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# Recommendations for Norwegian knowledge policy

Research, innovation and commercial development are crucial to wealth creation and the future evolution of society. These are SINTEF's most important recommendations:

SINTEF is an international, private and independent research organisation which is also an integral part of the Norwegian research community. Based on experience in our first 60 years we would like to take this opportunity to make some recommendations regarding Norwegian policy related to research and innovation.

First we will provide some background information about our position and some reflections regarding important challenges.

## Our distinctive character has created results and standing

In the field of commission-based research, SINTEF is one of the four largest establishments in Europe, alongside TNO in the Netherlands, VTT in Finland and Fraunhofer in Germany. Today we are a global research institute with colleagues of 69 nationalities. In 2009 we sold research services worth almost 2.8 billion Norwegian kroner to 57 countries around the world.

SINTEF has been created by our employees in collaboration with partners in commerce, research and government. We have developed a company with a solid research profile, well qualified to operate as an R&D partner for Norwegian and international business and industry. All our research, both pure and applied, is directed towards utilisation.

Our strategic and operational collaboration with the Norwegian University of Science and Technology (NTNU) and research institutes such as the University of Oslo (UiO) and the Institute for Energy Technology (IFE) is part of this.

Together we have supplied cutting-edge technology and expertise

of international calibre, which has contributed to making Norway a wealthy nation.

## Need for change

The world is faced with significant challenges and possibilities and there is a need for change.

We are living in a time of transition in which we must develop sustainable solutions for the future in a range of fields. The concept of sustainability is based on consideration of the environment, social responsibility and the efficient management of businesses and society.

Developments in the global economy are unpredictable and environmental challenges are increasing. Changes in climate are the most important factor, but by no means the only one. In 2050, there will be more than 9 billion<sup>1</sup> people in the world and we are already experiencing shortages of clean water, energy and food. There are still 1.5 billion<sup>2</sup> people who do not have access to an electricity supply.

A better balance can only be achieved if those with a high standard of living change their behaviour. At the same time we must develop the new economy and "green" technology which will make it possible to satisfy increasing demand for resources while protecting the environment. Sustainable development is impossible without new technology.

## A new geopolitical reality

We are living in a new geopolitical reality with an open global economy and development towards better economic balance between regions and countries.

<sup>1</sup> IEA Energy Technology Perspectives 2010 and World Energy Outlook 2009

<sup>2</sup> IEA Energy Technology Perspectives 2010 and World Energy Outlook 2009

"New" economies like China, India and Brazil have emerged. Increasing numbers of people are experiencing an improved standard of living and better health, but at the same time more people on the planet are starving.<sup>3</sup>

It can no longer be taken for granted that the traditionally strong economies such as the EU, the United States and Japan will retain the technological lead. Advanced technology is one of the prerequisites for a high standard of living and welfare also in Norway. Being a world leader in technology for the exploitation of offshore oil and gas resources has created considerable wealth.

We are witnessing increasing competition between nations and regions to provide the most attractive conditions for commercial enterprise and research, as well as a race to develop the new technologies. Success in this competition is important for wealth creation and for employment in the future.

Nevertheless, this is not a perspective which has high priority in Norwegian political debate. The proposed national budget for 2011 represents an actual decrease in allocations to industry-related research.

### General perspectives have returned to research

In science we are now witnessing closer connections between different specialist disciplines. New specialisations are being developed at the interface between, among other things, natural sciences and engineering, medicine and technology. There is increasing awareness of the value of interaction between experience-based and research-based knowledge.

Social and technological disciplines must work more closely together. We need better insight into the relationship between technology, people, culture and society.

Key technologies associated with advanced materials, microtechnology, nanotechnology, biotechnology and photonics will enable the development of new business enterprises and sustainable solutions which are unknown today. This will contribute to ensuring supplies of food, energy, materials and medicines.

## Our recommendations

### 1. Establish an overall innovation policy

Research, innovation and business development are crucial both to solving the major social challenges and to maintaining competitiveness and wealth creation.

Norwegian policy with regard to research, innovation and business development is perceived as piecemeal. Responsibility is shared between a number of government ministries and departments which often appear to be poorly co-ordinated. However, we have seen good examples of general research policy efforts in recent years. The Norwegian parliament's consensus on climate-related policy has led to a considerable increase in research into environmentally friendly energy sources, and the authorities are working on a general strategy for environmental technology. A fund was set up in 2008 for investment in scientific equipment.

These are good steps in the right direction and indicate a development which must be reinforced. It is essential that society's most important decisions are based on the best possible assessments of available knowledge and an integrated approach to the issues.

Our recommendation:

- The Prime Minister and the Prime Minister's Office must assume overall responsibility for research and innovation.
- A working practice with involvement crossing departmental boundaries, with clear, overall leadership.
- Stronger involvement of expertise from industry and research in political processes.
- Reinforcement of technological expertise in all government ministries.
- Closer dialogue between research and politics.

### 2. Maintain open competitive arenas

In recent years, open competitive arenas have been reinforced in Norwegian research circles. The foundation of the Centre of Research Excellence (SFF), the Centre for Research Excellence and Innovation (SFFI) and the Centres for Environment-friendly Energy Research (FME) has created increased competition, improved quality and greater potential. The same applies to the Research Council of Norway's User Driven Innovation Arena (BIA), whose strength is that it also allows for rapid reorganisation.

In a situation with increasing international competition in research, there is every reason to question the balance between open competitive arenas and government funding to individual research institutes. A good balance between direct funding and open competition is desirable for reasons of openness, co-operation and not least the quality of research.

While positive growth has occurred in the field of health research, little use is being made of open competitive arenas. This should be remedied.

Our recommendation:

- Reinforce open competitive arenas.
  - Grant independence to public sector commission-based research institutes.
  - Reinforce open competition in health research.
- Channel a portion of the research funding from the health facilities to the Research Council of Norway.

### 3. Make room for strong knowledge-based communities which are capable of assuming social responsibility and international leadership

Norway is totally dependent on being part of the international development of expertise. We need internationally conspicuous, strong, knowledge-based institutions. SINTEF is one of these, as are the universities in Oslo, Bergen, Trondheim, Ås and Tromsø.

In a small country with a large number of small companies, it is important to maintain applied research environments which can supply high quality research to all sectors of industry.

It is important for us to have strong, regional knowledge-based communities. However, the existing rights-based fragmentation of the university sector presents a challenge in a situation with limited hu-

<sup>3</sup> Shenggen Fan, World Bank: CAETS Conference "Feeding 9 billion people", Copenhagen June 2010

man and financial resources. A college now has the "right" to become a university provided that it meets certain minimum requirements. This is not commensurate with the requirements that increased internationalisation places upon scientific quality, or with the need for robust, professional specialist environments in both pure and applied research. One may also question whether making colleges into universities has a beneficial effect on the quality of vocational training.

Our recommendation:

- Give clear priority and independence to the internationally strong institutions, with increased attention to the quality of research provided.
- Set up systems which co-ordinate teaching in colleges and universities in such a way that it is easy to progress from college to university.
- Facilitate improved interaction between Norwegian research centres to enable us to build robust environments in important areas of expertise.

#### 4. Improve the internationalisation of Norwegian research

Our standard of living depends on us participating in the international development of expertise. This calls for capability and possibilities for participation in international research collaboration. Prioritising participation in EU-financed research is essential, as this is by far the most important international research arena for Norway.

The technical-industrial institutes are among the largest Norwegian participants in EU research, by far. SINTEF has amassed a great deal of expertise in important specialist fields through our participation in EU research programmes.

The technical-industrial research institutes in Norway receive low public funding. This is evident when we compare them with equivalent institutes in other countries, with universities and with government-financed institutes like NOFIMA<sup>4</sup>.

While low funding has given rise to close industrial collaboration and market orientation, the weakness is that the institutes are highly vulnerable and do not have much freedom for strategic development.

Our framework conditions present a growing challenge in view of the way the international competition in research is now developing. Norway's strength is that it has one large research establishment which is able to operate in the international arena. Sweden, Belgium, Luxembourg and Spain are now building up institutes similar to SINTEF, while the United Kingdom is considering following the same course. Fraunhofer and TNO are increasing their presence outside Germany and the Netherlands.

Our recommendation:

- A result-based public grant which makes it possible for institutes with low basic funding to increase their international involvement.
- Channel a larger portion of public funding directly to the technical-industrial institutes.

#### 5. Reinforce the interactive model

The Norwegian innovation model has resulted in close connections between education, pure research, applied research and

industrial development. The model includes research-strategic tools such as user-driven research, expertise projects with user involvement and a requirement for training to doctorate level.

This is a model for open innovation. Generic knowledge which is built up through research becomes available to society as a whole, while at the same time, product-specific knowledge remains the property of the companies investing in the research. The model is in demand all over the world.

It is also inherent in the interactive model that knowledge flows in both directions between research establishments and users. As researchers we have a responsibility for what we are researching into and how the results are publicised and used.

The Norwegian Ministry of Education and Research has introduced incentives which result in disadvantages for the universities if they collaborate with research institutes. This represents a major challenge in a small country where we are completely dependent on collaboration for maintaining robust research environments.

In a study which was recently presented at a conference in Berlin, NTNU was ranked in fourth place among the universities in the world with the most collaboration with trade and industry. MIT is in first place. Collaboration with SINTEF is one of the factors which have put NTNU in this position.<sup>5</sup>

Our recommendation:

- Introduce incentives which promote collaboration between universities and research institutes, and between research, industry and public enterprises.

#### 6. Build on Norwegian core skills – increase investment in research and innovation

It is crucial that expertise is available to Norwegian industry and the public sector. For industry, increased investment in both applied and pure research is necessary in order to maintain competitiveness.

We must dare to prioritise those fields in which Norway has internationally strong clusters. In Norway we have cutting-edge expertise in such fields as materials science, maritime science, biomarine technology and not least energy. The expertise in these clusters forms the foundation for success both in industry and in research, as well as providing solutions which the world needs.

This sort of focus can also contribute to the development of Norwegian high-tech industry in several areas, such as environmental technology and medical technology. New technologies are an integral part of this development. Thanks to our leading position in the oil and gas industry, Norway has been able to develop strong technological communities in the fields of ICT and microtechnology. In the same way, biotechnology and nanotechnology will be able to contribute to increased innovation and competitiveness in the established industrial clusters in the future.

Our recommendation:

- Increase investment in natural sciences and technology.
- Maintain the level of investment in social sciences and health sciences.

<sup>4</sup> NOFIMA is financed by a combination of public funding and fixed subsidy income.

<sup>5</sup> The result of a study carried out by Professor Robert Tijessen which was recently presented at the IREG 5 (International Ranking Experts Group) conference in Berlin. <http://www.socialsciences.leiden.edu/cwts/products-services/scoreboard>

- Reinforce the work of upgrading and renovating laboratories and other research infrastructure.
- Prioritise the internationally strong Norwegian clusters.

### **7. Reinforce the value chain for the commercialisation of research results**

The commercialisation of research results contributes to wealth creation and new jobs. A large part of the innovation work takes place in, or through interaction with, existing industry and independent research environments, while some takes place through the licensing of technology and establishment of new companies.

In Norway we have in recent years developed what we may call a

sustainable business chain for the commercialisation of research results. Participants which collaborate have become more professional and public policy instruments have improved. However, there are still deficiencies and weaknesses which must be remedied.

It is particularly important to ensure access to capital in the so-called pre-seed phase, among other things so as to verify technology before new companies are founded. This phase is characterised by its lack of commercial profitability, and is the Achilles heel of the business chain.

Our recommendation:

- Reinforce the Research Council of Norway's FORNY programme.
- Reinforce and maintain the seeding schemes through new financing of national and regional seed funding.