research infrastructure, the first time in mid-2011 (Research Council of Norway, 2010).

3.2.2 National participation in the ESFRI roadmap. Updates 2009-2010

The Norwegian roadmap 2010 includes projects on the European Roadmap for Research Infrastructures in which Norway has entered into binding agreements or has clearly signalled its desire to participate. Norwegian research groups are participating in the preparatory phase for six projects. All the projects have undergone a thorough review by ESFRI and are also considered to be of major strategic importance for Norwegian research. None of the projects had come far enough in their planning process for the Norwegian research groups to seek funding from the Research Council in the first funding round under the National Financing Initiative for Research Infrastructure (in 2009).

Projects on the European Roadmap for Research Infrastructures in which Norway has entered into binding agreements or has clearly signalled its desire to participate are shown in Table 10. These include five large scale facilities and one scientific database.

In October 2010 the Norwegian Social Science Data Services AS (NSD) in Bergen was chosen as host to the database cooperation project Council of European Social Science Data Archives (CESSDA RI).

Table 10: ESFRI facilities

<table>
<thead>
<tr>
<th>Project</th>
<th>Topic</th>
<th>Norway offers hosting</th>
<th>Participating Norwegian institutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIOS: The Svalbard Integrated Arctic Earth Observing System</td>
<td>Climate and Environment</td>
<td>yes</td>
<td>RCN, NPI, UNIS, NSC, UIB, UIT, METNO, NERSC, IMR, NILU, NMA, ARR</td>
</tr>
<tr>
<td>ESRF: Upgrade European Synchrotron Radiation Facility*</td>
<td>Materials Science</td>
<td>no</td>
<td>NordSync (Norway, Sweden, Denmark, Finland)</td>
</tr>
<tr>
<td>ECCSEL: European Carbon Dioxide Capture and Storage Laboratory Infrastructure</td>
<td>Carbon Capture and Storage, Energy</td>
<td>yes</td>
<td>NTNU, SINTEF</td>
</tr>
<tr>
<td>ESS: European Spallation Source</td>
<td>Physics, Materials Science</td>
<td>no</td>
<td>IFE, NTNU, UiO, UiB</td>
</tr>
<tr>
<td>EISCAT-3D: Next Generation European Incoherent Scatter Radar System*</td>
<td>Physics, Space Research</td>
<td>no</td>
<td>UiT, UNIS, UiO, UiB og FFI</td>
</tr>
<tr>
<td>CESSDA: Council of European Social Science Data Archives</td>
<td>Social Sciences</td>
<td>yes</td>
<td>Norwegian Social Science Data Services (NSD)</td>
</tr>
</tbody>
</table>

Source: RCN, 2010. *Norway is member of ESRF and EISCAT
3.3 Strengthening research institutions

The ERA green paper highlights the importance of excellent research institutions engaged in effective public-private cooperation and partnerships, forming the core of research and innovation 'clusters', mostly specialised in interdisciplinary areas and attracting a critical mass of human and financial resources. The Universities/ research institutions should be embedded in the social and economic life where they are based, while competing and cooperating across Europe and beyond. This section gives an overview of the main features of the national higher education system, assessing its research performance, the level of academic autonomy achieved so far, dominant governing and funding models.

3.3.1 Quality of National Higher Education System

In Norway there are in total eight public universities, 26 university colleges and five specialised university colleges. In 2009 there were in total 194,658 registered tertiary-level students in Norway. The number of students in universities were 82,967; in public university colleges 82,917; in private university colleges 8,857 (NIFU 2010).

Expenditure on R&D in the higher education sector (HERD) was estimated at €1.6m in 2008.

Table 11: Higher education sector performed R&D in current prices — Norway 1998-2008

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>HERD €m current prices</td>
<td>:</td>
<td>:</td>
<td>906.96</td>
<td>982.711</td>
<td>1,228.999</td>
<td>1,578.73</td>
</tr>
</tbody>
</table>

* Estimate

The HERD intensity ratio (HERD as a % of GNP) is, therefore, 0.51% which is above the OECD and EU27 averages of 0.39%.

Table 12: HERD as a percentage of GDP

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>OECD</td>
<td>0.34%</td>
<td>0.35%</td>
<td>0.39%</td>
<td>0.39%</td>
<td>0.39%</td>
<td>0.39%</td>
</tr>
<tr>
<td>EU27</td>
<td>0.35%</td>
<td>0.36%</td>
<td>0.39%</td>
<td>0.38%</td>
<td>0.39%</td>
<td>0.39%</td>
</tr>
<tr>
<td>HERD/GDP Norway</td>
<td>:</td>
<td>:</td>
<td>0.44%</td>
<td>0.47%</td>
<td>0.46%</td>
<td>0.51%</td>
</tr>
</tbody>
</table>

* Estimate

The share of business enterprise sector of HERD is not available in Eurostat.

Most institutions of higher education are state-run and are responsible for the quality of their own instruction, research and dissemination of knowledge. About 12.5% of students in higher education attend private institutions.

In 2003 a reform was carried out in Norwegian Higher Education. The Quality Reform introduced a degree structure, grading system and quality assurance system in line with the Bologna Process. The reform also meant the establishment of a quality assurance agency, NOKUT, and a centre for internationalisation, SIU. A system for institutional accreditation (voluntary for the private institutions) was also introduced, which had the consequence that some university colleges launched efforts towards becoming universities. The grading scale conforms to the European Credit Transfer System (ECTS) rating scale.
3.3.2 Academic autonomy
Pervasive reforms are being implemented in the HEI sector following the comprehensive "Quality Reform" that took place on the basis of a 2001 white paper. New laws have been passed on higher education, and fundamental changes have, under the auspices of the Bologna process, been made to the programme structure of higher education. HEI institutions have been accorded more extensive institutional autonomy and the funding of both teaching and research in HEIs has progressively become more performance based.

Changes to the structure of institutional governance have also been part of the Quality Reform. Traditionally the management of tertiary institutions in Norway has been a divided responsibility between a rector elected for a four-year term who is responsible for academic matters, and a general director, appointed by the board of the institution who heads the administration. The new law on higher education passed by the parliament in spring 2005, contained provisions allowing for a choice between the traditional model and a model in which the board is chaired by an external member, with the rector appointed by the board and responsible for both academic and administrative matters. Greater institutional autonomy in financial matters has been encouraged in recent years (for example by allowing institutions to retain financial surpluses), as have moves towards a more managerialist, rather than collegiate, approach to internal management structures (OECD 2006).

Universities have the possibility to make decisions for allocating resources autonomously in line with their research priorities. In general terms, evidence indicates inadequate management and weak strategic direction of institutional policies for research.

3.3.3 Academic funding
About 80% of public funds for R&D in HEIs are channelled directly from the Ministry of Education and Research to the institutions, almost all of which is institutional funding. Since 2003 a funding structure has been in place for these funds, which consists of three core components:

- basic funds which are block funding without detailed specifications of their use. This component initially amounted to about 60% of institutional funding (on average for all HEI institutions), but has decreased somewhat;
- a teaching component, in which funds are distributed on the basis of reported student performance; this component initially amounted to about one-quarter of institutional funding and has increased somewhat;
- a research component, which amounts to about 15% of institutional funding. This component is subdivided into two parts:
  1. a performance-based part, within which funds are redistributed among institutions on the basis of benchmarks for publications and competitive research funding, and
  2. a strategic component, within which earmarked funds are allocated to specific institutions for positions for PhD students and for scientific equipment.

An elaborate system for registering and reporting input to the performance-based parts of the system has been developed. NOKUT – the Norwegian Agency for Quality Assurance in Education – is an independent government agency that
contributes towards quality assurance and enhancement in higher education and tertiary vocational education. NOKUT conducts quality controls and stimulates the quality development of educational provision at Norwegian universities, higher education colleges and colleges of tertiary vocational education.

The higher education sector received most of its R&D funding from Norway’s General University Funds (GUF). GUF funding amounted to 65% of total R&D spending in the sector in 2007. This share has remained stable since 2003, after declining from 70% in the late 1990s. Other funding sources have thus increased from about 30-35% in the last ten years (Source: Report on Science and Technology Indicators for Norway 2009, NIFU STEP).

3.4 Knowledge transfer

The importance of knowledge dissemination and exploitation in boosting competitiveness and contributing to the effectiveness of public research has been increasingly recognised by EC and EU Member States. Following the publication of the ERA Green Paper in April 2007, the EC Communication "Improving knowledge transfer between research institutions and industry across Europe" was issued, highlighting the importance of the effective knowledge transfer between those who do research, particularly HEIs and PROs, and those who transform it into products and services, namely the industry/SMEs.

Several Member States have taken initiatives to promote and facilitate knowledge transfer (for instance new laws, IPR regimes, guidelines or model contracts) and many others are planning to intensify their efforts in this direction. However, these initiatives are often designed with a national perspective, and fail to address the transnational dimension of knowledge transfer. This section will assess the national policy efforts aimed to promote the national and trans-national public-private knowledge transfer.

3.4.1 Intellectual Property Policies

Important developments in Norwegian IPR policy have taken place under this government, including the ratification of the European Patent Convention, and support for the establishment of a Nordic Patent Institute.

All universities have established their own Technology Transfer Offices (TTOs). Following law amendments (a Bayh-Dole shift) in 2003, which gave intellectual property rights (IPR) to institutions, universities and colleges were assigned a more explicit commercialisation mission. In January 2008, Norway formally joined as a full member of the European Patent Office (EPO).

The Norwegian Industrial Property Office (NIPO) is a government authority organized under the Ministry of Trade and Industry. NIPO is responsible for processing applications for patent protection, and for trademark and design registration.

3.4.2 Other policy measures aiming to promote public-private knowledge transfer

Inter-sectoral mobility

Unemployment among graduates with higher degrees has been very low in recent years. At the end of November 2008 the unemployment rate among those with at least five years of university education was 0.7%. The financial crisis has led to
increased unemployment among highly educated employees, although less than the national average.

In Norway most doctoral candidates are employed in the public sector. However, a large minority – just under 40% – work in the private sector, including research institutions. Almost half of the private sector workforce that hold doctoral degrees are employed at research institutions or R&D companies. One in four works in a service company, one in six in a manufacturing company and one out of ten in oil and gas activities. Two thirds of public-sector employees with doctoral degrees work at universities and colleges, while a quarter work in the country’s health institutions.

**Spin-offs**

The creation of new ventures based on academic research, or academic entrepreneurship, has become an objective for policy makers and universities across Europe. In line with the international trends, the FORNY programme was established during the 1990s and is the main support mechanism for commercialisation of public funded research in Norway. The FORNY programme run by the RCN is the most important measure for supporting the commercialisation of R&D results. While the budget was €5.6m (NOK44m) in 2000, it has been tripled up to about €16.6m (NOK130m) in 2008.

**Figure 2: Approved commercialisations in the FORNY programme (Borlaug et al. 2009)**

On average, the programme has approved around 50 commercialisations per year since 2001; however, the number has varied considerably (see figure 2). While 50 commercialisations were approved in 2001, there was a falling tendency until 2003, and later there has been a significant growth up to the estimated 70 approved commercialisations in 2008.

According to an evaluation of the FORNY programme from 2009 the spin-off firms established as a result of the programme are placed within knowledge intensive industries. Spin-offs within information and communication technology are most
frequent (43.7%). Then follows biotechnology and energy/environment (both 16.9%), and maritime and med-tech/biomedicine (both 15.5%). The far most important sources of the technological ideas behind the spin-offs were the research in the institutions where the spin-off was initiated (Borlaug et al. 2009).

Promoting research institutions - SME interactions

There are several policy instruments in place which facilitate interaction between research organisations and SMEs. Innovation Norway runs the "IFU/OFU" programmes, which support R&D contracts between small and medium sized enterprises (SMEs) and either larger firms or public institutions. "SkatteFUNN" is a programme operated by RCN which support R&D investments in companies. For many of the FORNY start-ups, in particular those with a significant growth potential, the seed capital funds are important to provide risk capital, thus representing a good example of policy mix complementarity.

Involvement of private sectors in the governance bodies of HEIs and PROs

Public-private knowledge transfer is ensured by the involvement of representatives from the private sector in the governance of higher education institutions. At several universities a large part of board members are external members often representing private sector.

EU cohesion policy

As a non-EU Member State Norway does not benefit from EU cohesion funds.

3.5 Cooperation, coordination and opening up national research programmes within ERA

The articulation between the R&D Framework Programmes, the Structural Funds and the Competitiveness and Innovation Programme is still underdeveloped in terms of coordination, synergies, efficiency and simplification. The policy fragmentation at EU and national level, and between EU and national policies can hinder the build of critical masses of research excellence, leads to the duplication of efforts, sub-optimal impacts of the different instruments and unnecessary administrative overheads. Differences between research selection procedures and criteria can also be an obstacle to the overall spread of excellence. This section assesses the effectiveness of national policy efforts aiming to improve the coordination of policies and policy instruments across the EU, all part of the drive to create an integrated ERA.

3.5.1 National participation in intergovernmental organisations and schemes

Norway participates in a range of international collaborative efforts concerning education and research. Internationalisation of Norwegian research has been a top priority in research policy for a long time. This is manifest in official documents that outline public research policy such as the White Paper on research policy presented to the Norwegian parliament (Stortinget). The rational for participating emerges from the 2009 White Paper on research policy: “Internationalisation of research is important in order to increase quality and strengthen relevance of Norwegian research and in order to provide us with access to research done outside of Norway”.

The EU Framework Programmes are the most important international research programmes in which Norway takes part. Norwegian researchers have participated in
the EU FPs since 1987. Recent evaluations of Norway’s participation in the FPs shows that the Norwegian rate of success, so far in FP7, is approximately 22% which is above the EU average of 16%. In FP6, the rate of success was 25%, which also was above the EU average of 18%. In terms of funds, the Norwegian rate of success is less impressive and Norway pays more for the FPs than is returned to Norwegian participants (in pure financial terms). The implication of these hard figures is that there is a potential for increased participation in the EU FP (Godø et al, 2009).

Whereas the level of financial contribution from Norway has increased incrementally compared to FP6 during the first years of FP7, it is expected to double by the end of FP7. Norway’s annual financial contribution (contingent) to the EU for its participation in FP5 was €62m. In FP6 and now at the first part of FP7, this contribution has risen to at least €84m. The highest number of Norwegian participations in FP7 so far has been in the SME programme. ENVIRONMENT is the theme in the Cooperation part of FP7 with the highest number of Norwegian participations. ERC-activities (IDEAS programme) and participation in the PEOPLE programme in the FP7 represent a challenge for the Norwegian research system. The participation in these two programmes is very low.

In May 2008, the Norwegian Ministry of Education and Research (MER) published a document on the strategy for Norway’s cooperation with the EU on research and development.

The RCN has the role to facilitate Norwegian participation in international and European institutions, such as EUREKA, COST, ESF and EUROCORES and to follow up bilateral agreements. The budget for EUREKA in 2009 was €1.9b (NOK15m). Norwegian authorities have earmarked €5m yearly for participation in Eurostars. In 2010 there were 33 approved Eurostars projects with Norwegian participation.

Norway decides à la carte if to participate to COST actions based on the interest of national research groups. Once actions have been launched, participating Norwegian groups can request funding from the RCN to perform research in this area. RCN evaluates demands based on external reviews.

**National participation in inter-governmental Research infrastructure**

Norway participates in several international fellowship schemes and specialised, high-quality, pan-European initiatives such as the European Molecular Biology Laboratories (EMBL), the European Organisation for Nuclear Research (CERN), the European Space Agency (ESA), the European Synchrotron Radiation Facility (ESRF) and the OECD’s Halden Reactor Project, as well as in large-scale common infrastructure through the European Strategy Forum on Research Infrastructures (ESFRI).

**3.5.2 Bi- and multilateral agreements with other ERA countries**

Norway’s most important multilateral agreement with other ERA countries is represented by the formalised Nordic research cooperation. The organisation of Nordic collaboration in research and innovation rests on two main pillars, one for research, (the Nordic Research Board, NordForsk), and one for innovation (the Nordic Innovation Centre, NICE). The **Top-level Research Initiative (TRI)** is the largest joint Nordic research and innovation initiative to date. The committees provide a forum in which the research councils may exchange information on research policy, national funding strategies and priorities; may discuss relevant joint Nordic initiatives.
Norway also has signed a bilateral agreement with France (in 2008). The French Norwegian Foundation promotes long-lasting French/Norwegian cooperation through the financing of joint R&D projects in which both industry and research institutes/universities are involved with the aim of creating cooperation lasting beyond the project-period. On the Norwegian side, €375,000 (NOK3m) is allocated each year to finance the Norwegian participation in the projects.

The “EEA and Norway grants” supports projects in the 12 newest member states as well as in Greece, Portugal and Spain. The large majority of partnership projects within the field of research concerns protection of the environment and sustainable development. The largest number of approved projects in this sector is in the EEA and Norway Grants’ largest recipient state, Poland, with 41 approved projects worth more than €42m.

3.5.3 Other instruments of cooperation and coordination between national R&D programmes

Participation in ERA-NETs

Norway participates in approximately 40 ERA-NETs mostly though the RCN. The following table illustrates Norwegian participation in ERA-NETs by type:

Table 13: Norwegian participation in ERA NETs by type

<table>
<thead>
<tr>
<th>Research field</th>
<th>Total number of ERA NETs</th>
<th>Share of total number of ERA NETs</th>
<th>ERA NET with Norwegian participation</th>
<th>Share of Norwegian participation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biosciences</td>
<td>26</td>
<td>25%</td>
<td>8</td>
<td>20%</td>
</tr>
<tr>
<td>Environment and energy</td>
<td>25</td>
<td>24%</td>
<td>9</td>
<td>23%</td>
</tr>
<tr>
<td>Social sciences and humanities</td>
<td>14</td>
<td>13%</td>
<td>6</td>
<td>15%</td>
</tr>
<tr>
<td>Basic research</td>
<td>6</td>
<td>6%</td>
<td>2</td>
<td>5%</td>
</tr>
<tr>
<td>International cooperation</td>
<td>7</td>
<td>7%</td>
<td>2</td>
<td>5%</td>
</tr>
<tr>
<td>Industrial technologies, ICT, space, innovation and transport</td>
<td>28</td>
<td>28%</td>
<td>13</td>
<td>33%</td>
</tr>
<tr>
<td>Total</td>
<td>106</td>
<td>100%</td>
<td>40</td>
<td>100%</td>
</tr>
</tbody>
</table>

Source: Ministry of Education and Research, 2008

Norwegian participation in ERA NETs is notable especially in the area of industrial technology, ICT, space, innovation and transport, but also within environment and energy. ERA-NETs with Norwegian participation have received a total funding of €96.3m, with close to €8.7m to Norwegian participants (Ministry of Education and Research, 2008).

Participation in initiatives undertaken under Art.185 of the Treaty of Lisbon

Norwegian participation in Art. 185 initiatives is à la carte depending on the national interest of the programme. Norway currently participates to the following Art. 185 actions:

- Developing Countries Clinical Trials Partnership (EDCTP) through a specific cooperation agreement. Norwegian co-funding is available from the RCN under specific conditions.
• Ambient Assisted Living (AAL) and EUROSTARS. For these two programmes, Norwegian funding is managed through the Research Council of Norway under national rules.

**Participation in activities undertaken through frameworks supported by the European Science Foundation (ESF)**

For all ESF initiatives, RCN decides case by case of to join and the level of budget committed. RCN decides on funding mostly based on ESF panel’s recommendations and without its own evaluation. The annual budget for EUROCORES collaborative research projects was €1.36b (NOK10.9m); for ESF €187,500 (NOK1.5m) in 2009.

**Participation in European public-private partnerships**

With regard to Norwegian participation in Joint Technology Initiatives (JTI) there are Norwegian partners in ARTEMIS and ENIAC. Norway has committed to participate in annual calls in JTI. These financial commitments are not included in the annual allocations to the RCN. Allocations to JTIs for 2010 are €700,000 (NOK5.6m) from the Ministry of Industry and Trade.

**Involvement in Joint Programming (JP) Initiatives**

Together with Belgium and Spain, Norway has initiated the JPI for Health and Productive Seas and Oceans. This JPI seeks to create an integrated knowledge base that enables an integrated policy to make the most of marine resources in a sustainable way, while understanding and mitigating the impact of climate change on the marine environment and coastal areas.

Norway also participates in the following JPIs:

- A healthy diet for a health life
- Agriculture, food security and climate change
- Neurodegenerative Disease/Alzheimer’s
- Climate knowledge for Europe (CliK’EU)

Norway has expressed interest in participating in the JPI for Urban Europe.

**3.5.4 Opening up of national R&D programmes**

Opening of national programmes is a political priority in Norwegian research policy. The situation is currently that applicants from abroad must as a rule have a formal affiliation with a Norwegian institution to be eligible to seek Norwegian funding. However, some funding opportunities, programmes, grants and scholarships are specifically designed for foreign researchers and partners.

Normally, applications for funding under the Research Council’s research programmes and other funding opportunities are only accepted from Norwegian institutions and companies. Researchers from abroad must as a rule have formal affiliation with a Norwegian institution to be eligible to seek Norwegian funding.

**3.6 International science and technology cooperation**

In 2008, the European Commission proposed the Strategic European Framework for International Science and Technology Cooperation to strengthen science and technology cooperation with non-EU countries. The strategy identifies general
principles which should underpin European cooperation with the rest of the world and proposed specific orientations for action to: 1) strengthen the international dimension of ERA through FPs and to foster strategic cooperation with key third countries through geographic and thematic targeting; 2) improve the framework conditions for international cooperation in S&T and for the promotion of European technologies worldwide. Having in view these aspects, the following section analyses how national policy measures reflect the need to strengthen the international cooperation in S&T.

3.6.1 International cooperation

Norway has signed several bilateral agreements with third countries. The research cooperation with China (CHINOR programme) enables the RCN to enter into partnerships with Chinese governmental research financing bodies. The thematic priorities at start-up are climate change, climate technology, environment and welfare.

The South African-Norwegian programme for Research Cooperation has been established to continue the development of long-term and sustainable research cooperation between Norway and South Africa based on equal partnership. The aim of the programme is to achieve scientific excellence and relevance to the thematic areas. Prioritised research topics are: health and medical sciences, HIV/AIDS, Environment and Energy with emphasis on renewable and sustainable energy sources and socio-economic impacts.

Cooperation with India is achieved through the INDNOR programme launched in 2010. In the first call for proposals the energy and climate change field was prioritised.

3.6.2 Mobility schemes for researchers from third countries

The NUFU programme (the Norwegian Programme for Development, Research and Education) supports independent academic cooperation based on initiatives from researchers and institutions in the South and their partners in Norway.

The International Scholarship programme under the RCN promotes the exchange of students and researchers within the framework of international mobility and networking programmes. Normally the applicant must as a minimum requirement be admitted to an organised PhD programme to be eligible to apply for a scholarship but applications are also accepted from graduate/post-graduate students under some of the schemes. Specific schemes exist for different regions and include:

- **The Leiv Eiriksson mobility programme** is a follow-up to the "Norwegian Strategy for Scientific and Technological Cooperation with North America" (2004). The programme aims to contribute to the long-term escalation of R&D collaboration with the USA and Canada by allowing more Norwegian researchers to spend time in the U.S. or Canada, and vice versa. The total annual budget is approximately €750,000 (NOK6m).

- **The Yggdrasil programme** was launched in 2009 and replaces the Norwegian government scholarships under the Cultural Agreements between Norway and 50 countries within and outside Europe. The programme offers grants to international Ph.D. students and younger researchers for temporary research stays in Norway. The annual budget framework is about €1.2m (NOK10m).
• **NSFC mobility programme with China.** The Research Council of Norway (RCN) and the National Natural Science Foundation of China (NSFC) has entered into an agreement on strengthening Chinese-Norwegian basic research collaboration within the natural sciences. Information on the annual budget is not available.

• **The Norwegian Government scholarships under the Cultural Agreement with China** aim to establish and expand academic and cultural contact between Chinese and Norwegian individuals and between institutions of education and research. Information on the annual budget is not available.

• **Specialist exchange with China.** The specialist exchanges under the Cultural Agreement with China aim to establish and expand academic and cultural contact between Chinese and Norwegian individuals and between institutions of education and research. The scholarship will cover the cost of budget accommodation and a daily allowance of €88 (NOK700) for short visits up to three weeks.

• **Japan-Norway Researcher mobility programme.** The Japan Society for the Promotion of Science (JSPS) and the Research Council of Norway (RCN) have entered into an agreement (2006) on a Japanese-Norwegian fellowship programme for researchers in the humanities, social and natural sciences.

### 4 Conclusions

#### 4.1 Effectiveness of the knowledge triangle

The following table gives a short assessment on the effectiveness of policies in the knowledge triangle.

**Table 14: Effectiveness of knowledge triangle policies**

<table>
<thead>
<tr>
<th>Policy</th>
<th>Recent policy changes</th>
<th>Assessment of strengths and weaknesses</th>
</tr>
</thead>
</table>
| **Research policy** | • Establishment of Regional research funds;  
• Increase in funding for polar research in the state budget;  
• Establishment of a new centre of expertise in Education;  
• Increased earmarked funding for basic research;  
• Establishment of three new centres for environmentally friendly research within the social sciences;  
• Reorganisation of the Research Council of Norway. | • ± High increases in public funding of research over the last years (except in 2010);  
• ± Balance between selective (centres.) and general research funds;  
• ± Consolidated research council organisation. |
| **Innovation policy** | • New SME strategy underway  
Reorganisation and slimming of Innovation Norway. | • - Weak emphasis on innovation in industry policy;  
• + Strong emphasis on innovation in the health and energy sectors. |
### Recent policy changes

<table>
<thead>
<tr>
<th>Education policy</th>
<th>Assessment of strengths and weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>New university established 1\textsuperscript{st} January 2011; Prolonged Government financial support for cooperation to restructure the HEI system.</td>
<td>+ Stronger emphasis on performance and effectiveness in funding of higher education; - Slow restructuring of the HEI sector.</td>
</tr>
</tbody>
</table>

| Other policies | |
|----------------| |
| High increase in funds for energy and climate research. | + Strong political support for climate/energy R&D. Increase in sectoral funding and effective reorganisation of (applied) health research. |

### 4.2 ERA 2020 objectives - a summary

The following table gives a short assessment of national policies supporting the ERA 2020 objectives.

#### Table 15: Assessment of the national policies/measures supporting the strategic ERA objectives (derived from ERA 2020 Vision)

<table>
<thead>
<tr>
<th>ERA objectives</th>
<th>Main national policy changes</th>
<th>Assessment of strengths and weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Ensure an adequate supply of human resources for research and an open, attractive and competitive single European labour market for male and female researchers</td>
<td>- Government strategy to reduce the number of temporary contracts in the higher education sector.</td>
<td>+ Good salary terms for PhD students; + Establishment of internationally attractive centres of excellence; - Low salaries for researchers.</td>
</tr>
<tr>
<td>2 Increase public support for research</td>
<td>0.2% real terms decrease in total R&amp;D expenditure from 2008 to 2009.</td>
<td>Lack of long term planning for public R&amp;D expenditures affects predictability of research investments.</td>
</tr>
<tr>
<td>3 Increase European coordination and integration of research funding</td>
<td>Participation in joint programming initiatives (JPI) (healthy oceans) and a large number of ERA NETs.</td>
<td>+ Pro-active policies for participation in new EU/ERA policy developments; Norway contributed financially more for the FPs than is returned to Norwegian participants. Hence there is a potential for increased participation in the EU FP; + Strong engagement of the Research Council of Norway in European research initiatives.</td>
</tr>
<tr>
<td>4 Enhance research capacity across Europe</td>
<td>Government white paper (Report nr. 30 to the Storting 2008-2009) on research policy emphasises the need to strengthen internationalisation; New biotechnology strategy gets underway.</td>
<td>+ Increased funding on priority areas (health, climate/energy).</td>
</tr>
<tr>
<td>ERA objectives</td>
<td>Main national policy changes</td>
<td>Assessment of strengths and weaknesses</td>
</tr>
<tr>
<td>--------------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Develop world-class research infrastructures (including e-infrastructures) and</td>
<td>• The roadmap on RI gives an overview of Norwegian participation in RI projects which are part of the ESFRI process;</td>
<td>• + Strong alignment of research infrastructure policies with large European RI projects.</td>
</tr>
<tr>
<td>ensure access to them</td>
<td>• In October 2010 the Norwegian Social Science Data Services AS (NSD) in Bergen was chosen as host to</td>
<td></td>
</tr>
<tr>
<td></td>
<td>the database cooperation project Council of European Social Science Data Archives.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strengthen research institutions, including notably universities</td>
<td>• A New university established first January 2011;</td>
<td>• Hesitant long-term structural reform policies for the HEI sector;</td>
</tr>
<tr>
<td></td>
<td>• Government financial support for formal HEI cooperation in 2010 and 2011.</td>
<td>• + New incentives in funding policies (performance, centres) for promoting excellence in HEI research.</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Improve framework conditions for private investment in R&amp;D</td>
<td>• The strengthening of private R&amp;D spending is the aim of the R&amp;D tax incentive scheme introduced in 2001. This is the main regulation contributing to improving framework conditions for private R&amp;D investments.</td>
<td>• Private expenditures on R&amp;D are still low in international comparisons; criticism has been directed to the government budget for 2011 for not providing sufficient framework conditions for private investments in R&amp;D.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Persistent low private sector R&amp;D spending.</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Promote public-private cooperation and knowledge transfer</td>
<td>• The regional research funds launched in early 2010 have the aim to improve cross sectoral cooperation and boost research in the regions.</td>
<td>• + Norway has a higher than OECD average level of R&amp;D cooperation between private companies and research institutes.</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enhance knowledge circulation across Europe and beyond</td>
<td>• Launching of a new India-Norway joint programme in 2010;</td>
<td>• + Several bilateral agreements on research collaboration;</td>
</tr>
<tr>
<td></td>
<td>• Launching of the joint programming initiative (JPI) for clean seas and oceans;</td>
<td>• + Long experience from institutionalised cooperation in research with Nordic countries;</td>
</tr>
<tr>
<td></td>
<td>• No changes relevant to EU.</td>
<td>• + The Nordic top level research initiative on energy and climate is an important policy measure to enhance knowledge circulation in the Nordic region and beyond.</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strengthen international cooperation in science and technology and the role and</td>
<td>• Evaluation of the Norwegian Centres of Excellence (CoE) published in 2010 shows the scheme has positive effects on internationalisation of research and researcher recruitment.</td>
<td>• + The CoE scheme successfully strengthens internationalisation of research and promotes recruitment of researchers.</td>
</tr>
<tr>
<td>attractiveness of European research in the world</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ERA objectives</td>
<td>Main national policy changes</td>
<td>Assessment of strengths and weaknesses</td>
</tr>
<tr>
<td>----------------</td>
<td>-----------------------------</td>
<td>---------------------------------------</td>
</tr>
<tr>
<td>11 Jointly design and coordinate policies across policy levels and policy areas, notably within the knowledge triangle</td>
<td><strong>Internal reorganisation of the Research Council of Norway in 2011; evaluation of the RCN has been announced and will be carried out in the present mandate period.</strong></td>
<td><strong>- The strong sector based research funding system is a barrier against horizontal policymaking.</strong></td>
</tr>
<tr>
<td>12 Develop and sustain excellence and overall quality of European research</td>
<td><strong>Since the Quality Reform from 2003 funding of both teaching and research in HEIs has progressively become more performance based. A policy measure aiming at improving quality and excellence is the performance based system for institutional core funding introduced in 2009.</strong></td>
<td><strong>+ Performance based funding of HEIs has boosted high quality research publishing.</strong></td>
</tr>
</tbody>
</table>
| 13 Promote structural change and specialisation towards a more knowledge-intensive economy | **Official policy (emphasised the importance of supporting renewable energy; especially wind energy) research and CCS. In 2010 the government announced that it would delay the decision to finance the Mongstad CCS project after the life of the present Parliament;**  
**Introduction of a green electricity certificate system based on collaboration with Sweden to be implemented in 2012.** | **- Corporatist policy-making processes benefit established firms and industrial sectors**  
**- There is a general lack of incentives for development of and investment in new renewable energy in Norway.** |
| 14 Mobilise research to address major societal challenges and contribute to sustainable development | **The present white paper on research policy (Report to the Storting no.30 2008-2009) emphasises strongly the need for research to meet global challenges related to the environment, climate change, oceans, food safety and energy; Eight Centres for environmentally friendly energy research were established in 2009. Three new centres have been selected in February 2011 within the social sciences.** | **+ A challenge for Norwegian policy makers consists in is combining profitable petroleum related activities with meeting ambitious environmental goals; related knowledge developed in the off shore and oil industry activities are exploited to foster technologies for off shore wind energy technologies and CCS.** |
### ERA objectives

<table>
<thead>
<tr>
<th>Era objectives</th>
<th>Main national policy changes</th>
<th>Assessment of strengths and weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 Build mutual trust between science and society and strengthen scientific evidence for policy making</td>
<td>- There is an extensive use of evaluations of R&amp;D policy measures and programmes. Proposals for new reforms are often subject to hearings involving stakeholders from different sectors and interest groups.</td>
<td>+ There is a fairly extensive use and openness of both evaluations and indicators in the policy-making process. Reports are openly published, and have become subject to extensive policy awareness and debate. Evaluations are typically done by international peer panels + Active institutions for enhance public awareness and debate on controversial issues (biotechnology, ethics, and technology assessment).</td>
</tr>
</tbody>
</table>
References


SGHRM (2009): Report by the ERA Steering group on Human Resources and Mobility (SGHRM) 2009, Report on the implementation of the European Partnership for researchers (EPR) by Member States and countries associated to the FP7.


List of Abbreviations

BERD Business Expenditure of Research and Development
BIA User driven research based innovation programme
CCS Carbon Capture and Storage
CO₂ Carbon dioxide
CRI Centres for research based innovation
EEA European Economic Area
EFTA European Free Trade Association
EIT European Institute of Technology
ERC European Research Council
ERDF European regional development fund
ESF European Science Foundation
ESF European Social Funds
ESFRI European Strategy Forum on Research Infrastructures
EU European Union
FP European Framework Programme for Research and Technology Development
GBAORD Government Budget Appropriations or Outlays on Research and Development
GDP Gross Domestic Product
GERD Government Expenditure on R&D
GLOBVAC Global Health and Vaccine Research
GNP Gross National Product
GUF General University Fund
HEI Higher education institutions
HERD Higher Education expenditure on R&D
HES Higher education sector
HRST Human Resources in Science and Technology
ICT Information and Communication Technology
IN Innovation Norway
JPI Joint Programming Initiatives
LO Norwegian Confederation of trade Unions
MER Ministry of Education and Research
NCE Norwegian Centre of Excellence
NHO Confederation of Norwegian Enterprise
NICe Nordic Innovation Centre
NIFU Nordic Institute for Studies in Innovation, Research and Education
NOK Norwegian kroner
NOKUT Norwegian Agency for Quality Assurance in Education
NSD Norwegian Social Science Data Service
NTNU Norwegian University for Science and Technology
OECD Organisation for Economic Cooperation and Development
PNP Public private partnership
PRO Public Research Organisations
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>R&amp;D</td>
<td>Research and development</td>
</tr>
<tr>
<td>RCN</td>
<td>Research Council of Norway</td>
</tr>
<tr>
<td>RI</td>
<td>Research Infrastructure</td>
</tr>
<tr>
<td>S&amp;T</td>
<td>Science and technology</td>
</tr>
<tr>
<td>SF</td>
<td>Structural Funds</td>
</tr>
<tr>
<td>SIVA</td>
<td>The Company for Industrial Growth</td>
</tr>
<tr>
<td>TRI</td>
<td>Top-level Research Initiative (Nordic joint programme)</td>
</tr>
<tr>
<td>TTO</td>
<td>Technology Transfer Office</td>
</tr>
</tbody>
</table>