

Sweden – a leader within applied research

With a share for research and development of the Gross Domestic Product at above three percent, Sweden is among the world leaders within investing in knowledge and technology development. A country's usage of resources does not necessarily mean that it is in the technological forefront, but Sweden has for several decades proved that they can develop products and services of very high quality.

According to one of the most important policy tools for innovation system from the European Commission, the European Innovation Scoreboard, Sweden is ranked as number one at several of the indicators and has clearly a world-leading potential for innovation.



Much of technological growth is based on the basic research carried out through universities and research institutes. Swedish basic research is divided into fields such as natural and tech-

nological science, medical science, humanistic and social science and finally, the education science. The field that interests our readers the most is natural and technological science.

In this field Swedish researches have provided important contributions to the international progress within experimental particle physics and astrophysics, among others developed large experiment facilities for this research field. Large telescopes of different types and large detectors connected to the particle physics laboratories in Europe, a strong

research field within atomic- and molecule physics, space physics and fusion physics, as well as Sweden's successful small satellite programme, a programme that has placed Sweden in the forefront within European space research should be mentioned in this connection.

It is the Ministry for Education and the Ministry for Industry that financed most of the research and development in Sweden and the resources have been channelled through organisations like Swedish Research Council (VR), Swedish Business Development Agency (NUTEC), Foundation for Strategic Environmental Research, (MISTRA), the Swedish Research Council for Environment, Agriculture Science and Spatial Planning (FORMAS) and Swedish Agency for Innovation Systems (VINNOVA). All the abbreviations are Swedish terms for the organisations. In addition there are some other sources for grants, where the Swedish Foundation for Strategic Research and Kurt and Alice Wallenberg's foundation are the largest.

Not only positive trends

In spite of this key position, indications show that the country is about to lose this position because it has proved difficult to finance all the projects. In the period from 1990 up until today, Sweden has doubled the number of students in basic education and at the doctorate level. This has provided a very good supply of young researchers to the industry, in addition to making the students want to continue their research careers. This has proved difficult to achieve since there are not sufficient resources to employ highly qualified researchers and not enough challenging research tasks.

The large research organisations have therefore, in connection with the government's future political research proposition, handed the government a common application with proposals intended to make sure Sweden keeps the position in the forefront in areas of education and research, thus improving their position within highly qualified research, development and innovation.

An increase of the resources to be divided from the government is the main recommendation, but the organisations have also proposed how the limited resources best can be used. The red thread is that more of the resources must go directly to the researchers and teachers, thus increase their competence and their connection to international research.

To improve the innovation level the research organisations have proposed remedial actions to

provide growing promotion resources to VINNOVA, thus partly strengthen the long-term technical oriented research and the innovation system to promote a growth of new products, processes and services. This also may partly take place through a special backing of incubators, seedcorn financing at an early phase, all intended for the commercial utilisation of the research.

Basic research

The basic research in Sweden is mainly channelled through the Swedish Research Council (VR). The council is a governmental authority with the national responsibility to develop Swedish basic research so that Sweden reaches a strong international position within this type of research. VR replaced four other research councils from 2001 to provide aid for all types of basic research in Sweden. The council has three main areas they are going to take care of, research financing, research information and research politics. The council has sub-councils that are responsible for respectively natural and technological science, medical science, humanistic and social science. In addition there are an education science committee and a research forum.

This, together with the government's financing of universities and colleges, is the largest financial source for basic research, yet only accounts for 10 percent of the total financing. The researchers or research groups mainly initiate the projects that have been given financial support, and experiences indicate that this bottom-up process provides the most effective research results.

VR gives support to the best qualitative research and the quality evaluation is carried out through peer review. The council practises strict competence rules and in some evaluations international experts are used. The evaluation from VR also influences the following financial process, because the evaluation process also gives the project a quality mark. VR works with a five graded ranking system that will be a basis for the different institute's internal prioritisations in the future.

Applied research.

To use the results from the basic research Sweden has three main organisations, Swedish Business Development Agency (NUTEK), Foundation for Strategic Environmental Research, (MISTRA), and the Swedish Research Council for Environment, Agriculture Science and Spatial Planning (FORMAS).

NUTEK is a national agency that handles issues concerning industrial policies. The organisation is a national competence centre for entrepreneurship, business development and regional development

with the main goal to place Sweden in the forefront within purchasing power per capita.

MISTRA activities are placed in the crossing point between the interest of being in the cutting edge in knowledge and technological development and simultaneously taking care of the environmental problems connected to economical growth. A MISTRA programme must be able to provide users in enterprises, authorities and organisations, as well as international negotiators, decision-makers on different levels and interest groups the latest scientific findings within the field of environment.

FORMAS encourages and supports scientifically significant research related to sustainable development. Especially this means support in the area of the environment, agricultural sciences including forestry, horticulture, veterinary medicine, food, fish and reindeer husbandry and spatial planning including building science and community systems.

Strategic research to better Sweden's competitiveness in the future.

Swedish Foundation for Strategic Research was established in 1994 with the purpose to support research in natural science, engineering and medicine that will strengthen Sweden's competitiveness. The statutes and strategies are to promote the development of vigorous research settings of international class and of significance for Sweden's competitiveness. By strategic research is meant research considered to be a future advantage for Sweden.

The Foundation considers advantages on the basis of one or more of the following considerations:

- The power of internationally high-class research settings to create new knowledge and hence attract unique competence and international investment to the country.
- People with graduate education, broadened and enhanced research training, are attractive for employment primarily in industry and public administration but also in universities and colleges.
- Research with results that may form the basis for development of existing enterprises or the founding of new ones.
- Improved quality of life through new employment opportunities, better working conditions, better health and an improved environment.
- Research that acts as a focus for international co-operation of interest to Swedish industry and society can be gathered.

The autumn 2003 the foundation was financing around 80 large research programmes, a financing source that for the future will be approximately 500 MSEK a year.