Science and Technology Policy Council 2003-2006

In its vision of the future, the Science and Technology Policy Council views Iceland as a society at the forefront among nations, based on rich human resources and a culture with international flavour. Icelandic society will be characterised by high living standards, quality of life and health, strong moral awareness and a vibrant, multifaceted economy. The environment for conducting scientific research and technological development are favourable and knowledge is applied to underpin a wide range of innovations in industry as well as in public services. Public investments in education, scientific research, technical development and innovation reap ample returns from scientific, social and economic advances.

Internal Evaluation Report

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Summary

The purpose of the internal evaluation is to provide the necessary basis for an external evaluation of the performance and impact of the Science and Technology Policy Council from it inauguration in 2003 to the present day. It was undertaken in January and February 2007. It is based on existing documentation and statistics from the national authorities and the Research Centre, from 33 in-depth interviews with 39 individuals and other consultative meetings and a survey sent to 680 individuals who had applied to the two main competitive funds. The following main conclusions are justified respectively in chapter 4 though 9.

Main conclusion 1: There is an overwhelming support by all main stakeholders that the restructuring of the system in 2003 was a good thing. In particular there is strong support for a dialogue between science, industry and the highest political level. There is strong support for setting one coherent policy for three year periods which can guide individual ministries, institutions and companies in their own policy making. This main conclusion has already been feed into the new policy statement for 2006-2009 and into proposals for changes to the Science and Technology Council which would see its renaming to Science and Innovation Policy Council.

Main conclusions 2: It is evident that public resources for competitive funds have increased in real terms since 2003. This applies both to national and European funds. Competitive funding as a source of income for both public and private bodies in Iceland is significant and has increased in absolute and in relative terms since 2003. Coordination of operation of funds has been a continuous challenge and the Council has identified challenges that have not been fully addressed. There is a very sharp distinction between the two main funds where universities lead on average 80% of projects funded by the Research Fund and companies on average 65% of projects funded by the Technological Development Fund. When the Research Fund is compared to its predecessors, there is a very clear and a significant shift of responsibilities and probably funding from companies and particularly public research institutes to universities. The implicit objective to have fewer and larger projects with more cooperation between different actors has been achieved and projects are now on average bigger than under the previous system.

Main conclusion 3: The role of universities as research institutions has been strengthened by growth in graduate programmes and through increased research funding directly to the universities and from the Research Fund. New comprehensive legislation for Higher Education that came into force in 2006, creates conditions for improved quality control and further development of Icelandic Universities. The University of Iceland – by far the largest university – has presented a very ambitious objective to become a world leading university and a five year action plan that will significantly boost its research capacities. Following this action plan and new agreements with the government was signed that will very significantly increase its basic research funding.

Main conclusion 4: There is general agreement that review and reorganisation of public research institutes has moved forward since 2003. Two public institutes no longer exist as such; one was moved under the Agricultural University and one was transformed into a government owned limited company. At the same time there is agreement that progress has been slow, particularly regarding the Technology and Building Research institutes. A bill is before Parliament to establish and Innovation Institute which would see the merger of two research institutes and the Regional Development Agency. The regional aspect of this proposal has been controversial. The Science and Technology Policy Council has only partly functioned as a policy coordinating body in this restructuring process. Despite some difficulties, there are a number of public research institutions around which there is little controversy and where there is a feeling that review or reorganisation is not urgent.

Main conclusion 5: Considerable progress has been made on most of the specific objectives spelled out in 2003. Cooperation has been successfully encouraged though funding instruments which will also lead to stronger research teams. Success in international competitive funds indicates the existence of a number of strong research teams. Research training of young scientists has received a significant boost through increased number of graduate students and additional funding from the Research Fund. New law on inventions of employees has been passed that will hopefully encourage public institutes to take more active role in protecting and commercializing it research results. A national database on publicly funded research is maintained but more needs to be done to promote the utilization of research results. Finally quality assessments are slowly being implemented for public institutions but very few thematic assessments have been carried out.

Main conclusion 6: Coordination between different ministries on policy and operational issues related to research and technological development has significantly increased through the Council, its two committees and an inter-ministerial coordination committee that was set up. Policy development has been very well coordinated. Yet there is a perceived need for more coordination and the Council has not always been involved in deliberations on big decisions taken by individual ministries. There is a lack of clear guidelines or working procedures for decision on participation in international activities that the STPC should develop and could institutionalise in a regulation issued by the Prime Minister's Office as the law establishing the STPC foresees.

Foreword

This internal evaluation report was produced in a relatively short timeframe: A decision was taken in November 2006 and a project plan set in motion. It was decided that the Ministry of Education, Science and Culture would coordinate and manage the work, as it is that ministry which provides secretariat to the Science and Technology Policy Council. I was recruited to lead the internal evaluation team and draw up the internal evaluation report. In the team were also two people from the Ministry of Education, Science and Culture: Arnór Guðmundsson, director Office of Evaluation and Analysis who was responsible for the overall project plan and Edda Lilja Sveinsdóttir, from the Ministry's Science Office who provided information and support.

After consultation with Kim Forss, one of the external evaluators, the internal evaluation team jointly developed the detailed project plan, decided on the methodology, whom to meet and take interviews with and designed with the Social Science Institute of the University of Iceland the questionnaire for a survey that was conducted. The evaluation work was then carried out from early January until the end of the second week of February when the report writing began. It goes without saying that the time was too short to allow for detailed elaboration on many of the more specific points. However, a clear main picture has emerged and is hopefully truthfully presented in this report.

I would like to thank the other members of the internal evaluation team for their continued and unwavering support during the swift process. While swift, it has been a very enjoyable process: in interviews and at meetings I have had the privilege of meeting upward to a one hundred people who all share a common vision that science, technology and innovation are important for the future of our country.

I would like to thank all these people for stimulating and interesting discussions which have helped not only to draw up this report but have also stimulated me to continue in this arena and to undertake further research into the role public policy is playing in stimulating the knowledge society in Iceland.

Ágúst H. Ingthórsson

Part I – Background and Introduction

1. A New Science and Technology Support System

In February 2003, the Icelandic Parliament passed three legislations that were designed to reorganize and improve the Icelandic science and technology scene. The first law[1] established a new *Science and Technology Policy Council* (STPC) under the chairmanship of the Prime Minister. Three other ministers have a fixed seat on the Council but in addition the PM can call in two other ministers at his discretion. There are then fourteen stakeholders on the Council, nominated for a three year term by the Association of universities (4), Icelandic Confederation of Labour (2), Confederation of Icelandic Employers (2) , as well as one from each of six ministries.[2] The Minister of Education and Science appoints nine of the non- ministerial members to the Science Committee and the Minister of Industry appoints an equal number to the Technology Committee. The mutual overlapping membership on the committees contributes to coordination between science, technology and innovation in the policy making process. The new Council replaced the Research Council, where scientists and industry representatives had been represented, a council that effectively managed an independent organisation and was responsible for the allocation of competitive funding.

The second law[3] established three competitive funds under the auspices of the Ministry of Education, Science and Culture: The Research fund, the Equipment fund and the Graduate Study fund, that replaced four earlier funds. It also created a new organization – the Icelandic Centre for Research – "to provide expert assistance and service in preparing and implementing the science and technology policy" of the STPC. This organisation replaced the previous Research Councils secretariat although its acronym RANNÍS was retained.

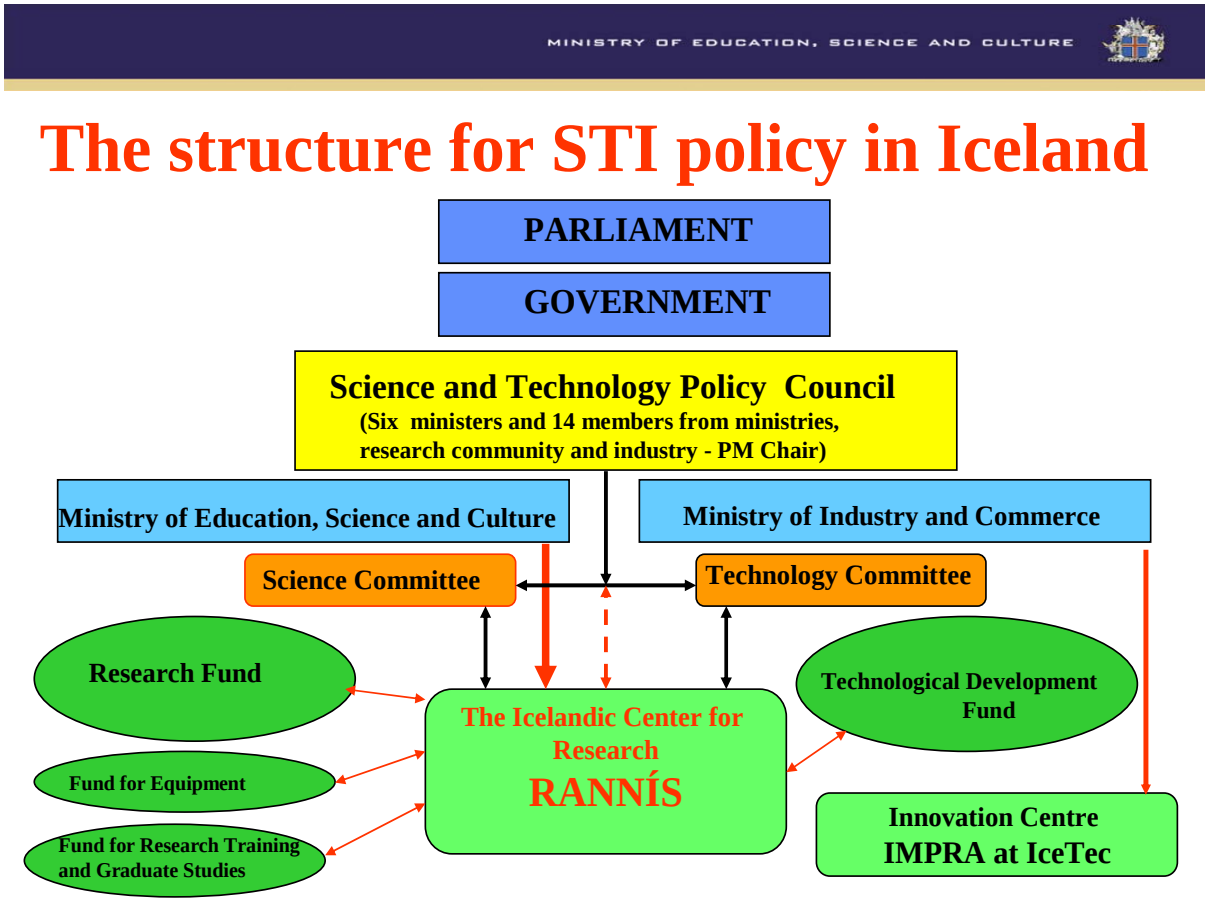
The third law[4] established a new competitive fund called the Technological Development Fund under the auspices of the Ministry of Industry. Its "role is to support R&D activities in the area of technological developments aimed at innovation in industry." The law also established formally an Innovation centre for small and medium-size enterprises, which had been operated by the Technological Institute of Iceland for some time.

Following the adaptation of these three laws, the Science and Technology Committees were set up and drafted a Science and Technology Policy for the period 2003-2006 which

[1] Law no. 2, 2003. Act on the Science and Technology Policy Council.
[2] The six are the ministers (1 nomination each) of Education, Industry, Fisheries, Agriculture, Health and Environment.
[3] Law no. 3, 2003. Act on Public Support for Scientific Research. See English translation: http://eng.menntamalaraduneyti.is/Acts/nr/2700.
[4] Law no. 4, 2003. Act on Public Support for Technological Development and Innovation in Industry. See English translation: http://eng.menntamalaraduneyti.is/Acts/nr/2651.

was adopted at the first meeting of the new Science and Technology Policy Council in its full constitution on December 18, 2003. Since then the full Council has meet twice annually, each time adopting a resolution on the issues at hand or the progress made. As the mandate for the science and technology committees is three years, a new council was nominated in early 2006 with a mandate until the end of 2008. At its first meeting, on June 1, 2006, the council adopted a policy for the period 2006-2009.[5] At its last meeting in December 2006 a general and open debate was organised without a formal resolution being adopted.

Figure 1 The new Science and Technology Structure in Iceland



The Law on Support to Scientific Research establishes a Research Fund, which was created through the fusion of the Science Fund and the Technology fund that existed under the Icelandic Research Council. The Research Fund is governed by a board, whose chairman is also the chairman of the Science Committee of the STPC. Linked to the same committee is the Equipment Fund, which is financed by a 20% annual levy on net income from the University Lottery. Similarly the Law on the Support to Technology Development and Innovation has lead to the establishment of a Technology Development Fund which is

[5] See Annex I for an English translation of the two Policy statements and selected parts of the resolutions adopted.

governed by a committee chaired a person nominated by the Ministries of Industry and Commerce. The Technology Committee of the STPC provides advice on technology development and innovation policies.

The Ministry of Education Science and Culture and the Ministry of Industry and Commerce provide support for the two respective committees in preparing policy documents. Overall co-ordination is provided by the Science Office including a secretary to the STPC placed at the Ministry of Education Science and Culture.

The Icelandic Centre for Research (RANNÍS), reporting to the Ministry of Education, Science and Culture, provides operational support to the committees and funding bodies, to manage the international connections, monitor the effects and impacts of policies and to provide intelligence and informed advice to the STPC and its boards and sub-committees, as requested. Thus RANNÍS administers the Research Fund, the Technology Development fund, the Instrument Fund, the Graduate Training Fund and other funds for science that the government may want to assign to it. It maintains the National Contact Point Coordination and support network to the EU Framework Program, the Nordic NOS - organizations and membership to several other international bodies in science and technology co-operation.

Following the adoption of these laws, an inter-ministerial committee was established. It represents the ministries involved in the STPC and is headed by a representative from the Prime ministers office. The ministries of Education, Science and Culture, Industry, Finance, Fisheries, Agriculture, Environment and Health have their representatives as well as the chairmen of the Science committee and the Technology committee, along with their secretaries, the secretary of the STPC and the director of RANNÍS. The role of the inter-ministerial committee is to ensure the coordination of strategic issues that are handled by the STPC and to follow up the implementation of its resolutions that belong to the different ministries.

The new STPC agreed to an extensive policy statement at its first meeting in 2003. There the Council laid out the long term goals and three main areas the government intended to take action on:

> The long-term goal of the science and technology strategy is to enhance the cultural and economic strength of Iceland in a competitive international environment, to ensure that Iceland's economy and quality of life continue to rank at the forefront of nations. This bringing the nation new knowledge and competence useful for the following purposes:
>
> - increasing sustainable utilisation of resources, creation of wealth, and generation of attractive job-opportunities in a knowledge society;
> - improved health and social security and encouraging maturation of a civil society where freedom of enterprise and social equity reign;
> - reinforcing the economic and cultural independence and thus the foundations for living in Iceland;
> - enhancing the influence of Iceland in the international arena and facilitating the adaptation of Icelandic society to variable external conditions.
>
> So as to provide still more favourable grounds for such development the Icelandic Government intends in co-operation with stakeholders in this arena to take the following actions during its term of office:

1. **Increase the public resources intended for allocation from competitive funds and** co-ordinate their operation to insure their optimum use for scientific and technical research and support to innovation in the Icelandic economy.
2. **Strengthen the role of universities as research institutions** by building up and encouraging diversity in research at Icelandic universities through competition between individuals and research teams for research grants from competitive funds.
3. **Review the organisation and work-methods of public research institutes**, with the objective of uniting their strengths and co-ordinating their activities more closely with the universities and business sector.

The above quote will guide us through the evaluation. In particular we will devote a separate chapter to each of the three main actions numbered above.

2. Economic Growth and Emerging Knowledge Economy

Since the beginning of the 1990s, Iceland has come a long way as measured by most conventional indicators. Whether it is GDP per capita, outward or inward investments, educational enrolment and graduation or spending on research and development – the figures have been moving up and Iceland has been moving up in most of the conventional comparative studies that are used to measure the success of nations. To quote the most recent OECD Economic Survey:

> Iceland's growth performance has been impressive. Over the past decade, its real GDP has grown by 4% per annum, significantly bettering OECD growth over that period. As result, per capita GDP has recovered most of the ground lost in a preceding spell of sluggish growth, making the country the fifth-wealthiest in the OECD on that benchmark. Most of the rise in trend growth reflects productivity gains following the implementation of widespread structural reforms, which opened the economy and enhanced competition. Financial-market liberalisation and privatisation have unleashed entrepreneurial dynamism. Many companies have expanded abroad, and the country now plays a role that belies the small size of its economy. Labour markets have been increasingly opened to foreign participants, helping to reduce labour market tensions. (OECD 2006b, p. 11)

This growth has come at a cost, with interest rates at an all time high as a response to relatively high inflation, very high current account deficit and in general highly indebted companies and households. However the economy has remained buoyant and predictions in 2006 that there would be a rough landing for the economy as a whole, after a large construction boom, have not yet come true. Judged by the performance of the Icelandic Stock Exchange – gaining more than 10% in the first six weeks of 2007 – the economy is still in an upward swing.

Figure 2 Iceland's GDP from 1990 to 2005 in Million ISK at constant prizes[6]

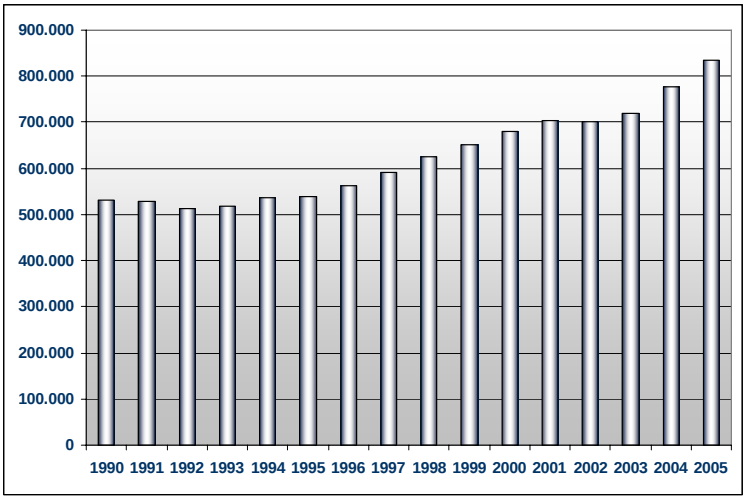


Figure 2 shows a steady growth of Iceland's GDP since 1994, with one exception in 2002. Preliminary figures for 2006 indicate more than a 4% growth and most predictions for 2007-08 show growth although not quite as rapid as in 2004 and 2005.

In parallel to this development, the underlying factors of the knowledge economy have been strengthened and grown considerably over the last 10-15 years. The two most significant indicators are the educational attainments and expenditure on research and development.

If we look first at education, the most important change in recent years is the explosion of the university level. There are more universities in Iceland today than there were 10 years ago[7], the number of students – and graduates – has grown very fast and consequently government expenditure on university education has grown. The number of students enrolled at universities and government expenditure to universities are good indicators of this rapid growth. These are presented in figures 3 and 4 below.

[6] Source: Statistics Iceland on-line database (http://www.hagstofa.is).

[7] "The system is characterised by one large public institution (the University of Iceland) and seven other public and private institutions: two agricultural institutions (Agricultural University of Iceland and the Agricultural College at Hólar), one academy of arts (Iceland Academy of the Arts), one institution of education (Iceland University of Education), one business school (Bifröst School of Business), and two other institutions offering a wide range of studies (Reykjavík University and the University of Akureyri)." (OECD 2006c, p. 8)

Figure 3 Number of students enrolled at Icelandic universities[8]

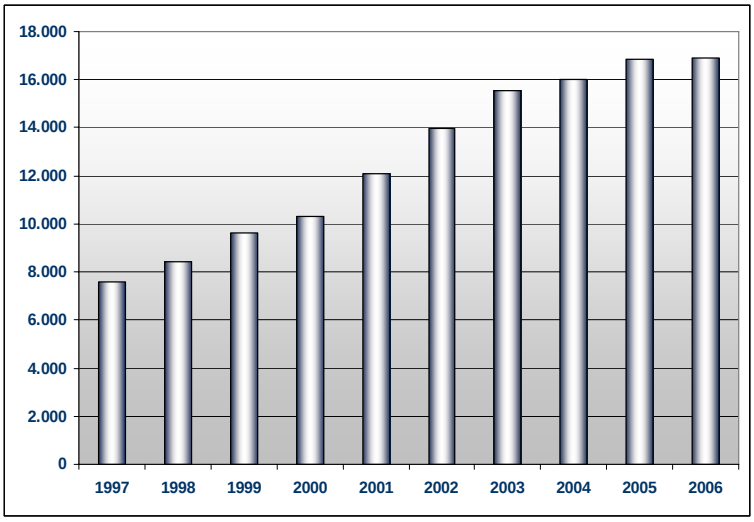
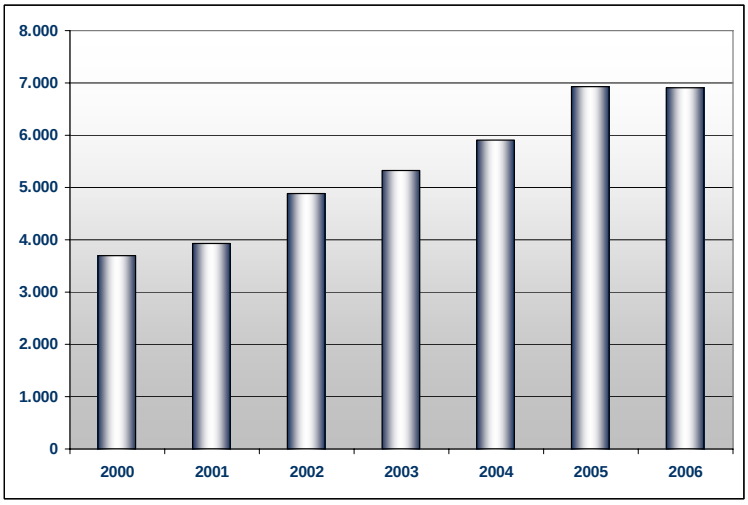


Figure 4 Expenditure to University teaching[9]



The Icelandic government decided to participate in a thematic review of tertiary education organised by the OECD and in August 2006 the OECD published a Country Note on Iceland. This thorough review provides a very good overview and policy lessons as well as extensive comparative statistical indicators for Iceland. In fact many of the issues addressed in the report had already been subject to debate in Iceland and one particular response was a new legislation covering tertiary education that came into effect in 2006. It addressed in particular issues of quality control and certification for universities and provides a framework for future developments. This is welcomed by the OECD economic survey of Iceland:

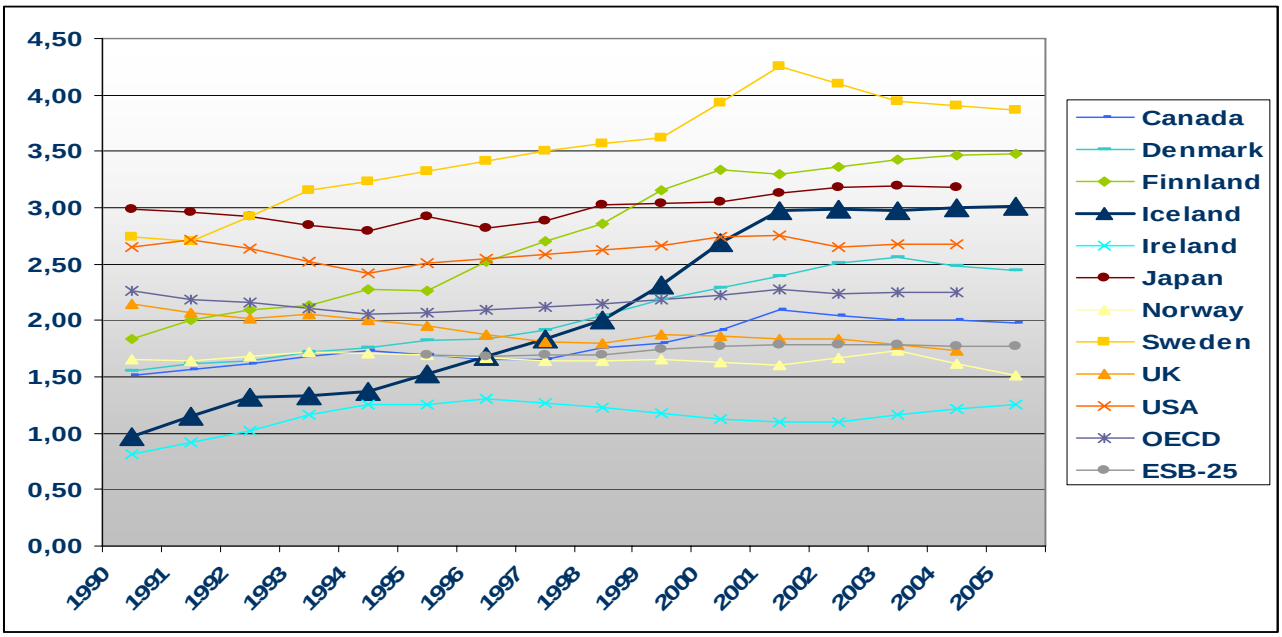
[8] Source: Statistics Iceland on-line database (http://www.hagstofa.is). Actual student count.

[9] Source: Ministry of Education 2007. Figures in million of Icelandic kronas (MISK) at each years' prize levels. Figures for expenditure are based on full-time equivalent number of students. See chapter 4 for more discussion on public expenditure to universities. To further drive home this point, the OECD reports that in 2002 Iceland spent 3.65% of its GDP on education, the highest of all OECD countries.

> The major issue regarding higher education is that quality might suffer in the face of an explosion of enrolment, which has doubled over the last decade, leading to substantial spending pressures. Legislation that becomes effective in mid-2006 addresses these concerns. *The new legislation governing higher education, which aims to ensure educational quality by stricter certification and evaluation requirements is welcome and should be swiftly implemented.* (OECD 2006 b, p. 17)

Turning then to expenditure on research and development: Figure 5 presents the development of R&D expenditure as a proportion of GDP. It shows a very significant proportional growth from less than 1% in 1990 to 3% in 2001. Even more importantly, it shows that since 2001 the 3% has been maintained despite the rapid economic growth in 2004 and 2005. It shows that research and development have kept pace with the general economy. It can be reasonably hoped that the economic impact of this significant R&D input can be felt in the next five to ten years.

Figure 5 R&D as a proportion of GDP in selected countries[10]



The third element that deserves attention in this context is innovation. The OECD Working Party on Innovation and Technology Policy summarized developments as follows:

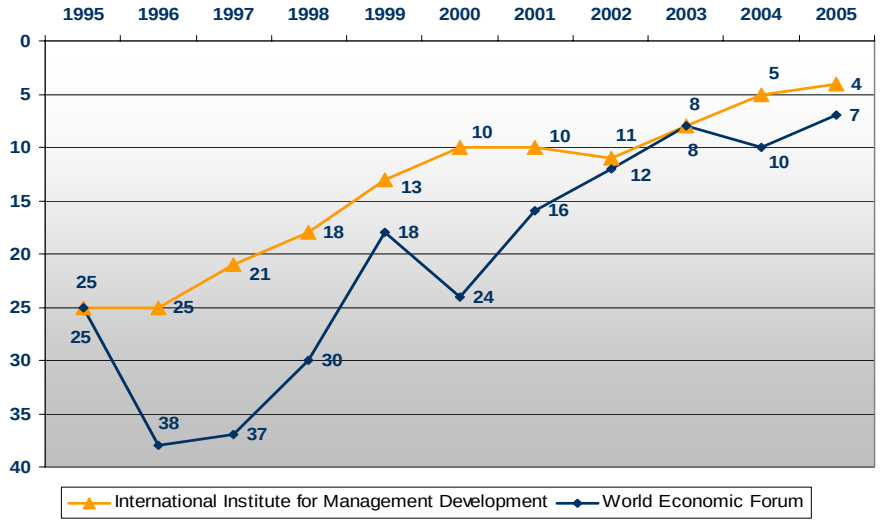
> Most international comparative studies on innovation performance praise Iceland's innovation and economic performance in the last five to seven years. Iceland performs well above the EU-average and in many cases above the OECD average for many of the leading innovation indicators and is often referred to as a leading country in innovation … (OECD 2006a p. 10)

Finally, a comparative indicator of this development is how the country's competitiveness is measured against other countries. On both of the two main international indicators – the World Economic Forum and the International Institute for Management Development –

[10] Source: RANNÍS, February 2007. 2005 figures are newly updated but not quite final figures for that year. For 2006 – 2008, RANNÍS predicts an increase to 3.25 in 2007 and as much as 3.4% in 2008.

Iceland moved up the list significantly in the last decade, being in the top 10 for both indicators for the last three years.

Figure 6 Icelandic Competitiveness[11]



3. Scope and organisation of the internal evaluation

In June 2006, the Council decided that an evaluation should be performed of its work from it's initiation in April 2003 to the year 2006. In November 2006, the Inter-ministerial Committee decided on the form and timeframe of that evaluation. Basically it was to be a two stage evaluation: First an internal self-evaluation report would be drawn up on the basis of existing data, interviews with stakeholders and a survey among the wider science and technology community. Secondly two external experts were recruited to review the self-evaluation and provide independent evaluation of the results achieved and recommendations on improvements and future evaluation work.

The objectives of the evaluation are the following:

- To bring forth the performance and impact of the establishment of the Science and Technology Policy Council and new laws on public support for scientific research, technological development and innovation that took effect in 2003.
- Evaluate the progress of specific objectives set by the Science and Technology Policy Council.
- Develop suggestions on how to improve the execution of science and technology policy.
- Evaluate and develop suggestions on how to improve organisation and effectiveness of the interaction between ministries, public institutions and private companies on science and technology issues.
- To define performance indicators for Science and Technology Policy Council's policy and to lay the foundation for a regular evaluation of its progress.

[11] Source: *Ísland í alþjóðlegum samanburði*, skýrsla Iðntæknistofnunar 2006.

The internal evaluation focuses primarily on the first two points and tries to provide some input for the external evaluators for the latter three points. The scope of the internal evaluation is not limited to the workings of the first STPC – but we have tried to take into account developments up until today. This is important as 2007 is seeing the implementation of some of the objectives agreed upon by the first STPC in 2003.

There are three sources of input into the internal evaluation: (1) Available data and information gathered specifically for this study; (2) 33 structured interviews with 39 individuals as well as meetings with the science committee, technology committee and key staff at the Icelandic Research Centre, and (3) a survey sent to all 680 applicants to the Research Fund and the Technology Development Fund.

As to the first source, information was mainly provided by RANNÍS – the Icelandic Research Centre – and by the Ministry of Education. General information was then available from the web of the Statistical Office. Some information was available and had been produced at the request of the committees or the full STPC but other information had to be produced specifically for this evaluation.

The main problem encountered in data gathering for this evaluation was that data is scattered and coordinated frame of presentation is lacking. Therefore it can be difficult to obtain fully comparable data without significant additional work. Further more we found that it was not possible to obtain data on the actual distribution of competitive funds between different types of participants. What we could get was funding distribution by type of coordinator and is presented in this chapter. It is a good indicator but not the actual distribution. This information is important in the context of the discussion that ensued following the change in 2003 that certain group of participants had been left out of the new system. Also there was very little information available on the impact of public support. It seems that for a long time, the public support system has focused more on gathering information about the output – in terms of grants allocated and support provided to different kinds of participants and scientific fields – but very little is gather about the actual effect of these support activities. *Therefore it is one conclusion of the internal evaluation that access to and availability of data is inadequate and in particular the system must be reoriented towards being equally occupied with impact as with outcome.* This is already recognized by the STPC, which recommends in its 2006-2009 policy that "The collection and analysis of statistical data pertinent to research, development and innovation be strengthened." (See chapter 3.3 of the policy statement.)

The second source, structured interviews and meetings, proved to be the most valuable source to gauge the "feeling" of the science and technology community. In all 33 structured interviews were taken from January 15 to February 15. In three cases the interviewees asked to have their colleagues present, so in all 39 individuals participated. Of these 29 (74%) were men and 10 (25%) women. 13 (33%) individuals have been or are currently on

the STPC. The people were purposely selected from four main groups, which were fairly evenly represented:[12]

Universities & research institutes	11	28%
Private Companies	11	28%
Politicians, incl. Ministers	8	21%
Assocations & others	9	23%

The main conclusions from the interviews will be presented in the relevant parts of this internal evaluation. The structure of the interviews is fairly similar to the structure of this report: the interviews begun with a general discussion about the structural change in 2003 and then moved on to the specific objectives in the 2003 policy statement. For each interview there was then a set of specific questions that related to the interest or specific point of view of the person in question.

The third source was a survey, designed by the internal evaluation team in cooperation with the Social Science Institute of the University of Iceland that carried out the survey. Questionnaire with 27 questions was sent to just over 700 e-mail addresses provided by RANNÍS. These were all the coordinators that submitted applications to the two main competitive funds, the Research Fund and the Technology Development Fund from 2004-2006. There were a few instances were the same person had two e-mails on the list and some instances where the e-mail was no longer active. The total number of actual individuals reached was determined to be 680.

The survey was sent out on January 22 and closed on February 14. 439 people viewed the survey, 275 started answering the survey and 266 people finished the survey. Number of answers to individual questions ranged from 275-256. The response rate is therefore 40.4% which is sufficiently high for the purpose of the internal evaluation. 75% of respondents were men and 25% women, which reflects well the distribution of coordinators of applications to the funds. The distribution between different types of organisations is as follows:

	responded to survey	share of applications
Universities	56%	52%
Research Institutes	13%	17%
Private Companies	24%	25%
Others	7%	6%

This high correlation between those responding and the distribution of application by types of partners increases the level of confidence in the accuracy of the survey. The distribution of the respondents be scientific fields is also representative of the distribution of applications by fields, with 30% of respondents identifying with engineering or technical fields, 20% with physical science, 20% with Health and bioscience and 30% with social sciences and the humanities.

[12] See the full list of people interviewed in Annex II.

Finally, 73% of respondents did receive a grant at least once from either fund in the three year period. This is much higher than the overall average success rate for both funds over the three year period which is 33%. However, it must be kept in mind that the total number of new applications in this three year period is 1.127, while the persons on the list are around 700, so on average each coordinator has submitted more than 1.5 applications.

Overall the survey can be said to be sufficiently representative of the applicants to the two main competitive funds under the auspices of the STPC to provide reliable and valuable input into the evaluation process.

Part II – Internal Evaluation Results

4. Structural Changes

Main conclusion: There is an overwhelming support by all main stakeholders that the restructuring of the system in 2003 was a good thing. In particular there is strong support for a dialogue between science, industry and the highest political level. There is strong support for setting one coherent policy for three year periods which can guide individual ministries, institutions and companies in their own policy making. This main conclusion has already been fed into the new policy statement for 2006-2009 and into proposals for changes to the Science and Technology Council which would see its renaming to Science and Innovation Policy Council.

Strong support for the changes in 2003 emerged from the interviews where more than 70% were either very or rather positive and 20% think that the change did not have much influence. Only two were negative and those belong to the service sector which generally feels left out of the science support system. The support from the applicants is not as strong, with almost half the respondents being neutral. The important fact is that less than 10% are rather or very negative towards the change. These attitudes are summarized in the table below:

Table 1 Attitudes towards structural changes

Interviews *				
Very positive	Rather positive	Neutral	Rather negative	Very negative
6 = 18,2%	18 = 54,5%	7 = 21,2%	2 = 6,1%	0
Survey results **				
Very well	Fairly well	Neutral	Rather badly	Very badly
28 = 10,9%	88 = 34,4%	121 = 47,3%	12 = 4,7%	7 = 2,7%

* There are only 33 views here, one for each interview, rather than for each person.

** The question was: "In 2003 the structure of the support system to science and technology was changed by setting up a Science and Technology Council. How do you think that this change has worked?"

When asked further concerning these positive attitudes, the main change according to many is that science and technology have moved higher on the agenda – both the political agenda but also the national agenda in the sense of being more visible and more accepted as being important. Those who are close to or part of the system claim that it has been very important to involve the ministers directly in the discussions and policy decisions of this kind. It is interesting to note that all five ministers interviewed thought that this forum was very useful and interesting and would, if anything, become even more important in the future. Nobody who was interviewed considered this dialogue between the politicians and the stakeholders to be negative – at worst some company people were sceptical that it was making much of a difference.

This needs to be contrasted with a discussion that took place when the Council was in the making in 2002 and 2003. Then there were relatively strong voices, particularly in the academic community, that warned of direct political meddling in the allocation of grants. We therefore wanted to gauge the feeling of the community regarding this political aspect. Not surprisingly a rather mixed picture emerges. While the majority of respondents to the survey are either positive or neutral towards the change in 2003, there is still a majority – 57% – who feel that political representation in the STPC is undesirable while 36% think it is positive. Since this was one of the key changes made, this does not fully square off – being positive towards the change on the one hand and against political representation on the Council on the other hand. Further, when asked more specifically if the initial worries by some in the scientific community that there was a risk of political interference in individual grant allocation were justified, the majority feels they were not warranted. Around 25% answer with "I do not know", but of those who do express an opinion only 19% feel the initial worries were justified for the Research Fund and 24% for the Technology Development Fund. *The conclusion to be drawn is that there is still some scepticism in the science and technology community, but that his is backed up by little hard evidence and people do not have actual cases or examples of this happening.*

This conclusion is further backed up by the fact that there is widespread support for the main goals set the STPC in its 2003 and 2006 policy statements. When asked about the three main goals in the 2003 policy statement only about 5% disagree with these. There is a very clear order of preference among the applicants: Increasing the amount available in competitive fund ranks no. 1 with two thirds, improving university research is no. 2 and the reorganisation of the research institutes is no. 3. As for support to the four main goals in the 2006 policy statement, there is similar level of support, with only 5-7% disagreeing with these. There are two goals with equal support as being the most important one: To develop competitive education and scientific system and to enhance competitive funding. No. 3 is to encourage companies in research and development and no. 4 is the redefinition of public role in monitoring.

Further on the dialogue between politicians and the science and technology community. On the STPC there are only ministers. Other politicians have no direct access to the STPC and it seems not much dialogue with the science community. While nobody did suggest to have more politicians on the STPC itself, it was suggested during the interviews that two of the Parliaments committees should be better informed and better connected to policy developments. This would facilitate a wider consensus building on the issues being discussed and better connect policy discussions with the annual Parliamentary budget appropriation discussion. It was suggested that the committees on Education and on Industry could meet with a joint meeting of the Council's two committees, during its informal meetings session held each fall.

During the interviews two examples of a new approach to policy development were mentioned as mainly positive. The first was the process leading to a decision on the Targeted Research Programme Post Genomics for Health and Nanotechnology, that was started up in 2005. The STPC asked for submissions for a theme for a new research

programme in 2004 and received 35 reasoned proposals. Many of them were quite substantive and well grounded and have helped in focusing research agendas in different field, even if they were not finally selected.

The second was the process leading up to the 2006 policy of the STPC which many feel was an open and inclusive process in a positive way. A group of leading people were invited to a policy forum organised outside Reykjavík to provide a more informal atmosphere for discussions. The main conclusions from that forum where then presented and further discussed and developed at an open conference where all stakeholders could come and express their views on what was important. As a consequence, the 2006 policy covers more areas than the 2003 policy and it aims to address all the most important factors needed to develop "a society at the forefront among nations" as says in the opening statement.

5. Increasing and coordinating competitive funding

Main conclusions: It is evident that public resources for competitive funds have increased in real terms since 2003. This applies both to national and European funds. Competitive funding as a source of income for both public and private bodies in Iceland is significant and has increased in absolute and in relative terms since 2003. Coordination of operation of funds has been a continuous challenge and the Council has identified challenges that have not been fully addressed. There is a very sharp distinction between the two main funds where universities lead on average 80% of projects funded by the Research Fund and companies on average 65% of projects funded by the Technological Development Fund. When the Research Fund is compared to its predecessors, there is a very clear and a significant shift of responsibilities and probably funding from companies and particularly public research institutes to universities. The implicit objective to have fewer and larger projects with more cooperation between different actors has been achieved and projects are now on average bigger than under the previous system.

The 2003 objective was to: "*Increase the public resources* intended for allocation from competitive funds and *co-ordinate their operation* to insure their optimum use for scientific and technical research and support to innovation in the Icelandic economy." (Emphasis added). Table 2 provides the figures with historical background for comparison.

Table 2 Fully Competitive Funds 1995-2007 in MISK 2007 prizes[13]

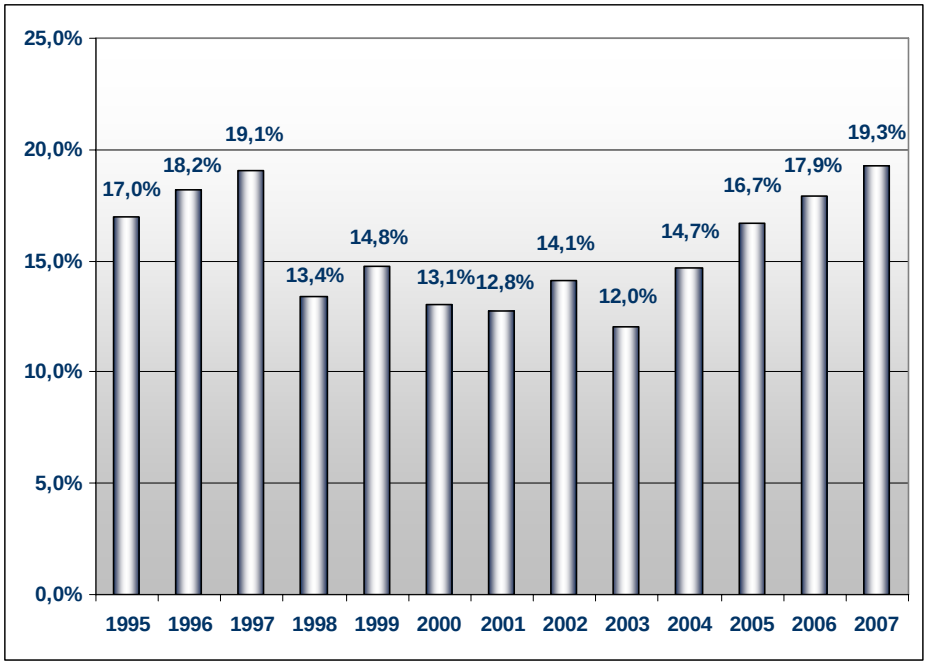
MISK in 2007 prizes	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*
Research Fund (from 2004)	*504*	*500*	*570*	*505*	*505*	*468*	*470*	*459*	*473*	448	525	575	590
Science Fund	217	202	294	225	221	215	244	242	242				
Technical Fund	287	298	276	280	284	253	226	217	231				
Technology Development Fund										204	298	481	500
Building and Equipment Fund	60	106	95	170	94	38	96	58	92	100	174	115	110
Fund for Graduate Students			23	45	37	47	53	62	64	58	69	63	80
Targeted Programmes					145	152	100	118	107	33	65	115	105
Improved Value of Seafood										109	218	219	235
Other competitive funds	18	17	19	16	35	36	46	134	118	97	147	15	16
Total Competitive Funds	**582**	**623**	**707**	**736**	**816**	**741**	**765**	**831**	**854**	**1049**	**1496**	**1583**	**1636**

There are two distinctive periods here. The first period is from 1994-2003, when the competitive funds are small but growing keep growing from year to year. Then in 2004 and particularly in 2005 there is a significant increase that has since continued moderately. It was clearly the policy of the STPC to increase competitive funds but also of the government, who in the memorandum to the 2004 budget proposal published a plan that would see the doubling of competitive funding during its term in office from 2003 to 2007. As table 2 show, funding at 2007 prizes has almost exactly doubled.

[13] Source: RANNÍS February 2007. These figures are *exclusively* funds that are open to general competition. Therefore these figures are somewhat lower than figures used e.g. in the OECD Policy Mix report (OECD 2006a). Contribution to the operation of RANNÍS is not included in these figures; until 2004 a small part of operation of RANNIS were paid from the funds, so if anything the increase in funding allocated is even greater than the table indicates. There are some smaller funds that are borderline – partly competitive – that were deliberately left out.

The policy and the actual increase in competitive funds have been welcomed by the community. As already mentioned, our survey found an overwhelming support for all main objectives in the 2003 policy and of these, increasing funding was ranked no. 1 by most respondents. This was well reflected in the interviews as well. But the interviews brought out another interesting dimension in this discussion: It appears that everyone supports a further increase in the competitive funds and feels that their share, as a proportion of public expenditure on research and technological development, is too small. At the same time there is also a widespread support for very substantial basic support to universities and research institutes. But there may be another reason for the fact that the current arrangement is not controversial – although this was not articulated in the interviews. The conventional way to present these figures is to present the share of government contribution that goes to national competitive funds. That would give a percentage of 12-14% for competitive funds – but that includes also the administration of competitive funding, which is relatively high for such small funds. If only the figures in table 2 are used, then the proportion drops down to 10% or slightly less in the period up until 2004 when in increases to 14% by 2007. What is missing is the Icelandic contribution to the Nordic programmes and more importantly to EU's Framework programmes which has also grown quite significantly and will grow even further during Framework Programme Seven.

Figure 7 Contribution to competitive funds as a proportion of government spending on R&D[14]



[14] The figures for 2006 and 2007 are most likely to high because they are based on figures in the finance bill for 2006 and proposed finance bill for 2007. On average, total government spending on R&D is 5% higher in reality than what is in the financial bill approved by Parliament at the beginning of each year. Consequently, for 2006 the final figure is likely to be 17.3% and 18.8% for 2007.

Still this is not a very high percentage, but if we were to add the administration and semi competitive funds usually included the percentage is moving from 12-14% in the pre-2004 period to just over 20% in 2007. That is bringing Icelandic numbers closer to what is recommended by the OECD.[15]

Finally, there is the institutional point of view, from which it makes more sense to look at the income and how much of that comes from competitive sources. While it is difficult to get accurate information on this we know that the expenditure of public bodies on research and development is between 15% and 35% higher than the government contribution.[16] Included in these figures is income from companies but also grant from international funds, not only the EU Framework Programme and Nordic programmes, to which we contribute, but also other sources and most importantly from the National Institute of Health and National Science Foundations in the USA. *We can therefore conclude that competitive funding as a source of income for both public and private bodies in Iceland is significant and has increased in absolute and in relative values since 2003.*

The second part of the initial objective was to coordinate the operation of competitive funding. At a formal level, this has been achieved with one exception. All the funds in table 2 above are managed by RANNÍS, expect for the two last. In particular the fund Improved Value of Seafood (AVS) is managed directly by the Ministry of Fisheries. The establishment of this fund in 2004 and then its doubling in size in 2005 contribute significantly to the overall increase in competitive funds. This fund was in preparation already before the STPC was set up and was developed in cooperation and consultation with the fishing and fish processing industries. The Ministry of Fisheries has maintained firm control over its operations. This has been cause of some friction as some ministries feel that the AVS fund could be merged with the other two main funds or at least that it should use fully comparable criterion for allocating grants. The Ministry of Fisheries and the main stakeholders have very strong views to the contrary and maintain that it would be catastrophic for practical applied research and development specific for the seafood industry if these were to merge. Their insistence on keeping AVS independent and outside is linked to the main criticism that has been levied at the new system which claims that certain kind applied of research activities has fallen by the wayside.

The STPC has been quite preoccupied with the need to coordinate the operation of the funds. In 2004 it asked the two committees and the boards of the individual funds to coordinate the "preconditions for public grants and clarify their objectives and criteria to better conform to the Council's policy."[17] This may have been – at least in part – a response to a very strong criticism from some of the public research institutes that followed the first

[15] In its most recent Policy Mix review, the OECD notes that significant progress has been made in terms of increasing competitive fund. However, there are two recommendations from that are very relevant here and which have some support in Iceland: "Improving the balance among support for R&D and innovation in universities, research institutes and business. […] Increasing the share of competitive funding for R&D." (OECD 2006a, p. 47)

[16] See RANNÍS Draft Analysis of the 2007 budget, table 7 (Government contributions) and table 8 (expenditure of public bodies on R&D), where the numbers range from 14% to 35%

[17] See STPC resolution from June 8, 2004, part 1. This issue is then discussed at greater length in the Annex to the resolution.

round of selecting projects from the new funds in 2004. The critiques claimed that certain kinds of applied research was not receiving funding from the Research Fund because it was not scientific enough and not from the Technology Fund because there was not enough business potential in it.

In December 2004 the STPC requested some action on this:

> The Council suggests to the Boards of the respective Funds to coordinate their selection criteria, reflecting the different roles of the Funds concerned, in order to avoid gaps in RTD financial support system. The guidelines published by the Funds should make it absolutely clear to the applicants to which Fund they should address their applications. The outcome of the annual decisions on support should be presented in such a way to remove misunderstanding that certain fields of research are eligible without any doubt. The Council requests this work to be completed before the next round of grants.[18]

A year later, after the second round of grant allocation from the new system, the Council partly recognizes that there still is a problem in its December 2005 resolution:

> Particular attention is needed for R&D that is of relevance to the Icelandic society. This type of R&D, of course, has to comply with the quality criteria even if the results are not always published in international scientific papers, patented or leading to a new product. The Agricultural Productivity Fund and AVS have in cooperation with other competitive funds supported research and development of companies, public research institutions and universities aiming at improving the economic and technical competitiveness of agriculture and fishing industry.[19]

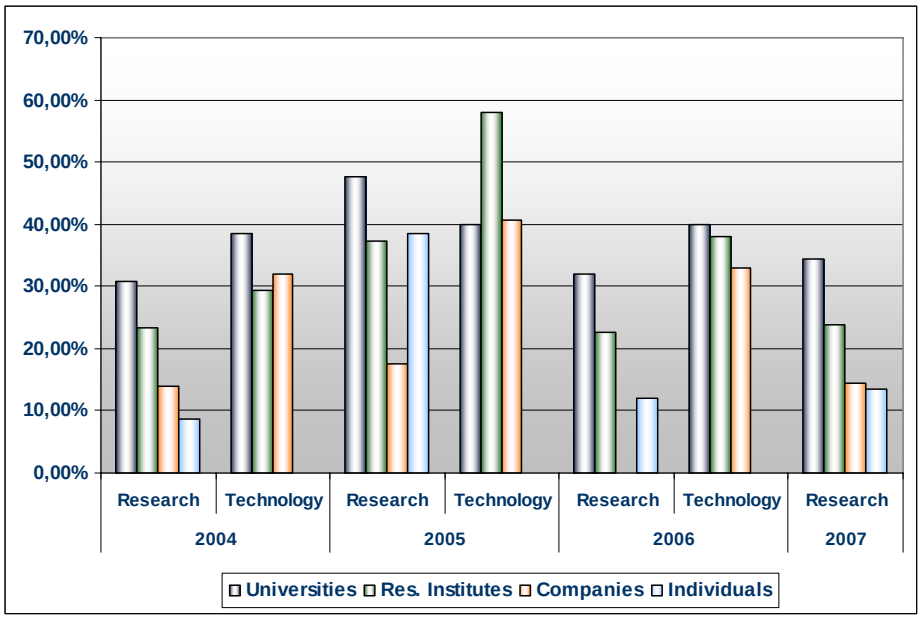
The conclusion to be drawn here is that there appears to have been a problem that the Council has identified and asked its committees, which are responsible for setting the general criteria for the two main funds, to address. It seems, however, that this problem has not been fully resolved and that there has been a difficulty to balance scientific and other criteria in the selection process. This may reflect a tension between academic perspective and the more applied approach and the message of insuring continuous funding many not have fully appreciated by the evaluation panels. [20]

The new structure for support to science and technology development designed two funds as its main instruments: the Research Fund that replaced two previous funds of the Research Council (the Science Fund and the Technology Fund) and the Technology Development Fund which was new. Therefore the internal evaluation looked at how they have functioned in relation to their original objectives. In 2007 they account for 2/3 of the total national competitive funding available.

First let us look at supply and demand. Figure 8 presents the success rate of applications for new projects for the rounds that have been completed. The Research Fund has only one deadline and main grant allocation per year, while the Technology fund has two deadlines (except for 2004).

[18] STPC resolution from December 17, 2004, chapter on competitive funds.
[19] STPC resolution from ... 2005, part 1.
[20] We see this from the fact that the new Council sees this as an issue that still needs to be addressed, see chapter 3.2 in the 2006 policy: "The STPC recommends that […]the grant policies and procedures of the competetive funds be reviewed regularly in order to better coordinate and simplify the administrative processing, increase continuity in financing and improve the evaluation procedures in view of scientific gains as well as socio-economic benefit."

Figure 8 Success rate in Research Fund and Technology Development Fund[21]



The overall number of applications for new projects represented in Figure 8 is 1.377 and the overall average success rate is 31.15%. As is to be expected, there is quite some difference between the two funds; the average success rate for the Research Fund is 29.8% while it is 35.7% for the Technology Development Fund. Overall this does not appear to represent a big change from the past. From 1995-2003 the overall average success rate for both the Science and Technology funds was 33.4% but that figure includes also applications for 2nd and 3rd year funding, so a comparable figure must have been lower. Success rate for new projects in Science and Technical funds in 2002 and 2003 was 24.2%.[22] The information that is available suggests that somewhat fewer new projects are supported on average per year from the Research Fund than were funded from the Science and Technology fund. In that context, it must be pointed out that the average annual budget has been about 15% higher in fixed prizes. *In effect this means fewer and larger projects*[23], which is what the research community has supported for a long time. 56% of the respondents to the survey supported the policy of increasing the grants even if it means fewer projects get supported, while 28% are against it and 16% are indifferent.

If we look at the success rate of different types of participants, we see that universities have been the most successful with an average success rate for both funds of almost 35%. The overall average success rate for companies is almost 30%, for public and private non-profit research institutes (that are grouped together) the success rate is 28.5% and for individuals the success rate is only 12.5%. A proportional figures can be misleading, when the

[21] Source: RANNÍS February 2007.

[22] Source: RANNÍS, presentation to the STPC Committees in 2006. It would have been informative to have fully comparable information between the old system and the new on success rate of applications for new projects. In fact very little data exists for the previous format that can readily be used to compare with the new system. There is no systematic and harmonized building up of historical data to cover the main functions of grant management.

[23] Figures for the last two years of the old system and the first two years of the new system show that the average size of grants per project grew by 60%.

difference in absolute numbers is big, the actual numbers of applications and approved projects is provided in table 3 below.

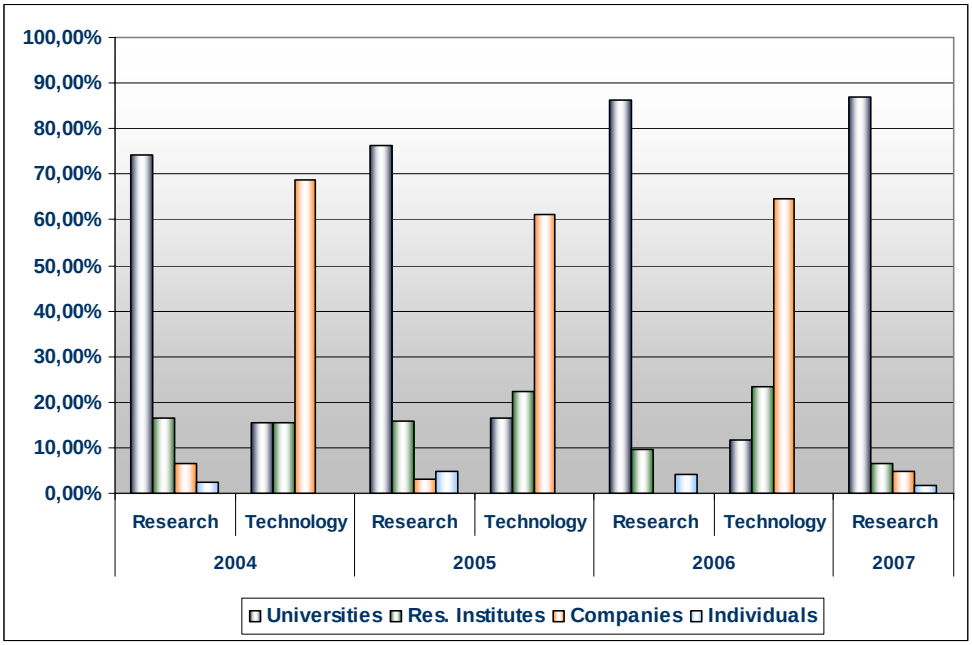
Table 3 Number of applications 2004-2007 by type of coordinator

	2004				2005				2006				2007	
	Research		Technology		Research		Technology		Research		Technology		Research	
	A	P	A	P	A	P	A	P	A	P	A	P	A	P
Universities	186	**58**	13	**5**	161	**77**	20	**8**	194	**63**	10	**4**	193	**54**
Res. Institutes	58	**13**	17	**5**	45	**16**	19	**11**	33	**7**	21	**8**	34	**4**
Companies	36	**5**	69	**22**	17	**3**	74	**30**	14	**0**	67	**22**	9	**3**
Individuals	23	**2**	3	**0**	13	**5**	5	**0**	25	**3**	4	**0**	14	**1**
Total	303	**78**	102	**32**	236	**101**	118	**49**	266	**73**	102	**34**	250	**62**

A = applications ; P = approved projects

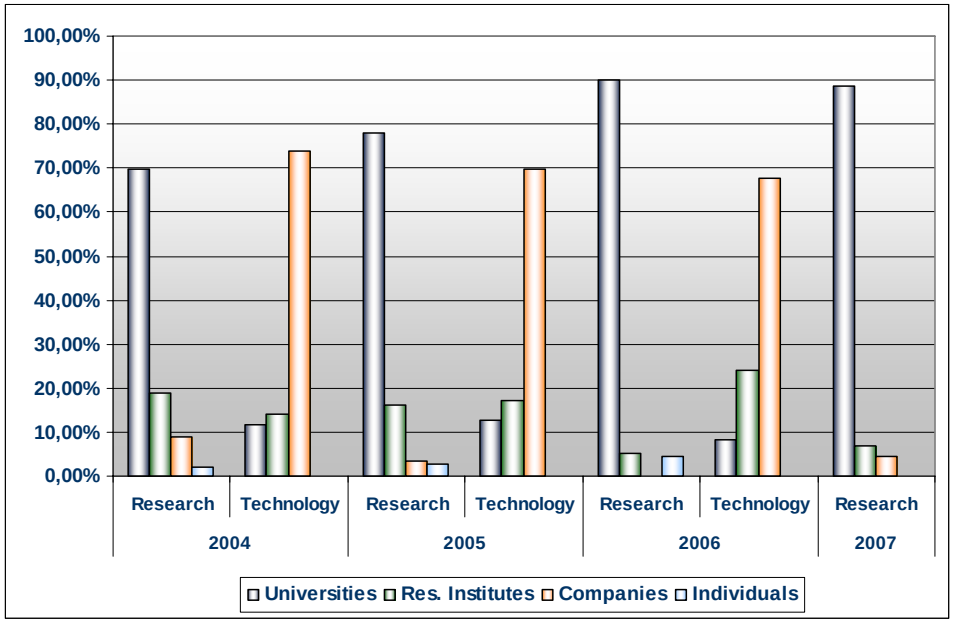
From this emerges a clear picture of a sharp distinction between the Research Fund, where 70-90% of the projects are lead by universities, and the Technology Development Fund, where between 60-70% of project are lead by companies. This is elicited in the following figure.

Figure 9 Distribution of accepted projects by type of coordinators



Project coordination is only one indicator. We need also to see where the funding is going and what kind of cooperation between different actors the projects entail. If we look first at where the grants go, the only information available is the distribution of funding by type of project coordinators. This is presented in figure 10. It was not possible to gather information on where the grant is actually going because this has not been systematically collected.

Figure 10 Distribution of funding by type of project coordinators[24]



How does this compare to the previous system? We should keep in mind that the idea was that the Research Fund would replace both the Science Fund and the Technology Fund and continue to support similar kind of activities. The Technology Development Fund was then to be an addition to the system, to support "R&D in the area of technological developments aimed at innovation in industry."[25]

The distribution in the former Science Fund was so that universities coordinated and received 66% of the funding, with research institutes standing for 24% and individual and foreign participants for the last 10%. Companies did not coordinate any projects.[26] However the distribution in the former Technical Fund was so that universities received as coordinators only between 10-20% of the funding and companies and research institutes received between 40-50%.[27] It must be kept in mind that from 1999 these two funds were roughly similar in size (see table 2 above). So taken together one could say that universities coordinated roughly 40% of projects and received similar proportion of the funding available, research institutes coordinated roughly 30-35%, companies 20-25% and individuals less than 5%.

This is quite different from the distribution we see for the Research Fund depicted above where universities represent 70-90%, research institutes just over 10% and companies and individuals less than 5% each type. Therefore based on the proportional distribution of coordination of projects and funding received, *we can conclude that for the Research Fund, there has been a significant shift of responsibilities and funding from companies and particularly*

[24] Based on information provided by RANNÍS. Please note that in these figures, only the first years allocation of funding to new projects is tallied. Projects have to apply for continued funding for the second and third year – with success rate being more than 90%. However this should fairly accurately represent the proportional distribution of funding by project coordinator.
[25] See Article 4 of the Law no. 4, 2003.
[26] RANNÍS : Report on the Science Fund 1995-2003. Only available in Icelandic.
[27] RANNÍS : Report on the Technical Fund 1995-2003. Only available in Icelandic.

research institutes to universities. We can perhaps also conclude that some of the applied research efforts have been transferred to the Technology Development Fund.

There is some difference between the proportional distribution of coordinators and the funding distributed to coordinators due to the fact that grants from the Technology Fund are fewer and larger. Thus the proportional share of companies and research institutes is higher in terms of funding than in terms of coordinating projects. Table 4 merges figures for both funds for the period 2003-2006 (figures for the Research Fund for 2007 are deliberately left out to have balanced figures).

Table 4 Proportional distribution of coordination and funding 2004-200

	share of coordinating	share of funding
Universities	62,70%	45,55%
Res. Institutes	14,92%	15,38%
Companies	19,81%	37,76%
Individuals	2,56%	1,31%

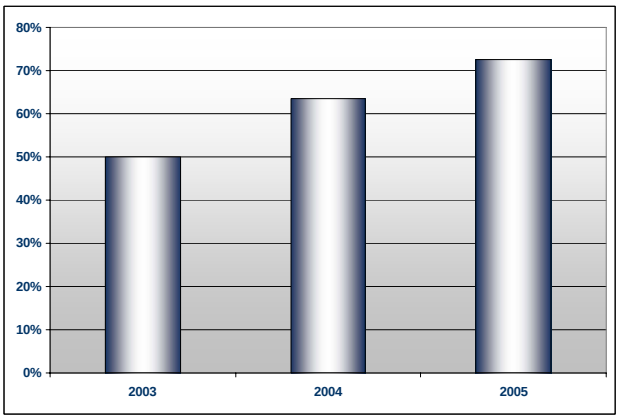
This distribution represents a more balanced picture of the support being provided the new system indicating that companies are receiving substantial support. That leaves the research institutions which clearly have not maintained their proportional share of the support offered by the competitive funds.

To get an appreciation of how the introduction of a new system was proceeding, we asked in the survey if the respondents felt well informed. Overall the survey shows that the science and technology community is fairly well informed about the two main funds, their objectives and evaluation criteria. As almost half the respondents did not apply for the Technology development fund, it is not surprising to find that it is not quite as well known by the applicants. Conversely, the majority of respondents feel they know the Research fund's objectives well – only 16% said they did not know much even if 25% had not even applied for funding from it.

Applicants were also asked to evaluate how fair they felt the criterion for selection where. Here we see a difference between the two funds: 70% of those who take a stand, feel that the Research Fund criteria are fair, while only 57% of those who have an opinion feel it is fair. In this context it is interesting to note that a number of people expressed opinions on a fund that they did not apply for. Applicants were also asked about their views on the policy of encouraging or requiring cooperation in projects. Roughly 50% were positive, 25% were negative and 25% did not have an opinion. Asked specifically about cooperation with companies as a requirement, this is strongly opposed in the case of the Research Fund – with 67% saying this to be undesirable and only 17% being in favour of this. In the case of the Technology Development fund, the picture is more mixed with 48% in favour and only 25% against.

Turning then to cooperation and recalling the specific objective in the 2003 policy to "increase the co-operation between research institutes, universities and business enterprises in forming knowledge clusters capable of attaining a strong position in international competition."

Figure 11 Cooperation in projects



RANNÍS provided data on cooperation in projects for 2003 for both funds under the old system and for the first two years of the new system, again for both funds. This data shows that cooperation is increasing, both in projects supported by the Research Fund and the Technology Development Fund. Fully comparable figures for 2006 were not available, it is interesting to point out that participation by companies is very significant in projects funded by the Technology Development Fund, where they participate in 90% of funded projects.

Finally we need to discuss the objective to "give increased weight to research training of young scientists in an internationally competitive research environment." Here we see a very interesting development which allows us to conclude that *in the new support system, much more support has been available for research training of young scientists than under the previous system*. The specific Fund for Graduate Students started up in 2002 and has only maintained its funding level until 2006 – but will increase by about 25% in 2007. But more importantly, funding of graduate students at both masters and doctoral levels has become a very substantive part of grants provided by the Research Fund. There is no detailed statistical information available, but RANNÍS staff reports that up to two thirds of the grant from the Research Fund to the universities goes to pay salaries for graduate students and post-graduates. If this is true then the funding from this source towards research training is 4-5 times bigger than what comes out of the fund for Graduate Students.

This was not by a deliberate design, but rather a consequence of acute demand, partly driven by the substantial increase in graduate students in the last few years as well as rules which provide for full funding of graduate students if funded by the Research Fund compared to much lower fixed funding from the Graduate Student's fund. Attitudes towards this development are varied. In the interviews some felt that too much of the funding was going for this while other pointed out that this was a very efficient use of public funding as graduate students are relatively inexpensive but very productive researchers.

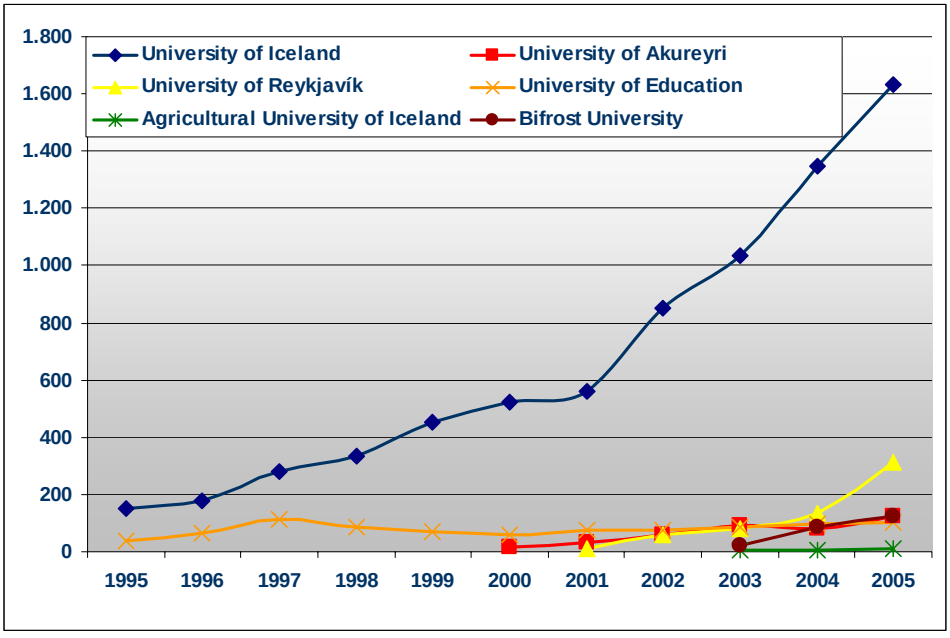
6. Universities as Research Institutions

Main conclusion: The role of universities as research institutions has been strengthened by growth in graduate programmes and through increased research funding directly to the universities and from the Research Fund. New comprehensive legislation for Higher Education that came into force in 2006, creates conditions for improved quality control and further development of Icelandic Universities. The University of Iceland – by far the largest university – has presented a very ambitious objective to become a world leading university and a five year action plan that will significantly boost its research capacities. Following this action plan and new agreements with the government was signed that will very significantly increase its basic research funding.

The objective of the 2003 policy was to "Strengthen the role of universities as research institutions by building up and encouraging diversity in research at Icelandic universities through competition between individuals and research teams for research grants from competitive funds. "

Significant increase in then number of students has characterized developments of Icelandic universities in the last decade. There are now eight Higher Education institutions in the country and a university student population of more than 17.000 students that has grown by 40% since 2001. While the biggest increase has been in undergraduate programmes, the recent growth in graduate programmes is more relevant from research's point of view.

Figure 12 Number of graduate students at Icelandic universities[28]

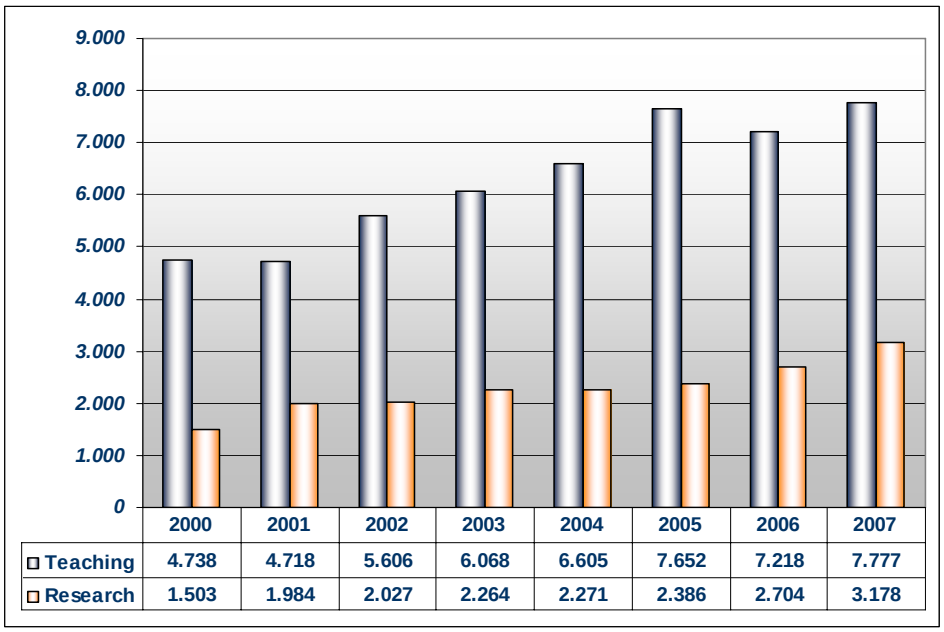


[28] Source: Statistics Iceland. Information was not available for 2006 and there are a number of students that are studying in addition to their first degree, but who are not formally registered at masters level, that are not included in these figures. Thus they probably underestimate the total number of students at graduate level.

Of the 2.300 graduate students in 2005 only 150 are Ph.D. students. There is not yet a strong tradition for organized Ph.D. programmes, which most Icelanders have attended in other countries. But the University of Iceland has set itself the objective to graduate at least 65 Ph.D. students in 2011. For that the Ph.D. student body must grow fast and the throughput must be accelerated.

This rapid growth at university level has come at a cost to the government. Figure 12 shows in 2007 prices the increase in government contributions to both teaching and research.

Figure 13 Government contribution to universities for teaching and research – Million ISK in 2007 prizes[29]



	2000	2001	2002	2003	2004	2005	2006	2007
Teaching	4.738	4.718	5.606	6.068	6.605	7.652	7.218	7.777
Research	1.503	1.984	2.027	2.264	2.271	2.386	2.704	3.178

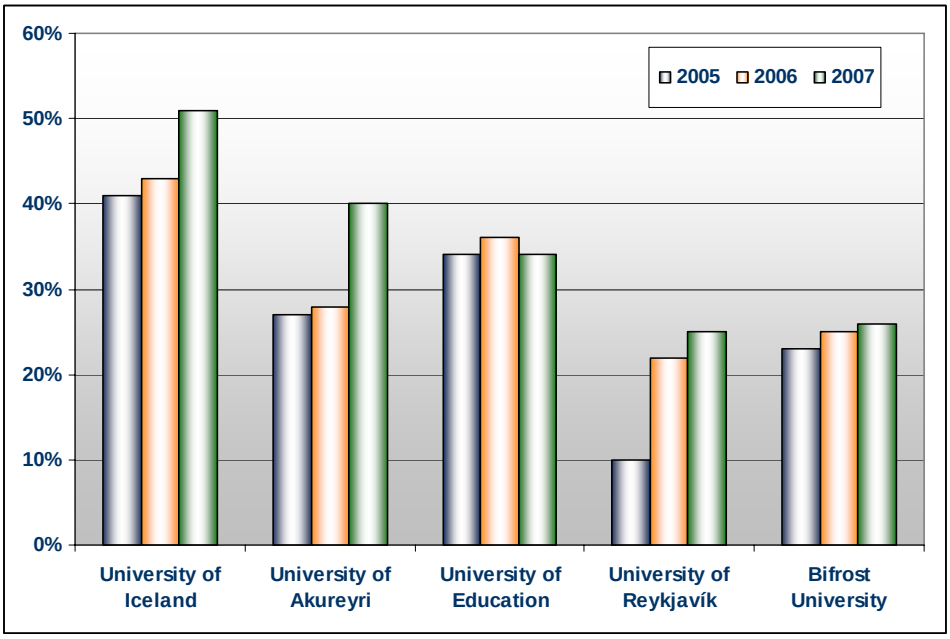
The government had also to react to the growth at university level by reviewing and then presenting a new legislation for Higher Education. This was done in 2005 and here the STPCs committees, notably the Science Committee, gave valuable input and insured that changes in the new framework legislation were conforming with STPC policy. The new law came into effect in mid 2006 and provided a new framework for accreditation of universities and particular fields of study as well as prescribing a rigid quality assessment arrangement. All the existing universities will have to go through an accreditation procedure before mid 2008 to receive formal accreditation for their fields of study and types of programmes they offer. RANNÍS will provide the secretarial service to the accreditation and quality assurance activities.

Another measurement that can be used to see if Icelandic universities have been strengthened as research institutions, is to look their research intensity, i.e. research as a

[29] Source: Ministry of Education, Science and Culture. Again figures for up to 2005 are final while 2006 and 2007 figures are based on the budget proposal for each year. The final figures could therefore be higher, especially for teaching.

proportion of teaching. This is provided in figure 14 below, showing that with the exception of the University of Education, their research intensity has grown.

Figure 14 Research intensity measured by government contributions[30]



The University of Iceland and the Ministry of Education, Science and Culture signed a new and important research agreement in January 2007. It entails very significant increase in the direct research contribution to the University if it can met the criteria laid out in the agreement. The direct contribution could rise from 51% of the contribution to teaching in 2007 to 103% is 2011. That will requiring the government to more that double the 1.925 MISK the University is receiving in 2007 to reach a level of approximately 4.500 MISK in 2011 at current prizes. To put this figure in context, the competitive funds, as presented in table 2 (see chapter 5), stand at just over 1.600 MISK.

This contract is a result of negotiations that started after the University presented its policy for the 2006-2011 period. The University has set itself the very ambitious long-term goal of becoming among the 100 best universities in the world. As universities are primarily ranked on their research merits, this will require the University to very significantly boost its research activities. In its policy the University present the five year objectives towards reaching this goal. These include quintupling the number of Ph.D. students graduating each year – to reach 65 by 2011, to double the publications in ISI journals by the end of 2011, to increase cooperation with the world's leading universities and to increase its income from national and international competitive funds by 80%.

[30] Source: Ministry of Education, February 2007. This is the direct contribution of the government for research activities as a percentage of the contribution from the government for teaching at that particular university. Figures for 2005 are final; 2006 and 2007 are estimates. All the universities get funding from national and international competitive sources and therefore they actual research intensity is higher. No information is available for the two HE institutions that fall under the auspices of the Ministry of Agriculture. The Iceland Academy of the Arts is omitted as government contribution to research is minimal.

The process of developing this policy was an interesting one and in good harmony with the methodology being advanced by the STPC. It was a very transparent and open process requiring the participation of all of the University's 1.000 staff. The University was very conscious of the STPC 2003 policy and took it into account but also through it own policy work influenced very much the development of the 2006 policy statement.

There are three other developments at university level which should be highlighted in the context of the SPTC policy. The first was the establishment of the Agricultural University on January 1, 2005. Under it were merged an Agricultural College and a Horticultural College as well as the Agricultural Research Institute. Because of the former institute and the relatively small student population, the Agricultural University is very research intensive – though precise figures were not available.

The second development was the merger of Technical College with the private Reykjavík University in 2005. This significantly strengthened the university which set up a full blown technical and engineering department. As the number is figure 13 show, research at Reykjavík University is significantly growing. It has secured a fairly large patch of land from the City of Reykjavík where it will relocate in the next five years and have space to grow considerably in the future. This site forms one corner of a potential knowledge triad, with the University of Iceland and the National University Hospital at the other corners.

The third development is still in the making. This is the proposed merger of The University of Education with the University of Iceland. As both are constituted by law, this requires Parliament's approval and a proposed legislation is now in its process in Parliament. It is expected to pass during the current session of Parliament. It is expected that the merger will take two years as it will involve restructuring the University of Iceland into fairly independent schools. It is expected that this will lead to increased research efforts in educational research.

The STPC did not play a very active role in bringing about these three developments but as can be seen from the regular declarations voiced its opinion and strongly supported reorganisation when it served the purpose of "encouraging diversity in research at Icelandic universities".

7. Reorganisation of Public Research Institutions

Main conclusion: There is general agreement that review and reorganisation of public research institutes has moved forward since 2003. Two public institutes no longer exist as such; one was moved under the Agricultural University and one was transformed into a government owned limited company. At the same time there is agreement that progress has been slow, particularly regarding the Technology and Building Research institutes. A bill is before Parliament to establish an Innovation Institute which would see the merger of two research institutes and the Regional Development Agency. The regional aspect of this proposal has been controversial. The Science and Technology Policy Council has only partly functioned as a policy coordinating body in this restructuring process. Despite some difficulties, there are a number of public research institutions around on which there is little controversy and where there is a feeling that review or reorganisation is not urgent.

The third main objective of the 2003 policy was to "Review the organisation and work-methods of public research institutes, with the objective of uniting their strengths and co-ordinating their activities more closely with the universities and business sector." There was fairly good consensus in the interviews that in this area least progress had been made of the three main objectives. Yet progress has been made.

Three important developments should be highlighted here. The first concerns the agricultural sector that was already mentioned in the previous chapter. There a public institute was merged into a university. The new Agricultural University started in 2005 and as of yet there has not been any evaluation of its activities. Like other universities it will have to undergo a formal assessment to get accreditation. There has not be evident much criticism or controversy surrounding this merger and in the absence of that a qualified success can be claimed.

The second development concerns the food production sector generally and fish processing and production specifically. After a long and delayed preparation phase Matís Ltd. started operating as of January 1, 2007. It is a publicly owned limited company that took over all the functions of the former Fisheries Research Laboratory and some food related activities that were carried out at the Technology Institute and the former Agricultural Institute. The rational is to consolidate publicly sponsored food related research but to do so in a more business like environment of a limited company. There have been some initial difficulties associated with employees rights as public employees and a sizable proportion of the old employees did not accept an job offer for this new limited company. That may however just turn out to be an opportunity for new recruitments and renewal of staff. In any event it is way too early to pass any judgement on success or failure.

The third development concerns industry in general and three institutions in particular and has turned out to be the most difficult. Initially it was proposed to merge the Technology and the Building Research Institutes into one new institute. After some

discussion there was reasonable consensus on this change and legislation for this new institution was in preparation. Then the idea surfaced that since this proposed new institute was to have a role in supporting economic and business development though its innovation centre, it might be prudent to merge the Regional Development Agency with this as well. The argument centred on efficiency and the claim that regional development was nothing but economic development and there was not a need for two public institutes doing the same thing. The critiques claimed that this had more to do with the troubles of the Regional Development Agency which was perceived by many to be looking for both funding and reasons for existence. When a proposal for legislation was introduced to Parliament strong criticism was levied against it from a regional perspective. As a consequence the proposal was withdrawn and the change was delayed for another year. It was then reintroduced in the fall of 2006 with some changes that had taken account of some of the criticisms. Whether it will pass before the end of term for the present Parliament is uncertain.

Three different models or approaches have been applied here: In the first instance, a research institute is brought under a new and reorganized Agricultural university. This then is a university model. In the second, a limited but publicly owned company is created taking over functions that were previously in three different institutions. This can thus be referred to as a limited company model – which also provides for relatively easy privatization. In the third instance, the proposal follows what may be called an institutional model. The three different approaches suggest that there has been relatively little coordination between the three ministries that have led these developments.

It is interesting to point out that the STPC did have limited direct involvement in this process but has repeatedly voiced its opinion, particularly on the two latter cases discussed above. For instance in its resolutions in June and December 2005 they state that these mergers will take place (although the limited company option for food research was not on the table) and in that context the Council emphasises the opinion that to relocate these newly reorganised institutes in proximity to the universities in central Reykjavík would be a good option.

The STPC has not undertaken a structured and open discussion on what the role of government should be in running public research institutions. The difficult and wearying process so far, suggest that such a discussion might be a good idea before more restructuring ideas are hatched.

In addition to these there are a number of government institutes with significant monitoring and research obligations. The largest one by far is the Marine Research Institute that receives in the 2007 budget 1.200 MISK, but there are others quite large like the Meteorological Institute. The interviews did not reveal any controversy or perceived urgent needs to review the organisation and working methods of these.

8. Specific objectives

Main conclusion: Considerable progress has been made on most of the specific objectives spelled out in 2003. Cooperation has been successfully encouraged though funding instruments which will also lead to stronger research teams. Success in international competitive funds indicates the existence of a number of strong research teams. Research training of young scientists has received a significant boost through increased number of graduate students and additional funding from the Research Fund. New law on inventions of employees has been passed that will hopefully encourage public institutes to take more active role in protecting and commercializing it research results. A national database on publicly funded research is maintained but more needs to be done to promote the utilization of research results. Finally quality assessments are slowly being implemented for public institutions but very few thematic assessments have been carried out.

In addition to the three main aims in the first policy statement, there are seven specific objectives mentioned, quoted below, that we need to look at.

> Furthermore, the Government will introduce a variety of supporting measures aimed at strengthening the infrastructure for science and technology in the country and the status of Iceland as a leading knowledge based society. More specifically the objective is to:
>
> 1. establish strong research teams for working in an international environment by giving priority to the most competent individuals, institutions and firms;
> 2. increase the co-operation between research institutes, universities and business enterprises in forming knowledge clusters capable of attaining a strong position in international competition;
> 3. make research and development attractive to business enterprises, supporting the emergence of high-technology firms which to a large extent rely on research for their growth;
> 4. give increased weight to research training of young scientists in an internationally competitive research environment;
> 5. assure open public access to the results of publicly financed research, databases and other scientific and scholarly information, promoting the utilisation of these for added value to society;
> 6. pass laws encouraging scientists to protect their intellectual property rights through patents, and institutions and firms to introduce measures to properly manage the intellectual property of their employees;
> 7. regularly assess the quality of research conducted by universities and research institutes, by subject areas or fields of employment or knowledge clusters, and take the results of these into account when deciding on appropriations and priorities.

Objectives 1, 2 and 4 have been addressed mainly though the criteria used to select projects supported by the main competitive funds. We have discussed this is earlier chapters. It is difficult to determine if strong research teams have been established except indirectly, but it is safe to say that the criteria especially for the Research Fund has placed much more emphasis on selecting the most competent individuals particularly. The strength of the research teams can perhaps be gauged from the success of Icelandic participants when applying for internationally competitive funding. The success of Icelandic participation in European Union's Framework Programmes for research and development suggest at least

some degree of results here.[31] As regards the training of young scientists, there has been significant progress, as we see from the proportion of grants from the Research Fund that goes to support graduate students. According to information from RANNIS this accounts for more than half and possibly as high as 65% of the total funding available from the Research Fund. In addition there is a specific Fund for Graduate Research Training.

As regards the third objective, it is difficult to point to specific achievements or changes that have occurred. In its policy statement for 2006-2009 that STPC recognized that "the business environment [needs to] be made more favourable to highly innovative and research intensive companies in the country. (See chapter 5.2 of the policy statement) It was specifically the role of the Technology Development Fund to address this. The significant company participation – coordinators or partners in 90% of funded projects in 2005 – suggest at least some degree of success here.

For Objective 5, not many new initiatives have been undertaken after 2003. Since 1998, the Icelandic Current Research Information System (RIS)[32] has been operated and has information dating back to 1995. It is a database with standardized information on close to 3.000 research projects. It is jointly managed by RANNÍS, University of Iceland and the Technology Institute. The problem however is that it is not an exhaustive list and project receiving public funding through the competitive funds are not required to file information about their projects in this database. As a result it is viewed with some suspicion as to its reliability as a good source of information.

In addition to the input into the RIS database, RANNÍS publishes on its web a short news release when projects finish but does not make any detailed information available in any kind of accessible format. The Added Value of Seafood fund, on the other hand, maintains a comprehensive web site where all final reports from projects to the fund a publicly available. This is part of a deliberate strategy to widely disseminate information to this specific sector, which is related to its core mission to serve the fishing and fish processing industry.

Objective 6 has been achieved. In 2004 Parliament passed a new law on Inventions of Employees[33], that came into effect in January 2005. It covers employees of both public and private bodies and spell out the respective rights and duties in cases where there are patentable inventions. The main change is that now public institutions have a claim to the exploitation rights of patentable inventions of its employees. With this change, Iceland is

[31] No information is readily available in English on Icelandic participation in Framework Programmes. Evaluation reports for FP 4 (http://bella.mrn.stjr.is/utgafur/Ahrifaislandi(1).pdf)and FP 5 (http://bella.mrn.stjr.is/utgafur/ramma.pdf) are available in Icelandic. In short it is the opinion of the relevant stakeholders that Iceland has been fairly successful and relative to the EU average very successful. This is based on comparisons of the number of applications per capita, on the overall success rate of applications as compared to EU average and on the funding received as a proportion of what Iceland contributes. On all accounts, Iceland scores well and on the funding, Iceland is receiving significantly higher amounts in grants than what is being paid into the programme. That is true in general of most of the EU programmes Iceland participates in.

[32] See http://www.ris.is/index_eng.html

[33] Law no. 72, 2004. See English translation http://eng.idnadarraduneyti.is/laws-and-regulations//nr/1439

moving in the same direction as many European countries in recent years. University of Iceland, in collaboration with the National University Hospital, did set up formal procedures in 2004 and after a slow start, the first disclosures have been made and one patent application in the name of the University has already been filed.

Finally objective 7 can be said to have been partially achieved. Quality assessments have been or are being implemented at institutional level rather than by subject areas, fields of employment or knowledge clusters. For research institutes this is done through Performance Management Contracts between the relevant ministries and the institute in question. For the universities, this was one of the main issues addressed in a new university legislation that took effect in 2006.[34] Previously quality assessment was more in the hands of the universities themselves. On the basis of the new law, all the universities are now undergoing a formal quality evaluation and certification in certain fields.

Thematic evaluation has not been carried out, with the exception of an evaluation report on the Targeted Programme for Information Technology and Environment 1999-2004 that was conducted in 2005.[35] In general it can be observed that there is limited culture of evaluations of this kind.[36] It was already pointed out – but worth repeating – that is very little information available on the impact of public support. It seems that for a long time, the public support system has focused more on gathering information about the output – in terms of grants allocated and support provided to different kinds of participants and scientific fields – but very little is gathered about the actual effect of these support activities. This is already recognized by the STPC, which recommends in its 2006-2009 policy that "The collection and analysis of statistical data pertinent to research, development and innovation be strengthened." (See chapter 3.3 of the policy statement.) The current evaluation of the Council's first three years is a first step in that direction. *Therefore it could be an important outcome of the evaluation of the STPC to point to how such thematic quality assessments could be carried out in the future.*

[34] Law no. 63, 2006 (http://www.althingi.is/lagas/nuna/2006063.html); English translation exists in a draft version only.

[35] Menntamálaráðuneytið 2005 *Framkvæmd og árangur markáætlunar um upplýsingatækni og umhverfismál 1999-2004*. (In Icelandic only)

[36] The OECD observes: "The notion of formal evaluations of programmes and institutions is a rather underdeveloped policy arena and as an instrument for policy implementation and follow-up." (OECD 2006a, p. 46)

9. Coordination

Main conclusion: Coordination between different ministries on policy and operational issues related to research and technological development has significantly increased through the Council, its two committees and an inter-ministerial coordination committee that was set up. Policy development has been very well coordinated. Yet there is a perceived need for more coordination and the Council has not always been involved in deliberations on big decisions taken by individual ministries. There is a lack of clear guidelines or working procedures for decision on participation in international activities that the STPC should develop and could institutionalise in a regulation issued by the Prime Minister's Office as the law establishing the STPC foresees.

The very set-up of the STPC – requiring three separate legislations proposed by three separate ministers reflects upon the strong role the ministries have under the Icelandic governmental system. So coordination within the government is necessary in research and technological development which can have an interface with any ministry. In particular there have been three ministries in addition to the Ministry of Education, Science and Culture, directly and actively involved as they are responsible for large public research institutions. These are the Ministry of Fisheries, under which the Marine Institute and the former Fisheries Laboratories Institute fall, the Ministry of Agriculture being responsible in 2003 for both schools at university level and research institutions and now for one Agricultural University and smaller institutes and finally the Ministry of Industry being responsible for three institutes covering technology, construction and energy.[37]

Based on the interviews and meetings held, the internal evaluation finds that coordination within the government has improved in particular of those ministries that are most involved. At the same time those close to the STPC or directly involved all feel that while progress has been made, there is still significant work to be done in terms of coordination between different ministries and government agencies. One of the biggest challenges for the new system has been the reorganisation of the public research institutes. There different ministries have chosen their own approach and with different degree of success managed to develop consensus on their proposals. *Our conclusion here is that the approach to reorganisation has not been sufficiently coordinated and STPC could have been used more effectively in that process.*

Another issue concerns the role of RANNÍS – the Icelandic Centre for Research and Development – in the new structure. With the structural change the old Research Council was abolished and STPC took over its policy function and the Boards of Directors of the different funds took over the funding decisions previously handled by the Research Council. RANNÍS became an independent institute under the auspices of the Ministry of Education, Science and Culture, with clearly defined tasks to provide service to the STPC and the different funds but with no mandate for any decision making.

[37] This is not an exhaustive list, as the Ministry of Health is responsible for the National University Hospital, which is an important research institution and the Ministry of the Environment is responsible for among other the Environment and Food Agency and the Icelandic Meteorological Office.

For the "customers" of the system, the individual applicants, there has not been much of a change. It was with them in mind – and to some extent also international partners – that the old acronym was maintained. Individuals continued to receive information from RANNÍS and send their applications to them and if successful receive contracts from them. This has not created many problems vis á vis management of the funds. But is has created some problems concerning participation in international cooperation, where decisions needs to be taken on who should represent Iceland in what forums and how that should be paid for. Previously, this was decided by the Research Council, but under the new system it has not been clear who should decide on who is to represent Iceland for instance in European Science Foundation activities or if Iceland should participate in international forum where it is required to contribute some funding. This has been sorted out on an ad hoc basis up until now, but it is evident from the meetings and interviews that relatively small issues or decisions have managed to cause both frustration and friction which is out of proportion to the importance of the cases at hand. There needs to be a clear answer to questions like "Who should decide on participation in international cooperation such as ESF, EMBL, ESA or most recently the ERA-NET Plus activities."[38] If this is not clarified and if there are no provisions of funding for these kinds of international activities, Iceland runs the risk of missing important opportunities. That in turn runs contrary to the policy formulated by the STPC, which has always advocated strengthening international cooperation. *The conclusion to be drawn is that there is a lack of clear guidelines or working procedures for decision on participation in international activities that the STPC should develop and could institutionalise in a regulation issued by the Prime Minister's Office as the law establishing the STPC foresees.*

Another dimension that emerged during the interviews and meetings is the role of RANNÍS regarding other ministries than the Ministry of Education, Science and Culture. There is an underlying feeling that other ministries may not fully trust RANNÍS as it belongs to one particular ministry. It was difficult to pinpoint this during the meetings or get people to articulate this point but the following is clear: In the law establishing the Technology Development Fund it is nowhere said explicitly that RANNÍS should provide the operational service to the fund as it specifically says in the law for the Research Fund. The Ministry of Industry or even the Board of Directors of the Fund could reach an agreement with some other agency to provide the operational service required. Why is this fixed in the law in one case but not in the other? A similar difference in practice can be observed by the fact that the director of RANNÍS is today always invited to participate in the meetings of the Science Committee (this was not the case initially) but only when it is thought to be particularly relevant is he invited to attend meetings of the Technology Committee. Who attends the committee meetings other than the members is left to the discretion of the chairman. It is also clear that RANNÍS does not provide operational service for the Added Value of Seafood (AVS) research programme which is controlled and

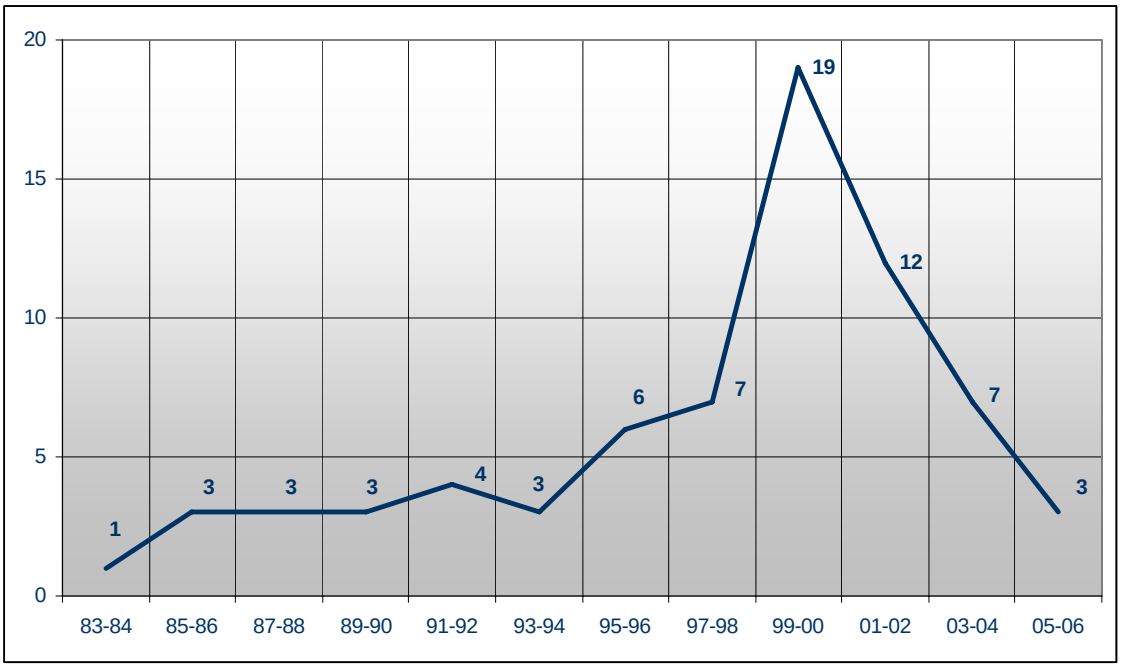
[38] For clarification: Iceland does participate and contribute to the activities of the European Science Foundation (ESF) and the European Molecular Biology Laboratory (EMBL) but does not participate in the European Space Agency (ESA). ERA-NET Plus are project managed jointly by different research founding agencies in Europe with a support from the Framework Programmes of the EU. They require direct financial contribution into a joint research programme which have open calls for proposal to fund project from all its participating countries.

operationally managed by the Ministry of Fisheries. In fact the claim is that it must be outside RANNÍS and the regular methodology of application evaluation to preserve the special character and criteria for project selection.

There is not concrete conclusion to be drawn from this – only the observation that *coordination of government activities can still be improved and the role of RANNÍS as a service centre for all ministries in matters of research and technological development can be further strengthened*.

The final issue is coordination outside of the current remit of the STPC – most notably the next stage after the role of the Technology Development Fund. Many of the people interviewed felt quite strongly that the most urgent challenge facing the science and innovation system now, is lack of support and a serious lack of funding for start-up and early stage companies. In support of this view, we end this evaluation with a figure that shows when 71 of the 100+ Icelandic start-up companies in Association of Start-up Companies were founded. As the life of a start-up is difficult and many will die before reaching maturity it must be very worrying if it is true that since the setting up of the Science and Technology Policy Council, few new companies have been started. The prognosis is that the fountain of future prosperity may be drying up. That is an issue the Council should discuss.

Figure 15 Founding year of existing Icelandic Start-ups[39]



[39] The definition used by the Association for a start-up company is more than 10% on R&D and less than 1 billion ISK (11 M€) in turnover. The following Figure is from a study conducted by Hilmar B. Harðarson and Pálmi Blængsson, University of Reykjavík, and presented at a Start-up Forum organized by the Association in cooperation with the Confederation of Industries and a number of others. The study can be found at (http://www.si.is/media/sportafyrirtaeki/2007-Sprotath-P&H-sk.pdf) – only in Icelandic.

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Annex I : Policy Statements and Resolutions adopted by the Council from 2003-2006

Science and Technology Policy 2003-2006[40]

Adopted at a meeting of the Science and Technology Policy Council on December 18. 2003

Introduction

When evaluating the competitive advantage of nations, the role of education and achievements in the field of scientific research and business innovation weighs heavily. Recent resolutions of the OECD Ministerial Council underline how education, research, innovation and entrepreneurship are the driving power for economic growth in societies that develop by acquiring and utilising new knowledge. Member states are encouraged to increase their support for science and research, creating favourable conditions for innovation based on new knowledge.

During the past decade, there has been a remarkable increase in expenditure on research and development work. Icelanders spent 3% of their gross domestic product on research and development undertakings in 2001, compared to 1.1% in 1990, thereby reaching the goal which the European Union has set itself to achieve by 2010.

The benefits of this investment may be measured for instance by the favourable outcome of Icelandic scientists in international co-operation and through added innovation, which has led to growth in employment and in the exports of goods and services based mainly on knowledge.

The increased emphasis by the business sector on research and innovation may in part be traced to Government policies in economic affairs, education, business environment and taxation. Here it is worth mentioning reform in the educational system, economic stability, growing freedom in the financial market, the privatisation of state-owned companies, and the tax environment for businesses, which is now among the best to be found in Europe. By responding to the opportunities created by these factors, Icelandic business has managed to restructure itself, invest in research and development, and better utilise human resources. A significant prerequisite for these changes is a higher number of people with a specialised education. All of this has helped result in Iceland's economic growth surpassing the average in other OECD nations.

Science and Technology Policy

The role of the Science and Technology Policy Council is to promote scientific research and research training in the sciences and encourage technological progress in Iceland, for the purpose of strengthening the foundations of the country's culture and boosting the competitive capacity of its employment sector. Operating under the direction of the Prime Minister and consisting of ministers, scientists and business representatives, the Council formulates public policy on scientific research and technological development.

[40] Translation provided by the Ministry of Education, Science and Culture, December 2006.

The principal function of scientific and technological policy is to express the priorities set by the Government and inform of the improvements to be made in support structure for research and development work. It also serves to guide those who participate in implementing the policy in selecting appropriate strategies towards established goals. It is important to provide appropriate framework for cooperation among the public actors in science, technology and innovation and to strengthen their links to business life and society at large, which benefit from their activities. These actors can either be in a state of competition, co-operation, or both at the same time.

The main strength of Icelandic research endeavours lies in competent people who have a solid, international education and connections and possess the ambition and initiative to use their knowledge and achieve success on an international scale. The main weakness, in contrast, is the country's small population and limited resources, not least because these are spread over many small research units. This is balanced by using the advantages of smallness and short routes of communication among individuals, institutions and business life – between those who gather and those who apply new knowledge.

This situation can considerably enhance the effectiveness of research and development. In this respect the conditions for research and development work are favourable in Iceland when tasks call for dissimilar stakeholders and interests having to work together. These conditions need to be better exploited, since this can to a great extent determine the success of Icelanders in international co-operation and competition. At the same time, the weakness stemming from the limited size of research units and groups must be remedied.

Priorities in the field of science and technology

The long-term goal of the science and technology strategy is to enhance the cultural and economic strength of Iceland in a competitive international environment, to ensure that Iceland's economy and quality of life continue to rank at the forefront of nations. This bringing the nation new knowledge and competence useful for the following purposes:

- increasing sustainable utilisation of resources, creation of wealth, and generation of attractive job-opportunities in a knowledge society;
- improved health and social security and encouraging maturation of a civil society where freedom of enterprise and social equity reign;
- reinforcing the economic and cultural independence and thus the foundations for living in Iceland;
- enhancing the influence of Iceland in the international arena and facilitating the adaptation of Icelandic society to variable external conditions.

So as to provide still more favourable grounds for such development the Icelandic Government intends in co-operation with stakeholders in this arena to take the following actions during its term of office:

1. **Increase the public resources intended for allocation from competitive funds and** co-ordinate their operation to insure their optimum use for scientific and technical research and support to innovation in the Icelandic economy.
2. **Strengthen the role of universities as research institutions** by building up and encouraging diversity in research at Icelandic universities through competition between individuals and research teams for research grants from competitive funds.

3. **Review the organisation and work-methods of public research institutes**, with the objective of uniting their strengths and co-ordinating their activities more closely with the universities and business sector.

Furthermore, the Government will introduce a variety of supporting measures aimed at strengthening the infrastructure for science and technology in the country and the status of Iceland as a leading knowledge based society. More specifically the objective is to:

- establish strong research teams for working in an international environment by giving priority to the most competent individuals, institutions and firms;
- increase the co-operation between research institutes, universities and business enterprises in forming knowledge clusters capable of attaining a strong position in international competition;
- make research and development attractive to business enterprises, supporting the emergence of high-technology firms which to a large rely on research for their growth;
- give increased weight to research training of young scientists in an internationally competitive research environment;
- assure open public access to the results of publicly financed research, databases and other scientific and scholarly information, promoting the utilisation of these for added value to society;
- pass laws encouraging scientists to protect their intellectual property rights through patents, and institutions and firms to introduce measures to properly manage the intellectual property of their employees;
- regularly assess the quality of research conducted by universities and research institutes, by subject areas or fields of employment or knowledge clusters, and take the results of these into account when deciding on appropriations and priorities.

[1] Enlarging the competitive funds

Governments support research in various ways. Direct budget appropriations for universities and research institutes create the general framework enabling them to obtain additional funding for their research by competing for grants from domestic and foreign funds and by contracts with those who use the results of their research. The policy adopted by the Science and Technology Policy Council is that public support of research, technological development and innovation should increasingly rely on competition for grants from public funds, based on good ideas, well-defined projects and competent applicants, who might be individuals, firms or institutions.

For this reason, the Icelandic Government has decided to give increased importance to competitive funds in financing research. Appropriations to public funds for science and technology sponsored by the Ministry of Education, Science and Culture, the Ministry of Fisheries, and the Ministry of Industry, as well as appropriations for their administration, amounted to around ISK 800 million of the national budget for 2003. This includes about ISK 700 million to funds within the Ministry of Education, Science and Culture. The Government of Iceland has made efforts to raise appropriations for these funds and their administration in the 2004 budget by about ISK 400 million, of which approximately ISK 200 million would be for funds within the Ministry of Industry and ISK 100 million to a programme, under the auspices of the Ministry of Fisheries, for increasing the value added the fishing industry.

The Government intends appropriations to public funds for the sciences and technology sponsored by the above-mentioned Ministries to rise by around ISK 250 million in 2005, about ISK 200 million in 2006 and approximately ISK 100 million in 2007. Thus appropriations for competitive funds and their administration will be about ISK 1,750 million at the end of this Government's term of office, i.e., around ISK 950 million higher than at the beginning of the term thus more than doubling the appropriations.

Research Fund

The Research Fund is the most powerful tool of the public sector for reinforcing the research community infrastructure through project grants based on applications from scientists, business firms and institutions. The Science and Technology Policy Council emphasises that the Research Fund give increasing priority to larger projects, encouraging the formation of knowledge clusters and larger research teams.. In addition, the Science and Technology Policy Council encourages the Fund to give young scientists an opportunity to establish their work in Iceland and contribute to the further accumulation of scientific and technical knowledge.

The Research Fund offers grants in accordance with the priorities set by the Science and Technology Policy Council and the grants strategy defined by the Science Board based on a peer review evaluation of research project quality, the competence of the individuals involved and the facilities available for completing the project. The target is to raise the available resources of the Fund from ISK 420 million in 2003 to ISK 600 million at the end of the current Government term of office.

Technical Development Fund

The Technical Development Fund is intended to support technological development and research to support innovation in the economy of Iceland. The Fund will in general operate as a competitive fund through which firms, research institutes and universities will have the possibility of financing projects that support technological development and innovation. The Fund is intended to give support to spin-off ventures and innovative firms to secure that economic benefits accrue to society from the scientific and technical knowledge and the innovation arising from these new ventures. The Science and Technology Policy Council attaches high importance to close co-ordination between the Research Fund and the Technical Development Fund, as well as co-operation with other public funds and venture investors as regards support for these firms. This will be an extremely significant factor in the scientific and technological strategy of coming years.

The Technical Development Fund can take the initiative to establish programmes and specific actions prepared in consultation with the business community, research institutes and universities, in areas which are likely to give economic returns and have a decisive impact on developments in a given economic sector or group of companies. Finally, the Technical Development Fund is permitted to enter into partnerships with venture capital investors for seed and early risk financing toward establishing firms which base their operations on technological development and research and which involves a novelty to the economy. The available resources of this Fund are to be ISK 200 million in 2004, rising to ISK 500 million towards the end of present Government term.

Fund for Equipment

The role of the Fund for Equipment is providing grants to universities and other public research institutions for the purchase of expensive and specialised equipment for research. The Science and Technology Policy Council emphasises that the grants strategy of the Research Fund be observed when making grants from the Fund for Equipment. Other things being equal, those applications involving co-operation among research bodies on financing and the use of

equipment purchases shall have priority. In this manner the Fund for Equipment can deeply influence the economic returns and impact of investments, on the one hand by a faster improvement of facilities and on the other hand by a reduction of unnecessary duplication in the purchase of scientific apparatus.

Fund for Graduate Research Training

The Fund for Graduate Research Training has the purpose of disbursing grants to research-linked graduate education. Above all, this Fund has supported university graduates engaged in research studies in Iceland toward the master's degree and fulfilled a significant function in the recent rapid expansion of research based graduate education. Nonetheless, doctoral students have become much more numerous in the past years. Since they play especially important role in research, whether in the public or private sector, the Science and Technology Policy Council emphasises their being offered educational opportunities in Iceland comparable to those offered elsewhere. The role of the Fund for Graduate Research Training should be reviewed in this context.

Already next year the resources of the Fund will be increased by 25%, then amounting to ISK 50 million.

Programming of research.

A major tool for coordinating the building capacity in the field of science, technology and innovation is defining the objectives for specific areas of research to receive priority in funding over a limited period on the basis of well-formulated research plans. Such temporary plans are called “research programmes”. On the initiative of the Ministry of Education, Science and Culture, the Government of Iceland made a special financial appropriation for a research programme in the field of information technology and environmental research. This plan was initiated in 1999 and will be completed in 2004, with a total financial provision of ISK 580 million.

Sponsored by the Ministry of Fisheries, another research programme is being launched under the label of “Added Value from Fisheries”. The first stage of this will last for five years. It was prepared in co-operation with professionals and stakeholders both in fisheries and fish processing industry.

In the future the Science and Technology Policy Council will lead the formulation of research programmes, Thus research plans that public bodies wish to implement shall be sent to the Science and Technology Policy Council for evaluation. The intention is that when recent programmes have come to an end the funds released will flow to new programmes in the area of research and innovation.

[2] Research at universities

Universities play a leading role in producing and transferring scientific knowledge and have attained an ever greater role in the utilisation of research results for innovation. Strengthening the universities as institutions of research and increasing the competition for public funding for research are among the three main policy objectives of the Science and Technology Policy Council. Thus the mechanisms for funding university research in a modern competitive environment are therefore extremely important for implementing the policies of the Council.

Decisions on state budget appropriations to university research have been based on tradition or special contracts, or have taken specific projects at individual schools into consideration, rather general rules or an external assessment of success. The appropriations vary widely among

universities. There are in some cases no budget allocations for university research, while in other cases they amount to up to one-third of the total allocations for the school concerned.

The Ministry of Education, Science and Culture is working on the modification of regulations affecting the direct appropriations for university-level research. One of the alternatives being examined is assuring universities a specified basic appropriation for research and toward internal development, whereas they would otherwise compete for research money. In this way increased appropriations to competitive funds would create the fresh opportunities for progress at universities, while competition would create the necessary quality control. These changes are necessary in the eyes of the appropriating authorities in order to guarantee that funds are used optimally and are subject to systematic prioritisation within the universities themselves as well as by the funds supporting research. However, it is important not to disrupt the foundation of the ongoing scientific and research activities that merit public support. At the same time, investment must be continued in facilities, apparatus and other infrastructure which is needed for the realisation of quality research work.

The Science and Technology Policy Council feels that appropriations for research at universities should be based first and foremost on the quality and results of the research conducted and that it is not possible to assume any fixed relationship between expenditure on teaching and research. It is therefore important for appropriations to build on general rules and clear criteria, which however need to be defined. Moreover, the Science and Technology Policy Council emphasises regular external evaluation being applied to research activities in universities.

Not only does the Science and Technology Policy Council place importance on universities formulating a clear policy for themselves on research, in accordance with the overall policy of the Council, but the Council also encourages increased co-operation among universities, research institutes and firms on research and research training. The participation of research institutes in master's and doctoral studies by providing research facilities and guidance is well suited to enhancing co-operation among these institutions and meeting the needs of the economy and society in general.

[3] Role of public research institutions

The Science and Technology Policy Council believes the division of tasks between public research institutions themselves and their relationship to the universities ought to be reviewed. The goal should be to increase co-operation, enlarge research groups, and share funds, knowledge and facilities better so as to achieve more impact on the international competitive market for technology development and innovation. Research institutes and universities have to work closely together, for instance on the training of young scientists and engineers. Another priority of the Council is co-operation on interdisciplinary projects that seem promising for innovation but firms would normally not undertake otherwise. In addition, the Science and Technology Policy Council urges institutions as well as universities to work with centres of knowledge outside the capital city area in cases where this is appropriate and where professionally attractive grounds can be found and local initiative brought into play.

The target is for proposals on further execution of these ideas to be available at the spring 2004 meeting of the Council.

[3] Improving infrastructure of the scientific and technological framework

Besides the three principal objectives outlined above in the strategy of the Science and Technology Policy Council, several important aspects are discussed below which concern the furthering of scientific and technological activities in Iceland. The Science and Technology Policy Council submits to the scientific and technological community, i.e. to universities, institutes and firms, as well as to others holding an interest, the consideration of these aspects during ongoing policy-making.

International co-operation

International participation by Iceland in work on science, technological development and innovation is one of the cornerstones in scientific and technological strategy and a prerequisite for blossoming Icelandic activity in this field. Iceland's participation in the EU Framework Programme on Research and Technological Development has led to considerable success. Furthermore, interest is growing in Nordic regional co-operation within the framework of the European Research Area, as described in the Sixth Framework Programme of the EU. Sponsored by the Nordic Council of Ministers, work is proceeding toward composing a white book (position paper) on the so-called Nordic Research and Innovation Area (NORIA), which in the coming years may be expected to shape Nordic co-operation in this field. In recent years, co-operation in the area of science and technology has also grown between Iceland and the USA and through memoranda and declarations of co-operation this has been brought into a more formal structure that link it to agencies that finance scientific research in the US.

Iceland's active participation in international co-operation on research provides backing to overseas marketing initiatives by the Icelandic companies and introduces the latest knowledge for them to use in international competition. Supporting technological development in firms is a significant factor in Nordic and European co-operative programmes, building in many instances on co-operation among research institutes, universities and business firms.

The Science and Technology Policy Council is of the opinion that Icelanders should take an active part in the discussion now occurring in Europe and within the Nordic countries on the possibility of reciprocally opening the support system of these countries to people in education and science in other countries. It is probable that the professional and financial advantages will outweigh the cost of participation for Icelanders, because they have qualified individuals in science and technology who have proved their abilities in an internationally competitive environment.

Centre for Technological Innovation - Co-operation on support for innovation

Offering support to innovation and technological development is the duty of the Centre for Technological Innovation, in accordance with the policies of the Science and Technology Policy Council at any given time. The Centre fills a major function by establishing co-operation among public bodies which comprise the support network for innovation in the economy and which shape and operate support projects tailored for small and medium-sized enterprises and individuals, particularly in regard to the realisation of new business ventures. The Science and Technology Policy Council calls attention to the operation of support centres for entrepreneurs as an important means of connecting knowledge in universities and research institutes to the running of businesses. Thus the Centre for Technological Innovation must maintain extensive co-operation with universities and institutes and provide service in this area.

> The Science and Technology Policy Council believes that experience demonstrates the effectiveness of promoting public-private co-operation through so-called “innovation clusters”. Such clusters involve public bodies and groups of firms in related fields working informally together so that potential users of new knowledge meet those who hold

knowledge needed by the users. Some experience exists in Iceland of carrying out projects which build on this concept; instances that might be mentioned are the Fisheries Technology Forum and the Health Technology Forum.

The Science and Technology Policy Council would like to encourage the Technical Development Fund, the Centre for Technological Innovation, and the appropriate governmental authorities, as well as associations in the employment sector, to engage in further co-operation on organising innovation clusters in Iceland. Not only will this approach allow for co-ordinating the energies of numerous bodies with the purpose of achieving added success for innovation and for entrance into foreign markets, but these means will also facilitate product development, innovation and the initial marketing of new types of goods and services.

Co-operation on building up research facilities - connections with the policy for regional development

The Science and Technology Policy Council wishes to encourage universities, institutes and firms to work together on creating research facilities within areas defined for common purpose. These bodies might apply together, as appropriate, to the Research Fund, Technical Development Fund, Fund for Equipment, or Fund for Graduate Research Training in order to finance specific items, among which expensive instruments, data-bases, and facilities used by a number of parties might be named as examples.

Regional development will probably be determined to a large extent by success with innovation in the economy and knowledge based job-creation in the rural communities of Iceland. Research units manned by competent personnel with strong initiative can have a decisive and positive impact on community development, especially in certain areas where it is possible to harness local uniqueness. The Science and Technology Policy Council emphasises that universities and research institutes in regions outside the capital city area should continue to be enabled to carry on research and technological development in fields especially well-suited to reinforcing innovation in the local economy and business life of the respective region.

In the opinion of the Science and Technology Policy Council, these endeavours should be promoted above all through the organised co-operation or linking of such rural centres to research institutes and/or universities which possess a greater breadth of knowledge and provide access to needed equipment and facilities. Regional support programmes can in this context play a significant role and lead to co-operation.

Incubation centres / technology parks / science parks

In many countries around the world, technology parks have been constructed in the vicinity of universities and research institutes so as to create a favourable environment for spin-off firms, meaning businesses ideas founded on knowledge gained through research. Moreover, it is common for mature companies to carry out part of their development work inside such knowledge centres. Part of the services that spin-off firms receive in such environments can be financial and administrative support. Experience shows it to be common for spin-off firms and new start-ups to take five to ten years before achieving notable success.

Domestically, the University of Iceland is an affiliate of the Tæknigarður Innovation Centre, while a Biotechnology Centre is operated at Keldnaholt by the applied research institutes. Several technology based firms have started operations at these locations. Recently the University of Iceland and other bodies have introduced the idea of building up Technology parks founded on such assumptions.

The Science and Technology Policy Council considers proposals for technology parks and knowledge villages could fall well in line with the Council's policy and areas of priority.

Patents and protecting intellectual property rights

The increasing volume of scientific and research activity in Iceland raises the importance of protecting intellectual property and knowledge assets. While this was for a long period not high on Iceland's agenda, that has changed in recent years. Patents issued to Icelanders by the US Patent Office have risen from 4-5 per year until 1997 to 20-25 since 2001. A similar increase is detected in patents issued by the European Patent Office. It is important that the patenting process be efficient and the legal status of employees and employer clear. There must also be appropriate incentives for registering patents and using them to economic advantage.

In Iceland, there are as of yet too few patents taken by the personnel of public research institutes and universities. The task of obtaining and defending patents remains extremely specialised and costly, and universities have not perceived benefits for themselves in attending to this matter to any degree, in particular because, according to laws currently in force, the right of use lies entirely with each and every employee.

During Iceland's current Parliament session, the Government intends to present a bill to amend laws regarding the inventions of employees, expecting the coming legislation to induce the further use of knowledge to economic advantage and also to encourage universities and research institutes to register patents more frequently. These institutions need to acquire the capacity to assess the patentability of research findings and to market the patents obtained along with the knowledge lying behind them.

The Science and Technology Policy Council also believes it would contribute to greater technological development and a more efficacious business environment for Iceland to become party to the European Patent Convention.

Access to public documentation

The public sector fulfils an important role by funding studies of Icelandic nature and the monitoring of the environment, of resource exploitation, of health and of care for public welfare. The expenses for these investigations are mainly paid by direct budget appropriations. Over the long term the data gathered during such research can become a valuable resource to be exploited by institutions as well as private parties, or through their co-operation. As a resource usable for scientific research and co-operation among universities, research institutes and firms or among countries, such databases must be managed in accordance with international standards and their utilisation provides just returns to society.

The Prime Minister has appointed a working group to prepare legislation to facilitate the freest possible access by the public and by users to research documentation and results from work funded by government appropriations. The goal is to ensure that the public has as much freedom as possible in accessing this information, against fair service charges. The work in this are now proceeding under the auspices of the OECD and the EU will be taken into account in determining Government policy in this area.

Women in the sciences - encouragement for the future

A significant factor in cultivating a vigorous scientific community is ensuring the active participation of women in research work. Lending ever more weight to demonstrated research experience and to competition in financing research creates the risk of women ending up in a more problematic position when they take a break from scientific work for childbirth. As a result they are at risk of not returning to research jobs. Valuable human resources might thereby vanish from the scientific community. Thus it is necessary to consider measures that will ease, for both parents, the unification of family responsibilities and work on research.

Support for self-employed scientists and scholars

Many scientists and scholars work on a freelance basis, providing their own work facilities. While independently-employed scholars and scientists have access to the Research Fund and in some cases to the Salary Fund for Authors of Scholarly Works, they normally have no possibility of providing their own co-funding in the manner of institutions or companies, and they usually pay the overhead costs out of their own pocket. Rules on the amount and conditions for research fund grants have to give consideration to the special situation of such scientists.

Taxation issues – fiscal measures

It is generally recognised as the role of the public sector to devote part of the national expenses to research and development in order to boost productivity for economic growth and increased welfare and the achievement of various other national goals. Recently, a survey sponsored by the OECD demonstrated that the situation in each nation determines the way in which governments help to encourage firms to use a portion of their expenditure for research and development undertakings. The main tools of governmental authorities are grants, tax rules, patent protection and the operation of public research institutions, all of which approaches have advantages and disadvantages.

Icelandic authorities have in past years worked toward simplifying tax rules and lowering tax percentages, so that firms retain a higher ratio of their income, thereby receiving indirect encouragement to engage in research and develop products bringing them future profits. The plan is to continue on the same path, taking care when modifying tax rules that no imbalance appears between different forms of business organisations. In this regard consideration will be given to suggestions that inequalities exist among firms, public institutions and non-profit foundations in connection with the levying of value-added tax.

Research culture

A fundamental aspect of shaping a creative research environment is that mutual trust pervades the scientific community and the public have trust and confidence in the scientists. Encouraging discussion on codes of ethics in science is an important effort to sharpen consciousness of ethical conduct in science and to be prepared if there are deviations.

The Science and Technology Policy Council emphasises the importance that those who work at research and technological development adhere to rigorous scientific and scholarly procedures and advance their professional development. The Council would like to draw attention to the importance that the outcomes of research be publicised and that researchers are do not hide results, methods, ideas or technique except temporarily and when commonly recognised reasons demand it, such as the need for protecting intellectual property rights and obtaining patents.

The next steps

This resolution on policy in scientific and technological matters is the first step in the task of the Science and Technology Policy Council. The plan is to use this winter to develop the strategy further and to aim at presenting an action programme for 2004-2007 at the spring meeting of the Council in April 2004.

The Science and Technology Policy Council

Resolution of June 8, 2004

At a meeting on June 8, 2004, the Science and Technology Policy Council reviewed the implementation of policy and progress of actions agreed upon at its meeting on December 18, 2003. As a result, the Council agreed to the following resolution concerning the work ahead.

1. Strengthening Competitive Funds

The Science and Technology Policy Council has assigned the Science Committee, the Technology Committee and the boards of competitive funds the tasks of coordinating the preconditions for public grants and clarifying their objectives and criteria to better conform to the Council's policy. At the next meeting of the Science and Technology Policy Council, these bodies will present a report on the results of their efforts to coordinate.

The boards of competitive funds will report annually to the Science and Technology Policy Council to explain how grants from the funds have contributed to the realization of the Science and Technology Policy Council's objectives.

The Science and Technology Policy Council assigns its working committees the task of submitting to the Council's next meeting a joint proposal for a new five-year programme for the development of knowledge and facilities in fields of research (scientific and technological) that are expected to be of significance to the Icelandic people in coming years. The committees will consult the scientific community and industry for ideas that meet the prerequisites specified by the Science and Technology Committees. The committees will do so with the assistance of RANNÍS (Icelandic Centre for Research) and in consultation with the Ministry of Education, Science and Culture and the Ministry of Industry and Commerce.

2. Strengthening University Research

The Science and Technology Policy Council suggests that the Ministry of Education, Science and Culture consult with the Science Committee to define policy concerning the requirements and qualifications for doctoral programmes in Iceland comparable with those in neighbouring countries and to review the regulations that govern The Fund for Graduate Research Training in that context.

The Science and Technology Policy Council encourages universities to define research policy that takes into account the Council's policy and to work towards increased flexibility in the division of university teachers' working time amongst research, teaching and administration.

The Science and Technology Policy Council emphasizes that all universities where research is conducted undergo evaluations and must fully meet basic requirements for both scientific quality and social relevance.

3. Redefinition of the Structure and Procedures of Public Research Institutions

The Science and Technology Policy Council accepts the recommendations of the Prime Minister's working group concerning the redefinition of the organization of procedures in public research institutes and assigns to the respective Ministers the task of acting upon the working group's recommendations.

4. Other Policy Items

a. International Cooperation

The Science and Technology Policy Council strongly encourages Icelanders to play as great a role as possible in the preparation of the next EU framework programme and in maintaining the initiative for projects.

The Science and Technology Policy Council proposes that Iceland take an active role in reorganizing Nordic research cooperation and in strengthening support for innovation with the objective that the Nordic countries may take a leading role in these fields and assert themselves as attractive partners in an international context. At the same time, Icelanders should seek to strengthen scientific links with other nations in the circumpolar North.

The Science and Technology Policy Council encourages the competitive funds to be receptive to applications for grants that relate to the preparation of international collaborations.

b. Continuity of Funding for Research and Innovation

The Science and Technology Policy Council attaches great importance to the continuity of funding of research and innovation and the development of closer ties and improved cooperation between the Research Fund, the Technical Development Fund, the Added Value for Seafood (AVS) Fund and the New Business Venture Fund, as well as other funds that operate in this sector.

c. Support Network for Innovation

The Science and Technology Policy Council proposes that the Innovation Centre (Impra) be assigned the task of establishing formal cooperation between organizations that provide support for economic development in Iceland, and for linking them to the public support system for scientific research, technological development and innovation.

d. Equality Issues

The Science and Technology Policy Council proposes that the Minister of Education, Science and Culture reappoint a national committee for women in science to monitor the conclusions of the EU management committee on women in science, among other duties. The committee will supervise the Women in Science project (which is part of the government's Equal Opportunities Strategy 2004–2008); collect statistical overview data, etc.

e. Increasing the Number of Students in Science and Technology Subjects

The Science and Technology Policy Council proposes that the Minister of Education, Science and Culture form a working group to explore ways to raise the level of interest among primary and secondary school students in courses and employment in the fields of science and technology.

Appendix to the June 2004 Resolution: More detailed explanatory notes

The Science and Technology Policy Council

The Science and Technology Policy Council finds that the introduction of legislation at the beginning of 2003 concerning the sponsorship of scientific research had an immediate and widespread effect on this field. It is the Council's view that many initiatives have advanced significantly. The Council has decided to expand competitive funds, and work has begun to

further define grant policies in order to boost research activities in Iceland. The Council welcomes the efforts that have been set in motion to improve cooperation between research performers as well as moves towards consolidation into fewer research units. The Council emphasizes the need for better coordination between the individual actors in the new system, as well as more effective publicity and clearer visibility for the new system. RANNÍS will provide the needed services for the actors involved.

Progress on the Principal Policy Issues:

1. Enlargement of Competitive Funds

The Government intends to more than double the budget of public competitive funds by 2007. Two new funds have been brought into operation. The Research Fund has assumed the roles of the earlier Science Fund and Technical Fund. The Technical Development Fund, however, has no predecessor in the old system; its role is the advancement of technological development, innovation and related research in the interests of the nation's economic and competitive capabilities. The inception of these funds and the work of the New Business Venture Fund have brought about a continuity in the financing of innovation, which is a prerequisite for economic regeneration and growth. In addition, a new programme of action has been created to increase the value of marine harvests: the so-called AVS Plan.

The Science and Technology Policy Council emphasizes that the grant policies of the competitive funds must take into account the Council's policy as of December 18, 2003. Grants from public competitive funds for research purposes must be based on clear objectives and quality criteria that comply with the general policy of the Science and Technology Policy Council. The grant regulations of the three funds must be transparent and must give a clear indication of the criteria that will be applied in the evaluation of applications and in the assessment of project progress. These criteria include those of the scientific community as applied in peer reviews along with expectations of economic and social benefits. These methods will ensure that public money goes to those who will produce the best results. It must be emphasized that regulations concerning the division of tasks between the funds' fields of coverage must be coordinated. At the same time the regulations must ensure continuity in the financing of research, development work and innovation so that companies, institutions and universities are able to compete with project ideas that might be centred on varying scientific and/or socio-economic goals. It is thus necessary to take into account the possibilities for utilizing projects' results, their contribution to increased economic competitiveness and the strengthening of ties between the scientific community and industry. This is a task for the Council's working committees and boards of the funds as defined in the new legislation that gives mandate to the Science and Technology Policy Council. In their annual reports to the Science and Technology Policy Council, the boards of funds must give an account of how grants from the funds have contributed to the realization of the Council's policy objectives.

Strategic research programmes are an appropriate means to meet the needs of society for research and innovation in areas of knowledge that can have significant impact. The Science and Technology Policy Council urges the preparation of new strategic programmes to replace the now expiring research programme on information technology and environmental research. A new programme should promote the building up of knowledge and facilities in areas that have clear potential for improving the lives of Icelanders in coming years. The scientific community and the industrial sector will be invited to present ideas that meet the prerequisites specified by the Science and Technology Committees, with the assistance of RANNÍS and in consultation with the Ministry of Education, Science and Culture and the Ministry of Industry and Commerce. The two committees under the Council select the fields and make more specific requirements about objectives and priorities before inviting tenders for the programme's

resources. Applications should involve leading-edge scientific and technological ideas and also involve proposals for the close cooperation and involvement of existing teams and start-up units from institutions and companies in this field. The development of shared infrastructure facilities will be an important part of the research programme. There may be interaction with the Instrument Fund and other competitive funds, as appropriate. The two committees shall present their proposals at the autumn (2004) meeting of the Science and Technology Policy Council.

2. Strengthening University Research

Strengthening university research is by its nature a long-term undertaking. It involves decisions about contributions to research and equally important decisions about strengthening infrastructure and improving communication both internally and with other research institutions and companies. The recent merger of the Nordic Vulcanological Institute and the Geology and Geophysics Department of the University of Iceland Science Institute to form the Institute of Earth Sciences, which occurred with the support of the Minister of Education, Science and Culture, has set a precedent. It demonstrates how joining forces presents new opportunities. It is natural to look for further areas for structural rationalization, such as through the reorganization and redefinition of work practices of research institutions according to the proposals of the working group appointed by the Prime Minister.

The Science and Technology Policy Council encourages the universities to outline a clear policy that is in accordance with the Council's general policy. The Ministry of Education, Science and Culture is working on criteria for specifying basic appropriations to university research. The cost of research is variable. All research projects require a firm foundation in order to apply to a competitive fund. Flexibility in the division of university teachers' working time amongst research, teaching and administration is desired. Public sector universities are working towards increased flexibility in this matter, especially when making new appointments and establishing new branches or departments. It is now possible to use research contributions other than salaries in a variety of ways within departments, institutions and research establishments in the education system. This development has led to an increase in the output and quality of research within the universities.

Postgraduate courses at universities have increased markedly during the last decade. The increase has occurred in both traditional theoretical studies and research-based training in which research projects play a major role. There is a broad consensus that the research-based training is now one of the main pillars of research and development work in Iceland and a desirable area for collaboration amongst universities, companies and institutions. The regulation of doctoral programmes needs to be examined and their requirements and qualifications must be made comparable with those of neighbouring countries. The role of the Fund for Graduate Research Training must be reviewed in light of this.

The Ministry of Education, Science and Culture has decided to evaluate the status of research at the University of Iceland. At the same time, in consultation with the Science Committee, the Ministry will make efforts to define and select benchmarks both for the quality and output of research and for broader contributions by the universities to the development of Icelandic society. The Science and Technology Policy Council stresses that all universities where research is conducted must undergo evaluations. It is important that discussions take place concerning the criteria for evaluation, which should include traditional academic criteria and scientific standards and also account for the universities' contribution to socio-economic progress.

The Minister of Agriculture has initiated the reorganization of agricultural research within the new agricultural university formed by the merger of the Agricultural University, Hvanneyri, RALA and the Icelandic Horticultural College. In this context, the new university is seeking closer cooperation and collaboration with the University of Iceland regarding foundation

courses in biology. The Minister of Agriculture should investigate possibilities for further integration or mergers of other research work that would benefit the agricultural sector and improve contact with other university- level educational establishments.

3. Redefinition of the Structure and Work Practices of Public Research Institutions

The Prime Minister appointed a working group nominated by various Ministries and the Science Committee and the Technology Committees to consider this matter. The group has delivered a preliminary report. Its principal recommendations are to increase the resources available to Icelandic research units, improve the results of their work and ensure that manpower and assets are utilized in the best possible manner. The working group is approaching its task by focusing on the subject matter based on its scientific and technical content and not the vested interest of individual institutions or ministries. The working group recommended merging or integrating similar operations between institutions where it is possible to achieve synergy and rationalization through reorganization. Universities and public research institutions are encouraged to visibly formalize their initiatives. The working group recommends that grants from public competitive funds should be used to encourage public research institutions to consolidate their resources, combine their energies and improve their contacts with universities and industry in Iceland.

4. Other Business

a) International Cooperation

A proposal has been put forward to increase the resources of the EU's Seventh Framework Programme to twice that of the Sixth Framework Programme. Many participating countries have put forward comments urging better assurance that smaller research units can participate in the framework. Iceland subscribes to this view. Information concerning the content of the Seventh Framework Programme is not yet available, but it is important that Icelanders work diligently to exert influence on the formation of the Framework Programme. The Sixth Framework Programme, which includes Integrated Projects and Networks of Excellence, places new demands on Icelanders. Now is the time to examine Iceland's participation in this initiative in light of its experience and give particular consideration to strengthening the support system for research applicants. It is important to take an active role in the formation of the next Framework Programme and to continue taking the initiative for projects in appropriate areas, while accepting subordinate roles in other areas. Further policy decisions must be made in this area in cooperation with neighbouring countries with comparable views, particularly other Nordic countries.

Proposals have been put forward to reorganize the Nordic framework for research cooperation and to strengthen the support for innovation, with the idea that Nordic countries would take a leading role in this field on the international stage. The objective of the proposals is to strengthen the position of the Nordic countries in international competition and increase their visibility, making them more attractive as partners in the international arena. Consultancy amongst countries to support innovation is expected to increase dramatically.

Iceland holds the chairmanship of a number of Nordic ministerial committees and institutions and thus bears heavy responsibility to act on current and future proposals laid before ministerial committees in the Ministry of Education, Science and Culture and the Ministry of Industry and Commerce. The proposals include the establishment of closer links between the support institutions for research and innovation in individual countries and Nordic institutions based on national priorities.

The Ministry of Education, Science and Culture proposes that permanent contributions to international programmes in the fields of research, development and innovation be paid by direct budget appropriations through the respective ministries. However, the competitive

funds need to be open to grant applications to facilitate strategic preparations for international collaborations. The funds' boards should establish appropriate directives for the distribution of such grants.

b) Continuity of Funding for Research and Innovation

The introduction of the Technical Development Fund and the improved financial standing of the New Business Venture Fund have improved the opportunities for financing innovation and related research. The New Business Venture Fund is authorized to establish new venture funding agreements in association with other investors who wish to acquire interests in young, growing companies. This authorization opens the way for joint initiatives that involve both Icelandic and foreign investors. It is expected that Icelandic pension funds will be prepared to take part in such ventures. It is also expected that partnerships will be established with foreign investment funds; such partnerships would thus benefit Icelandic companies looking for investment abroad as well as foreign companies seeking investment in Iceland.

It is important that closer and increased cooperation is achieved amongst the Research Fund, the Technical Development Fund, the AVS Fund, the New Business Venture Fund and other funds in the same field. Steps in this direction have already been made with formal consultancy meetings involving the New Business Venture Fund, the Regional Development Agency, the Agricultural Productivity Fund, the Agricultural Loan Fund and the Campaign for the Creation of Employment.

c) Support Network for Innovation

The Innovation Centre (Impra) has the role of coordinating actions for supporting technological development and industrial innovation. The centre has information and contacts with the industrial sector, both innovators and companies. It is appropriate that the Innovation Centre (Impra) assumes the role of initiating contact with the actors mentioned under b) above.

Closely related to the coordination of an extensive technical support network for economic development is the coordination of financial investment for economic and regional development. In addition to the Innovation Centre (Impra), the Regional Development Agency and the Investments Office under the auspices of the Ministry of Industry and Commerce provide assistance to foreign investors in Iceland. Employment development agencies and employment consultancies operate on behalf of local authorities (e.g. in connection with the tourism industry); similar schemes associated with agriculture are also widespread. The Trade Council of Iceland serves the overall interests of Icelandic industry and commerce in looking for foreign markets.

d) Equality Issues

When building a robust scientific community, it is vital to ensure that women play an active role in research work. Iceland aims to develop a social structure in which human resources are the driving force behind economic advancement. The development of a research environment in which gender equality is of high importance serves both justice and science.

The Helsinki Group is an EU standing committee concerned with women in science. Committee members are appointed by EU member countries and other countries that take part in the scientific and technological Framework Programmes. The committee's objective is to work towards the increased involvement of women in science and to act in an advisory capacity concerning the position of women in research and scientific services. Member countries also have national committees responsible for applying the conclusions of the Helsinki Group in their respective countries and collecting statistical data about women in science.

The Minister of Education, Science and Culture has decided to appoint a national committee for Iceland. In addition to the normal work of a national committee, the work of Iceland's national

committee will include the implementation of the Women in Science project, which is part of the government's Equal Opportunities Strategy 2004-2008; the collection of internationally comparable statistical information for Iceland; and its inclusion in the EU report "Women in Industrial Research", which proposes the objective to double the number of women in industrial research before the year 2010. The committee will also oversee the analysis of statistical data among other duties.

e) Increasing the Number of Students in Science and Engineering Programmes

The Science and Technology Policy Council's policy notes that education and achievement in the field of scientific research and innovation weigh heavily in the evaluation of a country's competitive standing. The number of man-years spent on research in Iceland is proportionally high compared to other countries and that number is growing. In order to maintain the trend, it is essential to ensure that industry always has access to a well-educated workforce with an adequate level of specialist knowledge to conduct research of world-class quality. To this end, it is crucial to increase young people's interest in pursuing courses and careers in engineering, science and technology.

The Minister of Education, Science and Culture has therefore decided to appoint a working group whose role will include proposing ways to stimulate interest among primary and secondary school students in university courses that involve research; looking for ways to increase the diversity and quality of science teaching material in primary and secondary schools; and evaluating the quality of curricula, teaching methods and facilities for science teaching in primary and secondary schools.

Science and Technology Policy Council

Resolution of December 17 , 2004

Introduction

The legal framework for STCP entered into force in early 2003. Albeit this happened fairly recently it can already be assumed that the main objective of this change has already been reached. Science and technology are now on the agenda in a much broader context than before and the follow-up of policy implementation is much more demanding. We are experiencing closer cooperation of Government, the scientific community and the parties to the labour market on making and implementing policy for science and technological development. The general policy document for the mandate period 2003-2006 was approved by the Council in December 2003 and subsequent resolutions address the implementation of its objectives as well as addressing new and upcoming issues.

Competitive Funds[41]

Compatible criteria and rules for supporting projects

The objectives of the STPC policy from December 2003, concerning the increase of competitive public funding to RTD have been realised in the Governmental Budgets of 2004 and 2005. The Councils Spring meeting in 2004 requested its working committees to address the first round of grants from the set of competitive funds and to suggest to the Council coordinated definition and prerequisites for support from the competitive funds, paying due regard to the different role of these funds, as defined in their statutes.

The Council suggests to the Boards of the respective Funds to coordinate their selection criteria, reflecting the different roles of the Funds concerned, in order to avoid gaps in RTD financial support system. The guidelines published by the Funds should make it absolutely clear to the applicants to which Fund they should address their applications. The outcome of the annual decisions on support should be presented in such a way to remove misunderstanding that certain fields of research are eligible without any doubt. The Council requests this work to be completed before the next round of grants.

Programme Funding

The STPC confirms the suggestions of its working parties and recommends that the Minister of Education Science and Culture take the initiative to start a RTD Programme focusing on nanotechnology and genomics for health. The Programme should last for five years and in the Budget year 2005, 95 MISK are allocated to this end.

The organization of public research

The Prime Minister called upon a working party to review the organisation of public research institutions. The major objectives of the working group's proposal, endorsed by the Council at its Meeting on 8 June 2004, are to strengthen the capacity of the public research institutes, improve the quality of their work and increase the efficient utilization of their resources. The

[41] The concept "competitive funds" covers: The Research Fund, The Technology Development Fund, The AVS-Fund (Added value from sea-catch), The Research Training Fund and the Fund for purchasinsg Research Equipment.

working group focused on food research and approached its task without regard to the prevailing ministerial or sectoral boundaries and suggested coordination and merging of existing institutions as appropriate. A similar group appointed by the Minister of Industry and Trade suggested organizational changes for public technological research.

Food-related research[42]

The STPC welcomes the opinion of a specific working party on the future organization of public food-related research that most of this research should be brought together in one powerful, independent public institution with close links to the relevant universities. The Council also suggests that the Prime Minister calls together a working party to work out a scheme for merging public food research into one institution. This working party should also suggest changes in the relevant legal framework amending the provisions for the operation of public research institutions and their management structure to facilitate closer cooperation with universities and provide for ample participation of private interests.

Technological research

The Working Groups of the Council are in agreement with the opinion of the Ad hoc working party appointed by the Prime Minister suggesting the merger of the Icelandic Technological Institute and the Icelandic Building Research Institute in order to reinforce public technological research and to increase the competitiveness of Icelandic industries. The groups also share the assessment that intensified cooperation of this new institution with the universities concerned will reinforce the research capacity, including research training of students in engineering and technology. The Working groups also agree that the new institution should provide opportunities take on new fields of technology for boosting industrial innovation, including nanotechnology and hydrogen-based energy technologies.

The STPC supports the merger of the ICETECH and the IBRI and recommends that the Minister of Industry and Trade concludes this merger based on the suggestions made by the Ad hoc working party, underlining the importance of close cooperation with the universities.

University research

Universities have changed quite dramatically during the past years. Following a rapid increase in number of university-based institutions and almost a doubling of the students during a short period, the consolidation and creation of critical mass is now on the agenda. Envisaged are the merger of the Icelandic Technological College and the University of Reykjavik (a privately operated institution), on the one hand, and the merger of agricultural education institutions with the Agricultural Research Institute into a new Agricultural University, on the other. These new institutions will start their operations as of the beginning of next year (2005).

The Minister of Education, Science and Culture has instructed the Science Committee of the Council, in cooperation with parties concerned, to suggest to the Ministry how best to distribute basic allocations to research at universities.

The committee is also requested to address the organization of PhD- and research based studies towards a Masters degree, in order to mobilise human capital and other resources at capable universities and public research institutions that are in the position to participate actively in international cooperation on scientific[43] *education and research training.*

[42] The food-related research sorted under at least four Ministries, i.e. Ministry of Fisheries, Ministry of Industry, Ministry of Agriculture and Ministry of the Environment. At the same time academic research in the fields was carried out at universities. The proposal suggests bringing together research carried out by the public institutions

[43] It should be recalled that the Icelandic conception of "science" is more related to the German "Wissenchaft" than to the English "science".

The Research Training Fund and improvement of PhD-studies

The STPC requests the Minister of Education, Science and Culture to suggest ways to meet increased university attendance and to prolong the grant period along with increased number of grants in agreement with the objectives of Council's policy of 18 December 2003.

Country wide access to digital international scientific databases and scientific journals

A country wide access to digital scientific journals and databases was initiated and negotiated by the Ministry of Education, Science and Culture in co-operation with all major scientific libraries including the Landsbókasafn-Háskólabókasafn in 2001. This agreement marked a watershed in general access to scientific information.

The Council requests that the Minister of Education, Science and Culture instructs a working group to suggest how to continue financing and operating country-wide access to international scientific databases and journals in the long term.

Regional Knowledge Centres

Access to good opportunities for education across all levels is considered crucial part of regional development. The whole society should enjoy the benefits accruing from scientific research, technological development and innovation and to pay due regard to the needs of industries at different locations. The availability of funds and qualified personnel limits the number of specialized universities and public research institutes. Regional development should build upon existing efforts and institutions, and aim for improving the quality of the services these provide to the level on internationally competitive standards.

The STPC supports the plans for regional knowledge centres and requests the Ministry of Education, Science and Culture and the Ministry of Industry and Trade to continue their efforts to this end in cooperation with other relevant Ministries, and to present to the Council's next meeting their proposal for design and implementation.

Innovation

The Council suggests that the Minister of Industry and Trade explores ways to increase funds for investments available to the Innovation Fund. Also the Council suggests to the Minister and its Working parties to initiate a broad and open dialog with private and institutional investors and cooperate with them to increase their contributions to industrial innovation.

International Co-operation

The number of opportunities for international co-operation increases rapidly. The envisaged doubling of the financial envelope of the EU's Framework programme 7 and the ideology behind the ERA concept is a challenge to the Icelandic RTD system in terms of financial contribution and capacity to participate in a highly competitive environment. Similar developments also apply to Nordic co-operation and bilateral co-operation with the US.

The Council asks the Minister of Education, Science and Culture and the Minister of Finance to present to the Councils Spring meeting (2005) their joint proposal on how to make it possible for scientists to make the best use of the opportunities provided for through the countries membership of international programmes on scientific and technological co-operation.

Gender issues

The Minister of Education Science and Culture has reappointed a country committee for Women and Science, for a period of four years, with the objective to gather and analyse best available information on gender issues at universities and private sector research, assess the recent development and suggest amendments if needed.

Increasing the number of science students

The Minister of Education, Science and Culture has called upon a working group to suggest how to increase the interest among students at compulsory and secondary schools for scientific and technological subjects and carriers. The proposals are expected in early 2005.

The Science and Technology Policy Council

Resolution of June 2, 2005

Introduction

The Science and Technology Policy Council (STPC) was established in the beginning of 2003. The Council, chaired the Prime Minister, convenes spring and autumn each year. The Council is formulating and organising extensive changes of the conditions for research and development.

The most important topics on the Council's agenda concern revision of the organisation of public research institutes and reinforcing university-based research, i.a. with a view to facilitate cooperation and service of those to the business sector in the country. Increased appropriation to competitive funds[44] and their funding policies is an important instrument to attain these goals. The STPC emphasises increased promotion of the importance of research and development (R&D) and the Council's *Encouragement Award* and *Innovation Price* are parts of this promotion. A homepage in the Council's name will be opened shortly.

Generally there is an agreement that public authorities participate in and fund research, development and innovation that comply with the following criteria:

- the production of general basic knowledge and the training of research personnel.
- the subjects for the research are such that no other instances in society are in a position to address them.
- the benefit accruing from scientifically progressive projects is so uncertain or can only be expected in such a long time that it is financially impossible for other instances to do this research without public support.
- the benefits are accruing to society as a whole.

1. Competitive funds

The share of competitive funds of the total RTD expenditure in Iceland has increased from 3% to 5% and as a share of the public contributions to research and development from 10% to 14%. The STPC has instructed the boards of the Research Fund, the Technology Development Fund and AVS-Research Fund to coordinate the selection criteria employed by the funds with their

[44] The Research Fund, the Technology Development Fund and the AVS-Research Fund (AVS is Icelandic for Increased value of marine catch).

tasks as defined by law in order to avoid gaps in the funding structure. R&D projects are now receiving increased support regardless of where the R&D is carried out and the funding system is attending to the multiple needs of Icelandic R&D community. A large share of projects awarded brings with them cooperation between universities, public researching institutions and companies.

A working group of the Science and Technology Committees of the Council is presently analysing the situation and will propose ways to ensure the access of all science and technology fields to the competitive funds. Particular attention is needed for R&D that is of relevance to the Icelandic society. This type of R&D, of course, has to comply with the quality criteria even if the results are not always published in international scientific papers, patented or leading to a new product. The Agricultural Productivity Fund and AVS have in cooperation with other competitive funds supported research and development of companies, public research institutions and universities aiming at improving the economic and technical competitiveness of agriculture and fishing industry.

In accordance with the Resolution of the STPC in December 2004, the Minister of Science, Education and Culture has launched a new program called ***Genetics for the Health and Nanotechnology.*** The Minister has appointed a board for this program for five years and calls for support are open. It is expected that the first projects will start later this year.

The Science and Technology Policy Council instructs its working committees of the Council and the boards of the competitive funds to carry on their work on coordinating funding policies and operations. Strict and multiple criteria on quality and results should be employed when assessing applications, without regard to in which institutional setting the R&D is carried out.

2. University research

Basic appropriations

The Ministry of Education, Science and Culture has been working to ensure basic appropriations for research and internal development at the universities to make them better fit to participate in the competition of the growing competitive funds.

Science Committee has submitted to the Ministry a proposal on the arrangement of basic appropriations to university research. It is important that quality of the research and the economic impact of universities on the one hand should be assessed according to measurable factors but also on an assessment of independent experts. The Ministry has taken note of the proposal by the Committee on basic appropriations for university research and ***decided to base evaluations on the quality of research at universities***. Particular attention will be paid to societal impacts that cannot be measured in a simplistic way.

The Science and Technology Policy Council supports the plan of the Minister on regular assessments of universities where e.g. the results and performance in research at universities that enjoy public contributions will be assessed. The results of these evaluations will be an important factor when deciding basic appropriations to university research.

Doctoral studies

The Science Committee has suggested to the Ministry to issue a regulation on doctoral studies at Icelandic universities. This regulation should be based on internationally recognised criteria and the experience of the University of Iceland, focusing on:

- Internationally accepted criteria defining quality and the volume of the doctoral studies.
- Defined demands on education, research activity and experience of the teachers and other instructors at the universities and the facilities provided for the students.

The Ministry has asked the Science Committee to carry on its work on a proposal on criteria and rules for doctoral studies. The Ministry will also seek Nordic cooperation on quality assurance of doctoral studies in Iceland in an international perspective.

The Science and Technology Policy Council agrees to the necessity that quality of doctoral studies at Icelandic universities be defined in accordance with international criteria and demands.

Research Training Fund

Research training is increasing rapidly at Icelandic universities. It is an important factor in research and increases the research volume at universities. Doctoral studies and research training are also an important part of the renewal of the knowledge-base and human capital at companies and public institutions. The Icelandic Research Training Fund has the objective to support research based education and has to an increasing degree been focusing on those attending doctoral studies. It is important to strengthen the Icelandic Research Training Fund because of an increasing number of students going for doctoral studies.

The Science and Technology Policy Council asks the Minister of Education, Science and Culture to prepare proposals on strengthening the Research Training Fund and these proposals should be on the Agenda of the Council during next year.

3. the links between public research institutions, universities and the business sector

Organisation and strengthening of public research institutes.

There is a great advantage linked with co-locating universities, research institutes and innovative companies. The benefit appears in better utilisation of investments and also in the synergy effects, including the encouragement and increased efficiency within the knowledge production.

There is a high level of activity and restructuring taking place at universities, public research institutions and in the business sector. It has been decided to move the University of Reykjavik to the Reykjavik Airport area in proximity to the University of Iceland and its research institutions. Under preparation is to move the Institute for Experimental Pathology of the University of Iceland at Keldur to Vatnsmýrin close to the The National Hospital - University Hospital, the biomedical research institutions of the University of Iceland and other institutions and companies that are doing important biomedical research in the area. The closer location of the universities and research activities is attracting high-tech companies and gives a unique opportunity to create new ways for cooperation for consolidating the country's knowledge society. This will strengthen the competitive edge of Iceland internationally and at the same time improve effective regional development through extensive contacts with knowledge based activities all around the country.

The merger of the Agricultural University at Hvanneyri, the Horticultural School and the Agricultural Research Laboratory into the Icelandic Agricultural University will strengthen the knowledge base for Icelandic agriculture. This creates new ways for cooperation with all the universities, research institutions and companies in the country and abroad and participation in international cooperation aiming for innovation in this branch.

Acting on the Science and Technology Policy Council's initiative, the Prime Minister has created a working group to prepare the merger of all public food-related research into one institute. The objective of this new institution will be to strengthen the international competitiveness of food production and to support related research carried out at universities. This new institution will carry out and participate in research, development, production and the handling of food from farm to fork, regardless of the origin of the raw material. Efficiency, quality and safety of the production will be in focus.

The working group will in particular look into the extent to which food research is already carried out in close cooperation with companies and ways to increase this type of research attending to the needs of the business sector. The group will also investigate how companies and the parties of the labour market can participate in this new type of institution. In addition the group will look into the need for facilities and the location of the new institute.

The Icelandic Technology Institute and the Building Research Institute will be merged into a new technological research institution with the objective to do R&D in high-tech branches that have close connection with research carried out at universities but operate closer to the market. An important part of technological research is related to innovation as well as numerous activities at universities as well. The merger is expected to facilitate competence at the new institute and improve the working conditions and efficiency.

The Science and Technology Policy Council emphasises the importance of the possibilities for a new offensive embedded in the merger of public research institutions and their co-location with universities and knowledge-based companies.

It is the aim of The STPC that a new vision for the future regarding the organisation and location of public research institutes be delineated in the policy documents of the Council for the period 2007-2009. Decisions will reflect professional and economic considerations. It is important that the strong-holds of Icelandic research and development contribute to strengthening theoretical and scholarly build up of knowledge centres all over the country.

Knowledge centres

In order to fully utilise the possibilities opened up by the concentration of universities, the public research institutions and other knowledge production units, it is important to device means to use this strength elsewhere in the country. Due regard has to be paid to the fact that circumstances differ between parts of the country. It is important analyse what is best suitable in each part based on an assessment on the local situation.

In December 2004 the STPC suggested that the Minister of Education, Science and Culture and the Minister of Industry and Trade jointly should propose ideas on how knowledge centres at the countryside be organised. A University Centre has been established in Ísafjörður with the participation of universities, public research institutions, public institutions and Ministries, associations, municipalities and companies. The University Centre will be a link for the people living in the Western part of Iceland to universities and public research institutions within the country as well as abroad. The Centre bases its strength on the particular local circumstances and on the interest back home. The Centre will contribute to increased opportunities for university studies and recurring education for those living in the area; strengthen cooperation on research with particular consideration paid to the regions circumstances and to become a venue for innovation and development. This rural policy, based on co-operation between those living in the area, public institutions, authorities and companies, aims at strengthening local communities and the development of this part of the country. Similar ideology will guide the build up of a knowledge centre in the eastern part of Iceland.

The Science and Technology Policy Council welcomes the establishment of the University Centre of the Westfjords and the broad cooperation this new centre is based on. The Council emphasises that this knowledge centre can become a model to be used elsewhere in the country joining the efforts of ministries and their institutions in co-operation with those living in the area.

4. High-tech in Iceland

Iceland is ahead of many countries in comparison concerning i.a. national expenditure on R&D, the development of information and communication's technologies, entrepreneurship,

publications of scientific articles, the number of citations to scientific articles authored by Icelandic scientists, competitiveness etc. The share of high-tech[45] in export from Iceland is though still too small in spite of the most rapid increase among the OECD countries. Iceland has quite a way to go to reach a comparable value of high-tech export as countries having similar living standards and policies. There are good prerequisites for increased high-tech production in the country but it is necessary improve the conditions for technology development and innovation and to improve the working conditions for high-tech companies further in order to be able to participate in international competition.

An example of the increase of high-tech in Iceland is the merger of companies in software and computer branches and their increased attention to the international market. These companies have jointly set as their objective to quadruple the present volume of activities by the year 2010 and a corresponding increase in the number of jobs. For the past 15 years a number of high-tech companies have reached the goal of one billion Ikr. turn-over per year and they are registered at the general stock market and thus create conditions for growth at an international market.

To contribute to further growth of high-tech it is important to find new approaches to financing the establishment of high-tech companies. The Ministry of Industry has appointed a committee to address the financing of innovation in Iceland. The committee will present its proposals in the autumn. The committee will seek extensive cooperation with financial companies and investors and also take a look at tax incentives and ways to facilitate investments, foreign and domestic, in high-tech branches. It is also important to increase the cooperation between universities, public research institutions and companies on R&D and research education and training, particularly in engineering and the sciences. In addition it is important to improve the conditions for high-tech companies to establish themselves at an international market. Strong support system, including legislation of patenting and intellectual property rights, is also extremely important.

The Science and Technology Policy Council underlines the importance of diversifying the sources of income in the national economy. The Council is aiming at a similar situation for Iceland as compared with countries with similar standards of living and emphasis, concerning the share high-tech in the creation of wealth in the economy. The Council asks the Minister of Industry to take measures to strengthen high-tech activities in Iceland in cooperation with scientists and companies.

5. International cooperation

The participation of Icelandic scientists in international cooperation increases by each year. This participation provides science and technology with new opportunities and is simultaneously a measure on the position of Icelandic science in a multinational comparison.

Europe

The proposal of the Commission of the European Union (EU) on the 7th Framework Programme on Research and Technological Development (FP7) envisages a doubling of disbursable funds each year from 2007-2013. The contribution of Iceland to the FP7 will increase accordingly. The Minister of Education, Science and Culture has already informed the Commission on Icelandic position concerning the general emphasis and the framework for the cooperation as well as on the main types of participations in FP7. It is envisaged that in the new Framework Programme there will be ample opportunities for Icelandic participants and

[45] The OECD defines as a high-tech company those companies using 4% or more of annual turnover for RTD. The products of these companies find application in a number of branches and high-tech development is also on the agenda in traditional industries.

universities, research institutions and companies have to be encouraged to make use of these opportunities. Proposals on specific topics will be published in the coming autumn.

The Science and Technology Policy Council encourages the Minister of Education, Science and Culture to seek advice from experts and prepare further suggestions by Iceland on topics to be addressed in the 7th Framework Programme presented by the EU and get them discussed where ever possible.

The Nordic Countries

The Nordic Science and Technology cooperation has been radically transformed recently with the establishment of NordForsk and NICe. These changes were among the major policy issues on the agenda while Iceland was serving as a chair in the Nordic cooperation during 2004.

The STPC requests that Ministers concerned contribute to strengthen the position of Iceland in international cooperation through active participation in Nordic cooperation.

The Arctic

During its chairmanship in the Arctic Council in 2004 Iceland's initiative on issues pertaining to the Arctic got positive responses. Most important are reports by the Arctic Council on climatic change and on human and economic development in the Arctic region. The meeting of the Ministers for Education and Science of the Arctic Council Member States was held on the initiative of the Minister of Education, Science and Culture. The renewed interest in strengthening the scientific cooperation between the member states of the Arctic Council will be followed up by the Nordic Council of Ministers. An international conference on scientific research in the Arctic region will be held later this year and will contribute to the preparation of the International Polar Research Year 2007 and 2008. RANNÍS, the Icelandic Research Centre, coordinates the scientific part of the preparations for Iceland's participation in the International Polar Research Year. This is an important area for the country and we need to follow up our own initiative in this matter.

STPC asks the Minister of Education, Science and Culture, in cooperation with the Minister of Foreign Affairs and others ministers concerned, to suggest ways to enhance the Icelandic participation in the research cooperation in the Arctic region and to propose these measures to the Council during the next year of its operation.

Climatic change

The Framework Agreement of the United Nations on Global Change was agreed upon in Rio de Janeiro in 1992. The Kyoto Protocol to this Agreement will come fully into force in the year 2008. Icelandic scientists and scientists elsewhere are doing research on climatic change and the importance of this objective for scientific research is becoming more and more obvious. The articles of the Climatic Agreement of 1992, and the subsequent agreements, will have increased impact upon the development of a number of issues in international cooperation.

Iceland has vested interests in the Agreement and it is important to attend carefully to the knowledge we have on relevant issues and also prepare carefully for international negotiations that follow the Kyoto Protocol which is going to last until 2012. It is highly likely that international agreements on climatic change will have great impact on the development of the Icelandic economy in a number of years including energy production, transport, fisheries and agriculture.

The position of Iceland, its particular location and a strong scientific community opens a number of possibilities in international cooperation on research as is stated in the reports of the Arctic Council. The Ministry of the Environment is responsible for public policy in this field.

The Science and Technology Committees of the Council should in cooperation with the Ministry of the Environment report on the implementation of the Climatic Change Agreement in Iceland, this report

should also analyse the State of the Art in knowledge and research that is being carried out as well as the possibilities embedded in the climatic agreements for Icelandic knowledge society and economy. This report should be submitted to meeting of the Council in the autumn 2005.

6. New topics and ongoing issues

Country-wide access to scientific journals

There has been an enormous increase in the use by the general public and experts of electronically published scientific journals through the country-wide access provided for by the Ministry of Education, Science and Culture. The number of those using the possibilities opened up this way greatly outnumbers the employees of the public institutions that have carried the costs of this national access agreements. This access to scientific information is an important asset for education and scientific and technological research in Iceland in general.

The Science and Technology Policy Council finds it is extremely important to ensure continuous access of all Icelanders to scientific knowledge through this unique agreements.

Icelandic competitiveness

The OECD is presently carrying out a new type of evaluations on the member states' science, technology and innovation policies. Last time the OECD made an evaluation of science and technology policy in Iceland was in 1992 and the conclusions of this evaluation initiated a number of changes in the science and technology policy system. Recently a number of international organisations have published their evaluation on the competitiveness and performance of nations in innovation. They all agree that Iceland is in front row among nations according to a number of criteria. The Icelandic Statistics Office has participated in a Community Innovation Survey (CIS) of the EU. Now the EU has requested that the participating countries carry the costs for the CIS. This survey is extremely important for policy making as it provides an assessment on how support measures in science, technology and innovation policies function in the different countries. In 2006 there are three years since the establishment of the Science and Technology Policy Council and the impact of its policy making are already obvious. Consequently its time to prepare a new OECD evaluation on science and technology policy in Iceland and this evaluation could preferably be carried out in late 2006 or early 2007.

It is requested that the Minister of Education, Science and Culture in cooperation with Minister of Industry to initiate preparations for an OECD assessment and to find ways and means to ensure the participation of the Icelandic Research Centre and the Icelandic Statistical Office in the EU Community Innovation Survey.

Hydrogen research and development

Icelandic authorities aim towards a hydrogen economy as soon as this will be technically and economically feasible. This policy is in accordance with the emphasis in energy, climate and environmental policies and takes note of a sustainable development of energy consumption. Iceland could become a venue for international hydrogen research with emphasis on feasible ways to operate research, development and demonstration projects. A part of this is an active participation in international cooperation, including the International Partnership for the Hydrogen Economy (IPHE), as well as in other cooperation, including opportunities based on the EEA Agreement. The objective of the IPHE is to facilitate international development and effective cooperation on hydrogen research in order to make easier the development towards a hydrogen economy. Hydrogen research is on the agenda of many states and increased funding is allocated to this type of research. Emphasising hydrogen as an energy carrier is linked to environmental policies and attempts to reduce pollution and greenhouse gases as well as to

enhance stability in the provision of sufficient energy. Limited oil resources of the world and price fluctuations are a pressure towards further development of new alternatives. Iceland is in a unique position as the production of hydrogen for energy is done by exclusively utilising renewable energy sources.

The projects in hydrogen research in Iceland, including the ECTOS project, have received international attention. This is an international experimental project on the operation of hydrogen stations and hydrogen powered busses for public transport and lasts until 2006.

The Minister of Industry is working on a policy encompassing the storage, distribution, research and the use of hydrogen. Emphasis is put on offering Iceland as a venue for experiments in producing, storing and using energy including vehicles on land and for ships. International cooperation in this field can give Iceland considerable competitive advantage.

The Science and Technology Policy Council requests the Minister of Industry to submit to the autumn meeting of the Council in 2005 a report on the analysis on the State of the Art of the hydrogen society and the results of the policy making on hydrogen research and related technological development and innovation.

Creative Industries

Recently attention has been pointed at the economical importance of the arts and cultural activities that in general have not been considered to be contributing to the economy. Focus is on job creation and wealth creating cooperation between the arts, culture and science in *Creative Industries,* where highly sophisticated technological know-how and specialised scientific knowledge are linked with a number of artistic and cultural activities. This activity can be labelled as Cultural Production[46] and it has been suggested that this activity will be important for economical development and job creation in the coming years. There has been an important innovation in this field in the country and the performance of individual artists has contributed a lot to the promotion of Iceland, to economical benefit and also been a model for young people. In a strong position of *Creative Industries* in Iceland there are a number of opportunities to improve the competitive edge of the economy.

The working conditions for *Creative Industries* have not been on the agenda as yet, but it is fair to address this new type of industry in the context of public support to innovation in other fields of the economy and pay particular attention to the cooperation between science, art and economic activities.

It is requested that the Minister of Education, Science and Culture and the Minister of Industry initiate further development in this field and to remind of the value of cooperation between art and innovation on the basis of scientific and technological know-how.

[46] The definition is broad and encompasses, i.a. work of art, design, media, including multimedia, computer science, engineering, architecture, teaching, publishing, exhibitions, management and other issues relating to artistic events and productions.

Science and Technology Policy Council

Resolution of December 19, 2005

Introduction

Favourable economic and legal framework for economic activities, high quality education among the workforce, entrepreneurial spirit, research and development have contributed to the engagement of Icelandic firms and investors in activities abroad. The competitive advantage of the country is now stronger than ever. This is confirmed by international reports.[47] The strength is based on good credit rating of the state Treasury, financial institutions and banks by international financial institutions, increased export income accruing from services and goods, higher share of high-tech products in growing export income, increased patenting, extensive participation in re-education incl. life-long learning, and increased number of students going for a second university degree in which research training is an important component. The number of highly skilled and university educated staff increases in the private sector. The volume of R&D is increasing and so are returns from RTD in a number of areas. Education, research and forceful entrepreneurship are crucial for continued wellbeing of our economy.

This favourable situation, however, is somewhat vulnerable. It is important to carry forward such economic policy that encourages high-tech companies to retain their activities in Iceland. Higher priority is needed for secure and reasonably charged telecommunications with other countries and ensuring good access to international data grids and networks that are important for our competition in international markets.

Research-based education and training at the tertiary level that meets international standards and attracts students from abroad will play a crucial role in knowledge production and contribute to the transfer of this knowledge to the private as well as the public sector. Increased international competition demands that the business sector, universities and public authorities join forces to strengthen research based education.

1. Reorganising public research institutions

The wide distribution and small size of public research institutions with too narrowly defined objectives is the weakest point of the science and technology system. During the past years, the institutions concerned have tried to ameliorate this situation through intensified co-operation among themselves and also with companies and universities. Important measures are underway or have already been introduced: The most important ones are:

- The merger of the Icelandic Fisheries Laboratories, MATRA (a joint undertaking of the ICETEC and Agricultural Research Institute in food research) and the Laboratory of the Environment and Food Agency of Iceland in a new publicly owned company.
- The merger of the ICETECH and the Icelandic Building Research Laboratory into a now public institution called Icelandic Technological Research Institute.
- The merger of five institutions in the field of Icelandic cultural and linguistic studies into one Institute for Icelandic Studies.
- The privately operated University of Reykjavik and the Icelandic College for Technology have merged under the name of the former, retaining its private status, while enjoying public support.

[47] E.g. OECD, reports, International Monetary Fund, World Economic Forum and European Trend Chart

- The Icelandic Agricultural University started in early 2005 through the merger of the Agricultural Research Institute, the Agricultural College of Haney and the Horticultural School.

The Council welcomes plans for merging public research institutions as this strengthens their competence and capacity for undertaking research and development, and their participation in research training in co-operation with companies and universities.

2. Location of public research institutions

The Government has decided to build a new high-tech hospital at the present location of the General-University Hospital in Reykjavik (the Vatnsmýri or Reykjavik Airport area). It is also planned to move the Institute for Experimental Pathology at Keldur, to the Hospital area for closer links with the research activities of the Medical Faculty and the Hospital services. The University of Reykjavik has also plans to move all its activities into new facilities in the vicinity in 2-3 years time.

The new Institute for Icelandic Studies will move to a new building close to the National-University Library. At the initiative of the University of Iceland, plans are underway in constructing facilities for a knowledge village (Technology Park) in the western part of the same area close to the premises of the University of Iceland and where a few high-tech companies are located. One of the first issues those in charge of the new publicly owned food-research company (MATIS) have to address is to find suitable facilities for its activities and this is also the case for the new Technology Research Institute, as both of them are expected to tie closer ties with universities, companies and other public research institutions.

The STPC encourages all parties having vested interests to co-ordinate their plans for constructing facilities in the Vatnsmýri area.

3. Public funding of research

The STPC advocates more competition based on sound well-defined criteria, among interested parties for public appropriations to RTD. The Government decided, during its period in office, to double the annual budget appropriations to the competitive Funds supporting RTD. This plan has already been materialised. Total available resources of the Funds have increased from 792 MISK in 2003, to 1.750 in the Government budget for 2006. At the request of the STCP, the policies of the Funds were modified so as to ensure a funding continuum covering the different phases of the development within projects. This has resulted in a higher frequency of co-operative grants awarded. In 2005, 76% of grants went to projects where co-operation between different actors was in important factor. This was an increase from 50% going to co-operative projects in 2003 of the Funds previous schemes. The Technology development Fund has awarded 73% of its grants to such projects during its first two years in operation. This policy has also encouraged other public funds to contribute to innovative projects.[48]

Increasing the number of in particular doctoral students is a key issue in strengthening research. It must be possible for young scientist to make niches for themselves in RTD after completing their formal studies. Time has come to review the role and financing of the Icelandic Fund for Graduate Studies to make it possible for the Graduate Fund to offer support comparable to what is provided in other countries. The amendments must contribute to strengthening the quality of doctoral studies and ensure that they comply with internationally recognized quality

[48] Incl. e.g. the Fund for improving productivity within agriculture

standards, including research training through participation in internationally qualified research.

It is the opinion of the STPC that there is still room for improving the financial continuum for projects ranging from basic research to developmental work aiming at innovation. It is also the Councils view that decisions in institutional funding through the Government Budget should to a greater extent reflect the objectives of the national policies for research, development and innovation. The Council also encourages a revision of the role of the Icelandic Fund for Graduate Studies.

4. Boosting research at the universities

One of the three main objectives in the STPC's policy for 2003-2006 is to strengthen research at the universities, i.a. through intensified competition for funds for research. The University of Iceland is the oldest and biggest university and there is the epicentre of university-based research in the country. This institution is held accountable for providing education and research on various subjects. The strong position of the teaching and research at the University of Iceland has been confirmed recently in three different evaluations.[49] The evaluations reports confirm strong research activities and a growing research output. The reports consider the University to have good capacity to strengthen its doctoral programmes in a number of fields and its management is efficient, while identifying a number of factors in its operations that need attention. It is the Governments general policy to strengthen the infrastructures for teaching and research at all the universities. Referring to this the basic appropriation in the Government Budget to research at universities reporting to the Ministry of Education, Science and Culture is increased for 2006 by 140 MISK.

Specific performance based assessments of universities and public research institutions is a fairly recent phenomenon, the benefit of which becomes more evident in times of increased public appropriations to research and increased overall volume of research activities. Such assessments are a part and a parcel of changing university roles and operations and contribute to improve quality and focusing of their activities. The quality and economic impact from university based research must be evaluated by independent competent experts from the outside. Particular attention has to be paid to societal impact, which may neither always be evident nor easy to measure. It is important that the outcomes from such evaluations are reflected in the basic Governmental appropriations to the universities.

The STPC congratulates the University of Iceland for the positive outcome from these evaluations. The outcome confirms the view of the University Board that through a strong research effort the University can find its place among internationally recognised universities in its fields of strength and make it useful for Iceland's economy and her society. Increased basic contribution to universities reinforces their infrastructure. Increased budgetary allocations call for assessments and results from such evaluations should be reflected i.e. in the size of basic appropriations.

5. Quality criteria and university degrees

At the initiative of the Minister for Education Science and Culture, a thorough revision is underway of the legal framework for universities (Nr 136/1997). The new provisions define general conditions and more focused demands on content and quality of subjects and degrees. The changes also reflect the provisions of the generally endorsed Bologna Agreement. The

[49] Sigfússdóttir I D., Ásgeirsdóttir B., Macdonald A., Feller I.: *An Evaluation of Scholarly Work at the University of Iceland*, úttekt unnin fyrir menntamálaráðuneytið, 2005. *Háskóli Íslands. Stjórnsýsluúttekt*. Ríkisendurskoðun, 2005. *Quality Review of the University of Iceland*. European Association of Universities, 2005.

changes aim for securing those degrees issued by Icelandic universities become fully comparable and on equal footing as degrees issued by universities in other countries, which makes it easier for students to take some courses at universities in other countries. The changes also imply a possibility to organize joint courses and issue degrees jointly with other universities.

The involvement of companies in research and research training has increased rapidly during the past few years. This has brought about increased opportunities for students, including company employees, and the companies benefit by increased competence among their staff and gain access to knowledge embedded in the universities. This creates strength for companies and universities as well and contributes to the creation of added value.

The STPC thinks it is important to strengthen doctoral programmes at universities and encourages the Minister of Education, Science and Culture to present policies for this end. Universities are encouraged to formulate clear policies for their own research and build-up of doctoral programmes, reflecting the changes in the roles of universities.

6. Innovation/venture capital etc.

- High-tech and the funding of innovation

High-tech companies have been expanding, particularly within pharmaceutics, biotechnology, and information technology and food industry. In spite of the fact that high-tech companies have contributed to the Icelandic economy only for approximately 20 years it is estimated that such companies contributed 10 BISK to RTD in 2003, their share of the total GNP was 4% and their part of the total export income was around 7%. It is estimated that since 1990, approx. 20% of all new jobs were created in this sector and the total number of employees is now about 6.400. The growth of RTD intensive companies is higher in Iceland than many other countries while their share of the total export income still remains low.

The Government supports the development of high tech companies. It has been decided that 2, 5 BISK of the net revenue from the privatization of the National Telephone Company will be used to increase the capital of the Innovation Fund. The decision stipulates that out of this capital increase the Innovation Fund has to invest 1 BISK in spin-off or start-up companies. The remaining funds should, during 2007-2009, be invested in joint ventures together with pension funds and other investors.

The STPC recalls the importance of creating favourable conditions catering for continued and expanding operations of companies in the country. Strengthening the Innovation Fund contributes to keep RTD intensive SME's floating across difficult initial stages. The Council urges the Ministers concerned to pay due attention to promoting high-tech and start-up companies.

-Knowledge centres and rural development

In a Parliamentary petition on rural development scheme 2006-2009 the emphasis is put on the value of RTD, innovation and the creation of new jobs as the most important factors of rural development. It is suggested to define priority areas and shape ways for co-operation. The development of knowledge centres will be continued, and support provided for employment promotion and creative industries. The support system for job creation and rural innovation will be streamlined in order to focus the efforts. There is a need to secure direct and extensive co-operation with RTD actors in the Capital area and to make the latter become an important backbone and dedicated partners at the local and regional.

It is the STPC's opinion that increased RTD and innovation building upon local strengths and particular opportunities may contribute to increased regional economic development and consequently also to increase the competitive advantage of the economy.

- New energy carries for transport

The STPC encourages the Minister of Industry and Trade to monitor closely the technological development of new energy carries for transport and to initiate participation is such projects accordingly.

7. International co-operation in science and technology

Icelandic participation in international co-operation on science and technology increases constantly and international contributions to projects with Icelandic participation plays an ever increasing role in the overall Icelandic research effort, as projects with Icelandic participation enjoy quite a success. The conditions for entering into co-operation with Icelandic scientists seem to render an increasing interest among scientists in different institutional settings abroad.

If this development is to continue there is a need to review the present mechanisms for funding research in the country and how priorities are made in allocating RTD expenditures in order to make room for forceful participation in international co-operation. This is an issue of relevance for a number of Ministries and agencies having RTD in their portfolio.

The STPC notes that all Ministries concerned need to prepare proposals on how to respond to changes that are envisaged in the funding and participation in international scientific and technological cooperation through agreements to which Iceland is a party.

- Climatic changes and the Arctic region

A number of scientists expect important climatic changes that will affect Iceland and the adjacent areas. The consequences may concern the environment as well as important natural resources, although the actual impact for Iceland is not clear. The basic assumption behind the UN Framework Agreement on Climatic Change and the Kyoto Protocol is that these changes generally will be detrimental. The first responses have included a reduction in the emissions of greenhouse gases and efforts to bind these through changes in area use. Iceland has to strengthen the knowledge base upon which its implementation of the Agreement rests. Further, it is important to undertake research aiming at facilitating an adoption to circumstances that might be brought about by the envisaged changes. This research has to focus on opportunities embedded in climatic changes and define measures to reduce eventual detrimental impacts.

The STPC requests that the Minister of the Environment, in co-operation with other Ministries concerned with climatic research, present a communication on this issue to the Spring Meeting of the Council in 2006

- Computational networks and broadband connections

With the FARICE submarine optical cable, linking Iceland with Europe, the capacity for transmission of electronic data increased dramatically, however sofar only a fraction of the transmission today. RH-net h.f. (The Research and University Network Inc.) has not, for economical reasons been able to benefit from this capacity as NORDUnet (which is paying transmission costs for all university and other research networks in the Nordic countries) has not been prepared to triple its expenditures for increasing the transmission capacity for Icelandic users. This has resulted in less than optimal participation of Icelandic scientists in the rapid, development of international scientific data exchange, the so-called GRID-cooperation, and consequently Icelandic scientists have to an increasing extent been forced to take their complex scientific calculations to other countries where capacity has been available at reasonable prices.

The STPC requests that the Minister of Communications, in co-operation with other Ministers concerned, present amendments providing for secure scientific data exchange at a reasonable price.

8. Public health research – life sciences, research education and business

In certain fields health related research is outstanding. This excellence is based foremost on good education, scientific ambition, risk taking, comprehensive and high quality health service and active co-operation between universities, research institutions and companies, nationally and internationally. The Agreement made between the National-University Hospital and the University of Iceland is the framework for increased co-operation on research and research training of students. With the new high-tech hospital, which is under construction, it will be possible to create a still stronger centre for research in medicine and other life sciences in cooperation with institutions and companies. High quality research is fundamental to progress in health services, building up knowledge-based companies and the participation in international co-operation

In 2003 the expenditure on RTD in the medical and health related field was 8.5 billion ISK, which amounts to roughly 35% of our total GERD. The bulk of this research is carried out at private companies and NGO's and funded without public support. Since RTD expenditure exceeds 10% of the total turnover within the health sector, the sector meets the OECD criteria for high-tech activities. In a number of countries, the rapid development of health research and related technologies has contributed to innovation in high-tech production and services, as well as to boost economic activities and employment. Among an increasing number of spin-off companies from this research, a few Icelandic companies are internationally recognized as leading research and development in their fields.

Comprehensive health records and bio banks make up a unique resource for RTD and are of course central to the health service provided. Substantive amount of records still needs to be digitalized in order to become more useful in medical and other scientific research, and in order to preserve the records more securely, while paying due attention to public requirements for respect for integrity and privacy of the citizens.

Life sciences and medical research can play an important role in the creation of a knowledge-base and prosperous society in the future. For this to come true, wee need a progressive policy and planning taking into account distinctive features and strengths of our society. Public health research needs to pay more attention to embedded opportunities for high-tech development suitable for start-ups and other companies providing service or production.

The STPC suggests that the Ministers concerned initiate a foresight exercise for research in the health sector to be followed by a policy for improved health services and innovation related to that sector.

9. Other issues

- Strengthening marine research

In the Government Budget for 2006 the direct appropriation to the Marine Research Institute, and a similar increase is envisaged for the Budget in 2007. Further, the rules of the Fisheries Project Fund will be amended and a reasonable share of the annual budget will be subject to competition among marine scientist with relevance criteria for the branch as a whole matching criteria of scientific excellence. This will boost research at this important research institute and provide opportunities for independent marine scientists and those working in different institutional settings.

The STPC welcomes this strengthening of marine research and recommends that selection criteria compatible with those of other competitive funds be applied in the selection of projects for support by the Fisheries project Fund.

- Research on Education

An evaluation of research in the field of education requested by the Ministry of Education, Science and Culture and IRC, the predecessor to the STPC, in 2003 was completed this year. This research is carried out at universities and other institutions for instruction, by public research institutes and at companies. The main conclusion of this evaluation is that there is a need to review the objectives for this research, increase co-ordination and co-operation in defining such new objectives.

The STPC notes the importance of linking research objectives on education with policy making and to make use of research results is improvements in education.

10. Final comment

The preparation of a Policy Statement of the STPC 2006-2009 is already in progress and it is expected that this work will be concluded in the spring of 2006. It can now be anticipated that in this new Statement the location of public research institutions will be addresses, public support for RTD and the development of the competitive funds, health relegated research and development and further strengthening of research at the universities.

The STPC instructs its working committees and requests that the Ministries having RTD and innovation in their portfolio to address issues that might become a part of the agenda in the Council's policy making for 2006-2009. The objectives must take the present objectives into consideration, assess strengths and weaknesses of the national RTD system and identify opportunities and obstacles in this context. Due regard should be paid to the conclusions and recommendations of OECD evaluations and reviews carried out in Iceland recently.

Science and Technology Policy 2006-2009

Adopted at the meeting of the Science and Technology Policy Council, June 1. 2006

1 Guided by vision for the future

In its vision of the future the Science and Technology Policy Council (STPC) views Iceland as a society at the forefront among nations, based on rich human resources and a culture with international flavour. Icelandic society will be characterised by high living standards, quality of life and health, strong moral awareness and a vibrant, multifaceted economy. The environment for conducting scientific research and technological development are favourable and knowledge is applied to underpin a wide range of innovations in industry as well as in public services. Public investments in education, scientific research, technical development and innovation reap ample returns from scientific, social and economic advances.

The competitive edge and social well-being of nations in the age of globalization are largely determined by their ability to look to the future, recognize opportunities and systematically exploit their knowledge and competence. Globalization is accompanied by increasing competition but at the same time it opens new opportunities for wealth creation based on novel ideas and specialized know-how. The key to success is a vision of the future and tenacious, well educated people capable of evaluating and exploiting opportunities associated with the rapidly changing social and market conditions. A coordinated effort by the government sector and the private sector is needed to elevate Iceland internationally to a forefront position in scientific and technological performance thus underpinning a competitive, rich and highly performing economy.

2. The Strategic Priorities 2006-2009

The STPC places highest priority on the following:

- to establish an internationally outstanding educational and scientific institutional system, closely connected to a dynamic economy, capable of recognising and providing leadership in responding to rapid changes;
- to strengthen public competitive funding schemes and merge these in related areas;
- to encourage private firms and the public sector institutions to join efforts in strengthening research and development in order to boost successful and profitable innovation and thus international competitiveness based on knowledge;
- to redefine the role of the public sector in financially supporting scientific monitoring and research in support of public interest, environmental protection and sustainable economic growth.

3. Coordinated efforts

3.1 Financing of science and technology development

The STPC considers important that the overall expenditure on R&D, as a share of GDP, continue to increase beyond the 3% mark which was reached in recent years. The share of the private sector economy should increase relatively faster than the public sector share and

reach 60% of the total by 2009[50]. This division of percentage share between the public and the business sector in financing RTD would be approaching the ratio in the countries against which Iceland would like benchmark. The goal would be 10% annual increase in RTD spending on the average until 2009. For this to be realized new methods and coordinated efforts by the public sector and the business sector is needed. This will be further elaborated in the following sections.

The STPC recommends that:

- further increases in the direct public appropriations to research be primarily directed towards competitive funds and programs that offer grants on the basis of applications and quality assessment;
- funds which are designated to finance research at public institutions be integrated into larger competitive funds to allow the enlargement of grants, increasing the volume and ambition level of projects and ensure that comparable procedures be used in evaluating the quality of applications for all public funding;
- basic institutional financing of research institutions and universities be reviewed in the light of performance evaluations;
- programmed financing be increasingly used in line with the STPC policy. The financing of the Program on Health Related Genomics and Nanotechnology be secured for the period 2007-2009.

3.2 Transparency and continuity in competitive funding

Competitive funding is among the most effective tools for promoting result oriented conduct of research and development. It is vital that there is continuity in funding from basic research to innovation in the market and strong cooperative interaction between universities, research institutions and industry. This promotes timely and efficient exploitation of research results towards social and economic benefit. Enterprises need to become more active participants in research and innovation and market prospects need to be taken into consideration when awarding grants for financing risky RTD projects.

The STPC recommends that;

- the grant policies and procedures of the competitive funds be reviewed regularly in order to better coordinate and simplify the administrative processing, increase continuity in financing and improve the evaluation procedures in view of scientific gains as well as socio-economic benefit.
- the objectives of the Technology Development Fund be broadened with the view of strengthening cooperation with risk financing organisations in financing projects with new start-up and spin-off companies.
- enterprises be encouraged to participate in and apply for project grants for research, development and innovation from competitive funds against their own contribution;
- projects meeting the quality criteria and implemented through active, professional and financial collaboration between companies, universities and research institutions, other aspects being equal, be given priority in the awarding of grants;
- special attention be given to the procedures for evaluating applications involving two or more scientific disciplines as well as applications that span the interface of humanities, social sciences, technology and the creative arts;

[50] In 2003 the total expenditure on r&d was 2.97 % of GDP. The share of the public sector was 48% and 52% by the private sector. The average inncrease in total expenditure on r&d was about 13% per annum at fixed prices in the decade 1993-2003.

- special emphasis be given to the international contacts in development and innovation related projects and incentives developed for that purpose.

3.3. Policy making and evaluation of policy effectiveness

The STPC underlines the importance of an effective interaction between the public and the private sector in formulating and implementing science- and technology policy with the view of clarifying the overall goals and finding the most appropriate means of implementation. Strategic assessment of the impact of science and technology policy plays an important role in the efforts to learn from the implementation and design more efficient tools to attain the goals of the STPC.

The STPC recommends that:

- the effectiveness of research be raised and efforts be made to shorten the time of development phase of business related project ideas as far as possible. Measures to this end be introduced into the STPC policy agenda;
- the impact of STPC policy on research, development and innovation be regularly evaluated by appropriate means. The first such evaluation shall be started in the fall of 2006 covering the outcome of the first three operational years of STPC.
- the collection and analysis of statistical data pertinent to research, development and innovation be strengthened.

3.4 Strengthening international cooperation

Active international cooperation in science, technology and innovation opens a number of opportunities in education, training and cooperation through collaboration with many of the World's best universities, research institutions and research companies. Participation in international cooperation programmes, both Nordic and European, has been very successful which gives some measure of the strength of Icelandic science and technology community in international competition. Procedures to prepare decision about participation in such programmes must be established. Iceland offers ideal conditions for research cooperation in many fields of science and technology and a positive environment to develop and test technical solutions before launching these in larger markets.

The STPC recommends that:

- participation in international science and technology cooperation be further strengthened as a part of the globalising strategy of the Icelandic science and business community;
- the outcome and benefits gained so far from the participation in international cooperation be evaluated and the strategic priorities made accordingly;
- support be given to enhanced efforts in Nordic science and technology cooperation and in the EU 7th Framework Programme for Research and Technological Development;
- cooperation with the Arctic Council member states, The United States of America and Asian Countries be strengthened;
- financial resources be ensured for allocations to common, programmed funds in those areas where Icelandic participation appears particularly appropriate and where international peer review panels evaluate the applications in competition;
- the leadership by Icelandic scientists be encouraged in international co-operation projects where Icelandic competence is at the forefront and support be given to such participation in international cooperation.

3.5 Knowledge Park (Vatnsmýrin)

The STPC has in its resolutions encouraged the various interested parties involved to coordinate their efforts to establish a "knowledge park" in the area of Vatnsmyri in Reykjavik.

The planning and construction design for this area is still at an initial stage and offers a unique opportunity to concentrate "knowledge activities" into that area in order to improve the conditions for innovation and stimulate the exploitation of the outcomes of research and development work. The establishment of a dynamic knowledge park in Vatnsmyri would benefit the country as a whole and provide a powerful backbone for regional knowledge centres.

3.6 Review of the organisation and roles of universities and public research institutions

The STPC is of the opinion that the roles and the organisational framework of the universities and research institutions need further review. Where mergers may not be possible the STPC emphasises the urgent need for cooperation and coordination at the same time as competition for funding at the project level is encouraged. The organisational framework and the administrative structure of the universities and research institutions must be developed to promote their efficient operation.

The STPC encourages the institutions concerned to:

- merge or co-locate operational units that work towards similar goals in order to improve their effectiveness improve their relations and provide stronger platforms for cooperation and contact with industry.

4. Education at the frontier

The STPC underlines that policy for education, in important respects, is also a policy for employment and economic affairs. The Icelandic society is transforming from an economy based on natural resources towards a knowledge-based and service-based economy that is goal-oriented and fully participating in international competition.

4.1. A better primary and secondary school

A coherent and continuous education from kindergarten to graduation from a university is essential for the development of a knowledge-based society. The focus of the curricula of the whole educational system must be sensitive and responsive to the needs of society at all times. Competition among students and schools is healthy to the extent it promotes creative thinking and cultivates entrepreneurship in order to harness knowledge and promotes innovation.

The STPC underlines the following in the efforts to strengthen primary and secondary education:

- that the recommendations put forward in a recent evaluation of educational research in Iceland be elaborated in order to underpin and reinforce policymaking in the field.
- that educational practices be refocused on encouraging students to build up a positive self-image, introduce them to independent, disciplined and diversified working methods and constructive, critical thinking.
- that ethical consciousness, based on humanitarian and egalitarian values should guide the social development of students living in a multi-cultural society.
- professional leadership in the schoolwork and in teachers education has to be reinforced in order to make available at all times sufficient number of ambitious and interested staff ready to develop teaching methods that respond to changes in society and underpin improvements in schoolwork at all levels.
- there is a need for more coherence between the choice of topics in educational research and the needs of policymaking and development of the educational system.

- there is a need for improving teaching methods in sciences and technological subjects at the compulsory schools and to encourage young people to enrol in such fields. This includes also changes in the curricula for teacher education.

4.2 Stronger universities – demands for quality in education and research

The number of students at universities has increased by 75% since 1997. Today universities prepare a greater number of students, than ever before, to take on tasks that require scientific approach, knowledge and skills.

It is the STPC's opinion that university education at all times has to pay due attention to the needs of society at large: It has simultaneously to be academically stringent and oriented towards societal needs for practical skills. Research is an important element in support of undergraduate education, a necessary aspect of education towards a secondary university degree, and a fundamental instrument in scientific training towards a doctoral degree. The co-operation between companies and universities is steadily increasing and is focused on solving particular problems, scientific training and exploiting the results of research. Universities are a part of the international community of education and science and their operations need to be strengthened further.

The STPC encourages those concerned to:

- clarify further the demands made to students and academic staff and to improve regular quality control of teaching and research through evaluation of performance and working practices;
- develop further indicators, reflecting the objectives and intended societal impact of the funds spent on higher education;
- link budget appropriations to the universities to evaluation of the their performance;
- make an assessment of how the education offered by universities corresponds to the needs of society;
- introduce more flexible and a wider scope of academic and practical university education that meets both academic quality standards and the diversified needs of society.
- increase flexibility in fulfilling the obligations of university staff between research, teaching and administrative tasks.

4.3 Freedom for research

The production and the use of knowledge is not a linear process from basic through applied research and development towards innovation. When addressing issues in innovation it is often necessary to raise fundamental question, the answer to which has an applicability that ranges far beyond single technical solutions. It is the opinion of the STPC that applied research needs support at the same time as we need to strengthen the universities as institutions of education and research. Free research has intrinsic independent cultural, social and economic values, and may sometimes challenge accepted truths and knowledge. This type of blue-sky research can contribute to a more fundamental understanding of nature and society and sometimes produce results that were neither planned nor could be anticipated.

The STPC considers that:

- Freedom of inquiry at universities must be ensured at the same time as their ties with companies become closer and cooperation intensifies.

4.4 International universities – selected Ph.D. programmes

There has been a rapid increase in the number of students enrolled in research based tertiary education and at present roughly 300 Icelandic students take part in such studies. One main explanation is the rapid increase in the number of students heading for a Masters degree,

presently around 2000 students, of which approximately 50% are enrolled in a Masters programme involving considerable research training. The Icelandic Graduate Fund plays an important role in strengthening research based education and training in the country.

The STPC shares the opinion that:

- research based university education and Ph.D. programmes need to be internationally recognized, offering first class guidance and good facilities for conducting research.
- while improving options for obtaining second or third level degrees offered by the universities at home are increased, it is very important to retain the source of scientific strength obtained through Icelandic students attending the best universities in the world.
- internationally recognized doctoral programmes in selected fields of scientific strength can attract Ph.D. students and teachers from abroad.
- the Graduate Student Fund needs to be strengthened and enabled to support Icelandic and foreign students based on outstanding merits.
- Icelandic students involved in Ph.D. programmes abroad must also be eligible for support from the Fund.
- it should be feasible to grant support to companies that want to strengthen their scientific and technological capacity by means of the Graduate Fund's contributing up to 50% of the cost of Ph.D. training for company employees.

4.5 The links between universities and public research institutions and society, the business sector and innovation

The universities need to make an effort to spread knowledge about the results from scholarly work, scientific research, and technological development and opportunities arising from these, to the society as a whole.

The Council is of the opinion that:

- scientists must be made more aware of the value of patenting and intellectual property rights, and the importance of exploiting their intellectual assets for the benefit of society, without discouraging the efforts to publish in peer reviewed journals;
- more effort should be put into to acquiring patents based on research and to encourage companies to use them, as well as to increase awareness of the importance and ways to secure patents.
- it is important to draw the attention of companies to the technological and innovative potential of scientific results;
- there is a need to promote the development of a market for intellectual assets and to encourage the exploitation of research results particularly in sectors that often are considered to be outside the scope of innovation, such as trade and services.
- the emphasis placed on international publishing in the evaluation criteria used by the universities should not discourage the will to publish in the Icelandic language;
- there is a need to create a forum for cooperation between universities, spin-offs and research-intensive SME's, innovative and high-tech companies, and public research institutions.

4.6 Life-long learning

Innovations across all sectors of the economy and rapid technological changes demand renewal of the knowledge and skills of the workforce. This calls for increased and more focused efforts in life-long learning. It must respond to the needs of the individual for increased knowledge as well as the needs of the labour market for increased and more focussed knowledge and job related skills.

It is the STPC's opinion that:

- life-long learning, student- and professional counselling needs to be reinforced in particular for those who need to strengthen their position in the labour market.

5. Effective innovation – more competitive companies

5.1 The ICT community – heading for the frontline

In recent years the Government has through a concerted effort promoted more extensive use of ICT technologies. The STPC favours continued efforts to make the best use of ICT in order to keep Iceland among the leading nations in the use of ICT.

The Council encourages that:

- the collaboration between governmental organisations and private companies on ICT applications be strengthened, in particular by the participation through calls for tender of private companies in the development of new software solutions;
- secure, high-speed communication at acceptable rates should be available for transfer of data for scientific, service and business purposes between Iceland and other countries.

5.2 Business climate – opportunities for more research and innovation

It is the role of government to facilitate economic stability and to create favourable business environment for companies in order to foster innovation and growth. Active innovation in companies is the prerequisite for the growth of well-paid jobs that create added value from knowledge. It is important that the business sector increase its research and innovation efforts. It is therefore important that the working committees of the STPC and the Ministries concerned develop effective tools to encourage increased business investment in RTD. The Council is of the opinion that it is important to increase the number of companies performing their own research and that the business environment be made more favourable to highly innovative and research intensive companies in the country.

The STPC recommends that:

- the public support system for research, development, innovation and economic growth be simplified and made more transparent and comprehensive taking also into account the different needs of new companies for public support.
- more efforts should be made to encourage companies to build up their knowledge base and that grants be provided to support RTD projects carried our by their employees who are enrolled in research based tertiary education.
- innovative efforts in the service sector be strengthened, particularly in culture-based service activities, humanities and social science sectors.

5.3 Public tenders in support of RTD and innovation

In a number of countries public tenders and procurement are used to encourage research, development and innovation. This implies the involvement of public organisations as informed buyers participating in setting the specifications and carrying out the development of particular technological solutions needed in the public sector.

The STPC encourages the public sector organisations involved to:

- consider how co-operative tenders may be used to promote development and innovation in the business sector.

- enter into collaboration with research intensive and high-tech companies on development projects where appropriate.
- issue calls for tenders and buy research services from private companies, where appropriate, instead of building up in-house capacities.

6. Research for the public good

An important feature of the Icelandic cultural identity is respect for the environment, nature and society. Knowledge about its own culture, social fabric and its development, national history and language, is the key to being an independent nation. Understanding and monitoring of the natural assets, their diversity, properties and conditions at any time is basic to a rational and sustainable use of important natural resources. Quality of life relies to a large extent on a healthy population. Healthy food and lifestyle are important factors. Research on the interaction of these factors will be decisive for the development of our society in the future. It is important to disseminate and bring the results of such research to the attention of the public and the authorities.

6.1 Society and ethical values

Research in humanities and social sciences provides the basis for insight and understanding of the organisation and development of our culture, education and society. More than half of all academic researchers in the country conduct their work within these fields. Their research relates to Icelandic realities and the results become immediately applicable e.g. in the development of the administrative and legal framework, social provisions and in the educational system. Consequently, humanists and scientists have put emphasis on making their results known and accessible to the general public in addition to publishing their findings in international peer-reviewed journals.

Controversial ethical issues have figured prominently on the agenda in the public debate recently, including issues relating to the environment, business practices and in science and technology. It is important to ensure the freedom of scientific enquiry and at the same time to comply with accepted ethical standards and conventions. It is essential that there exists a mutual trust and good practice among scientists themselves and between the science community and the general public... The present legal framework for science ethics is primarily limited to biomedical research and the protection of the individual integrity when handling sensitive information.

The STPC emphasises that:

- there is a need for a comprehensive evaluation of opportunities and appropriate strategies to encourage innovations based on research in the humanities and social sciences.
- more use should be made of results from humanities and social scientific research in support to policymaking and for stimulating innovations in public service, education and for cultural ends.
- there is a need to stimulate active debate on ethical values in education, research and exploitation of knowledge.
- the legal framework for scientific ethics, including bioethics and the protection of individual rights should be reviewed.

6.2 Monitoring the environment and a sustainable use of natural resources

Knowledge about the fundamental processes of the land and its natural environment is basic to policy making for utilization of natural resources, protection of the environment and preparing responses to natural hazards. There is a need to better define the role of government in the

gathering basic data on nature, mapping, conducting basic research on nature and in monitoring the land and marine environment. Monitoring efforts are less suited for engaging in competition for research funds on the basis of scientific novelty and need a different source of funding. This issue calls for co-ordination of the operations of many public institutions, reporting to different ministries.

Well co-ordinated system for monitoring the environment is an important tool contributing to the implementation of government policies and gives weight to Icelandic standpoints in international negotiations, e.g. on environmental and fisheries policies. Databases established through monitoring of environmental processes are also an important source of information for future research on natural phenomena, environmental changes and the development of human societies in Iceland and the Arctic region.

The STPC encourages continued efforts in research on sustainable use of natural resources both on land and in the sea, that contribute to environmental improvements, the creation of new jobs and increasing exports of knowledge-based products and services.

The STPC recommends that:

- a comprehensive overview should be made of existing databases on the land and marine environment and the nature of Iceland, including the sea-bed of the oceans surrounding the country, and a multi-annual plan should be drawn up to improve and co-ordinate these databases;
- these databases need to be built up continuously in a digital form to be preserved and made accessible for research and public use;
- a plan for environmental monitoring should be drawn up in support of policy making for sustainable management of natural resources, environmental protection and in preparation for natural hazards;
- efforts should be made to increase international co-operation in these fields.

6.3 Health and nutrition

Health services are based on biomedical research. Co-operation in the fields of biomedical and clinical research has an impact upon the provision of health services and opens up new opportunities for innovative development by companies engaged in production and service, including pharmaceutical development, diagnostics and the production of bioactive agents. Icelandic researchers have a documented strength in a number of research fields that have been given priority by international organisations.

Research on nutrition and public health are gaining more attention. Research on the quality, security and nutritional value of food products are becoming essential for food production, using land- or marine-based resources.

The STPC places emphasis on:

- increasing innovation in the health sector based on biomedical research.
- the feasibility to use bio-banks and patient records for research, as well as to improve service to patients.
- that it is important to initiate a public debate on policy for keeping and maintaining health-related databanks and bio-banks for future research, health service and innovation.
- the need to introduce measures to facilitate co-operation of biomedical and clinical researchers with domestic and foreign companies in this field.
- increasing food security for the benefit of consumers as well as for producers.
- increased research effort on factors that are decisive for healthy food and lifestyles.

Annex II : List of people interviewed

Universities and research institutes (11):

Ágúst Sigurðsson, rector, Agricultural University of Iceland
Áslaug Helgadóttir, vice rector for research, Agricultural University of Iceland
Björn Þór Jónsson, professor, Reykjavik University
Hafliði P. Gíslason, professor, University of Iceland, former chairman of Science Committee 2003-2006
Jóhann Sigurjónsson, Director. Marine Research Institute,
Jón Atli Benediktsson, professor, University of Iceland
Kristín Ingólfsdóttir, rector University of Iceland,
Magnús Jónsson, director, The Icelandic Meteorological Office
Ólafur Arnald, professor, Agricultural University of Iceland
Sjöfn Sigurgísladóttir, director, Matís – Food Research Institute
Viðar Hreinsson, director, Reykjavik Academy (independent researchers)

Private Companies (11):

Bjarni Ármannsson, Chairman, Glitnir Bank – Financial Services
Einar Mäntylä, Orf Genetics, – Genetics
Freygardur Thorsteinsson, R&D division, Össur Inc. – High technology manufactoring
Hilmar Veigar Pétursson, CIO, CCP Inc. – ICT (Gaming) sector
Ingileif Jónsdóttir, prófessor, DeCode Genetics, National University Hospital and member of the STPC.
Jón Ágúst Þorsteinsson, CIO, Maroka Inc., chairman of Association of Start-up companies
Kári Stefánsson, forstjóri, Decode Inc. – Genetics
Kristinn Andersen, Research Director, Marel Inc. – Production Engineering and member of the STPC.
Rögnvaldur Guðmundsson, RFF Inc. – Tourism
Sigríður Ólafsdóttir, researcher, Lyfjaþróun – Medical Development
Þóra Björg Magnúsdóttir, CIO, Lyfjaþróun – Medical Development

Politicians (8):

Árni Matthíasson, Minister of Finance
Björgvin G. Sigurðsson, opposition representative Parliament Education Committee
Björn Bjarnason, Minister of Justice (Minister of Education until 1999-2002)
Hjálmar Árnason, chairman Parliament Industry Committee
Jón Sigurðsson, Minister of Industry
Kolbrún Halldórsdóttir, opposition representative Parliament Education Committee
Thorgerður Katrín Gunnarsdóttir, Minister of Education, Science and Culture
Valgerður Sverrisdóttir, Minister of Foreign Affairs (Minister of Industry 2003-2006)

Associations & others (9):

Bjarni Guðmundsson, professor, chairman Agricultural Production Committee
Emil B. Karlsson, Federation of Trade and Services and director Retail Research Centre, Bifröst University
Friðrik Friðriksson, chairman, Fishery Production Committee
Jón Steindór Valdimarsson, assistant director, Federation of Icelandic Industries
Kristján Þórarinsson, scientist, Federation of Icelandic Fishing Vessel Owners
Sigríður A. Guðjónsdóttir, project manager, Federation of Trade and Services
Sigurður Jónsson, director, Federation of Trade and Services
Thorsteinn Tómasson, director, Ministry of Agriculture
Vilhjálmur Egilsson, director, Confederation of Icelandic Employers

Also consulted specifically during meetings:

Guðrún Nordal, professor University of Iceland, chairman Science Committee.
Hallgrímur Jónasson, director, Technological Institute of Iceland, chairman, Technology Committee
Vilhjálmur Lúðvíksson, director Office of Science, Ministry of Education, Science and Culture.
Eiríkur Baldursson, Eiríkur Baldursson, secretary to the Science and Technology Council, Ministry of Education.
Sveinn Thorgrimsson, director, Ministry of Industry