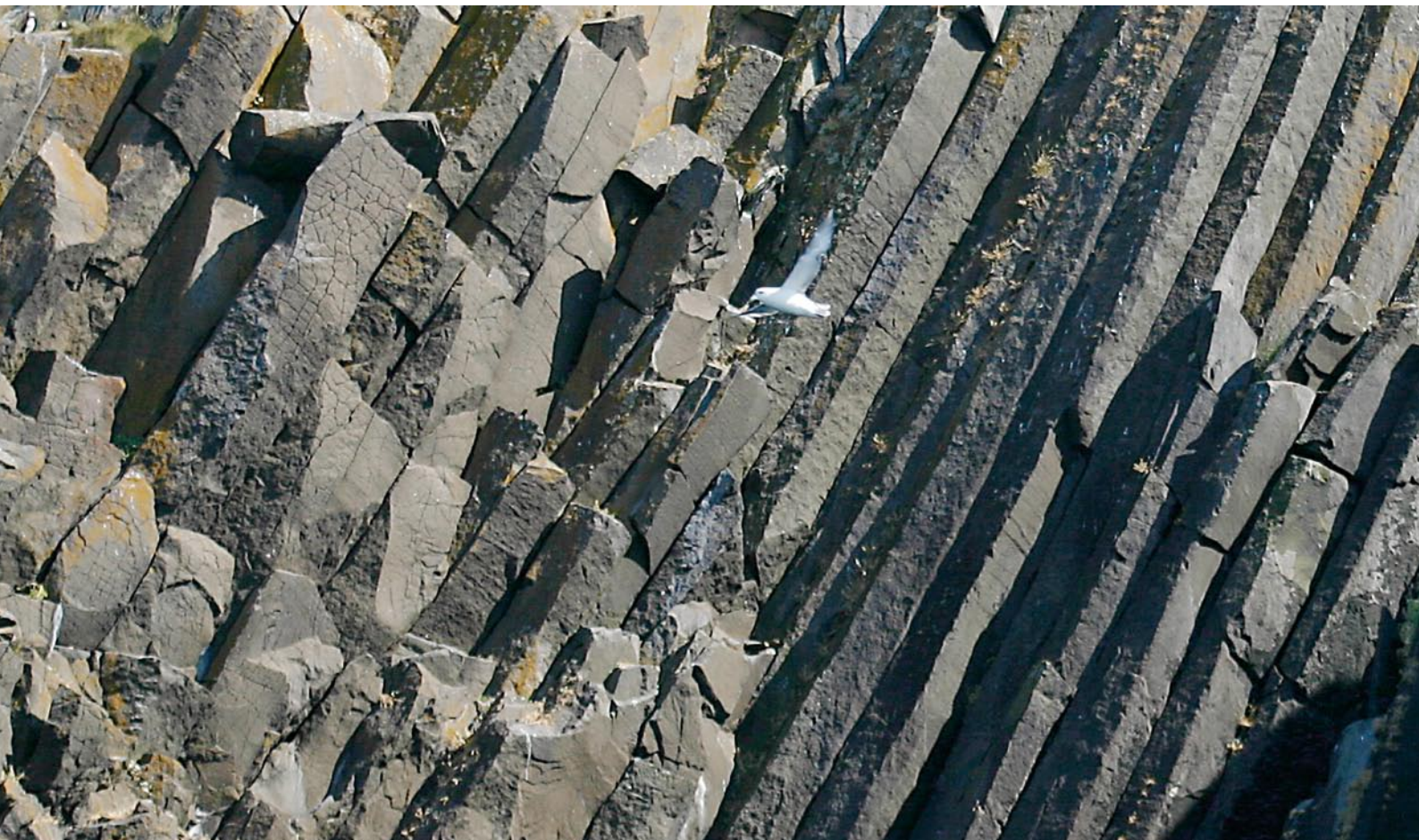


# BUILDING ON SOLID FOUNDATIONS

Science and Technology Policy for Iceland 2010 – 2012



# Science and Technology Policy

## Introduction by the Prime Minister



The Science and Technology Policy 2010-12 is dedicated to the importance of fostering and strengthening of research and innovation in Iceland. A main objective is to use knowledge and the creation of new technologies as a basis for new opportunities for Icelandic industry and society. The policy emphasises increased sectoral cooperation in research and innovation.

The policy was prepared by the Council's science and technology committees in an open and extensive consultation with stakeholders. By making the right decisions in the months ahead we will strengthen the foundation of our knowledge based society even further.

The Science and Technology policy will provide important guiding principles for a coordinated and targeted approach for strengthening Icelandic industry and society. The project called "20/20 Challenges and Opportunities for Iceland" involves devising a strategy and scheme for future investment in industrial policy, economical infrastructure, education, human resources, research and development, and social infrastructure. An integrated national and regional approach will be introduced in Parliament in the autumn of 2010.

The Council is convinced that the extensive consultation and cooperation in the planning of this policy will lead to its successful implementation and a better society.

A handwritten signature in blue ink that reads "Jóhanna Sigurðardóttir".

Jóhanna Sigurðardóttir  
Prime Minister and Chair of the Science and Technology Policy Council

# Contents

- 5 Guiding principles
- 6 Going forward with clear objectives
- 10 The Science and Technology Policy
  - 11 Universities and research institutions
  - 12 Innovation
  - 13 Quality and achievements
  - 14 International cooperation in Research and Innovation
  - 15 Competitive funding
  - 16 Research infrastructures
  - 18 Open access
  - 19 Recruitment

# Guiding principles

## Cooperation and sharing

Research and innovation is widespread in Icelandic universities, research institutions, with entrepreneurs and in industry. Collaboration within and between sectors has increased in recent years but in the current economic situation there is a strong need to encourage further collaboration and more open and responsible sharing of the available resources including national and regional facilities.

## Quality and rewards

To guarantee high quality and significant results from research and innovation efforts in Iceland it is necessary to provide guidelines ensuring international quality standards. Information on quality and achievements in universities, institutions and industry must be improved and coordinated using the appropriate achievement indicators for diverse scientific fields.

## International research and innovation

It is important to strengthen international scientific cooperation and encourage Icelandic innovation companies and institutions to target the international market. International funds and research programmes already finance a significant part of research and innovation in Iceland. The aim is to encourage the development of multinational joint science and technology actions to advance Iceland's success in the international community, to strengthen scientific excellence, and to expand international funding opportunities.

# Going forward with clear objectives

The collapse of the Icelandic financial system has led to a fresh perspective on the future of scientific excellence in Icelandic society in the 21st century. Public funding allocation to research and technological development has strengthened the position of Icelandic research internationally with an increasing number of high impact peer-reviewed publications by Icelandic scientists. Moreover, significant progress in the foundation for research and innovation has led to numerous well-educated scientists and entrepreneurs in a diverse array of fields. The next challenge is to utilize this scientific foundation and infrastructure to boost innovation, industry, and economy, thereby providing numerous benefits to Icelandic society.

The short-term approach of the Icelandic government during times of reduced public expenditure is to prioritise allocation of funding towards long-term scientific development leading to substantial benefits to Icelandic society as a whole. With this in mind, the Science and Technology Policy for 2010-12 aims to develop a coordinated approach that involves individuals and institutions from the public and private sectors in an attempt to optimize further development of Icelandic research and innovation. The main objectives are twofold. One objective is to ensure that public support is available to both private and public sectors in the research and innovation community, including universities, research institutions, entrepreneurs and industry and the second is to promote intersectoral cooperation to maximize efficiency, financial, and economic benefits.



This challenge requires that the ministries, along with the Science and Technology Policy Council take into account the entire research and innovation community and assess the following important issues: competitive funding; collaboration between universities, research institutions and industry; access to valuable knowledge, data and facilities for private and public sectors; recruitment of manpower in the research and innovation community; facilitating intersectoral mobility of people and projects; and encourage careers in science and technology.

Now is the time for coordinating groups performing outstanding basic research with those producing cutting-edge innovative technology. To promote enterprises to enter the international market in lead positions, it is crucial to interconnect innovation to cutting-edge basic and applied research in Iceland. Participation of Icelandic companies in research and innovation has increased in recent years, however it still lags behind by international comparison. The long-term research and manpower necessary to develop products for the marketplace is too costly for small enterprises, and only few companies have the financial capacity to set up large research teams. It is therefore important that existing resources are used to strengthen intersectoral cooperation between entrepreneurs in industry, universities and research institutions. Furthermore, specific actions, such as tax incentives or competitive funding will encourage industrial participation. Thus, the Science and Technology Policy Council welcomes the new Act on tax incentives for innovation enterprises, which has been part of the council's policy for many years.

The current strategy of allocating public funding for research and innovation has to be addressed. It has repeatedly been pointed out that a relatively small share of the public research and innovation budget in Iceland is allocated through competitive funds. With restructuring and cutbacks in State finances, it is critical to re-evaluate financial allocation to universities, research institutions, competitive funds, various smaller research funds and projects with emphasis on coordination.

The research and innovation community in Iceland has adapted clear awareness of the importance of quality assessment in recent years and this will lead to progress in knowledge-based international competition. Importantly, in times of severe cuts in State expenditure, it is important to safeguard the quality of research and innovation and ensure that financial resources are allocated to projects that will potentially yield excellent results and benefits for society.

## Universities in Iceland

University of Akureyri • Bifröst University • Reykjavik University • University of Iceland  
Holar University College • Agricultural University of Iceland • Iceland Academy of the Arts

## Public competitive funds under the auspices of the Science and Technology Policy Council

Strategic Research Programme • Icelandic Research Fund for Graduate Students • Icelandic Research Fund  
Equipment Fund • Technology Development Fund

## Other major public competitive funds for Research and Innovation

AVS R&D Fund of Ministry of Fisheries in Iceland • Regional Employment Opportunities  
Archaeological Research Fund • Agricultural Productivity Fund • New Business Venture Fund  
Icelandic Student Innovation Fund • Energy Fund • Landsvirkjun Energy Research Fund  
Icelandic Road Administration Research Fund • Fisheries' Project Fund

## Public Research Institutions

Iceland GeoSurvey • Marine Research Institute • Landspítali – University Hospital • Matis  
Icelandic Institute of Natural History • Innovation Center Iceland • National Energy Authority  
Science Institute - University of Iceland • Árni Magnússon Institute for Icelandic Studies  
Institute for Experimental Pathology – University of Iceland at Keldur • Icelandic Meteorological Office  
Institute of Freshwater Fisheries

An important objective will be to ensure that direct public funding in addition to competitive funding calls for research and innovation are based on clearly defined rules and that research projects are assessed based on the quality of the proposed work and potential benefits to society. The newly implemented working procedures of the Science and Technology Policy Council will strengthen its policy-making role and facilitate follow-up to current policy. The Council and its committees must assume a leading role in Icelandic policy-making at the international level because research and innovation activities have become increasingly more international and there is a growing demand for complementary State contributions for international projects.

Competitive funds must be evaluated to assess whether there is a basis for merging funds, discontinuing certain funding programmes, promoting cooperation between funding programmes, and evaluating the potential of joint funding of individual projects.

Scientific excellence in Iceland is the basis for new opportunities in the coming years. Clearly, investment in education and research, innovation will lead to advances in knowledge, financial rewards and a high quality of life. Therefore we have every reason for being optimistic.

# The Science and Technology Policy

- I. Universities and research institutions
- II. Innovation
- III. Quality and achievements
- IV. International cooperation in research and innovation
- V. Competitive funding
- VI. Research infrastructures
- VII. Open access
- VIII. Recruitment

## I. Universities and research institutions

Research funding, scientific publications and marketing of innovative products is a globally competitive field. For Icelandic research and innovation to thrive it is time to make the public support system work as a coherent whole. It is essential to build on the best available talent and resources in all sectors when developing research capacity and research training, and to foster new talent in all sectors for the benefit of society and strengthening competitiveness.

Acquisition of basic data is one of the most important roles of public research institutions. However, this requires high level financing and long term commitment, leaving the research institutions with limited resources to undertake further research. Coordinating basic and applied research activities between universities, research institutions and industry and enabling joint use of research findings, will assist the progress of technology and innovation. Projects requiring long-term state financing should be carefully examined and evaluated and their financial support guaranteed, irrespective of sector. These projects should be assessed on quality and decisions made regarding strategic need to develop certain high potential, high impact fields that have the capacity to produce valuable results and increase competitive advantages.

### **The Science and Technology Policy Council recommends:**

1. Research institutions, universities and business enterprises shall be linked with well-defined cooperation agreements that detail the research cooperation, recruitment of specialists, joint use of staff and facilities and strengthening of research education.
2. Exploring the feasibility of merging universities and research institutions, aiming to improve professional and/or financial return.
3. Examining the possibility of combining efforts and/or transferring projects when similar or related projects are being done in universities and research institutions.
4. Prioritising projects requiring long-term State-financing to ensure sufficient funding.
5. Determining the building of research infrastructures in institutions best-suited to acquire research data, with the capacity for open access to data for the use of other private and public institutions.
6. Ensuring preservation and open access of State-financed databases and materials.

These recommended measures will strengthen research and research education in universities and research institutions by promoting shared use of facilities, which will enable private enterprises to participate in research and innovation using research findings from universities and other institutions.

## II. Innovation

Innovation capacity and productivity of companies is a prerequisite for economic growth and prosperity in Iceland, and must be reinforced during the next decades. There are many unused opportunities for enhancing knowledge transfer from research into industry and society.

Creative industries are connected to research and innovation in various ways. They are intertwined with the entire innovation process, from the research and development phase to marketing and utilization. There are numerous possibilities for research in the creative sector. Important opportunities for innovation and increased productivity stem from developing solutions that can both exploit new market opportunities and meet the demands of new users. User-driven innovation calls for new approaches and interdisciplinary cooperation between technical and scientific topics and the creative industries.

### **The Science and Technology Policy Council recommends:**

1. Strengthening the capacity of universities and public research institutions to turn research findings into business, by encouraging enterprises to obtain patents and encouraging the creation of start up companies. Intersectoral knowledge transfer should also be supported. The advantages of an incentive system should be explored to ensure intersectoral knowledge transfer and the dissemination and exploitation of research.
2. Actively supporting the private sector to participate in international cooperation in research, technology and knowledge transfer.
3. Accurately defining and targeting support to assist start-up companies heading for international markets by providing comprehensive counselling built on knowledge of markets and relevant regulatory frameworks.
4. Reviewing legislation that inhibits research freedom, taking into consideration issues of safety, ethics and quality. This should be based on the premises that legislation should support innovation without hindering research or business development of innovative companies.
5. Competitive funds, research and educational institutions as well as The Icelandic Centre for Research (Rannis) and Innovation Center Iceland actively support the progress of industry dedicated to research, development and innovation.
6. Encouraging companies, research and educational institutions to realise the innovation potential and value creation within the creative industries with focused efforts and cooperation.

Increased support to research-driven innovation and interdisciplinary cooperation between the private and public sectors at national and international levels provides opportunities for increased value creation and sustainable prosperity.

## III. Quality and achievements

Although quality assurance in Iceland has been reinforced in recent years, it is important to enhance the achievements assessment at universities, industry, institutions and competitive funds. This should preferably be carried out by independent foreign specialists and the international standing of Iceland examined. Research and development achievement assessments should play a larger role in public policy making.

The gathering of comparative statistics on research and innovation for the assessment of quality and achievements need to improve, in order to strengthen the assessment of Iceland's international scientific ranking. For this to work as a targeted tool to improve quality and achievements the objectives of public allocation to research, research institutions and universities and publicly financed projects need to be clearly defined. Included will be the definition of the boundaries of actual research projects and monitoring and data collection projects.

### **The Science and Technology Policy Council recommends:**

1. Encouraging independent analysis of achievements in research, development and innovation.
2. Increasing cooperation between The Icelandic Centre for Research (Rannis) and Statistics Iceland in the evaluation of the research contributions made by Icelandic institutions and improving the monitoring of their results and achievements.
3. Public allocation of funds to research and innovation shall be based on quality and achievement and that transparency and professional evaluation will apply to the allocation of competitive funding. This refers to all public competitive funds.
4. Public financial contributions to universities and research institutions shall be correlated with performance;
5. Entrusting The Icelandic Centre for Research (Rannis), in cooperation with a relevant monitoring body, to monitor the outcome of publicly financed research.
6. Establishing a Quality Council of foreign experts responsible for quality control of teaching and research in universities.

These recommendations will ensure that all publicly-financed research and innovation projects will be based on comparable and transparent quality and achievement criteria, to promote fairness and to ensure effective use of financial resources and scientific excellence.

## IV. International cooperation in research and innovation

International cooperation is vital for the development of research and innovation in Iceland, but it should be strengthened and a more direct and targeted approach applied. The importance of international cooperation will even increase in the coming years, partly due to the foreseen increased commitment of Iceland in the European research cooperation.

### **The Science and Technology Policy Council recommends:**

1. Assessing the scope, commitment and opportunities in international research and innovation cooperation, particularly programmes that require cofunding and membership fees.
2. Strengthening The Icelandic Centre for Research (Rannis) as the main supporting and analysing body in research and innovation in Iceland.
3. Mapping the existing support services for Icelandic applicants in international cooperation programmes and collaborative efforts made towards combining support services to existing programmes.
4. That the Science committee and the Technology committee actively cooperate in shaping and implementing the research and innovation policy in the Nordic countries, Europe, and additional international programmes and use this experience in policy making in Iceland.

These recommendations will assist international cooperation and participation in international programmes with the intention of increasing scientific and technological excellence.

## V. Competitive funding

To maintain a strong research and innovation community, it is essential to thoroughly evaluate the quality of applications and promote close cooperation between universities, research institutions and industry. Competitive funding programmes should be sustained and strengthened and where possible, programmes should be merged. Individual competitive funds should increase collaborative efforts.

To evaluate achievements, the role and the objectives of individual competitive funds should be precisely defined and clarified. The aim of competitive funding is to establish a meritocratic system that will fund high impact projects with the potential of delivering international level scientific results and high financial return.

### **The Science and Technology Policy Council recommends:**

1. Increasing the proportion of public funding to research and innovation through competitive funding.
2. Collecting comprehensive overview of the current public funds for research and innovation, evaluating them and providing recommendations to the Science and Technology Policy Council for potential changes in current strategy, e.g. merging of specific funds or changing administration.
3. Public funds adopting comparable cost assessment criteria for projects, taking into account real overall costs of research and development.
4. In the evaluation process of application for competitive public funding, the fundamental role of individual funds and the system should be taken into account. Evaluation should be based on quality, but also on potential capital gains, and cultural and social innovation.
5. Creating a legislative framework for the new Science and Technology Policy Councils strategic funding programmes that set out clearly defined professional evaluation and decision-making criteria.

These measures will promote a more transparent and efficient funding system, providing better feedback to applicants regarding quality and potential funding opportunities and will create defined criteria for evaluating past and future achievement.

## VI. Research infrastructures

In the spring of 2009, a committee appointed by the Science and Technology Policy Council developed a roadmap for the development of research infrastructures in Iceland. The roadmap identified the most important and prosperous facilities in the Icelandic research community. The aim was to ensure that these would be supported so that the Icelandic science community would continue to prosper at international level. Since this roadmap was published, several of its main objectives have been further developed.

One important benefit from the roadmap was to ensure continued national access to electronic journals and databases with the complete understanding that such access is a critical part of infrastructure needed to maintain high impact research and innovation activities in Iceland.

Another point stressed in the roadmap is the importance of access to high-speed internet connections to international research networks in Europe and North-America. This will provide better opportunities for international cooperation in fields that rely on the methodology of electronic science (eScience). This improves the potential for working with large quantities of information and data with computer networks, high-speed computers, diagnostic imaging, combined databases and net-based research instruments.

Hundreds of diverse scientific databases exist in Iceland having massive quantities of data and valuable research material. A key project is to organise the structure of the databases, improve access to data which would be useful for advancing research in many fields.

In Europe, the value added tax (VAT) on equipment and research supplies is refunded or waived, but this is not the case in Iceland. International competitive funding such as the European Commission framework programmes does not allow that VAT be paid off the research funds. The Equipment Fund was established to support the purchase of expensive research equipment and instruments. It does not support other research infrastructures such as databases. The other Nordic countries have specific research infrastructure funds.

### **The Science and Technology Policy Council emphasises the following recommendations in the roadmap on research infrastructures:**

1. To ensure future national access to databases and electronic journals.
2. To encourage Icelandic scientists to participate more actively in international research cooperation that uses eScience.
3. To form a task group to lead the “Future arrangement of databases in Iceland” project that will focus on database coordination, open access, intellectual property rights, accessible interface, security and usefulness, and administration and maintenance of databases.
4. To revise rules for refunding value added tax (VAT) for research supplies and equipment for publicly-funded scientific research.
5. To revise the legislation on the Equipment Fund to promote support for a variety of research infrastructures and to change the name to The Infrastructure Fund.
6. To target participation in international cooperation on research infrastructure, enabling Icelanders to participate more actively in international development of research infrastructures.
7. To promote the development of research infrastructures in high impact, well-established fields in Iceland.

A strategy addressing the important need for supporting research infrastructures will ensure a high level of international research and innovation in Iceland.

## VII. Open access

Accessible publicly-funded research findings are essential for efficient use of research as a basis for advances in new technology and innovation in Iceland. Legal and financial aspects of open access should be scrutinized focusing on intellectual property rights.

### **The Science and Technology Policy Council recommends:**

1. Developing public policy to ensure open access of publicly-funded research findings.
2. Evaluating the necessary open access infrastructure that can be used for coordinating databases and accessing them and ensuring permanent preservation.
3. Defining utilisation rights for data derived from public institutions and cooperative intersectoral research.
4. Raising general awareness to the importance of open access within the research and innovation community.

The need for open access of publicly-funded research will be promoted with the aim to improve the opportunity for scientific excellence and capital gain.

## VIII. Recruitment

It is essential to attract young people to research and innovation and create opportunities for engaging in independent research and the development of start-up companies. This is a particularly important concern as there is an increasing risk of promising young people leaving Iceland without plans for returning after their studies or training abroad. It is crucial to ensure that young people embark on vocational or research-based studies at universities, complete their studies, and even more importantly that there are sufficient numbers of jobs available for them. Furthermore, Icelandic institutions and enterprises need to be more active in applying to international programmes that support the development of human resources.

Innovation in industry demands constant updating of employees' knowledge and skills. This demand should be met with an organised approach focused on increasing the diversity of education and training of the Icelandic workforce. An important goal of government and industry will be to increase the proportion of the workforce with higher education to 90% from the current two-thirds who lack formal education beyond compulsory school.

### **The Science and Technology Policy Council recommends:**

1. The Icelandic Research Fund for Graduate Students should aim at connecting universities, research institutions and industry more actively and connect its allocations to grants awarded from the Icelandic Research Fund and other competitive funds.
2. That the Icelandic Research Fund supports young scientists with generous grants to enable them to initiate and develop their research activities in Iceland.
3. Encouraging institutions and companies to apply for funding in the Marie Curie People programme within the EC 7th Framework Programme.
4. Promoting lifelong learning in the labour market, guidance and counselling, recognition of real competences and other solutions that serve as opportunities and motivations for people and industry to strengthen their position.
5. Encouraging enrolment in technical and vocational studies.

These measures will contribute towards creating new opportunities for young people in research and innovation in Iceland and encourage new recruitment in research and innovation activities in the coming years.

In 2007, Research and Development (R&D) expenditure in Iceland amounted to 35 billion Icelandic krona (335 M€). The business sector accounted for over 19 billion ISK.

As a share of the Gross Domestic Product (GPD), R&D expenditure in Iceland accounted for 2.7% which places Iceland 6<sup>th</sup> among OECD countries using this indicator.

About three thousand FTE's were performed in R&D in Iceland in 2007.  
Almost half were performed within the private sector.

In 2007 approximately 50% of the total expenditure on R&D was financed by the private sector, 38% by the government and 10% of the funding came from abroad.

Grants to Iceland from the EC 7<sup>th</sup> Framework Programme for 2007 - 2008 amounted to 15 M€.

Iceland ranks 5<sup>th</sup> among OECD countries of the number of published peer reviewed papers per 100.000 inhabitants for 2003 - 2007

Impact of publications by scientists, measured as citations to their papers in 2003 - 2007, ranks Iceland 2<sup>nd</sup> among OECD countries.

source: Icelandic Centre for Research (Rannis)



**Prime Minister's Office**  
Science and Technology Policy Council

ISBN 978-9979-9870-3-1