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ERAWATCH COUNTRY REPORTS 2011: Iceland

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Executive Summary

Iceland is a small open economy with a population of 319,000. Following the collapse of its banking sector in October 2008, the country went into a long and deep recession. After falling for two consecutive years, Iceland's total Gross Domestic Product (GDP) increased from 2009 to 2010. Real GDP growth continued to be negative at -4.0%.

Gross Expenditure on Research and Development (GERD) as share of GDP was 3.1% in 2009, a relatively high level compared to the EU-27 average of 2.01. Iceland also has a relatively high share of Human Resources in Science and Technology (HRST). In 2009, HRST accounted for 50% of the labour force, compared to 40.1% in the EU-27 (Eurostat 2011, ERAWATCH data).

Despite being a small country, Iceland has a fully-fledged research and innovation system. On the policy design level, the Science and Technology Policy Council (STPC) is the key strategic body. The Council is headed by the Prime Minister and has 20 members that include government Ministers, scientists and business representatives. The role of this body is to define the country's strategic orientation for science and technology policy. The Icelandic Centre for Research, RANNIS, is a central agent on the operational level. The Centre provides technical support to STPC and operates the major competitive funds of science, technology and innovation. The centre reports to the Ministry of Education, and Science and Culture and has a contract to operate a fund for the Ministry of Industry, Energy and Tourism, who owns the largest competitive funds in Iceland. The centre, and also manages and follows up on the implementation of most research programmes and monitors the resources and performance in the R&D&I system.

Iceland has seen an increase in the GERD/GDP ratio over the past few years, from 2.68% in 2007 to 3.1% in 2009. The business sector's share of total national R&D investments declined from 54.6% in 2007 to 48.5% in 2009, the following statistical year (Eurostat 2011, ERAWATCH data). The public sector, including the seven nationally accredited higher education institutions, accounted for 43% in 2009. The main instruments for public research funding are block grants to universities and research institutions on the one hand, and competitive funding programmes on the other hand.

The public budgets for research and development reached a peak in 2009. From 2009 to 2011, cuts to public R&D budgets have been around 18% (2010 prices). The policy for the budget cuts has been to maintain the competitive funding element as far as possible. Some minor cuts in competitive funds were nevertheless made in the 2011 budget.

After the onset of the economic crisis, an international expert panel prepared a report on education, research and innovation policy in Iceland on behalf of the government. Based on this report and subsequent policy analyses, the following structural challenges facing the Icelandic research and innovation system can be identified:

- low share of private R&D investments;
- low levels of competitive research funding;
- insufficient research prioritisation;
- weaknesses in governance; and

- focus on research rather than innovation.

The level of private R&D investments in Iceland is believed to be low when compared to other OECD countries (Taxell report, 2009). The country has a small number of R&D-active firms, and policy measures aimed towards stimulating company R&D are perceived to be insufficient or ineffective (Taxell, 2009, p. 16).

Public research funding mainly takes the form of block grants, and it is argued that the low levels of competitive funding prevent efficient management of science and research. Increasing the levels of competitive funding would make research prioritisation easier and benefit the quality of Icelandic research.

Several weaknesses were pointed out by the Taxell Commission in the area of research and innovation governance, relating both to the policy making abilities of STPC, the policy preparation capabilities at RANNIS, and the use of systematic and structured evaluation.

A final, general challenge is to give higher priority to innovation. The Icelandic innovation system has traditionally had a stronger focus on research than innovation, and the argument has been voiced in recent years that the country needs to develop a clear growth strategy based on innovation, most particularly voiced by the Taxell Commission in its set of nine recommendations under the heading «Focus on innovation».

Current research and innovation policy priorities in Iceland seem to a significant extent to match the structural challenges the country is facing. The current strategy of STPC, entitled *Building on Solid Foundations. Science and Technology Policy for Iceland 2010-2012* highlights the following priorities:

- focus on innovation and close industry support, creative industries, and user-driven innovation;
- more cooperation and synergy among the various universities, research institutions and other actors in the system;
- evaluation and quality control;
- international cooperation and participation in international programmes; and
- funding on the basis of excellence and thus competition.

The strategy emphasises the need for specific actions to encourage private sector R&D investments, and in 2009, a tax deduction scheme for industrial R&D was introduced.

STPC also recommends increasing the proportion of public funding for research and innovation through competitive funding. The Centre of Excellence programme, launched in 2009, is an example of a new policy measure that provides funding for R&D based on competition and excellence criteria.

The Icelandic policy mix has been characterised by a high degree of stability, but since the economic crisis, a number of changes can be observed. Besides the introduction of the R&D tax deduction scheme and the Centre of Excellence programme, key developments include a general trend towards more thematic prioritisation - illustrated by the current focus on the creative industries and geothermal energy and sciences, as well as the Centres of Excellence initiative; and a stronger focus on innovation and non-technological support. The latter is evident

from intensified support in the areas of research commercialisation, entrepreneurship, design and creativity, and social innovation.

Until recently, Iceland did not have any quantitative target for R&D investments along the lines of the Barcelona 3% of GDP target. In January 2011, however, the target was set that 4% of GDP should go to R&D by 2020, with companies contributing 70% of the total and the state 30%.

The Icelandic policy mix is generally well aligned with the ERA pillars and objectives. The country has a strong international orientation in the areas of research and innovation, and participates actively in cooperative agreements on both the European and Nordic level. Even though the domestic basis is in fairly good shape, the major challenges are related to the international context of the ERA pillars.

Several challenges have emerged in the wake of the economic crisis. Icelandic policymakers have been concerned that the country may experience an outflow of qualified human resources. This would undermine the possibility for future provision of S&T personnel, as well as weakening the domestic labour market for researchers.

On the background of the 2008 financial crisis and its aftermaths, a key challenge has been and will also be in the future, the monetary and fiscal effects of the crisis. The monetary effects affect in particular students' and researchers' possibilities for international mobility. This has already been acknowledged by the Icelandic government. In recognising that the weak national currency can make it difficult for researchers with Icelandic salaries to go abroad, a programme offering mobility support is currently being established.

It may also lead to substantial increases in the costs related to international cooperation. In particular monetary uncertainty about the Icelandic currency and national status may lead to the costs of international collaboration reach unsustainable levels in terms of public funding. In tight fiscal environments it will be a challenge to maintain the level of public commitment to S&T, education and related activities in Iceland over the last ante-crisis years.

Over the last four years Iceland has been through a tumultuous period, financially, economically and politically. A key to a successful conclusion of the various recovery initiatives is to what extent confidence in the financial and political system can be built up again. This is a key focus of the work of the centre-left government of Johanna Sigurdardottir. There is the danger that the more immediate critical needs and challenges overshadow the longer term needs and objectives of S&T performance. However, with recent efforts such as the Iceland 2020 Moving Iceland Forward Initiative and the STPC 2010-2012 strategy, the foundations are laid for meeting the main future challenges for Icelandic R&D&I policies.

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1 Introduction

Iceland is a small open economy with a population of 319,000 (Jan 1, 2012, Statistics Iceland 2012), of which about two in three live in the Reykjavik capital area. After falling by more than 10% over two years, Iceland's total Gross Domestic Product (GDP) increased in real terms from 2010 to 2011. Total GDP in 2011 was €10,1b, which constituted less than 0.1% of the total EU-27 GDP. Real GDP growth from 2010 to 2011 is estimated to be +3.1%. (Statistics Iceland)

The main pillar on which the political and economic relations between Iceland and the European Union rests, is the European Economic Area (EEA) agreement which came into force in 1994. In addition to giving access to EU's internal market, the EEA agreement gives Iceland the right to participate in a range of EU programmes in areas such as research and education.

In July 2009 Iceland applied for accession to the European Union. The European Commission published its *Opinion on Iceland's application for membership of the European Union* in February 2010 and recommended that negotiations for accession should be opened.

Following the collapse of its banking sector in October 2008, Iceland went into a deep recession. Real GDP declined by 6.8% in 2009 and by 4.0% in 2010, driven by a strong adjustment in domestic demand. The recession bottomed out in the second half of 2010 and the economy started to recover mildly, based on stronger private consumption and exports. The recovery continued throughout 2011 with real GDP growing at 3.1%. However, the pace of recovery is faltering and uncertainties continue to persist. (European Commission economic forecasts, 2011)

As in the EU-27, GDP per capita in Iceland increased in 2010 compared to the previous year. Nominal GDP per capita in 2010 was €29,900 which is 22% higher than the EU-27 average. In PPS terms the gap to EU-27 was 11%. (Eurostat)

Iceland's Gross Expenditure on Research and Development (GERD) as share of GDP was 3.1% in 2009, a relatively high level compared to the EU-27 average of 2.01. (Eurostat) The business sector's share of total national R&D investments declined from 54.6% in 2007 to 52.9% in 2009 (Eurostat 2011, ERAWATCH data). The public sector, including the higher education institutions, accounted for 41% of total national R&D investments (GERD) in 2009.

There are seven nationally accredited higher education institutions in Iceland. The University of Iceland in the capital of Reykjavik is the largest actor, and the only university that offers a broad range of disciplines. The other institutions are smaller specialised universities or university-level institutions.

Despite being a small country, Iceland has a fully-fledged research and innovation system. While the share of activities based on primary resources exploitation continues to account for a high proportion of GDP and exports, the growth of R&D activities has been significant, shifting the GERD/GDP ratio from 1.1% in 1991 to 3.1% in 2009. The country has a relatively high share of Human Resources in Science and Technology (HRST) in the economically active population. The share has increased over the years to above the EU-27 average. HRST accounted for 50% of the labour force in Iceland in 2009, compared to 40.1% in the EU-27 (Eurostat 2011, ERAWATCH data).

Iceland performs well in terms of scientific output. In an international comparison of scientific publications per million inhabitants in 2009, Iceland ranks fourth among the OECD- and BRIC-countries. Icelandic researchers furthermore rank third when it comes to publication impact based on citations per publication calculated over the four-year period 2005-2008. (Danish Ministry of Science, Innovation and Higher Education, 2009)

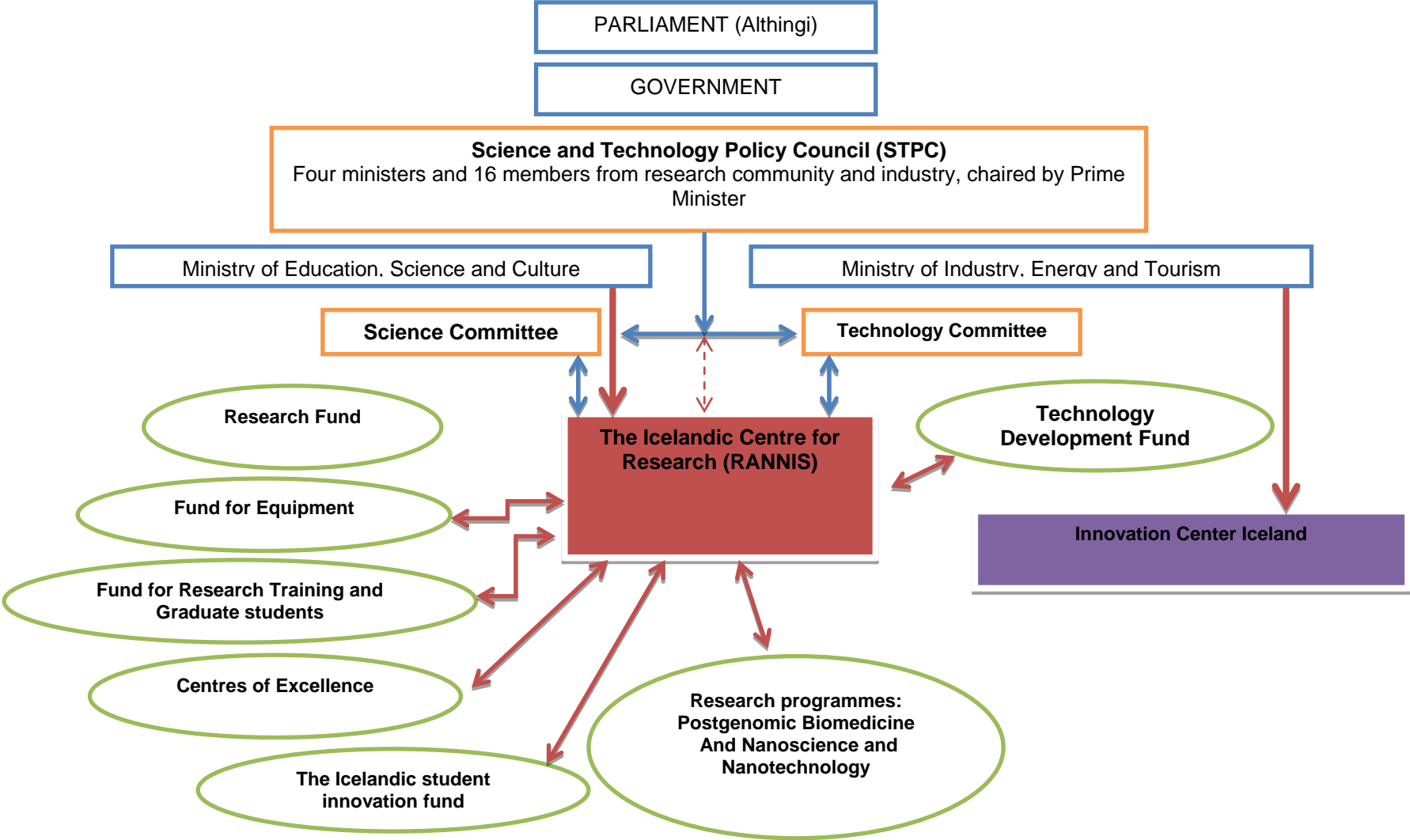
Iceland has increased its number of patent applications, especially since the 1990s. According to the latest figures from the Icelandic Centre for Research, RANNIS, the number of Icelandic patent applications made to the European Patent Office (EPO) was 84 per one million inhabitants in 2006 (of which 7 were high tech patents). This indicates a doubling of patent applications compared to 1995 levels.

Figure 1 below depicts the main actors and institutions, as well as funding flows, within the Icelandic research system. On the policy design level, the Science and Technology Policy Council (STPC) is the key strategic body. The Council is headed by the Prime Minister and has 20 members that include government Ministers, scientists and business representatives. The role of this body is to define the country's strategic orientation for science and technology policy. The Council is organised in two committees, the Science Committee and the Technology Committee, which prepare the decisions of the Council. There is an overlap between members of these two committees in order to foster synergies.

The individual Ministers make decisions with regards to the R&D institutions and funds that are placed under the control of their respective ministries.

On the operational level, RANNIS (reporting to the Ministry of Education, Science and Culture) is an important agent: the Centre provides professional assistance to STPC and its committees in the preparation and implementation of the science and technology policy. RANNIS operates the major part of national competitive funds for science and technology.

Figure 1: Iceland's research system governance structure. ERAWATCH Research Inventory



Source: ERAWATCH Research Inventory

2 Structural challenges faced by the national system

Iceland has, as already pointed out, a fully-fledged research and innovation system. Total investments in R&D are relatively high, and the share of Human Resources in Science and Technology (HRTS) has increased over the years to above the EU-27 average.

The Innovation Union Competitiveness Report 2011 describes Iceland as a very knowledge intensive economy with a strong public research system and high-quality human resources.

According to the Innovation Union Scoreboard 2010, Iceland has a below average innovation performance and the country is categorised as an *innovation follower*. Relative weaknesses are observed in the scoreboard categories:

- Intellectual assets; and
- Economic effects.

Indicators where Iceland scores well below the EU-27 average include:

- community designs;
- knowledge-intensive services exports;
- new doctorate graduates; and
- PCT patent applications.

Still, the indicator on 'community trademarks' show high annual average growth, while 'PCT patent applications' and 'knowledge-intensive services exports' on the other hand show a strong decline. The index of 'new doctorate students' shows high growth. However, this concerns domestic PhD candidates, and does not include PhD candidates with offshore education. About 50% of Icelandic PhD candidates have their PhD degree from abroad.

A significant share of total R&D investments in Iceland comes from the public sector. In 2009, the public sector accounted for 43% of total investments. The business sector accounted for 52.6%, which represented a decline from 2007 when the share was 54.6%. According to the Innovation Union Competitiveness Report 2011, the average annual growth in business enterprise expenditure on R&D in Iceland is lower than in the EU on average, and this is seen as a key weakness in the Icelandic innovation and research system.

The government-appointed international expert panel led by Christoffer Taxell stated in its report in 2009, that «only a few companies ... account for a large share of industry related research and development. This makes the entire industrial research and development landscape vulnerable [Thus] the population of research and development active/intensive companies needs to be broadened». This concern over the relatively low share of private R&D funding in Iceland has been expressed in previous ERAWATCH country reports. The country has few R&D active domestic firms, and government funding for private R&D performers is limited. (ERAWATCH country reports

for Iceland for 2009 and 2010). The Taxell Commission panel believed that present policy measures aimed towards stimulating R&D were insufficient or ineffective, and saw it as a challenge to broaden the share of R&D-active companies, and particularly high-tech companies. (Taxell et al, 2009)

Another challenge identified by the international expert panel, was the low level of competitive research funding. The panel argued that the level of competitive funding (14%) was too low for efficient management of science and research and that increasing the level at the cost of block funding would also benefit research quality. (Taxell et al, 2009)

The challenge of increasing competitive funding is not new, as the ERAWATCH country report for 2009 points out. It was a key issue when the STPC was established in 2003, and remained valid when the economic crisis set in after the banking collapse in 2008. The report stresses that it is not only a matter of increasing the share of competitive funding at the cost of block funding, but also an extension of performance-based criteria for block funding. According to the 2010 ERAWATCH country report, actual and expected cuts in public R&D funding due to the crisis in the late 2000s mean that the level of competitive funding in Iceland will continue to pose a challenge.

The strong position of block funding in Iceland contributes to the fact that setting of thematic priorities in public R&D funding is difficult. This point is made in the report of the aforementioned international expert panel. It is stated that Iceland seems to lack sufficient instruments for research prioritisation, and that this has a negative influence on research in general (Taxell et al, 2009). The lack of prioritisation in research policy is also identified as a weakness in the most recent ERAWATCH country reports (ERAWATCH country reports for Iceland for 2009 and 2010).

A fourth challenge faced by the Icelandic innovation system, which is highlighted both in the report of the international expert panel and the TrendChart mini country report for Iceland for 2011, relates to governance. The management of the innovation system is described as fragmented, involving several ministries and lacking sufficient coherence and coordination between the different actors. Other weaknesses in terms of governance include:

- diversity in the higher education and research system;
- weak policy making abilities in the key strategic body in the R&D policy system, STPC;
- weak policy preparation capabilities at RANNIS; and
- lack of systematic evaluation, especially with regards to R&D programmes.

A final, general challenge is to give higher priority to innovation. The Icelandic innovation system has traditionally had a stronger focus on research than innovation, and the argument has been voiced in recent years that the country needs to develop a clear growth strategy based on innovation (TrendChart mini country report Iceland, 2011). The Taxell expert panel believed that the economic crisis should be viewed as “an opportunity to ramp up innovation levels” and one of the main recommendations of the panel was “that the new Icelandic government makes innovation a key strategic priority.” (Taxell et al, 2009)

3 Assessment of the national innovation strategy

3.1 National research and innovation priorities

On the policy design level, STPC is the key strategic body in Iceland. The role of the Council is to define the strategic orientations for science and technology policy in Iceland.

Since its establishment in 2003, STPC has devised multiannual strategies for research and innovation. The current strategy, entitled *Building on Solid Foundations. Science and Technology Policy for Iceland 2010-2012* highlights the following priorities:

- focus on innovation and close industry support, and user-driven innovation;
- a strong focus on the role of creative industries in national innovation performance,
- more cooperation and synergy among the various universities, research institutions and other actors in the system;
- evaluation and quality control;
- international cooperation and participation in international programmes; and
- funding on the basis of excellence and thus competition.

Several of the priorities are in line with the challenges identified in various expert reports. Mention should in this context be made of the national task force appointed in 2009 by the Ministry of Education, Science and Culture with the mandate to analyse the future challenges of Iceland's education, research and innovation policy. The work of the national task force was complemented by the work of the aforementioned international expert panel led by Christoffer Taxell. The main recommendations of the Taxell expert panel dealt with the importance of continuous investments in education at all levels; the reshaping of the education and research landscape in order to create and stimulate higher levels of synergies; the need to increase the focus on innovation; and the need to reform the research and innovation governance structures and systems (see TrendChart mini country report Iceland. 2011). The mission statement of the STPC strategy, «Tækifæri til markvissrar sóknar» - translated as going forward with clear objectives is clearly an answer to the Taxell report's call for intelligent prioritisation.

The current STPC strategy emphasises the need for specific actions to encourage private sector R&D investments. The introduction of a tax deduction scheme for industrial R&D in 2009 is a recent example of a development in the Icelandic policy mix aimed at fostering private R&D investments. The Centre of Excellence programme, launched in 2009, is the most recent policy measure aimed at fostering excellent collaborative research.

At the same time, there has been a trend towards more thematic prioritisation. This is reflected in the current focus on the creative industries and geothermal energy and sciences, as well as the establishment of the Centres of Excellence programme in 2009.

A recurrent criticism of the Icelandic research funding system has been that insufficient public research and innovation allocations are made through competitive funds. This

was a key point in the Taxell report, the Taxell Commission said that «the [present] level of competitive funding is too low ... 86% block funding needs to be redistributed [within a competitive funding scheme] ». They also argued that the size of individual grants is generally too small.

This challenge is further reinforced by budgetary practice and rules in the setting up of annual state budgets. The major expenditure type in both types of funding, block and competitive grants, is salaries. However, from a state budgetary perspective they are treated differently. While block grants are seen as providing a framework for intermediate public consumption, there is a tendency to see competitive funding schemes as ordinary transfer payments. Hence, while block grants to institutions are more or less automatically adjusted for wage increases and inflation in the budgetary process, the allocations to competitive funding schemes are not. This, of course, tends to aggravate the already low ratio of competitive to non-competitive funding.

The STPC strategy responds to this criticism by recommending increasing the proportion of public funding for research and innovation through competitive funding and by performing «a comprehensive overview of the current public funds...and providing recommendations for potential changes».

Iceland 2020 Strategy

In January 2011 the Icelandic policy response to the Europe 2020 strategy, «Iceland 2020 – Knowledge, sustainability, welfare», was published, under the auspices of the Prime Minister's Office¹, see also the conclusion report of the Iceland 2020 Moving Iceland Forward Initiative². The development of the Iceland 2020 reform program was integrated with the recovery program of the Icelandic economy, government and society, following the financial crisis and the ensuing political crisis. The collapse of the Icelandic financial system was seen as an expression of the failure of the national governance and regulatory system to forestall and manage the crisis. Hence, the loss of public confidence in the political systems has been seen as challenging as facing the breakdown of the economic structures themselves. Any recovery program would require substantial public acceptance and support. Involvements of stakeholders as well as the wider public in the development, gives the Iceland 2020 program a wide acceptance in the Icelandic society. This background thus also provides a stronger importance and impetus for the Icelandic 2020-targets, relative to other EEA countries.

The 2020 program sets up 20 objectives to be achieved within 2020. 15 of these are characterized as «measurable» targets, as milestones. Of particular relevance to this report are the following targets³:

¹ <http://www.forsaetisraduneyti.is/media/Skyrslur/island2020.pdf>, Accessed: 25 March 2012

An English translation of the policy statement is available at

<http://eng.forsaetisraduneyti.is/media/2020/iceland2020.pdf>, Accessed: 25 March 2012

² For an English translations, see

<http://www.forsaetisraduneyti.is/media/2020/2020Moving-Iceland-Forward-Initiative.pdf>, Accessed: 25 March 2012

³ Present values of the milestones are given at <http://www.forsaetisraduneyti.is/2020/maelikvardar/>

- That 4% of the GDP shall be allocated to research, development and innovation⁴ by 2020. The investment by the private sector shall be 70% against a 30% contribution from the public sector through contributions to competitive funds and research programs.
- Latest available data are from 2009, when the index was at 3.1%. The share of private funding was at 49%, with public funding at 40%.
- That by 2020, Iceland be in the top 10 nations on the E-government development index and E-participation Index measured by the United Nations.
- From being no. 14 in 2004, Iceland fell, being no 22 on the UN E-government index in 2010. On the UN E-participation index, Iceland was at 135th place in 2010.
- That by 2020, the high-tech industry will account for 10% of the GDP and 15% of the value of exports.
- Present data not given.

The setting of a quantitative target for R&D spending is a new development in Icelandic research and innovation policies. Until recently the country did not have any quantitative target along the lines of the Barcelona 3% of GDP target. But strategy document *Iceland 2020*, includes a quantitative target for R&D spending. According to the plan, 4% of GDP should go to R&D&I by 2020. It is unclear, however, to what extent this target is evidenced-based, or founded on a consensus among stakeholders and the public.

An economic activity plan (EAP) will elaborate and manage some of the targets Iceland 2020. Some of the targets identified for the EAP that are relevant for this report are

- Competitiveness of the operating environment; competitiveness and sustainability of the financial and tax environments, access to both domestic and foreign credit, and to support more diversified foreign investment etc.
- Facilitating the foundation and operation of companies; simple administrations and regulations, a strong and straightforward innovation environment, and a focus on the needs of small and medium enterprises
- Green growth, including the high-tech and knowledge industry, innovative sectors and tourism. It will be the task of the Science and Technology Policy Council to define the areas of growth.
- Support for business clusters; with emphasis on investing in education, science and innovation.

⁴ Both the Icelandic policy statement and the English translation, states explicitly that the target is for R&D&I, «rannsóknna, þróunar og nýsköpunar», resp. «research, development and innovation». However, the list of milestones, <http://www.forsaetisraduneyti.is/2020/maelikvardar/>, reproduces the standard GERD/GDP indicator.

- Temporary support for growth sectors; special support for research and development, education and continuing education, as well as investments in the infrastructure and social framework.
- Education a key factor – flexibility and security in the labour market; a special focus will be placed on further study opportunities and on-the-job training for people who are temporarily excluded from the labor market.

The plan does not include thematic priorities, but lists several economic and themes to be prioritized, under the heading of «The uniqueness of Iceland as a whole»;

- Tourism services – related to nature and culture
- Health and wellbeing
- "Pure" food and water
- Finished food products
- Knowledge and research centres
- Use of renewable eco-friendly energy (hydropower, geothermal energy)

Furthermore the Iceland 2020 strategy suggests two consolidating initiatives; merging of universities and the integration of research and industrial funds under RANNIS.

3.2 Trends in R&D funding

Table 1 below shows the evolution of main R&D indicators for Iceland since 2008. The GERD/GDP ratio has increased and was 3.1% in 2009. In this area, Iceland performs relatively well compared to the EU-27 average. The same is true for GERD per capita and Government Budget Appropriations or Outlays on R&D (GBAORD) as percentage of GDP.

Business Expenditure on R&D (BERD) has increased since 1998. Iceland's BERD intensity ratio peaked in 2001 at 1.74%, exceeding EU average levels. Since then the BERD value has decreased, but it was higher than the EU-27 average in 2009.

Table 1: Basic indicators for R&D investments in Iceland

	2008	2009	2010	EU average 2010
GDP growth rate	1.3	-6.7	-4.0	2,0
GERD as % of GDP	2.65	3.1	N/A	2.0
GERD per capita	863.3	843.8	N/A	490.2
GBAORD (€ million)	78,975	73,167	75,854	92,729.05
GBAORD as % of GDP	0.77	0.84	0.79	0.76
BERD (€ million)	148,599	142,463	N/A	151,125.56
BERD as % of GDP	1,45	1,64	N/A	1.23

	2008	2009	2010	EU average 2010
GERD financed by abroad as % of total GERD	0,27	0,31	N/A	N/A ⁵
R&D performed by HEIs (% of GERD)	25,1	24,9	N/A	24.2
R&D performed by PROs (% of GERD)	N/A	N/A	20%*	13.2
R&D performed by Business Enterprise sector (as % of GERD)	54,6	52,9	N/A	61.5

Source: Eurostat

* Source: RANNIS (March 2012)

As was pointed out in the ERAWATCH country report for 2009, the financial crisis has led to severe challenges for public research funding in Iceland. The public research sector has seen revenues from university capital funds deteriorate. At the same time rising unemployment has resulted in a marked increase in the number of university students. In combination with public budget cuts, this places extreme pressure on the universities.

The public budgets for research and development reached a peak in 2009. From 2009 to 2011, cuts to public R&D budgets have been around 18% (2010 prices). These cuts mean that the public contribution has returned to something close to 2005 levels (in real-terms/2010 prices). The policy for the R&D budget cuts has been to maintain the competitive funding element as far as possible. Nevertheless cuts in competitive funds were made in the 2011 budget. Compared to 2010, 2011 saw a 9% general cut in the state budget, which breaks down as a 7.5% cut in public spending on universities and a 5% cut in competitive funds. (ERAWATCH country report, 2010)

The current STPC strategy emphasises the need to increase private sector investments in research. The previously mentioned tax deduction scheme for industrial R&D is one initiative linked to this aim.

The main instruments for research funding in Iceland are block grants to universities and research institutions on the one hand, and competitive funding programmes on the other hand.

In 2011, public competitive funding of research and development amounted to approximately €12m (ISK3b). This accounted for 17% of the total R&D expenditure (RANNIS statistics).

Competitive funds for research are: the Research Fund (closely linked to the Research Equipment Fund) and the Fund for Research and Graduate Education. They are governed by a board appointed by the Ministry of Education, Science and Culture. A competitive fund targeting technology is the Technology Development Fund, governed by a board appointed by the Ministry of Industry and Commerce. In addition, targeted research programmes are launched for limited periods. Since 2009, Iceland has also has a Centre of Excellence programme.

⁵ 8.4 (2009), 9.04 (2005)

Public as well as private R&D performers access funding from abroad (from the EU Framework Programmes (FP), Nordic funds, US funds and private sources). The share of R&D funding from abroad amounted to 11% of total R&D funding in 2005 (ERAWATCH country report, 2009).

Table 2: Government appropriations to research and development by recipients in million ISK (in fixed 2011 prices), 2010-2011

	R&D in 2010	Percentage of total R&D in 2010	R&D in 2011	Percentage of total R&D in 2011	Change from 2010 to 2011 in %
Universities & university institutions	7,244	41.6	6,441	42	-11.1
EU Framework Programme for R&D	1,498	8.6	1,016	6.6	-32.2
Funds	2,945	16.9	2,675	17.4	-9.2
Institutions	5,483	31.5	4,971	32.4	-9.4
Projects	264	1.5	232	1.5	-20.2
Total	17,434	100	15,334	100	-12

Source: Rannis statistics 2011

3.3 Evolution and analysis of the policy mixes

A succinct overview of the evolution of the innovation policy mix in Iceland is given in the TrendChart mini country report for 2011. According to the report, the policy mix has been characterised by a high degree of stability and a general focus on

- research rather than innovation;
- knowledge generation rather than knowledge diffusion and application;
- general, horizontal support rather than thematic focus and prioritisation;
- technological rather than non-technological support (e.g. services, business model innovation, social innovation, etc.); and
- direct rather than indirect types of support.

Since the economic crisis, however, a number of changes have been observed. First of all, the 2011 TrendChart Report points out that budgets for support for R&D and innovation were substantially reduced – down by 10-15%.

At the same time, there has been a small trend towards more thematic prioritisation. This is reflected in the current focus on the creative industries and geothermal energy and sciences, as well as the establishment of the Centres of Excellence programme in 2009. Three Centres of Excellence were established in the first year, all of which are planned for a seven year period (an evaluation of the centres will be done during the autumn of 2012): the Icelandic Institute for Intelligent machines; the Geothermal

Research Group; and the Centre of Excellence in Gender, Equality and Diversity Research. However, in terms of public R&D funding, these initiatives affect a rather small share.

In 2009, Iceland also introduced a tax reduction scheme for industrial R&D. The question of tax reductions for R&D had been discussed for many years, and the introduction of the scheme in 2009 is described in the TrendChart report as a “major step”. RANNIS administers the scheme which allows companies tax deductions for up to 20% of costs incurred in R&D projects (within the limit of annual project costs of €625,000 per company). If the company is in a tax position, the 20% refunding is done through the income tax system by lowering the taxes. If the company accounts run with a loss and are not levied with income tax for the accounting year, the 20% of R&D costs are refunded through a direct refunding to the company. The first refunding of companies of research and development costs was done in 2011.

The report moreover sees a stronger focus on innovation and non-technological support, mainly through Innovation Centre Iceland (ICI). ICI, and particularly the subunit Impra – Service Centre for Entrepreneurs and SMEs, has intensified support in the areas of research commercialisation, entrepreneurship, design and creativity, and social innovation. A recent ICI initiative that receives special attention is the Iceland Living Lab (LL). This is an initiative aimed at establishing user-producer relationships and promoting collaboration in the development of goods and services.

Mention is also given of an assessment RANNIS has made of the impact of the Technology Development Fund. The assessment showed that the fund plays an important role in promoting industrial innovation and the creation of valuable knowledge.

Another development highlighted in the report is that both the government and STPC now recognise the low Icelandic levels of competitive funding as a problem and view the introduction of competitive elements in R&D funding as an opportunity to improve quality and excellence. Yet, there are few signs of concrete initiatives. While STPC addresses the issue in its current science and innovation strategy and recommends “increasing the proportion of public funding to research and innovation through competitive funding”, the economic crisis and the resulting budget cuts have made it difficult to meet this recommendation. The ERAWATCH country report for 2010 pointed out that, even though the policy for the budget cuts has been to maintain the competitive funding element as far as possible, cuts in competitive funds were made in the 2011 budget.

Based on the Innovation Union self-assessment tool, the strong political focus on promoting research and innovation in Iceland can be identified as a major strength.

The role of research and innovation has increased in importance on the general government agenda over the past decade, and in the wake of the economic crisis, R&D and innovation have been defined as key elements in the process towards recovery and new growth. According to the TrendChart mini country report for 2011, the focus on other major societal challenges has become less explicit after the crisis, but lifelong learning and the development of adequate skills for the future are mentioned as areas that receive political attention.

The strong political commitment to research and innovation in Iceland is evident from fact that in an economic situation that calls for cuts in public spending, the government emphasises that it will prioritise allocation of funding to R&D and innovation. The total

annual R&D investments of the country are relatively high: they amounted to 3.1% of GDP in 2009, and a significant share – 44.9% - came from the public sector. From 2009 to 2011, however, cuts to public R&D budgets have been around 18% (2010 prices), and the economic crisis clearly makes it challenging to maintain sufficient public funding for research and innovation (TrendChart mini country report, 2011).

Mobilising private R&D funding in times of economic crisis is another challenge (TrendChart mini country report 2011). The level of private R&D funding in Iceland is generally believed to be too low: in 2009, the business sector accounted for 48.5% of total annual R&D investments, which represented a decline from 50.4% in 2008. Against this background, it emerges as a major weakness that private R&D performers receive limited government support. The policy measures aimed towards stimulating business R&D in Iceland are characterised by the aforementioned expert panel led by Taxell as insufficient or ineffective (Taxell et al, 2009).

The current STPC strategy emphasises the need to increase private sector investments and a recent initiative to stimulate companies to invest in R&D is the tax reduction scheme that was introduced in 2009. It is too early to assess the effects of the scheme, but around 100 companies are reported to have made use of it in 2010 (TrendChart mini country report, 2011).

That the Icelandic government has ambitious goals for national R&D investments - and not least for private sector investments - is evident from the aforementioned target that 4% of GDP should go to R&D by 2020 with companies' contributing 70% of the total. It is, however, as already pointed out, unclear whether this new target is justified by an evidence base or public consensus. Moreover, it implies raising R&D expenditure by almost a further 25%, and given the current economic climate, there is reason to question how feasible the target is.

Governance constitutes another weakness in Icelandic research and innovation policies. On the one hand, the design and coordination of R&D policies is linked to the highest political level. The key strategic body, STPC, is headed by the prime minister and involves all ministries with responsibilities within the science, technology and innovation domain. On the other hand, expert assessments of the Icelandic innovation system have identified a number of weaknesses related to governance. They include weak policy making abilities in STPC; weak policy preparation capabilities at RANNIS; and lack of systematic evaluation practices. This could imply that the country might be better served by more focused and strategic research expenditure based on its current levels, rather than simply increasing its expenditure – sometimes the decision to spend more is easier than the decision to spend wisely.

There is evidence of some improvement in the area of governance. The TrendChart mini country report 2011 argues that the current strategy of STPC contains stronger statements than previous versions, and this is seen as “a welcome development that reflects the empowerment of the Council as a policy setting body.” The strategy also place emphasis on evaluation, but the TrendChart report maintains that evaluation capabilities are still limited and that Iceland lacks a genuine evaluation culture. Strengthening evaluation practices is a critical point in relation to the point made above about spending more wisely rather than simply spending more.

According to the current STPC strategy, basing R&D funding on excellence criteria and competition should be a priority. The strategy also stresses the importance of enhancing R&D achievement assessments of universities, industry and competitive funds, and maintains that independent foreign specialists should be used for this purpose.

The establishment of the Centre of Excellence programme in 2009 is an initiative that reflects the focus on basing R&D funding on criteria of excellence. The government moreover sees the opportunity to improve quality and excellence through higher levels of competitive funding, and the STPC strategy recommends that the proportion of public funding to research and innovation through competitive funding should be increased. The economic crisis and the resulting budget cuts have made it difficult to meet this recommendation, however, and the 2011 budget saw cuts in competitive funds.

Stimulating innovation through public procurement is also an opportunity that receives political attention in Iceland. According to the TrendChart mini country report for 2011, the country is witnessing «increasing awareness of the importance and potential power of the government as purchaser of innovative solutions.» The report stresses that while there are concrete initiatives in the area of innovative procurement and even a legal framework, the country still has a way to go. It argues that “the major challenge and step forward at the same time, would [be] that government official (sic) take up the commitment and formulate an effective public procurement policy that centres on innovation».

In 2011 the Technology Development Fund received additional money to initiate an experimental project on public procurement within the energy/environment, health and education sectors. The initiative, «More value for less money» is a venture of Rannis in collaboration with the Confederation of Icelandic Industries, together with many stakeholders. Following the publishing of a call for projects, funds were allocated to 10 projects at the end of the year.

3.4 Assessment of the policy mix

The weaknesses of the Icelandic policy mix that emerge from the analysis based on the Innovation Union self-assessment tool are to a large extent in accordance with the structural challenges that are identified in Chapter 2. The challenges are:

- low share of private R&D investments;
- low levels of competitive research funding;
- insufficient research prioritisation;
- weaknesses in governance; and
- focus on research rather than innovation.

This section assesses the extent to which the current policy mix is able to meet these structural challenges.

It has already been pointed out that the current STCP strategy places emphasis on increasing private sector investments and that a tax reduction scheme for industrial R&D was introduced in 2009. This shows that there are policy developments addressing the challenge of low levels of private R&D funding. The actual effects the tax reduction

scheme will have on company R&D investments cannot be established at this point, but around 100 companies reportedly made use of the scheme in 2010 and the reimbursement for R&D projects is expected to be significant (TrendChart mini country report, 2011).

The low level of competitive research funding in Iceland has become an explicit political concern. The STPC strategy recommends that the proportion of public funding to research and innovation through competitive funding should be increased, and in a situation where budget cuts have to be made, the policy has been to maintain the competitive funding element as far as possible. Cuts in competitive funds were nevertheless made in the 2011 budget, and to increase the level of competitive funding is a challenging task given the current circumstances.

The STPC strategy and the Iceland 2020 initiative, address all these five challenges. The two initiatives set up new targets for facing the first three challenges, for increasing the private share of R&D investments, increasing the level of competitive funding, and outline several priorities. The targets set for the ensuing Economic Activity Plan to be developed, address several of these challenges as well.

As pointed out earlier, there has been an observable trend in the evolution of the Icelandic policy mix toward somewhat stronger thematic research priorities. The establishment of the Centres of Excellence programme in 2009 and the current focus on the creative industries and geothermal energy and sciences, are cases in point. As noted above, the size of these prioritized funds is as of today fairly small, compared to total government R&D funding.

According to the TrendChart mini country report for 2011, there is evidence of some improvement in the area of innovation governance. The operations of STPC have been strengthened, e.g. through more frequent meetings, and the current strategy indicates that the Council has become a more powerful policy setting body. It is also a positive sign that the strategy stresses the importance of evaluation. Still, as the TrendChart report underlines, Iceland has no real evaluation culture yet and evaluation capabilities remain limited.

This would complement a consolidation of both research and industrial funds under RANNIS, together with the effect of an increased level of competitive funding on RANNIS and its role in Icelandic R&D&I policy development and implementation.

Knowledge application and innovation have gained a stronger position in the Icelandic policy mix in recent years. New and intensified support efforts in the areas of research commercialisation, entrepreneurship, design and creativity, and social innovation are offered by ICI, and particularly Impra. An assessment of the impact of the Technology Development Fund has moreover shown that the fund plays an important role in promoting industrial innovation. Further efforts are needed, however: giving priority to innovation and developing a clear growth strategy based on innovation are identified as key challenges for Icelandic policymakers in the TrendChart mini country report for 2011.

The following table summarises the main challenges facing the innovation system and assesses the appropriateness and effectiveness of policy responses introduced in recent years.

Table 3: Assessment of the policy mix in Iceland

Challenges	Policy measures/actions ⁶	Assessment in terms of appropriateness, efficiency and effectiveness
low share of private R&D investments	<ul style="list-style-type: none"> • introduction of a tax reduction scheme for R&D performing companies • introduction of target for national R&D investments: 4% of GDP by 2020, with 70% coming from companies 	<p>In 2010 more than 100 companies made use of the scheme, which is perceived as a positive response (TrendChart report 2011). It is too early to assess the scheme in terms of appropriateness and effectiveness but it is regarded as a strong instrument for stimulating R&D activities in Icelandic companies.</p> <p>The target for national R&D investments is ambitious, not least when it comes to the level of private investments. It is unclear, however, whether the target is justified by an evidence base or public consensus.</p>
low levels of competitive research funding	<ul style="list-style-type: none"> • The challenge is addressed in the STPC strategy 2010-2012. 	<p>The recognition by the government and the STPC of this challenge is important and it represents opportunities for increased quality and excellence in R&D funding. However, there are no tangible indications that there have been a shift in balance as of yet.</p>
insufficient research prioritisation	<ul style="list-style-type: none"> • The challenge is addressed in the STPC strategy 2010-2012. • establishment of the Centres of Excellence programme in 2009 • current focus on the creative industries and geothermal energy and sciences • The Iceland 2020 sets up milestones that emphasises the role of prioritisation 	<p>The need for increased thematic-oriented funding has been debated for several years. It has been a main issue in external reports and is addressed in the current STPC strategy. Recent introduction of thematic oriented policy measures have been welcomed. It is too early to assess the effectiveness of the measures, but they are interesting and should be followed up closely.</p>
weaknesses in governance	<ul style="list-style-type: none"> • Strengthening of STPC operations, e.g. through more frequent meetings • Emphasis on evaluation in the STPC strategy 2010-2012. 	<p>External experts have identified several weaknesses related to governance and come up with a number of recommendations. Some recommendations have been taken up, but not all. The current strategy of STPC indicates that the Council has become a more powerful policy setting body. The importance of systematic evaluation seems to be recognised, but more efforts are needed in order to strengthen evaluation capabilities and develop a true evaluation culture.</p>

⁶ Changes in the legislation and other initiatives not necessarily related with funding are also included.

Challenges	Policy measures/actions ⁶	Assessment in terms of appropriateness, efficiency and effectiveness
focus on research rather than innovation	<ul style="list-style-type: none"> Intensified support efforts in the areas of research commercialisation, entrepreneurship, design and creativity, and social innovation 	The need to give higher priority to innovation has been stressed by external experts. Work is underway in this area, but it is too early to assess the efficiency and effectiveness of concrete initiatives.

4 National policy and the European perspective

The Icelandic policy mix is generally well aligned with the ERA pillars and objectives. When it comes to fostering an effective labour market for researchers, challenges have emerged in the wake of the economic crisis. Icelandic policymakers are on the one hand concerned that the country may experience an outflow of qualified human resources. On the other hand, they recognise that the weak national currency can make it difficult for researchers with Icelandic salaries to go abroad. Financial resources for researcher mobility have traditionally been scarce, but a programme offering mobility support is currently being established.

Iceland places strong emphasis on international cooperation in the areas of research and innovation, and in the new Centres of Excellence programme international cooperation is a compulsory criterion but not practiced much until now. It is a widely held view among key stakeholders that Iceland's participation in international research infrastructures should be strengthened.

While universities and research institutes in Iceland receive most of their public funding as block funding, there is a tendency towards a more intense debate on increased use of competitive grants based on research performance assessment. There have been recommendations to restructure the university system and concentrate efforts, but so far attempts in this direction have failed.

A recent expert assessment concluded that formalised programmes supporting industry-science linkages are relatively underdeveloped in Iceland, but underlined that strong informal linkages exist (Taxell et al, 2009). The Centres of Excellence programme, launched in 2009, aims to stimulate collaboration between industry and academia.

Iceland's research community participates actively in the EU FP. Instruments for internationalisation include a number of limited grants for preparation of international cooperative projects, as well as soft support for access to international funding sources (mostly from the EU). RANNIS coordinates and promotes Icelandic participation in collaborative international projects in science and technology. The European Research space is not the only focus for Icelandic science and technology policy. Iceland places great emphasis on integration in Nordic R&D co-operation programmes, including the Nordic Research and Innovation Area (NORIA).

Over the last four years Iceland has been through a tumultuous period, financially, economically and politically. A key to a successful conclusion of the various recovery

initiatives is to what extent confidence in the financial and political system can be built up again. This is a key focus of the work of the centre-left government of Johanna Sigurdardottir. But through recent efforts such as the Iceland 2020 Moving Iceland Forward Initiative, the foundations are laid for meeting the challenges identified in the previous section:

- A low share of private R&D investments;
- Low levels of competitive research funding;
- Insufficient research prioritisation;
- Weaknesses in governance; and
- Focus on research rather than innovation.

Some measures and objectives are in place, as such as the tax scheme. The present strategy document of the STPC and the Iceland 2020 Initiative, both point in the right directions. But the important work of developing measures and initiatives to address the objectives lies ahead. A key ingredient in the process of doing this is the relations and relative roles of the various policy institutions involved, of particular importance here are the triangular relations between the Cabinet, the STPC and RANNIS. It is important that STPC and RANNIS obtain sufficient strengths in the national policy making system that the long term objectives set are given sufficient emphasis relevant to short term challenges and recovery needs.

The regionalisation outlined in the Innovation 2020 Initiative, and the consolidation of the college and university sector is interesting. But this requires efficient and effective relations between national and regional actors and authorities.

Table 4: Assessment of the national policies/measures supporting the strategic ERA objectives (derived from ERA 2020 Vision)

	ERA dimension	Main challenges at national level	Recent policy changes
1	Labour market for researchers	<p>The supply of science & engineering is considered to be inadequate. There is no formal channel for the education system to systematically identify needs in this respect.</p> <p>The weak Icelandic currency may be a considerable barrier for researchers with Icelandic salaries to go abroad.</p>	<p>All universities have signed the European charter for researchers and their code of conduct.</p> <p>RANNIS participates actively in the EURAXESS service network that provides practical assistance to mobile researchers and their families.</p> <p>New programme dedicated to researchers' mobility under the Research Fund to offer incoming, outgoing and reintegration grants irrespective of the applicant's nationality.</p>
2	Cross-border cooperation		The new Centres of Excellence programme includes international cooperation as a compulsory criterion.
3	World class research infrastructures	Iceland participates actively in five ESFRI groups. Due to budgetary constraints it is unclear if Iceland will be able to continue its engagement in the implementation phase of some of the projects.	A new working group on research infrastructure has been set up with the mandate to make recommendations on how Iceland can better link up with Nordic RI. The STPC strategy 2010-2012 emphasises the importance of eScience for Icelandic researchers.
4	Research institutions	There have been too many universities in relation to population size. External reports have recommended policymakers to merge universities	Recent attempts in this direction have failed.
5	Public-private partnerships	A recent expert assessment concluded that formalised programmes supporting industry-science linkages are relatively underdeveloped in Iceland.	The Centres of Excellence programme, launched in 2009, aims to stimulate collaboration between industry and academia.
6	Knowledge circulation across Europe		The new Centres of Excellence programme includes international cooperation as a compulsory criterion.

	ERA dimension	Main challenges at national level	Recent policy changes
7	Participation in international S&T cooperative agreements	There is a need to diversify the participation of Icelandic companies in the EU framework programmes. Participation rates are highly sensitive to participation of a handful of companies.	

Annex: Alignment of national policies with ERA pillars / objectives

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

1.1 Supply of human resources for research

In the wake of the financial crisis, Icelandic policy makers have raised concerns about an imminent outflow of qualified human resources. It has been feared that young people would be particularly likely to leave the country, or not return after studies or training abroad. The STPC 2010-2012 argues that Icelandic institutions and companies have not been active enough in using the possibilities provided by international programmes that support the development of human resources. It is moreover recognised that a greater diversity of education and training is needed amongst the Icelandic workforce. Compared to the Nordic countries, Iceland lags behind when it comes to the workforce's general educational level. It is estimated that one third of people currently in the Icelandic labour market have no formal education beyond compulsory schooling. In light of this, a common goal has been set between the authorities and industry to reduce this figure to 10% by 2020.

Iceland's human resources in science and technology (HRST) as share of the total labour force is at about 50%, well above the EU-27 average. Compared to other European countries Iceland compares well as regards the share of researchers of total employment which was 2.49% in 2009 (Eurostat).

There were in total 57 new doctoral degrees awarded in 2009. Of these, ten degrees were awarded to doctoral students with foreign citizenship (NORBAL)⁷. There is no information on outward flows of Icelandic doctoral students or on inward and outward flows of postdoctoral researchers.

Because of the small size of the domestic tertiary education and research system, PhD programmes in Iceland now tend towards granting joint degrees with foreign organisations. Increasing numbers of programmes are also taught in English. The University of Iceland offers a diverse selection of courses taught in English. A few academic programmes are offered entirely in English, both at the undergraduate and graduate levels, and all schools offer at least some courses taught in English. Travel grants are offered to master and doctoral students at the University of Iceland and are intended for attending conferences.

Financial resources for researcher mobility have been scarce. The STPC however acknowledges that institutions and companies have not been making satisfactory use of international programmes that support the development of human resources. There are no explicit strategies for attracting foreign researchers to Iceland. The lack of policies for

⁷<http://www.nifu.no/English/Pages/STATISTICS/NORBAL/NORBAL.aspx?ItemId=1855&ListId=8252dfaf-6056-4ccc-b6e1-7806d4dc4878>

inward researcher mobility has been subject to criticism in the past (see Taxell et al. 2009). There is also limited information on the outward mobility flows of Icelandic researchers.

The Icelandic Research Fund, managed by the Icelandic Centre for Research, is currently establishing the first programme dedicated to researchers' mobility with cofunding from the FP7 People programme. The programme will offer incoming, outgoing and reintegration grants, irrespective of the applicant's nationality.

1.2 Ensure that researchers across the EU benefit from open recruitment, adequate training, attractive career prospects and working conditions and barriers to cross-border mobility are removed

A large number of diverse scientific databases exist in Iceland, containing substantial quantities of data and valuable research material. A key project prioritised by the government is to better organise and structure these databases, to improve access to data. This is considered to be crucial for advancing Icelandic research in different fields.

The STPC 2010-2012 strategy emphasises a problematic issue for Icelandic researchers, compared to those operating within EU regulations. In Europe, the value added tax (VAT) on equipment and research supplies is refunded or waived, but this is not the case in Iceland. Furthermore, international competitive funding such as that provided through European Commission framework programmes, does not allow VAT to be paid with research funds. The Icelandic Equipment Fund was established to support the purchase of expensive research equipment and instruments. The total annual available funds from the Equipment Fund recent (2007-2009) were €641,437(ISK110m) (Rannis). However this does not support other research infrastructures such as databases. Policymakers also point out this as an important area of difference from the other Nordic countries, which have specific research infrastructure funds (STPC, 2009).

Before the financial crisis, salaries for researchers in HEIs in Iceland compared reasonably well with those of other developed countries, though not with US salaries. In 2006 the yearly average salary of researchers in Iceland (€50,803) was well above the average for other Associated States (€34,730). The difference between the remuneration of a female researcher and a male researcher is significant in most of the countries (over 35%) but for Iceland this gap is significantly smaller, at just 10%.

No significant difference could be detected in the yearly salaries of researchers in the government and in the higher education sector (no survey data was collected for the business enterprise sector for Iceland). Salaries for researchers also compare relatively well to other similar professions. There are however some differences depending on researchers' scientific domain. Total yearly salary costs of researchers in the life sciences are lower than in similar professions, while they are much higher in the social sciences and humanities (European Commission, 2007).

The depreciation of the Icelandic Krona is eroding the competitive position of these jobs, although the cost of living in Iceland has been reduced for those people paid in foreign currencies.

All seven Icelandic universities have signed up to the “European Charter for Researchers” and to the “Code of conduct for the recruitment of researchers”. Iceland does not participate in the Scientific Visa Package for long term admission.

Despite the lack of an official policy to attract foreign researchers to Iceland, there are no formal barriers to recruiting non-nationals for permanent research and academic positions. On the Icelandic EURAXESS (the European Researcher’s mobility portal) pages there is information for foreign researchers on vacant positions in Icelandic universities, research institutions, and companies.

1.3 Improve young people's scientific education and increase interest in research careers

Icelandic investments in education are generally high. Yet, at the level of tertiary education, investments are below the OECD average even though the number of university graduates has increased significantly over the past decade. There has been a particularly sharp rise in university enrolment in the wake of the economic crisis (Taxell et al, 2009).

Previous ERAWATCH country reports have pointed out that Iceland is characterised by shortages in science and engineering graduates and a lack of specific mechanisms to target this problem. Recent years have seen increases in the level of graduates in science, mathematics and computing at the upper secondary level, though, and also a general increase in S&E and SSH doctorate graduates (Taxell et al, 2009; ERAWATCH country reports 2009 and 2010). The current STPC strategy moreover stresses the importance of attracting young people to research and innovation, and argues that encouraging enrolment in technical and vocation studies should be a priority.

1.4 Promote equal treatment for women and men in research

Generally, Iceland scores very well in terms of gender equality. In the annual *Global Gender Gap* reports published by the World Economic Forum, Iceland is ranked as the best of more than 130 countries when it comes to equality between men and women, in both 2010 and 2011. The ranking is based on four main categories of indicators: *Economic Participation and Opportunity*, *Educational Attainment*, *Health and Survival*, and *Political Empowerment*. In both years, Iceland comes out top in the two first categories. Like its Nordic neighbours Finland and Norway, Iceland has 1.5 women for every man enrolled in tertiary education. All in all, Iceland’s top ranking is linked to the country’s extensive parental leave and preschool and day-care systems, and the legal right for parents to return to their jobs after childbirth. (Global Gender Gap reports for 2010 and 2011).

2. Facilitate cross-border cooperation, enhance merit-based competition and increase European coordination and integration of research funding⁸

⁸ Promote more critical mass and more strategic, focussed, efficient and effective European research via improved cooperation and coordination between public research funding authorities across Europe, including joint programming, jointly funded activities and common foresight.

International cooperation is at present an important priority in Icelandic funding programmes. It is not given particular emphasis in the work of the two main competitive funds, except for the “grants of excellence” in the Research Fund. The new Centres of Excellence programme includes this as a compulsory criterion. However, funding is always allocated to Icelandic organisations, and there are few cases of trans-border funding flows from national programmes to foreign R&D performers.

3. Develop world-class research infrastructures (including e-infrastructures) and ensure access to them

The general view among Icelandic stakeholders seems to be that there is a great potential for improvement regarding Iceland’s participation in international research facilities, and room for raised awareness of the importance of increased participation.

Apart from the participation in research facilities such as CERN, EMBO and EMBL, Iceland has a relatively low participation in international research infrastructures overall. Iceland is also involved in the ESFRI process and is a member of a number of RIs under this framework.

4. Strengthen research institutions, including notably universities

On 12 May 2008 a new Act on Public Universities (Act no. 85/2008) was adopted by the Icelandic Parliament. It resulted in a new management structure for university councils in public universities, with the majority of members coming from external bodies. A new definition of the overall organisation of public universities was also introduced, by establishing Schools/Faculties according to fields of study, introducing more decentralisation and increased autonomy of HEIs.

The institutions have private boards that have a significant degree of autonomy: they can, for example, decide such matters as admission requirements, progression of students from one year to the next, certification etc. These matters do not differ much between public and private institutions.

For the private institutions, strategic research plans constitute the basis for the negotiation of the performance agreement signed between the university and the government.

In Iceland the Rector of each university is appointed by the Ministry of Education, Science and Culture according to the recommendation of the University Council, for a limited period of time, normally four or five year (European University Observatory).

Institutional funding to universities and research institutes primarily takes the form of block grants, but the trend is for these to be replaced in part by competitive grants, based on research performance assessment. The government has decided that public support should increasingly rely on competition, based on criteria of originality, well-defined projects and competent applicants, who might be individuals, firms or

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- Ensure the development of research systems and programmes across the Union in a more simple and coherent manner.
 - Promote increased European-wide competition and access of cross-border projects to national projects funding

institutions. Institutional funding is seen as necessary to enable institutions to participate in the competition for resources. The definition of performance indicators for research has been included in the University of Iceland's Strategic Plan, in negotiation with the Ministry of Education, Science and Culture. Annual reports on these indicators are provided by the University to the Ministry, and are subject to follow-up. Similar agreements are being prepared with the other universities. In the future, research performance indicators should also be established for public research organisations.

5. Facilitate partnerships and productive interactions between research institutions and the private sector

The Act on Public Universities (Act no. 85/2008) stipulated a new management structure for the university councils in the public universities, with the majority of members coming from external bodies.

A recent expert assessment concluded that formalised programmes supporting industry-science linkages are relatively underdeveloped in Iceland, but underlined that strong informal linkages exist (Taxell et al, 2009). The Centres of Excellence programme, launched in 2009, aims to stimulate collaboration between industry and academia.

There are limited connections between technology transfer professionals in public institutions such as universities and innovation centres. While there are only a few examples of connections between universities and private companies, the University of Iceland has been quite active over the years in establishing spin-off companies. Some of these companies have been very successful and are now recognised as international success stories (Nordic Innovation Centre, 2008).

There is limited expertise in technology transfer in Iceland. In the last decade or so there has been an increase in expertise within the field of technology transfer through the operations of successful research and development active companies, like Marel Food Systems Ltd, CCP (multi-player game developer), Decode Genetics, etc. (Nordic Innovation Centre, 2008).

The Innovation Centre Iceland (ICI) has the central role of disseminating technology towards SMEs. This is achieved through education and training of staff and managers of SMEs, as well as offering various means of support to entrepreneurs, growth companies and innovative enterprises. Within ICI, the Enterprise Europe Network office also disseminates technology profiles introducing the latest European technology and trends to SMEs in Iceland.

The Federation of Icelandic Industries takes an active part in promoting technology dissemination in cooperation with industrial companies, their customers, universities and institutions in the fields of research, product development and problem solving.

6. Enhance knowledge circulation across Europe and beyond

International cooperation is at present an important priority in Icelandic funding programmes. It is not given particular emphasis in the work of the two main competitive funds, except for the "grants of excellence" in the Research Fund. The new Centres of Excellence programme has international cooperation as a compulsory criterion.

However, funding is always allocated to Icelandic organisations, and there are no cases of trans-border funding flow from national programmes.

The STPC strategy for the years 2010-2012 demands that results from publicly funded research are made accessible to all. It recommends:

- developing public policy to ensure open access of publicly-funded research findings;
- evaluating the necessary open access infrastructure that can be used for coordinating databases and accessing them and ensuring permanent reservation;
- defining utilisation rights for data derived from public institutions and cooperative inter-sectoral research; and
- raising general awareness of the importance of open access within the research and innovation community.

7. Strengthen international cooperation in science and technology and the role and attractiveness of European research in the world

Iceland's research community participates actively in the EU FP and sees its contribution as providing positive rewards, both in terms of funding sources (the returns are seen as positive) and in terms of networking opportunities. Instruments for internationalisation include a number of limited grants for preparation of international cooperative projects, as well as soft support for access to international funding sources (mostly from the EU). RANNIS coordinates and promotes Icelandic participation in collaborative international projects in science and technology. Iceland has been an active member of EUREKA since 1986, making it one of the very first members. The Icelandic Innovation Centre acts as the EUREKA office in Iceland. By November 2010 Iceland was participating in eight on-going EUREKA projects, of which three were approved EUROSTARS.

Mutual cooperation by companies, other organisations and even individual scientists are quite frequent. There is active cooperation with multitude of organisations in many countries. This kind of cooperation is quite common and has led to considerable amount of research grants from abroad.

Rannis leads Icelandic participation in a number of ERA-Net projects. Some of these projects have the objective of becoming Article 185 initiatives in the future. Eurostars has been running as an Article 169 initiative since 2008, with Icelandic participation from the start. Iceland has not yet had an official policy regarding participation in the governing bodies of Article 187 initiatives (JTI). Icelandic organisations do, however, participate in *Innovative Medicines and Hydrogen and Fuel Cells initiatives* (European Commission, 2010). Iceland also participates in the joint programming on *Cultural Heritage and Global Change*, together with 14 other ERA countries.

Rannis has mapped the cooperation of Icelandic scientists in the EU Framework programmes and compare the participation with the applications and grants from the national Research and innovation funds.

The European Research space is not the only focus for Icelandic S&T policy. Iceland places a great emphasis on its integration in Nordic R&D co-operation programmes, including the Nordic Research and Innovation Area (NORIA).

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List of Abbreviations

BERD	Business Expenditures for Research and Development
BRIC	Brazil, Russia, India, China
CERN	European Organisation for Nuclear Research
COST	European Cooperation in Science and Technology
EEA	European Economic Area
EMBO	European Molecular Biology Organisation
EMBL	European Molecular Biology Laboratory
EPO	European Patent Office
ERA	European Research Area
ERA-NET	European Research Area Network
ERP Fund	European Recovery Programme Fund
ESA	European Space Agency
ESFRI	European Strategy Forum on Research Infrastructures
EU	European Union
EU-27	European Union including 27 Member States
FDI	Foreign Direct Investments
FP	Framework Programme
FP7	7th Framework Programme
GBAORD	Government Budget Appropriations or Outlays on R&D
GDP	Gross Domestic Product
GERD	Gross Domestic Expenditure on R&D
GOVERD	Government Intramural Expenditure on R&D
GUF	General University Funds
HEI	Higher Education Institutions
HERD	Higher Education Expenditure on R&D
HES	Higher Education Sector
HRST	Human Resources in Science and Technology
ICI	Innovation Centre Iceland
IP	Intellectual Property
ISK	Icelandic króna
NORIA	Nordic Research and Innovation Area
OECD	Organisation for Economic Co-operation and Development
PCT	Patent Cooperation Treaty
PPS	Purchasing Power Standards
PRO	Public Research Organisations
R&D	Research and Development
R&D&I	Research and Development and Innovation
RANNIS	Icelandic Centre for Research
RI	Research Infrastructures
RTDI	Research Technological Development and Innovation

S&E	Science and Engineering
S&T	Science and Technology
SF	Structural Funds
SME	Small and Medium Sized Enterprise
SSH	Social Science and Humanities
STPC	Science and Technology Policy Council
VC	Venture Capital