# TECHNOPOLIS

## RCN International Context

**Background report No 16 in the evaluation of the Research Council of Norway**

**Erik Arnold**
**Stefan Kuhlmann**
**Barend van der Meulen**
**Alina Östling**
**Arie Rip**
**Sarah Teather**

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## Reports in the evaluation of the Research Council of Norway

**Synthesis report**
Erik Arnold, Stefan Kuhlman and Barend van der Meulen, **A Singular Council? Evaluation of the Research Council of Norway**, Brighton: Technopolis, 2001

**Background reports**

**1. The Research Council of Norway and its different funding mechanisms: The experiences and views of researchers in universities, colleges and institutes.**
Background report No 1 in the evaluation of the Research Council of Norway
*Magnus Guldbransen, NIFU*

**2. Bibliometric Analysis of Norwegian Research Activities.**
Background report No 2 in the evaluation of the Research Council of Norway
*Sybille Hinze, ISI*

**3. RCN in the Dynamics of Research: A Scientist's Perspective.**
Background report No 3 in the evaluation of the Research Council of Norway
*Frank van der Most and Barend van der Meulen, University of Twente*

**4. RCN in the Research and Higher Education Sector.**
Background report No 4 in the evaluation of the Research Council of Norway
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**6. RCN and international co-operation .**
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**7. RCN budgets, policy instruments and operations**
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*Egil Kallerud, Liv Langfeldt and Randi Søgnen, NIFU*

**8. Internal functioning of RCN.**
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*Barend van der Meulen, University of Twente, James Stroyan, Technopolis*

**9. RCN in the Public Understanding of Science.**
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*Heidi Wiig Aslesen, Marianne Broch, Per M. Koch and Nils Henrik Solum, STEP*

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*Erik Arnold, Technopolis*

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Background report No 15 in the evaluation of the Research Council of Norway
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*Sarah Teather and Erik Arnold, Technopolis*

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# 1 Introduction

This report documents data we collected addressing issues identified as significant in the evaluation of RCN. These data were used selectively in generating the synthesis report for this evaluation. Further analysis was not necessary for our purposes, and is therefore not offered here.

The countries were chosen for the following reasons

| | |
|---|---|
| Sweden, Finland | Scandinavian neighbours who have realised some industrial modernisation |
| Netherlands | Small country with some functional differentiation |
| UK | Attempts to modernise system |
| New Zealand | Similar size to Norway, modernisation, strong primary based industry |
| Germany | Interesting because of the institutional differentiation and the current attempts within several organisations to improve research management |
| Switzerland | Similar size, similar position in Europe |

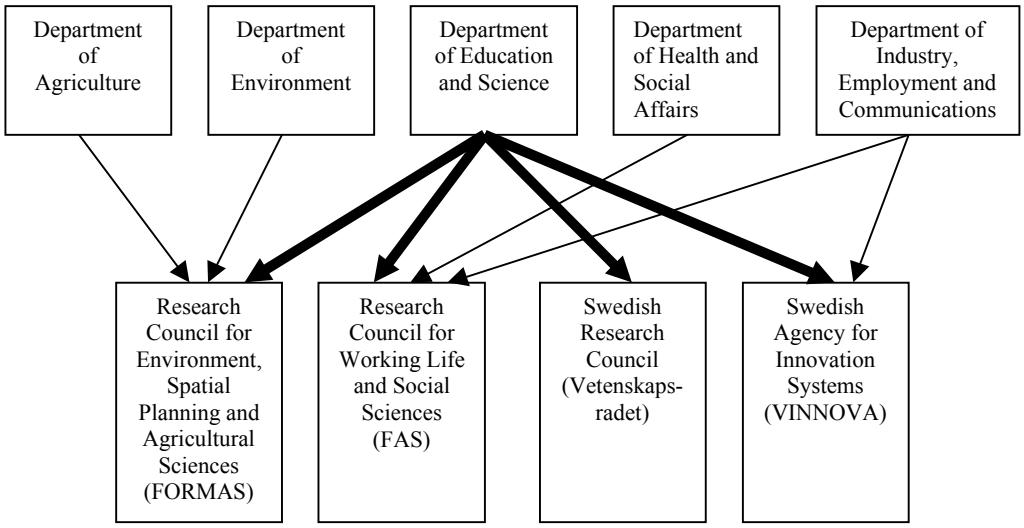
# 2 Organisation of government role in national innovation system

## 2.1 Sweden

From the start of 2001, a series of reforms has been implemented in Sweden, which have restructured the state's research and innovation funding institutions.

Swedish Departments of State are traditionally rather small. They tend to work via operating agencies, rather than themselves getting involved in the implementation of policy. Traditionally, they work under a 'sector principle', using operating agencies specific to their own sector.

**Exhibit 1 Organisation of the Swedish research system**




The Department of Education and Science is the lead Department for national and international research questions. As there are research resources within the responsibility areas of all the departments, research policies are made in active collaboration with the other departments. The Department of Education and Science collaborates particularly closely with the Department of Industry, Employment and Communications on research issues. [1].

The Secretary of State for Industry, Employment and Communications is responsible for R&D within the following fields: technology, space activities, communication, energy, work life, employment market and regional policy. The Department of Industry, Employment and Communications also determines goals and distribution of resources for the Swedish Agency for Innovation Systems (VINNOVA).

[1] http://utbildning.regeringen.se/inenglish/educresearch/research.htm#International

The Secretary of State for Education is responsible for taking the lead on all discussions of research policy in the cabinet. The Department funds the universities and the research councils, which under the binary support system provide research project resources to the universities. While formerly funds for the universities were passed through a national agency, they are now paid directly to the universities by the Department.

A number of independent research foundations also operate - private foundations, three independent national research foundations and seven regional 'Technology Bridge' foundations, all of which were founded in 1993-4, using the resources built up in the so-called 'Wage earners' funds[2]' in the previous few years.

The Wallenberg foundation is the biggest private research foundation. It promotes scientific research and educational activities that benefit the country. The research is supported mainly by funding of expensive scientific equipment (minimum cost is 500 000 SEK) and bigger research programmes through direct grants to associations or research institutes and individual researchers or research groups linked to a Swedish scientific institution.

The foundation's grants amount to 500-600 millions SEK a year and are mainly directed to universities (circa 85%), a small part goes to the research to institutes (5-6 %). Grants are allocated to "research areas of deficiencies" and to advanced research projects with high potentials with priority to multidisciplinary projects.

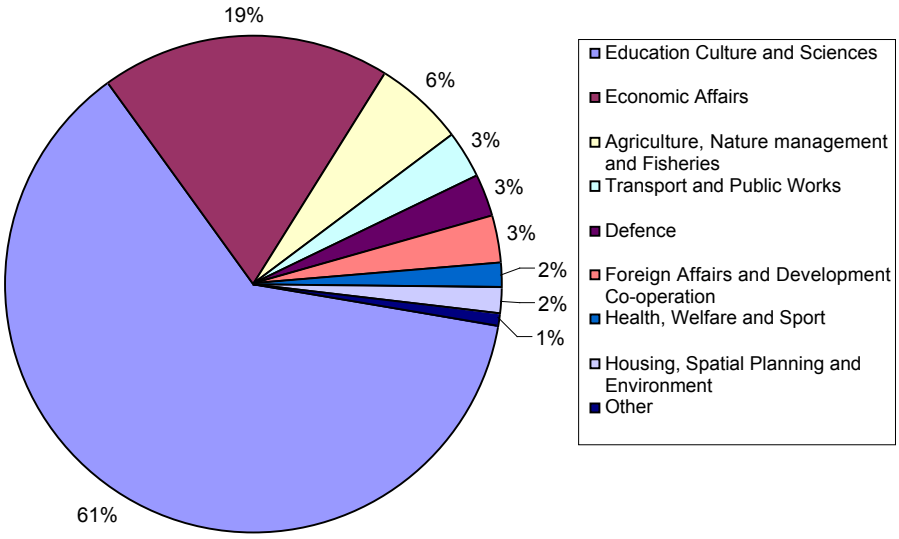
## 2.2 Netherlands

The responsibility for science and technology policy is divided between the Ministry for Education, Culture and Sciences and the Ministry for Economic Affairs. The former has the responsibility for the universities, one of the major research performances, for the science sector as such and for the co-ordination of the science policy of the government. The latter is responsible for technology policy, including some of the policies for engineering sciences, technological institutes and university-industry interaction. In addition, the Ministry for Agriculture is often involved in general issues on university policy and science and technology policy, because of its responsibility for the agricultural knowledge infrastructure, including the Wageningen Agricultural University and Agricultural Research Institutes.

Most of the government expenses on R&D come from the Ministry of Education, Culture and Sciences (61%). The Ministry of Economic Affairs spends 19% of the total government R&D budget. Other Ministries with a substantial R&D budget are the Ministry of Agriculture, the Ministry of Public Works and Transport, the Ministry of Defence and the Ministry of Foreign Affairs and Development Co-operation.

[2] The wage-earners' funds had been set up by the state to buy shares in Swedish companies on behalf of the workers

**Exhibit 2 R&D expenses in Dutch Ministries**[3]




The AWT is the 'regular' advisory body, of a kind one can find in many other countries. In addition, within the research system several sector advisory councils operate, that advises the government on its research policy in areas like agriculture, environment and health.

### 2.2.1 The Advisory Committee on Science and Technology Policy, AWT

The AWT is an advisory body to the Dutch government on science and technology policy. The core of its advisory task is focused on the knowledge and innovation process and its development. The recommendations made by the Council may also relate to matters that affect or are the result of research and science practice and technology development. In the Framework Act on advisory bodies the government is committed to informing the Parliament of its position on the recommendations within three months of receiving an advisory report. As a rule reports are made public. In addition the Council publishes a series of background studies.

The Council has a minimum of 9 and a maximum of 12 members including the chairman all of whom are appointed by Royal Decree. The members have various backgrounds (university, industry etc.). The Council is assisted by the secretary who is head of the secretariat and responsible for supporting the Council's work. The secretariat comprises about fifteen members, eight of whom are academics and who constitute the research staff. The staff may be reinforced by temporary members for specific subjects.

[3] Source: Science Budget 1998 Progress Report

#### 2.2.1.1 The Sector Advisory Councils

In several sectors, Advisory Councils on Research (ACRs) have been set up. Their main task is to program research for the mid-term and long term, but they are also involved in processes which advance or follow research programming, like foresight and evaluation. There four of such councils: for agricultural research and innovation, for environment and nature research, for development-related research, and for health research.

ACR's have a tri-partite membership of scientists, research users and government representatives. They have no research funds to allocate and thus depend on quality of advice and relation with funders (that is Ministries with a research budget for the respective sector). Their main impact is through a variety of reports published in the meantime, and the interactions and networking that are part of the preparation and dissemination of the reports.

The ACRs collaborate, in addition, in a Consultative Committee for the Sectoral Councils, which maintains a public profile for linking research to societal objectives by regular (annual) symposia, special workshops, and background studies feeding into the workshops and symposia. The continued interest in these overarching activities, both from the ACRs and from policy makers, spokespersons for research, and persons from organisations in the intermediary level, are an indication that activities to link research with societal objectives are important to almost all relevant actors

### 2.2.2 Executive Agencies

In the nineties, the government more and more has drawn back from executive science and technology policy tasks and delegated responsibilities for these tasks to intermediary organisations. As the main organisations were responsible for partly overlapping tasks, a system of checks and balances at the intermediary level has emerged. Tasks which are merged within the Norwegian research council, are in the Dutch system divided over the organisation for scientific research NWO, the technology policy agency SENTER, the Royal Academy for Arts and Sciences, the University Associations, and the Sector Advisory Councils.

#### 2.2.2.1 The Netherlands Organisation for Scientific Research, NWO

The Netherlands Organisation for Scientific Research (NWO) is the central Dutch organisation in the field of fundamental and strategic scientific research. NWO encompasses all fields of scholarship. This means that NWO holds approximately a five percent share in the total annual investment by government and industry in scientific research and development. Despite this comparatively small share, NWO is the largest national sponsor of fundamental scientific research at the thirteen Dutch universities

#### 2.2.2.2 The Royal Netherlands Academy of Arts and Sciences

Over the last twenty years the Academy's has got more and more responsibilities in addition to its traditional role as an Academy and as a advising body to the Government in all fields of science.

The Academy makes its expertise available for assessing the quality of basic and strategic research performed in institutes, research groups or within the framework of specific programmes. One of its main tasks in evaluation is its responsibility for accrediting university institutes for postgraduate research training.
The Academy stimulates international co-operation of scientists in the arts and sciences. The KNAW contributes to the progress of the scientific debate. The Academy intends to provide a global scientific forum and subsidises congresses and symposia, actively promotes co-operation with sister-academies in other countries, host the Dutch committees on International Global Change programmes and manages the intergovernmental scientific programmes with China and Indonesia. The Academy presents several internationally renowned awards, such as the Leeuwenhoek Medal and the Lorentz Medal. Five Heineken Prizes are awarded every two years.

In addition to these activities, and like NWO, the Academy also oversees the work of para-university institutes. Complementary to NWO, the Academy is responsible for the institutes in fields of Science and Humanities which are administered by the Academy's Life Sciences Institute Board and Humanities/Social Sciences Institute Board. Most institutes have a long-term research commitment with a multi-disciplinary approach.

#### 2.2.2.3 Association of Dutch Universities, VSNU

The VSNU is the organisation of the Dutch universities, raised in 1985 as a platform for the universities to discuss common interests and issues and for protection of the universities interests. With respect to the latter, the VSNU is responsible for the universities participation in the dialogue with the Minister for Education, Culture and Sciences on higher education and university research policy and actively engages itself in discussions with the parliament. It is also the employer’s organisation, responsible for the dialogue with the unions on the collective agreements about the university employment contracts and policies.

It’s main task however within the research system, is probably the management of the quality system for university teaching and university research. In 1986 it took full responsibility for the university quality assurance system, at that time a condition of the Minister for more autonomy of the universities. Since, it has developed a consistent evaluation system based on self evaluation and visitation committees. In 1989 pilot visitations were run for the university education in History, Physics and Mechanical Engineering. In 1994 the first round was finished and a second round will be finished this year. In principle all university courses are evaluated every four year. The first university research evaluation started in 1993, and succeeded an evaluation system set up by the Ministry for Education, Culture and Sciences. The first round of these evaluations was finished last year. Again, every research group is to be evaluated every four years.

#### 2.2.2.4 Technology agency SENTER

SENTER is the agency of the Ministry of Economic Affairs for the implementation of taxation, credit and funding programs for technology policy, energy, environment policy, export and international collaboration.

It has not a policy role, but is a real agency focussing on the managing of schemes. In its aim to improve it has implemented quality systems focussing on the quality of its services towards clients.

2.2.2.5 The Sector Advisory Councils

In several sectors, Advisory Councils on Research (ACRs) have been set up. Their main task is to program research for the mid-term and long term, but they are also involved in processes which advance or follow research programming, like foresight and evaluation. There are only four of such councils: for agricultural innovation, for environment and nature research, for development-related research, and for health research.

ACR's have a tri-partite membership of scientists, research users and government representatives. They have no research funds to allocate and thus depend on quality of advice and relation with funders (that is Ministries with a research budget for the respective sector). They have to prepare quadrennial documents on overall policy and research directions. Their main impact is through a variety of reports published in the meantime, and the interactions and networking that are part of the preparation and dissemination of the reports.

.The ACRs collaborate, in addition, in a Consultative Committee for the Sectoral Councils, which maintains a public profile for linking research to societal objectives by regular (annual) symposia, special workshops, and background studies feeding into the workshops and symposia.

## 2.3 UK

### 2.3.1 Ministries

The Secretary of Trade and Industry has overall responsibility for the Government's science policy and support for science and technology as a whole. However, the Minister for Science and the Office of Science and Technology (OST) support the DTI in this role. When formed in 1992, the OST was based in the Cabinet Office, but since 1995, it has been a part of the DTI.

The OST's role is to take an overview of science, engineering and technology (SET) activities. OST inputs to overall macroeconomic policy formulation as well as having a direct investment role by allocating funds to the science base via the Research Councils. The Head of the OST is the Chief Scientific Advisor (CSA), who advises the Prime Minister, Cabinet and the Secretary of State for Trade and Industry, and the Minister for Science. The CSA is supported by the Trans-departmental Science and Technology Group within OST.

Other government departments also fund research and development. A number of Government Departments were reorganised in 2001, but notable funders of R&D include the Department of Health (around £500million a year), the Ministry of Defence (around £450million per year), the Department of Environment Food and Rural Affairs (DEFRA; around £250million per year), and the Department for

Education and Employment which for example funds the Higher Education Funding Council for England (HEFCE).

### 2.3.2 UK Research Councils

The UK Research Councils are established under Royal Charter to fulfil the objectives set out by Government in the May 1993 White Paper *Realising our Potential*. Statutory control of the Councils is exercised by the DTI, supported by the Director-General of Research Councils, within OST. The Research Councils comprise

- Biotechnology and Biological Sciences Research Council (BBSRC)
- Engineering and Physical Sciences Research Council (EPSRC)
- Economic and Social Research Council (ESRC)
- Medical Research Council (MRC)
- Natural Environment Research Council (NERC)
- Particle Physics and Astronomy Research Council (PPARC)
- Council for the Central Laboratory of the Research Councils (CLRC)

All except for MRC and CLRC are based at the same location in Swindon.

The Arts and Humanities Research Board (AHRB) was established in October 1998, as an initial response to the Dearing Report. This recommended that a body be set up to provide support for research in the arts and humanities. Development of the AHRB into the Arts and Humanities Research Council is pending a decision by the Government. The AHRB is based in Bristol.

### 2.3.3 Major Charitable Funders

The Wellcome Trust is the world's largest medical charity, with an asset base of around £13billion and an estimated expenditure in 1999/2000 of around £600million. The Wellcome Trust are working in partnership with the Government in a £1billion programme to renew infrastructure for science.

Other important charitable funders include the Imperial Cancer Research Fund, the Nuffield Foundation the Kohn Foundation.

### 2.3.4 Other channels for public funds

2.3.4.1 Royal Society

The Royal Society is the UK's national science academy. It receives around £26 million from the government a year as a Parliamentary Grant in Aid. Around £14million a year is spent financing research directly

**Exhibit 3 Allocation of the Science budget 1999–2000**

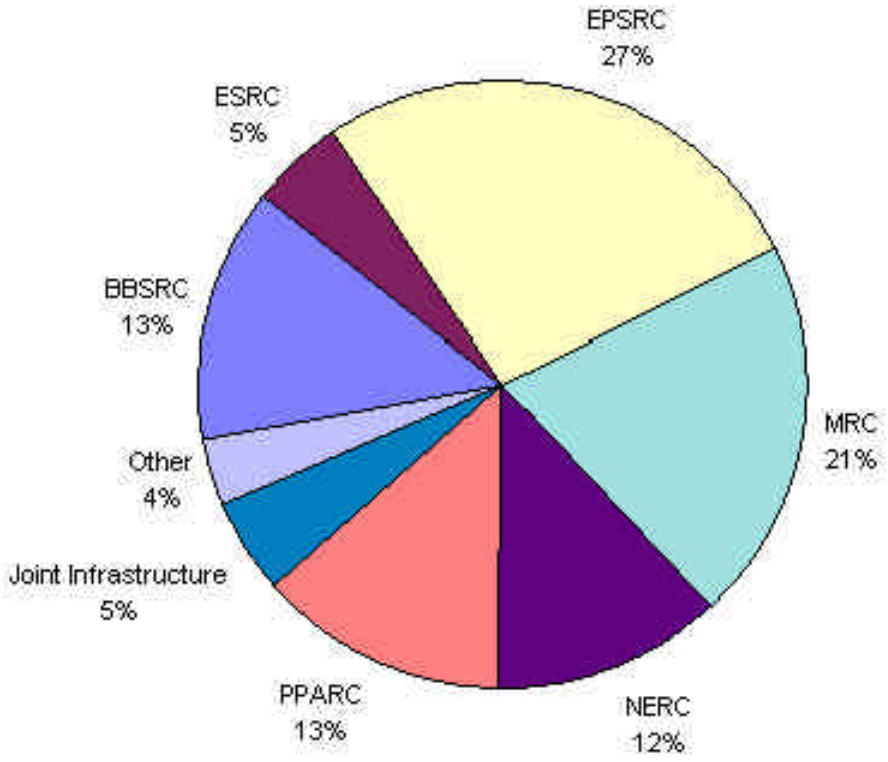

EPSRC
27%
ESRC
5%
BBSRC
13%
MRC
21%
Other
4%
Joint Infrastructure
5%
PPARC
13%
NERC
12%

**Exhibit 4 Hierarchy of relationships between actors in the UK science base**

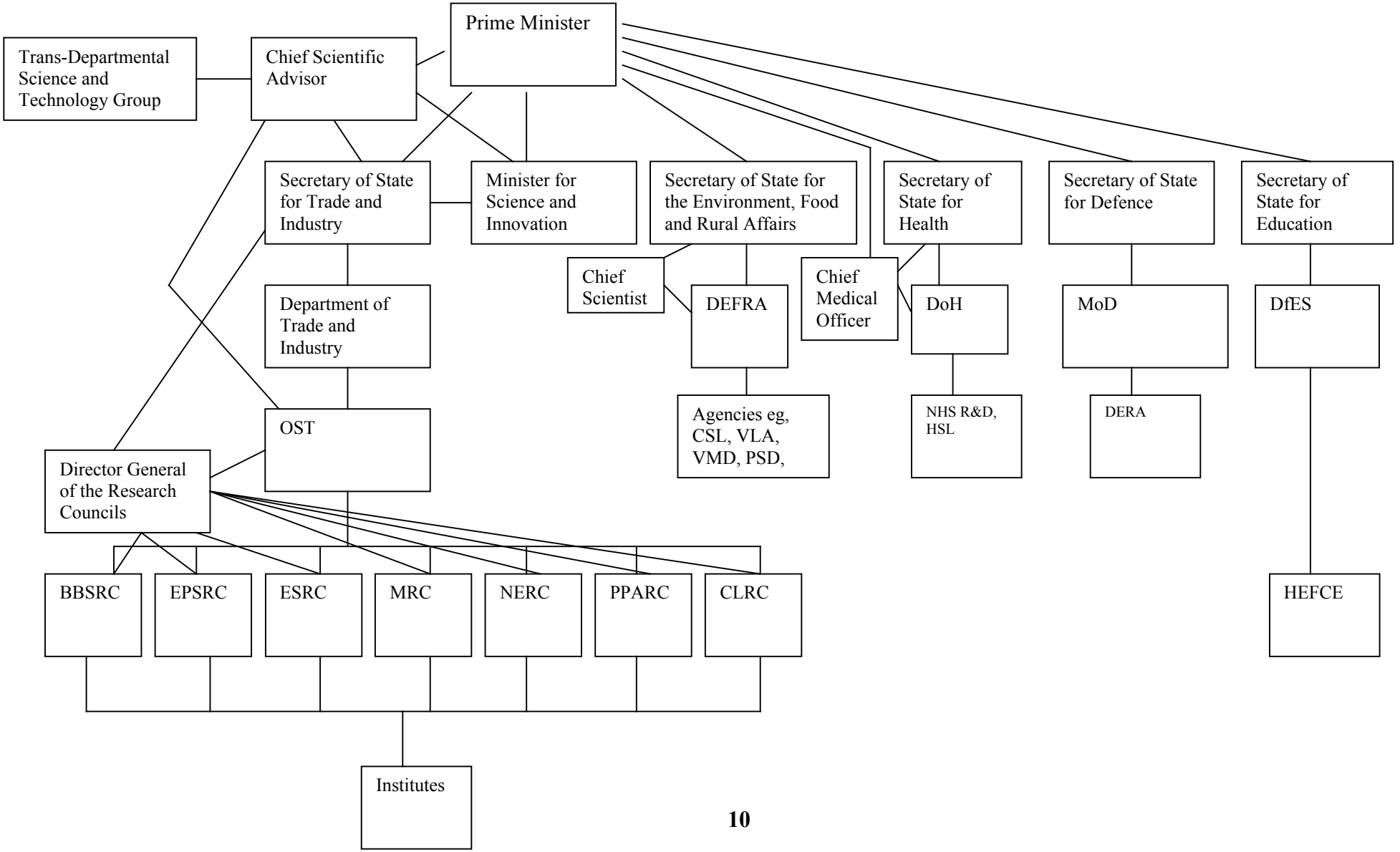
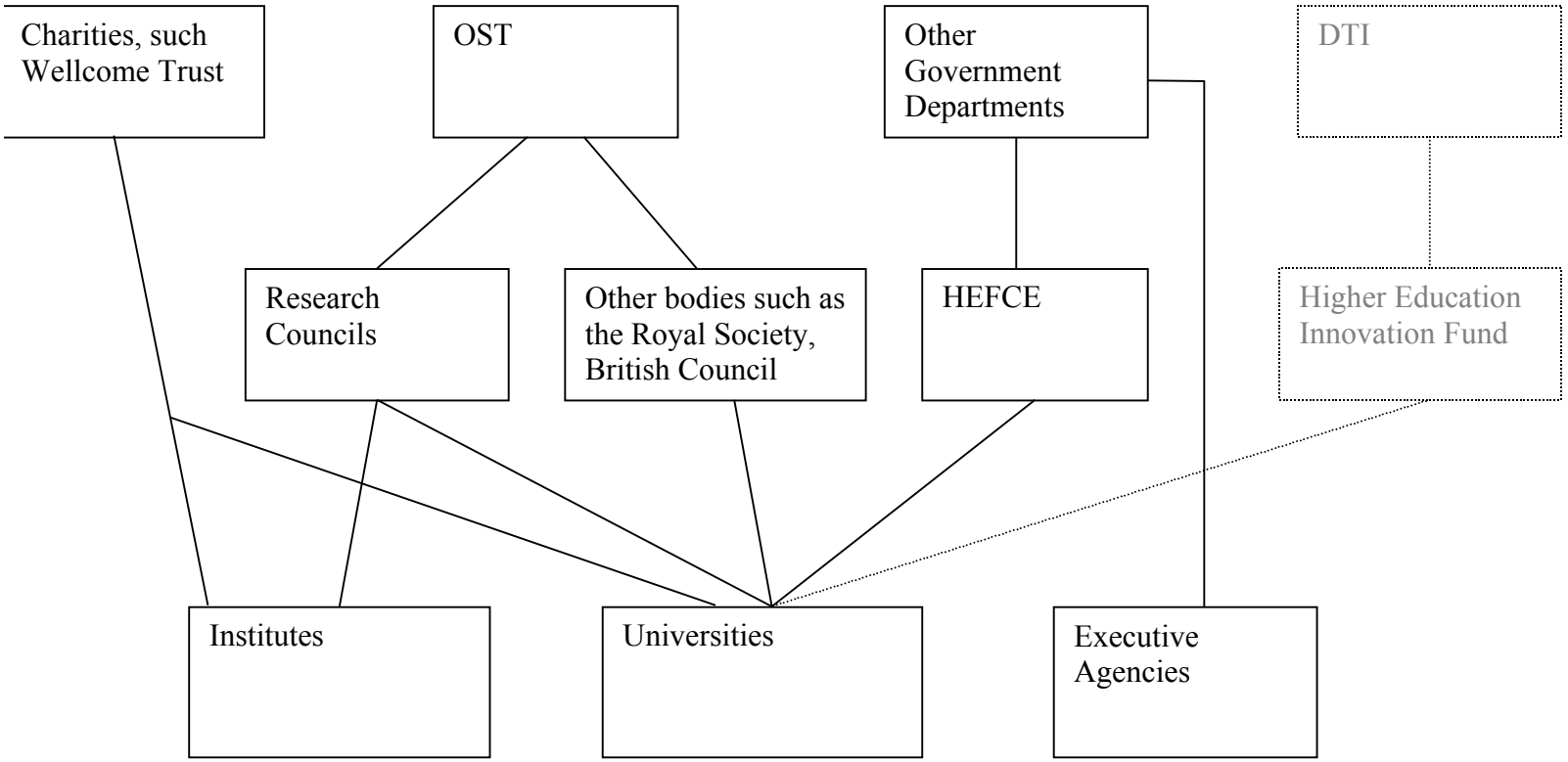


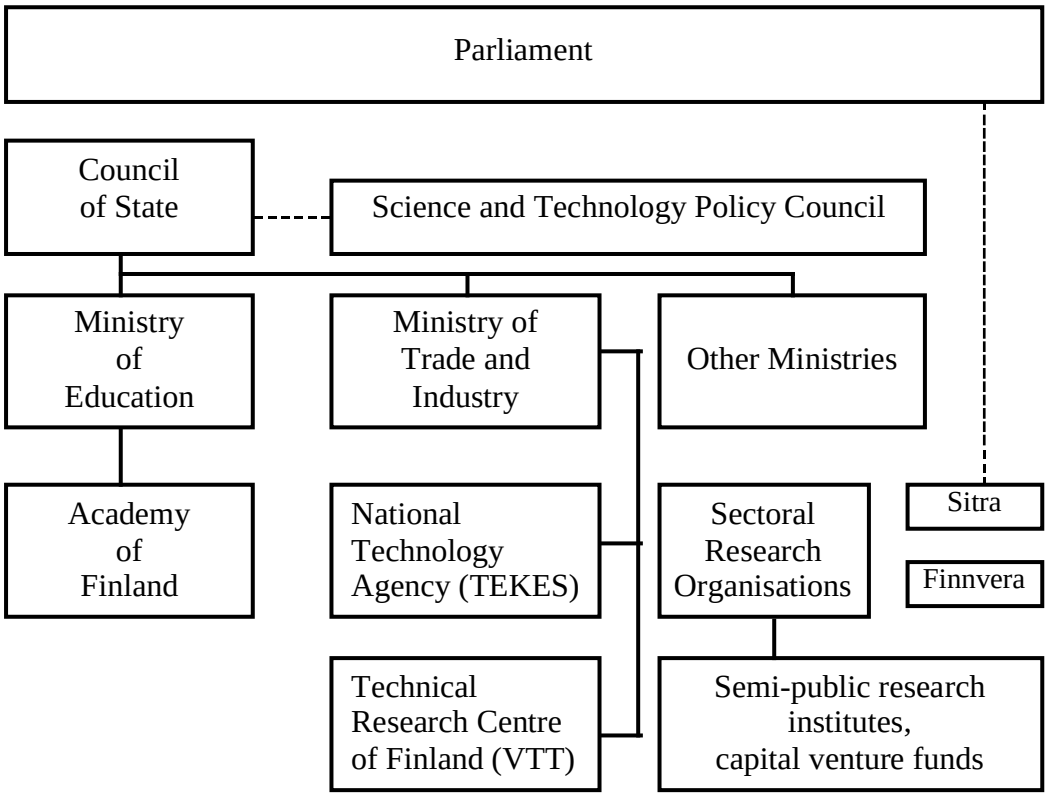
**Exhibit 5 Sources of funding for research in the public sector in the UK**



## 2.4 Finland

The broad structure of the Finnish research and development (R&D) system is shown in **Exhibit 6**. The structure is far simpler than the UK equivalent. Essentially a cabinet committee (Science and Technology Policy Council) sets science and research policy, with the Academy of Finland dealing with central financing of basic research, and the national Technology Agency (Tekes) dealing with the financing of technical research and development. The two most important Ministries in the R&D system are the Ministry of Education (ME) and the Ministry of Trade and Industry (MTI). The ME is responsible for universities and the Academy of Finland. The MTI on the other hand is responsible for the National Technology Agency (Tekes), and the Technical research Centre of Finland (VTT).

**Exhibit 6 Structure of the Finnish research and development system.**




Other Ministries also have responsibility for research that serves their own fields. Most of this research is carried out in the sectoral institutes.

Other significant players in the Finnish R&D system include the Finnish National Fund for Research and Development (Sitra). Sitra is a relatively autonomous organisation, subordinate to Parliament. Sitra works within the field of technology transfer and seed finance.

The Science and Technology Policy Council was established in March 1987, following on from its predecessor, the Science Policy Council. It is chaired by the Prime Minister. The membership includes the Ministers of Education, Trade and Industry, and Finance, as well as four other Ministers and ten members drawn from representatives of the Academy of Finland, Tekes, industry and employers' and employees' organisations. The government appoints the Science and Technology Policy Council for a three-year term.

## 2.5 New Zealand

Until mid 1980s, NZ was protectionist, R&D was done under the aegis of government departments (the Commonwealth system, including a DSIR at the level of a government department). A strong liberalisation movement created a minimal government, which could intervene only in the case of market failure, or when public goods had to be produced. This led to the Science Reform of the early 1990s. Independent Crown Research Institutes [CRI] (owned by two Ministers: Treasury and the newly established Minister of RS&T [Research, Science & Technology] responsible for the Science Vote which introduced contestable funding for the CRI) were created, following traditional sectorial lines. At the same time, new public management was introduced, where government ministries were small and policy-oriented. MoRST (serving the Minister) elaborated global priority statements to guide the purchasers, i.e. the newly established Foundation for RST, the renamed Health Research Council (moved from Ministry of Health to MoRST). In addition, there were purchasers managing funds for open-ended research (FoRST, then Royal Society of New Zealand managing the Marsden Fund, an output class within the Science Vote – and the nearest equivalent to a university-oriented research council). Research performers (in terms of budget, mainly CRI – up to 85 %) were called providers. In the case of R&D, a PPP set-up (policy/purchase/providers) cannot work in terms of outputs alone. So notions of investment, and by now also change incentives, were added.

Very recently (partly because of the Labour Government coming into its own since 1999), cross-agency and cross-Ministerial interactions are set up, which have led to a Centre of Research Excellence Program (for the universities) managed under the responsibility of MoRST but financed through the Education Vote. Also, a Science and Innovation Council was established by the Prime Minister. This has to do with the interest in a "new" economy in contrast to the agricultural-commodity-based "old" economy, and is linked to buzzwords like the 'knowledge society.'

## 2.6 Germany

In 1996 the federal government spent a total of 16.7 bn DM on research and development. The spectrum of instruments available to German research and technology policy is widely differentiated in the meantime (see **Exhibit 7***)* reaching from the *institutional* support for research facilities (6.8 bn DM), over various forms of financial incentives (*programmes;* 7.5 bn DM) to the carrying out of research and experimental development in public or industrial research laboratories, to the creation of an "innovation-oriented" infrastructure, including the institutions and mechanisms of technology transfer. These instruments characterise, by and large, the practice of research and innovation policy in the Federal Republic of Germany since the 1970s.

In 1995 approx. 460,000 persons (full-time equivalents) were employed in R&D. The research infrastructure can be characterised as comparatively differentiated (See **Exhibit 8***)*

- *Industry* carries out the greatest part of research and development (R&D) in Germany (283,000 employees in R&D): in 1995 industry invested ca. 50 bn DM, for the most part in applied research and experimental development. Only a very few large multinational enterprises, especially in the chemical and electrical engineering industry, carry out long-term application-oriented basic research themselves.
- The second largest share of expenditure on research (14.4 bn DM) falls to the *higher education institutions (HEIs)* (335 national or officially recognised HEIs, including 113 universities and comparable installations; 101.000 employees in R&D). They concentrate on basic research and long-term application-oriented research, for the most part financed by the federal states and the German Research Association (DFG 1997: 2.1 bn DM), a government-funded but largely independent and self-organised body in research promotion. In the course of the 1980s the share of industrial research contracts in the research budgets of individual universities, especially technical ones, increased significantly (to 1.2 bn DM).
- The 15 "national research centres" of the federal *Helmholtz Society* (20,000 R&D employees), perform above all long-term oriented research which is considered too risky, or entails high costs (plants/facilities) and large research teams. In the past years the Helmholtz Centers have transformed their fields of activity significantly, ranging today from high-energy physics to space technology, medicine, biotechnology, applied mathematics and software development up to environmental technology. Moreoever, various federal ministeries maintain so-called *departmental research institutions* to execute their scientific-technical tasks.
- The institutes of the *Max Planck Society* (9,900 R&D employees), a research organisation which has its origins in the "Kaiser-Wilhelm-Gesellschaft" established in 1911, concentrates on selected fields of basic research in the natural sciences and humanities. They focus above all on those research areas in which a significant knowledge and development potential is assumed, while not yet anchored in university research, either because of their interdisciplinary character or because of the resources required.
- The institutes of the *Fraunhofer Society* (ca. 9.000 R&D employees) aim to promote the practical utilisation of scientific knowledge via long-term application-oriented and applied research. The Fraunhofer Society principally carries out contract research, which is financed partly by industry and partly by government bodies. The society regards itself as an "interface" between science and industry in Germany. It was established in 1949; no other research organisation in Germany has grown so rapidly in the past 25 years.
  In 2001, a big national information technology research centre (GMD, so far part of the Helmholtz Association, i.e. 100% institutionally funded), was merged with the Fraunhofer Society. As a consequence, Fraunhofer is no disposing of the largest ICT research capacity in Europe.
- The research institutions of the *Confederation of Industrial Research Associations* (AiF) carry out above all applied research and experimental development for the

sector-specific needs of industrial enterprises. Their research palette, which is partly financed by public means and partly by industry, is geared especially to small and medium-sized enterprises which are organised in industry-sectoral research associations.

Finally, the institutes of the *"Science Association G.W. Leibniz (WGL)"* (formerly the "Blue List") form a last category which has in common that they are supported by the federal government and the federal states (ca. 9,800 employees). After the fusion of the East and West German research systems in 1990, many East German institutions found their home base here.

**Exhibit 7 Governance of Research Funding in Germany (source: BMBF 2000)**

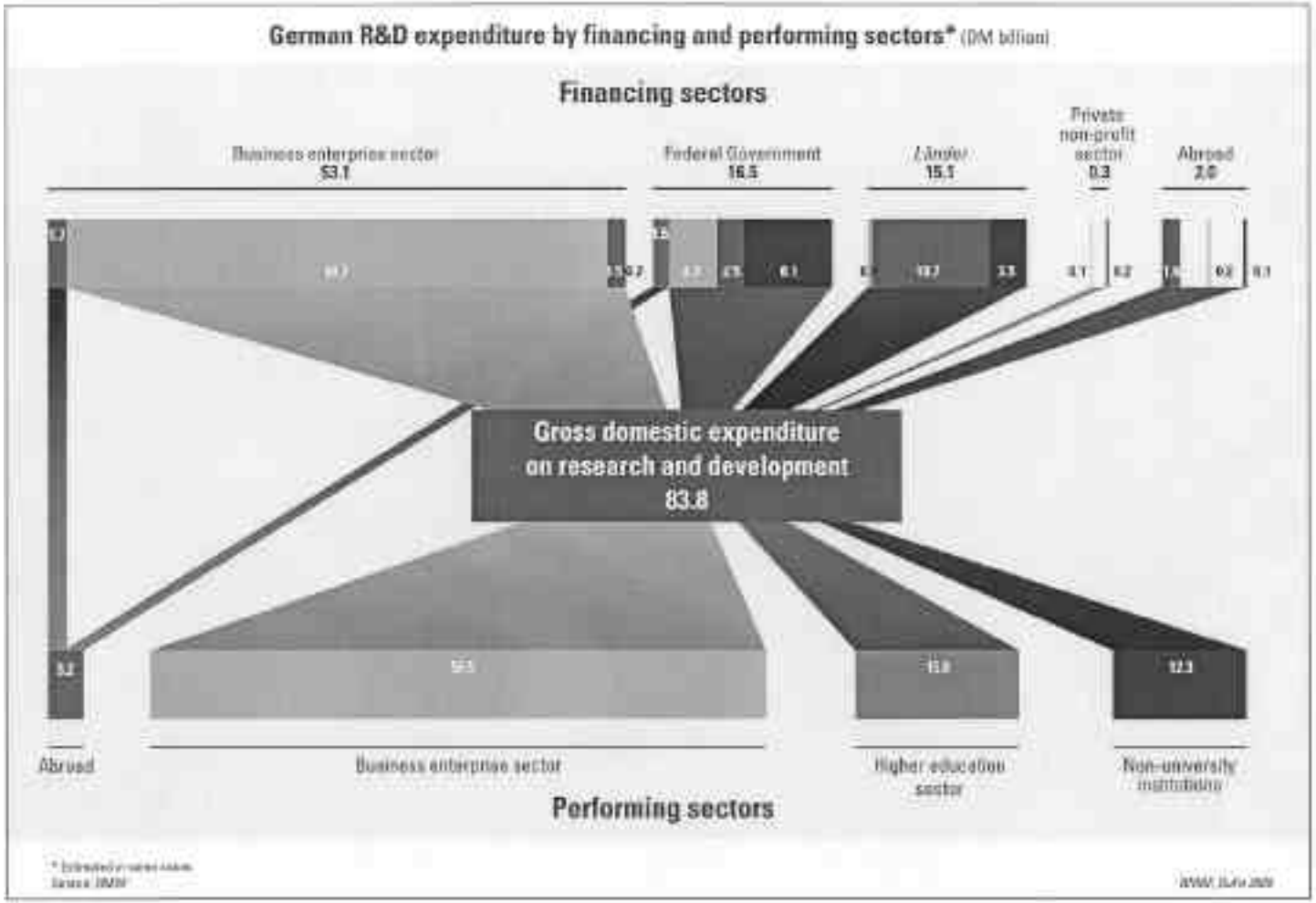
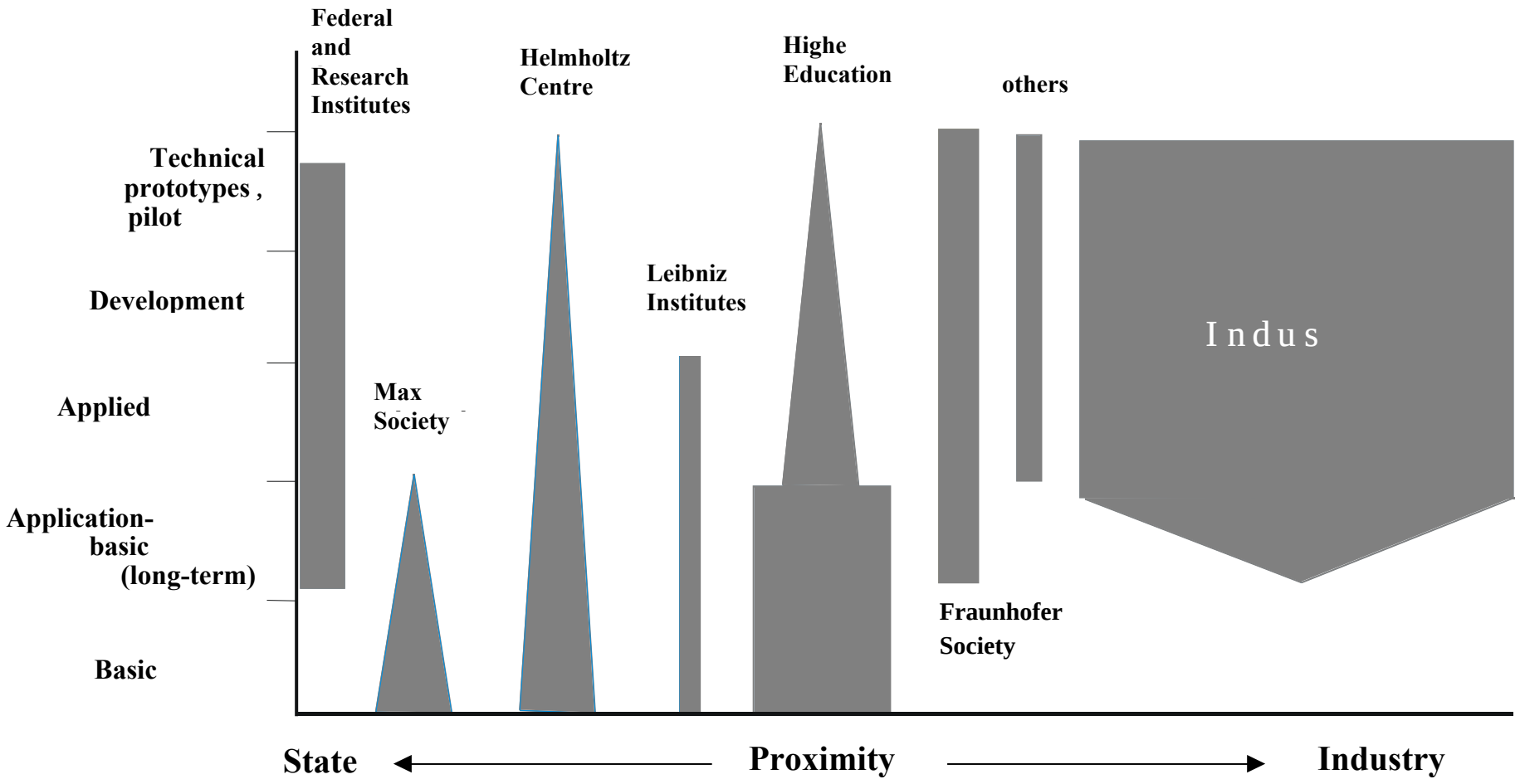


**Exhibit 8** German "Research Landscape" by type of research, degree of state or industry funding, and expenditure



## 2.7 Switzerland

Switzerland has a strong industrial research base (in particular in chemical and pharmaceutical sector), strong technological universities on national level (the Swiss Federal institutes of Technology, ETH, EFPL), several universities on regional level, and relatively small institute sector. There is no central political research and innovation responsibility, but relatively clear separation of science and research funding tasks (*Swiss National Science Foundation, SNSF*) and the related ministry (Home Affairs) on the one hand, and innovation policy responsibility (*Commission for Technology and Innovation, CTI*) and the related ministry (Economic Affairs) on the other (**Exhibit 9)**

Presently this governance structure is under review, based on system level evaluations both of SNSF and CTI (see below). The evaluation is carried out under the auspices of the *Swiss Science and Technology Council* (SSTC) is the advisory body of the Federal Council for all matters relating to science, education, research and technology policy. SSTC works together with institutions of the Swiss science policy such as the Center for Science and Technology Studies (CEST). On own initiative or on behalf of the Federal Council, the Federal Department of Economic Affairs, or the Federal Department of Home Affairs, the SSTC takes position on national science, education, research and technology policy problems and issues.

The *Swiss Science Agency* (Gruppe für Wissenschaft und Forschung) within the Federal Ministry of Home Affairs consists of the State Secretariat and the *Federal Office for Education and Science (BBW)*, the Board of the Swiss Federal Institutes of Technology (ETH, EFPL) is assigned to the Agency. The State Secretariat prepares decisions for a coherent policy in the areas of science, research and higher education; it works towards a co-ordinated university an research policy and ensures sufficient consideration of the position of the Confederation in the co-ordinating bodies; it maintains ralationships with international partners and develops international relations particularly within the EU framework;

The BBW implements the national research policies. 43 % of BBW's budget is devoted to the SNSF (science foundation) (Exhibit 10)

**Exhibit 9 Hierarchy of relationships between key actors in the Swiss research and innovation system**

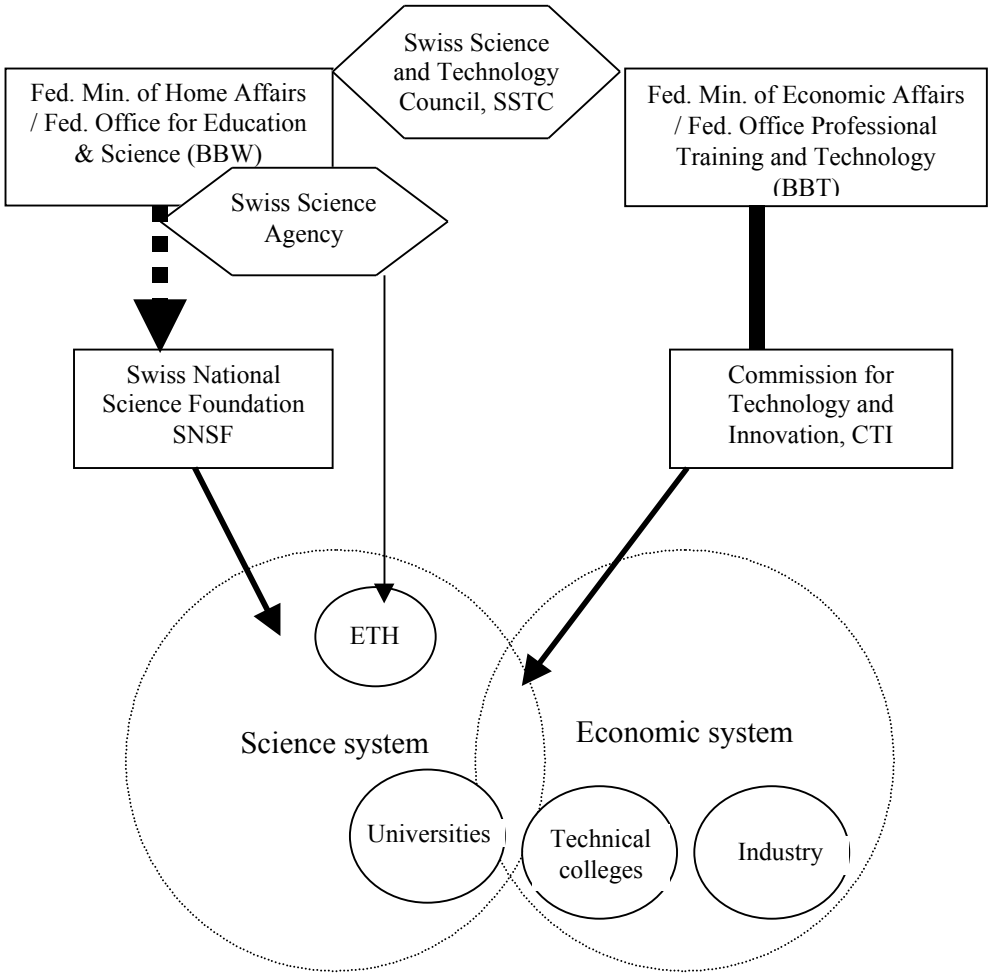
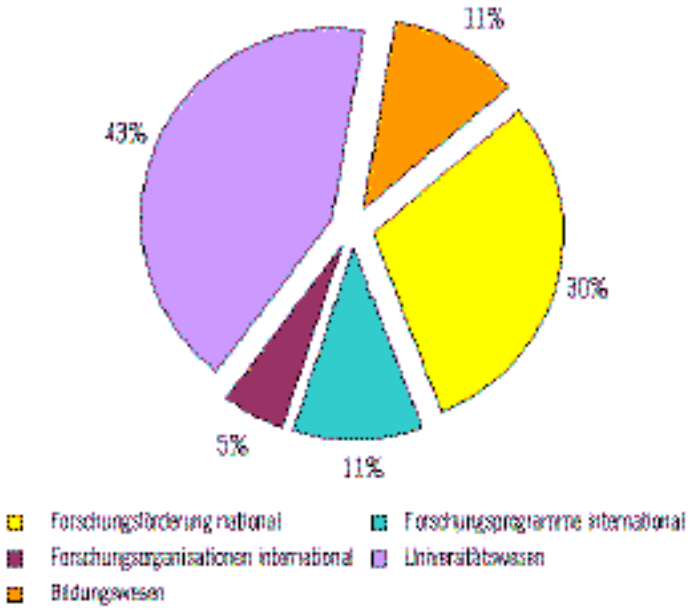


**Exhibit 10 Budget distribution Office for Education and Science (BBW) 1999**



# 3 Governance of the research councils

## 3.1 Sweden

On 1 January 2001, a new organisational structure came into being. Three new research councils have been established, one Science Council and two specialised research councils; one council for working life and social science and one for environment, agriculture, forestry and societal planning. In addition, a new authority, VINNOVA, has been created for research funding and development work to support the innovation system and sustainable development and growth. [4]

*The Swedish Research Council* has the leading role among the councils. The *Swedish Council for Working Life and Social Research* and the *Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning* are active in fields prioritised by the government.

The Government determines the goals, guidelines and distribution of resources for the Research councils and the innovation agency VINNOVA through appropriations and regulatory letters. The regulatory letters often underline the research priorities, indicating earmarked sums, but are not very detailed. However, the Government does **not control** the above mentioned agencies' application of laws or their decisions on various matters.[5]

The research councils consist partly of research representatives, and partly of general representatives appointed by the Government. The research representatives hold the majority on the boards, and are appointed by the research community through electorate bodies according to a special election procedure. [6]

The research council part of the system, where academics dominate the governance process, is being extended to cover more of the state's non-defence R&D spending than before. The resources for the research councils and for the general university funds, which are also spent under academic control, are being increased.

The Government has decided to increase the funding of research and research education with 1 279 millions SEK during 2000-2003.

## 3.2 Netherlands

The Netherlands Organisation for Scientific Research (NWO) is the central Dutch organisation in the field of fundamental and strategic scientific research. NWO encompasses all fields of scholarship. This means that NWO holds approximately a five percent share in the total annual investment by government and industry in scientific research and development. Despite this comparatively small share, NWO is the largest national sponsor of fundamental scientific research at the thirteen Dutch universities.

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4 http://utbildning.regeringen.se/inenglish/organisation/agencies.htm
5 http://utbildning.regeringen.se/inenglish/organisation/agencies.htm
6 http://utbildning.regeringen.se/inenglish/educresearch/research.htm#International

NWO is a decentralised organisation. It comprises seven Councils which represent as many fields of science: the Geo and Life Sciences, the Chemical Sciences, the Physical Sciences, the Humanities, the Social Sciences, the Medical Sciences and the Technical Sciences. The Councils are responsible for the implementation of research policy and resource distribution in their area. When allocating funds they are responsible to the Governing Board.

In addition there are two multidisciplinary foundations, reporting directly to the Governing Board. These are the Netherlands Foundation for the Advancement of Tropical Research (WOTRO) and the National Computing Facilities Foundation (NCF). WOTRO is engaged in the promotion and co-ordination of research in tropical and developing countries, with the emphasis on environmental research, tropical medicine, urban deprivation and cultural identity and change. NCF furthers scientific and technical research by providing access to advanced computing facilities.

Since the early nineties, NWO is in a process of transformation, and partly because of external pressures, it has now reorganised itself into a research council that operates strategically The structure of the organisation has been drastically revised. Previously the twenty or so foundations within the Councils were responsible for the allocation of the funds to specific disciplines. This management level has now been eliminated. This means the organisation can operate in a more flexible way. The most important reason for this restructuring was to facilitate interaction among disciplines in scientific as well as social questions. Institutes, often with the legal status of foundations, are now directly responsible to the Governing Board. This means the institutes are also formally more in competition with other applicants to obtain NWO subsidies.

Every four year NWO makes a strategic plan , which the ministry of science has to approve, and which each sub council has to elaborate an own strategic plan. There is no direct influence from the government in the strategic plan, but through the consultation with the stakeholders, which includes also other bodies in the research system.

## 3.3 UK

### 3.3.1 Broad principles

The role of the government in the governance of the research councils was laid out in the 1965 *Science and Technology Act*, and later in the 1993 White Paper *Realising Our Potential*.

The policy framework for the Research Councils is determined by Government in the Comprehensive Spending Review, and more specifically in the Science Budget, which sets broad priorities between several classes of activity. In practice, priority areas are defined in consultation with the Chief Executives of Research Councils and the Director General of the Research Councils. Within that policy framework, and in

keeping with the Haldane Principle, day-to-day decisions on scientific merits are taken by the Research Councils.[7]

This means that OST and DTI stipulate, for example, whether to join particular International Collaborations, whether certain broad areas of science or activities should be given priority, how much money should go to each Council and indeed whether there should be a particular Council at all. Government has no involvement in deciding Research Council programmes or thematic areas beyond some broad priority setting. Neither does it have any involvement with which people or which research projects receive funding. Within this, the Councils are free – and are expected – to set their own policies.

### 3.3.2 Governance of the Councils themselves

The governing body for research councils is a Council, which has responsibility for decisions on policy and planning. Membership of the Council is drawn from the academic and industrial communities; all members are appointed *ad hominem* by the Secretary of State for Trade and Industry. There is no DTI/OST representation on Councils, but OST will send an observer to attend Council meetings.

The Councils are guided by a variety of advisory committees. On a day-to-day basis the research councils are governed by a part-time Chairman of Council, with responsibility for management of programmes being delegated to a full-time Chief Executive.

## 3.4 Finland

### 3.4.1 Academy of Finland

The Academy of Finland's operation covers all scientific disciplines. The Academy operates within the administrative sector of the Ministry of Education and is funded through the state budget. In 2000, some 12 per cent of all government research funding was channelled through the Academy.

The objectives for the Academy's operation, and the resources made available to the Academy are decided on an annual basis in a performance-agreement between the Academy of Finland and the Ministry of Education. The Academy's President makes the corresponding agreements on target outcomes with the research councils and the Administrative Office, and the Director of Administration with different units within the Administrative Office.

Act regarding the Academy of Finland (May 27 1994), Section 7:
"An appeal may not be made against a decision by the Academy of Finland concerning a research appropriation, grant or contract."

[7] The Haldane Principle, which was formulated nearly 80 years ago, is that the Research Councils and universities shouldchoose which research to support on scientific criteria, at 'arms length' from political considerations.

The president of the Academy of Finland is a member of the Science and Technology Policy Council, which is presided over by the Prime Minister of Finland.

The highest executive body of the Academy of Finland is its Board, whose seven members are responsible for the Academy's science policy line and the allocation of research appropriations to research councils. The head of the Academy of Finland and the Chair of its Board is the President, whom the President of the Republic of Finland appoints for a fixed term.

The Academy's Board and the members of the research councils are appointed by the Council of State for a three-year term.

The Academy of Finland has **four research councils**: the Research Council for Biosciences and Environment, the Research Council for Culture and Society, the Research Council for Natural Sciences and Engineering, and the Research Council for Health. Each council has a Chair and ten members. The councils decide on research funding within their respective fields and act as experts in science policy issues.

### 3.4.2 Tekes

There is close liaison between Tekes and the MTI since the Chairman of the Tekes Board is the Deputy Director General of the MTI. Guidelines for research funding priorities are provided by the MTI in consultation with Tekes, however, the allocation of funds between different programmes and indeed the formation of programmes themselves are a matter for Tekes to decide.

Tekes itself is governed by a Management Group, which includes Directors from the various operating units.

## 3.5 New Zealand

The purchasers are relatively independent within an overall framework. The framework consists of definition of goals and overall approaches for various output classes (= funding "silos"), and their actual allocation and management is contracted out (after a bidding process). For example, this is how the Centres of Research Excellence programme was awarded to the Royal Society of New Zealand. For the Public Good Science Fund (PGSF), now Public Good Science & Technology (PGST), and for the New Economy Research Fund (NERF), there are also regular (tri-annual) outline priority statements from the Minister of RS&T. While such statements are directed to the purchaser (here, FoRST), their aim is to "move" New Zealand's R&D, in particular the CRI, into strategically relevant directions. FoRST has taken up this long-term in goal in earnest, and was working towards it (by introducing Strategic Portfolio Outlines) already at the time of the "Transition" (1999-2000), when MoRST (partly based on a foresight exercise and the resulting Blueprint for Change) introduced outcome-orientation rather than output-orientation. Internal reorganisation of FoRST took precedence, and for two years earlier patronage of the CRIs was continued more or less unchanged (at the level of funding contracts). The new approach is now in place, including a message of possible disinvestment, and will be felt by the providers, in particular the CRIs.

In addition to the specifics of the contract, purchasers also have to meet “stewardship expectations”; responsiveness to Maori is an example of such a stewardship expectation.

FoRST, under its Act (1989, 1993), has also the task to advise the Minsiter of RST about policy. In the early years, FoRST was active in helping shape the system. After 1995, it “fell out of the loop”, and MoRST remained as the only policy agency. During the Transition, FoRST was reactive. By now, it is back in the loop, but for specific advice on strategic priorities, and for policy-relevant information about the state of the research and innovation system.

## 3.6 Germany

One of the main reasons for the extent of institutional differentiation in the German research „landscape“ is the fact that there is *no strong, central policy body responsible for science, research and technology*: within the federal system of Germany, it is essentially the 16 states (*Länder*) that are responsible for science and academic research. Although in the course of time the Federal Government has, in agreement with the states, taken on many areas of responsibility, there is always a certain degree of competition between the central authorities (in particular the Federal Ministry for Education and Research, BMBF, and the federal ministry for Economic Affairs and Technology, BMWI) and the states, and also between the various states. The states are running nearly all higher education institutes; they maintain (to a varying extent) non-university research institutions and - also to a varying extent - launched their own technology policy programmes. This does lead to some redundancies in the capacities of the research and innovation system, but it also guarantees a de-central, "autonomous" structure of research capacities, even outside the large cities and agglomerations. Against this background, it is not surprising that German S/T policies are *not characterised* by immediate *top-down political control* and steering – state policies aiming at change and modernisation can rather be mediated than executed. Accordingly, over the last decades public policies relating to industrial innovation have been described as "diffusion-oriented" rather than "mission-oriented" (cf. Ergas 1987, 192).

Since the late 1990s, nevertheless, the Federal Government in Germany made several *attempts at re-organising* the "research and innovation landscape" by means of promotional policy, and by exercising pressure to modernise on research institutions:

- So since the mid 1990s many research and innovation policy *programmes* have been formulated as *competitions*, which aim to bring about a structural change in science and the economy: consortia of candidates (usually institutions) should in a self-organised process elaborate joint project plans and detailed goals. Partnerships among the various institutions (research facilities, universities, private firms, technology centres, further education establishments etc.) aim with a bundle of coordinated measures to optimise entire innovation systems. Such *multi-actor and/or multi-measure programmes* can apply either to regions and/or certain aims and/or certain technologies and branches.
- During the years 1995 – 2001 the missions of all major research (funding) institutions Germany were critically assessed through so-called system-level evaluations. *"System evaluations"* were conducted with the Leibniz-Association,

of the Max Planck Society together with the German Research Association (DFG), the Fraunhofer Society, and the Helmholtz Association. In sum, the international groups of evaluators called for a loosening of the strictly disciplinary orientation, the development of flexible and efficient forms of organisation for a temporary co-operation of different disciplines and groups in problem-oriented research fields, efficacious procedures for quality assurance with external participation, an improved collaboration between universities and non-university research institutions, the promotion of institutions from cross-disciplinary research centres as well as an increasingly international orientation and networking among the institutions.

Recently, the BMBF urged a big national IT research centre (GMD, part of the Helmholtz Association), so far 100% institutionally funded, to join the Fraunhofer Society (applied industrial contract research). As a consequence, Fraunhofer is no disposing of the largest ICT research capacity in Europe.

## 3.7 Switzerland

The universities are run under a national university law. The SNSF which funds basic research is set up as a relatively independent foundation (Stiftung), while CTI fostering industrial innovation is under direct control of the Ministry of Economic Affairs.

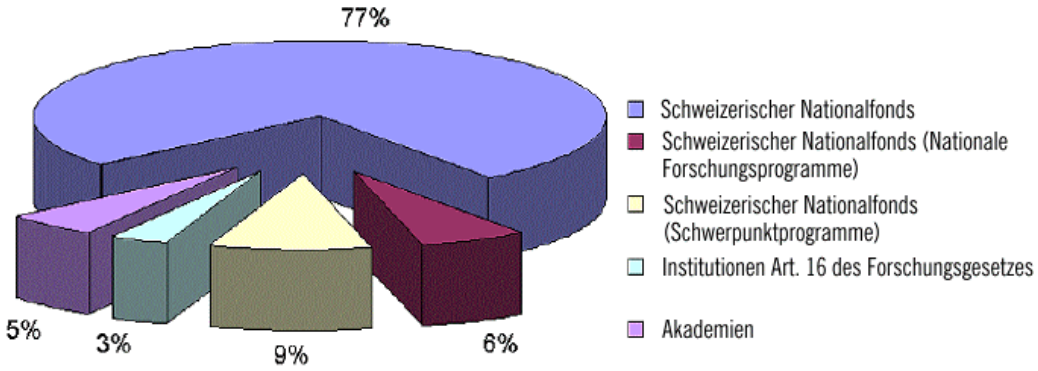
### 3.7.1 Research funding by the Swiss National Science Foundation (SNSF)

Acting on a mandate issued by the Swiss Federal Government, the Swiss National Science Foundation (SNSF) supports research undertaken inside and outside universities and fosters young scientific talent. The Foundation Council is the governing body of the SNSF, which was founded in 1952. The Foundation Council has representatives of the scientific and research communities, the Federal Government and the cantons as well as economic and cultural institutions.

The Research Council, which is divided into four Divisions, evaluates research projects and makes decisions about awarding grants. The Local Research Commissions award fellowships for prospective researchers and assist the SNSF with the evaluation of grant applications.

The SNSF is responsible for responsive mode research funding (77 %), and for various national and international research programmes (see **Exhibit 11**). These programmes are coordinated research efforts of restricted duration and with clearly defined aims. Co-operation with non-academic partners, the transfer of knowledge and know-how in training and in practice and the translation of research results into a form suitable for future users and interested members of the public are all important features of the research programmes.

**Exhibit 11 Budget distribution of the Swiss National Science Foundation (SNSF)**




### 3.7.2 Innovation policy of the Commission for Technology and Innovation (CTI)

Swiss technology and innovation policy, according to the Federal Council, encompasses 'all measures undertaken by the State which are aimed at directly or indirectly influencing the development, as well as the application and dissemination, of new, technically relevant knowledge. The primary goal of technology policy is the securing of the basic necessities of life of the population and the competitiveness of the economy.'[1]

Characteristic of the Federal Government's technology policy is support of technology diffusion throughout Switzerland. The body charged with this responsibility is the Federal Office of Professional Training and Technology (BBT) of the Federal Department of Economic Affairs. Accordingly, the mandate of the BBT sets the following goals, among others, in the field of technology and innovation[2]:

- "[the BBT] … promotes innovation activity and ability, especially in respect of the speedy application of the latest knowledge concerning innovative products and processes."
- "[the BBT] … has the primary responsibility for the policy of the Federal Government concerning vocational training, the Universities of Applied Sciences and technology policy including international responsibilities in the field of technology policy."
- "Within the BBT, the Commission for Technology and Innovation (CTI) is the centre of competence for the promotion of technology as well as for knowledge and technology transfer."

BBT and the Commission for Technology and Innovation (CTI) jointly implement the government's technology and innovation policy. CTI is the most important institution

[1] Federal Council, The Technology Policy of the Federal Government, Berne 1992, S.V.
[2] Extract from the procedural regulations of the Federal Department of Economic Affairs, 14 June 1999

of the Federal Government with regard to technology and innovation policy. It represents the key instrument of the Government's efforts in the promotion of innovation as well as the transfer of knowledge and technology. The Commission's appointed members are industrialists, researchers, and policymakers; they do the commission work as citizen's service (Milizdienst). The CTI's activity is considered as an instrument of economic policy, thereby searching for complementarity with science and research policy, it's mission is characterised as follows:

- Support for the innovation processes of the economy to achieve improvement in its competitiveness and improvement of the performance of the public sector
- Promotion of the development and application of new technologies through financial contributions, professional services and know-how in innovation management
- Promotion of projects on national and international level
- Comprehensive approach
- Bringing together dynamic private sector enterprises and institutions of the public sector, with researchers from non-profit making research institutions
- Contribution to the accelerated application of research results to products, processes and services which can be successful in the market place
- Specific services for other Offices of the Federal Government.

### 3.7.3 System level evaluations

Because the Federal Council wants to enhance the effectiveness of the fostering instruments Swiss National Science Foundation (SNSF) and Commission for Technology and Innovation (CTI), and in order to optimize coordination of its science and economic policies, it has mandated the Swiss Science and Technology Council to conduct an evaluation of the SNSF and the CTI. The focus is to be on the following aspects: 1) The role of the SNSF and the CTI in the Swiss system of promoting research, development, technology and innovation. 2) International involvement with respect to the activities of the SNSF and the CTI. 3) The strategic positioning of the SNSF and the CTI in this context. The results of this evaluation should help in establishing the governmental goals for education, science, and technology policy 2004-2007.

The evaluation of the SNSF is a three-step process:

1.Self-evaluation of the SNSF (including the SNSF basic report)
2.Evaluation by external top experts (including an expert report). Further to consultations with the SNSF and the Federal Office for Education and Science (BBW), the experts are appointed by the SSTC.
3.The SSTC publishes a final report which includes recommendations to the Federal Council. Its report is based on the two basic reports (self-evaluation and expert report).

The evaluation of the CTI is organised similarly:

1.Self-evaluation of the CTI (including the CTI basic report)
2.Evaluation by external top experts (including an expert report). Further to consultations with the CTI , the experts are appointed by the SSTC.

3.The SSTC publishes a final report which includes recommendations to the Federal Council. Its report is based on the two basic reports (self-evaluation and expert report).

*In 2002*, the results of these system level evaluations will feed a national political debate on the future institutional shape of the country's research and innovation policy. Thereby, a *key question is whether CTI – and innovation policy – will be strengthened, or will be more narrowly linked to SNSF and the Ministry of Home Affairs*.

# 4 Programming vs. free funding

## 4.1 Sweden

The Swedish Research Council promotes basic research within its field of interest setting its priority according to Government guidelines. The other two councils are supposed to fund both basic and needs-driven research.

Formas has a rather free funding approach. The council finances both applied and "directed" basic research, the balance between the two forms of research depends on the quality of the incoming proposals.[8]

FAS receives guidelines from the government on the priority areas of research and sets up a more detailed research strategy by holding thematic conferences and strategic "knowledge overviews". The council funds program research but not in the traditional meaning of the word. Its program funding aims at giving additional resources to major research initiatives with international aspects. [9]

VINNOVA only finances needs-driven research by basing its activities on the needs that exist among the different types of players in society. These may be regions, suppliers, emerging industrial clusters, and such like.

## 4.2 Netherlands

In the mid nineties NOW developed a policy in which the traditional emphasis on disciplinary, bottom up projects has shifted more towards multidisciplinary research and larger grant schemes, sometimes with co-funding by government ministries and industry. NWO also funds a small number of research institutes, (co-)funds large facilities and instruments, and has programmes for researcher mobility, foreign visitors and the like.

At present, the backbone of its work as a funding agency are three kind of grant schemes:
(1) The traditional open competition for what NWO calls 'curiosity driven' research. The award of funding is mainly based on peer review of scientific quality of proposal and applicant. Increasingly, the disciplinary boards within NWO structure the open competition to some extent by defining themes or fund collections of 4-5 projects around a common theme.

(2) A recent development is the introduction of individual-oriented grants to stimulate excellent research. In the PIONIER programme, every year five excellent researchers below the age of 40 are awarded a five-year grant of 1-2 million guilders. Having passed a stringent selection, the rewarded scientist has complete freedom in using the funds for 'pioneering' at the frontiers of science. The aim of the PIONIER programme is to allow 'rising stars' to set up their own research team. The other major individual-oriented grant programme is SPINOZA. It aims to support

[8] Telephone talk with an employee at the Information department at Formas, on 6/11/01.
[9] Telephone talk to Kenneth Abrahamsson, head of programme at FAS, on 6/11/01.

internationally outstanding researchers up to the age of 55. Candidates are selected by a committee after being recommended by leading figures in the Dutch research world. Every year three or four awards of 2-4 million guilders are allocated.

With funding from the Ministry, the research council and the university a new fund was established two years ago, aiming to stimulate innovation in the academic research field by give young talented researchers the opportunity to gain entry in the academic institutions. The Innovational Research Incentives Scheme targets the the top 10-20% of their peer group. Applications maybe submitted by candidates with or without a permanent contract of employment, irrespective of geographical origin.
The Scheme comprises three forms of grant directed at threedifferent stages in researchers' academic careers.

- **VENI grants,** which offers researchers who have only recently completed their doctorates the opportunity to develop their ideas over a further three years in the Netherlands or to some extent abroad.
- **VIDI grants,** targeted at researchers who have completed their doctorates and already spent some years conducting post-doctoral research in the Netherlands or abroad, thereby demonstrating the ability to generate new ideas and bring them independently to fruition. They will be given the opportunity to develop their own innovative lines of research and themselves to appoint one or more researchers to assist them in the task.
- **VICI grants** are directed at senior researchers who have shown that they have the ability successfully to develop their own innovative lines of research and to act as coaches for young researchers. They will be enabled to build up their own research teams, often in advance of a regular professorial appointment. Their lines of research will be given a structural place within the research institution.

Strategic programmes belonged to the spectrum of NWO activities, but were only a limited part until the Ministry of Education, Culture and Science (in 1994) transferred its incentive funding to NWO, and NWO itself set up special schemes, in particular the PRIORITEIT programmes. Incentive Funding was to be used as co-funding for joint programmes with other sponsors like government ministries, intermediary agencies and industry. They were seen as a means to implement priorities, in particular those highlighted in the government’s annual Science Budget. Allocation of funds is decided by the NWO Board and more a result of a negotiation process, than of a selection process.

In it’s recent strategic plan for 2002-2005 the council identified nine cross disciplinary themes for the programmatic research, which it sees as priorities for the Netherlands with an eye on scientific and societal developments. These themes are:

1. Cultural Heredity;
2. Ethical and Societal Aspects of Research and Innovation
3. Changing Governance
4. Cognition and Behaviour
5. Fundaments of Life Processes
6. System Earth
7. Digitalisation and Information
8. Nanoscience

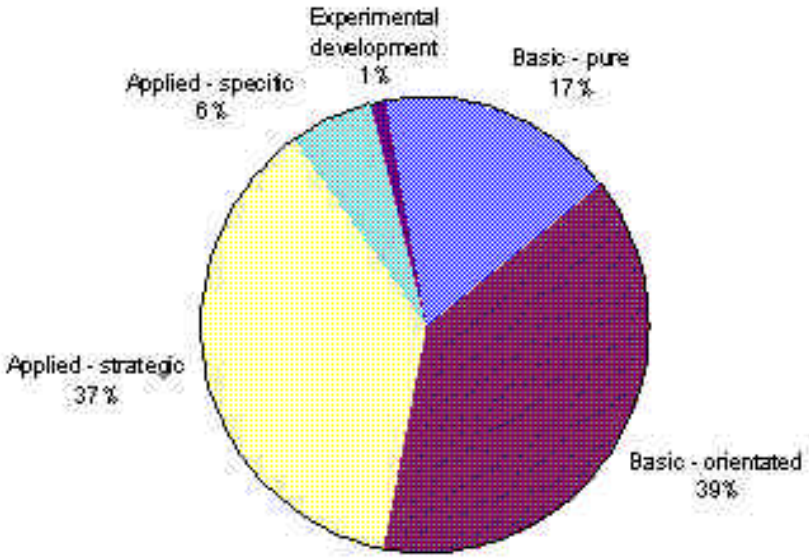
9. Emerging Technologies.

The aim is to develop these themes through own funds, and co-financing of users and intermediary organisations.

## 4.3 UK

**Exhibit 12** below gives the breakdown for the Science budget.

**Exhibit 12 Analysis of the Science budget by Frascati definition**




There appears to be a trend away from entirely free funding towards the use of programmes by Research Councils. However, all Research Councils would state that their funding is largely in the 'responsive-mode'. Flexibility is maintained in the system by using very broad thematic areas for programmes to accommodate a variety of proposals. In addition, some research councils also operate 'Initiatives', either in key government priority areas or in priority areas identified by the research councils themselves, for example, BBSRC have operated a special programme inviting proposals researching into ageing.

Where research councils have institutes, they also provide core funding, analogous to HEFCE funding for universities. This then accounts for around 50% of Council expenditure on research.

## 4.4 Finland

### 4.4.1 Academy of Finland

The Academy of Finland allocates funding both via thematic programs and for individual research projects. A research programme consists of a number of interrelated projects within the same target area of research. The aim of a programme

is to raise the quality of research in the field, to create a sound knowledge base, to increase the networking of researchers and to intensify researcher training.

Research programmes are, as are the Academy's other forms of funding, for fixed periods, and various other funders are often also involved.

Research projects proposed by researchers and research teams constitute the most extensive individual form of the Academy's research funding. Academy funding is used for subsidising outstanding researchers and research teams and for promoting co-operation among them. The aim is to attain the international forefront of research.

Research projects are granted funding for the hiring of scientific staff and other personnel, for the acquisition of equipment and supplies, and for other expenses.

In 2000, the proportion was as follows
- Research programmes and targeted programmes: 20 % (FIM 183,4 million)
- Research projects and other support: 43 % (FIM 404,5 million)

The main criterion for making decisions on grants applications is scientific excellence.

### 4.4.2 Tekes

Tekes has around FIM 2.1 billion (¤350m) available to fund R&D projects. Industrial R&D represents more than 60% of Tekes R&D funding, and is made allocated in the form of grants, loans and equity loans. The remaining 40% is used for national technology programmes and other applied technical research projects. There are currently 51 such applied technical programmes.

## 4.5 New Zealand

So-called free funding is limited (5% of the Science Vote). University research is under pressure of teaching loads, but will be upgraded through the new Centres program (where collaboration among universities is stimulated).
Health Research Council (HRC) and New Economy Research Fund (NERF) funding is investigator-initiated (and uses peer review), but against a background of "benefit to New Zealand."

There are no special or stimulation programmes for R&D initiated by MoRST (or another Ministry). Such programmes do occur, but at a lower level in the system, in particular through the Strategic Portfolio Outlines of FoRST (26 at the moment). These are created through consultation with stakeholders, are developed into specific portfolios (72 at the moment) and some cross-portfolio actions (like the Possum/tuberculosis programme), which then provide a frame for proposals (primarily from CRIs). FoRST creates Reference Groups to assess the proposals; they have freedom to consider the overall balance, and to decide that the proposals are insufficient, and go for tendering instead. FoRST staff is expected to negotiated with providers to improve the eventual portfolios of funded research. Indicative of the move toward strategic funding decisions is that scientific quality is not a separate

assessment criterion anymore; the provider is expected to assure quality (and this can be checked).

## 4.6 Germany

Since the 1950s, German S/T policy – as in other western European industrialised countries – has continually extended the scope of its activities; this can be illustrated using a "shell model". In this model, the core area of S/T support in the 1950s comprised the (basic) university research and "special area research" carried out in federal and state research establishments.

- A first "layer" is characterised by big technology programmes from the mid 1950s onwards, showing a marked orientation towards goals similar to those of the USA, mainly in the fields of nuclear technology, aerospace and data processing, and later microelectronics.
- A second research support "layer" was developed from the beginning of the 1970s, in order to create and support the conditions necessary for the export of technology-intensive goods. Public funding flowed into research projects of industry and institutes for applied research to promote cross-sectoral technologies (e.g. materials), key technologies (e.g. microelectronics) and technological systems (e.g. transport systems).
- In the 1970s, the reform policies of the Social Democratic government triggered the formation of a third research support "layer", complementing the goals of the first and second layers by research activities in the areas of environment, public health and the employment market whose aims related primarily to social policy.
- From the end of the 1970s, a fourth "layer" emerged, using the instruments of innovation policy: their aim is the diffusion of innovative or improved technologies, also among SMEs and in less developed geographical regions. This includes the support of activities in R&D as well as the building up and strengthening of an infrastructure for the support of technology transfer from the science system into industry. This layer grew during the 1980s but has lost importance since the early 1990s.

The shell model illustrates that over the last 50 years these focal orientations of policy have not succeeded one another, but have accumulated! The result has been the formation of a differentiated range of S/T policy instruments, extending from institutional support measures, over financial research support programmes and the creation of institutions for technology transfer, to regulative policy measures. Today, roughly speaking, half the S/T funding of the Federal Ministry for Education and Research (BMBF) and the Federal Ministry of Economic Affairs and Technology (BMWI) is spent in the form of institutional support and the other *half in the form of research, technology or innovation programmes (i.e. project funding).*

The DFG – the main funder of *basic research* – largely offers *responsive mode* funding, but also thematic funding; a system-level evaluation in 2000 recommended strongly to extend the thematic *programmification* of funding!

Only recently – not at least as a consequence of the system-level evaluations – the governance of funding the big *national research centres* (in particular Helmholtz, still

almost fully institutionally funded) has started to change: in the future *growing shares* of funding will be channelled through thematic *programmes*!

## 4.7 Switzerland

SNSF offers responsive mode funding, but also thematic programmes. CTI runs targeted programmes.

# 5 Research user interaction

## 5.1 Sweden

Since a very large share of Swedish public R&D resources historically have been directed to the higher education sector, there has always been a discussion on how society could profit by the R&D work carried out by universities and university colleges. The beginning of the 90's brought with it an escalation of this debate and The universities were given the responsibility of carrying out a "third task" i.e. activities aimed at connecting universities/university colleges and foremost industry.[10]

Public initiatives in the field include the building of Competence Centres, that is joint ventures between universities, industrial firms and research institutes. This measure has the aim to achieve a stronger industrial impact and enhanced concentration of resources by creating multidisciplinary academic research environments in which industrial companies participate actively and persistently in order to derive long-term benefits.

There are also minor activities, such as the Research forum and Research attaches, to promote research user interaction. The Research forum is an independent co-operation body that manages general questions regarding the relation between research and society. The forums main objective is to promote the dialogue between researchers, those who finance the research, those who use the research results with the public and the private sector, the trade unions and the public. The forum is supposed to be a discussion arena for the three research councils and VINNOVA but it is still not fully effective after the change of the Swedish research structure in the beginning of the year.

The Swedish Research Council's research attachés is a small project concerned with the interaction between society and researchers. Their aim is to try innovative modes of increasing the contact between researchers and different groups (industry, authorities, decision-makers, educational system).

## 5.2 Netherlands

No information available.

## 5.3 UK

In addition to the dual support system – core funding provided by the Funding Councils and grants for research provided by Research Councils – the 1999 Comprehensive Spending Review announced a series of measures in the form of the Higher Education Innovation Fund (HEIF). The HEIF aims to provide a third stream of core funding to universities to encourage knowledge transfer and innovation (see **Exhibit 5**). The HEIF incorporates 'people funds' such as the Business Fellows

[10] http://trendchart.cordis.lu/Reports/Documents/Sweden_CR_Dec2000.pdf.pdf

Scheme, which pays for an academic to be released from their duties to lead their colleagues in working with business; it also incorporates the university challenge schemes and schemes to promote the formation of clusters.

Other major collaborative initiatives include the LINK scheme, which funds collaborative research projects; the Faraday scheme, which funds the formation of centres of excellence in partnership with industry; and the TCS, which places individual graduates to work with industry on joint projects.

There are a large number of institutes and Research Technology Organisations which work under contract to the public and private sectors.

## 5.4 Finland

Since the 1980s, technology policy has acquired an increasingly important role in Finland, with funding for technology research becoming the most rapidly expanding area within public funding. The 1990 review of the Science and Technology Policy Council established the concept of a national innovation system as an important instrument of Finland's science and technology policy. Finnish R&D funding mirrored the rapidly changing industrial structure in the country: the shift away from raw material based forestry towards a more knowledge-based economy accompanied a rapid rise in R&D activities.

The Cabinet Economic Policy Committee decided upon a major increase in innovation financing in 1996, increasing government research funding in order to raise the national research input to 2.9% of the GDP by 1999. In fact, through the programme for additional R&D funding, Finland actually raised national research to 3.1% of GDP in 1999, with the industry share accounting for ¤2.6 billion. The additional FIM 1.5 billion has been mainly targeted at the Academy of Finland and Tekes. The estimated public research expenditure in years 2001–2004 will be 1.04% of the GDP.

Close cooperation between companies, research organisations and universities is often considered to be a special strength of the Finnish system of innovation. The single most important ongoing activity within this field has been Tekes national technology programmes. To receive funding from Tekes, the project must have participants from both industry and the research community. Apart from these ongoing technology programmes, other important developments include the cluster programmes, which have now been in operation since 1996, and they are funded out of the programme for additional R&D funding.

Nation-wide networks of technology parks and centres of expertise have also been set up in Finland in the last five years. There are 14 regional Centres of Expertise and two nation-wide networks carrying out the Centre of Expertise Programme for 1999-2006. The technology parks have initiated spin-off projects and incubators. Different kinds of technology transfer companies have been established to commercialise the results generated in universities and research institutes. Public and private venture capital operations have increased, although the market in Finland is less developed than in many other European countries, not to mention in the United States. Some of these

arrangements have been created at the national level, but many have come into being on the basis of local and regional initiatives, albeit with national funding.

## 5.5 New Zealand

Providers are expected to link up with users. FoRST is considering creating incentives to make sure that such link-ups occur, e.g. to commercialize findings or to be responsive to Maori. Users and other stakeholders are involved in consultation about portfolios and Strategic Portfolio Outlines, and about their review and adaptation.
The user-side is weakly developed in New Zealand, apart from the traditional agricultural users. Part of the problem is that the new economy is oriented towards export, and a globalizing economy. So where are the relevant users? There are other intermediate bodies (Trade New Zealand, Industry New Zealand), and other Ministries (esp. Ministry of Economic Development) which play a role here, and among which collaboration is now visible. The interface between the R&D system and the economy (society) is seen as the big challenge by almost all actors.
For Maori users, there is an understandable reluctance of a disenfranchised group to enter into interaction with parts of the establishment (CRIs, FoRST). MoRST attempts to redress, and is focusing on human capital development.

## 5.6 Germany

The strongest mechanism of maintaining a vivid research user interaction is *cooperative research*. In particular the institutes of the Fraunhofer Society – and also a considerable number of applied research institutes linked to universities ("An-Institute") – are strongly user-oriented due to large share of contract research (60-70%) and a relatedly low share of public block funding.

Another instrument striving for stronger research-user interaction is the *"FUTUR process"*, initiated by BMBF in 1999. FUTUR is defined "a communication process about the future". By means of this process, new topics should be generated and research strategies defined for the BMBF and other actors in the innovation system. In contrast to previous *foresight exercises* (e..g, the Delphi execises 1993 and 1998), FUTUR considers socio-political or educational policy questions, beyond innovations of a technical-scientific nature. Therefore interdisciplinary and cross-sectoral working groups have been established to work with future research methods. No longer should only the various "experts" but also other groups of the interested public would collaborate in the process. Collected information and interim results appears on the website www.futur.de to ensure transparency.

## 5.7 Switzerland

CTI's policies are by definition strongly user driven since they are governed – besides the economics ministry – by the commission including many industrial representatives.

The Swiss Science and Technology Council is, not at least, involved in various initiatives in the area of 'public understand if science and technology'.

# 6 Peer review mechanism/selection of proposals

## 6.1 Sweden

The research funds from research councils are distributed according to scientific quality criteria following assessments by the boards' preparation groups corresponding to traditional peer review mechanisms.

VINNOVA also has a peer review mechanism. The agency gathers a programme council with representatives from industry, public authorities, research community and the political sphere in order to have an opinion on the incoming research proposals. VINNOVA makes the final judgement regarding the proposals but the programme council's assessment constitute the basis for its decision.

## 6.2 Netherlands

### 6.2.1 Netherlands Organisation for Scientific Research (NWO)

The Netherlands organisation for scientific research has general rules for the evaluation of proposals:
Proposals need to be evaluated by at least two independent experts, who have to make a review report of the quality the proposal.
The applicant is given a possibility to respond on the reports.
Based on the proposal, the review reports and the response the respective committee recommend on fundability of the proposal in relation to other proposals, taking into account program criteria, the quality of the proposal.
In some of the programs, program committee make a pre-selection based on proposal abstracts especially with an eye on the relevance of the proposed project to the programme.

### 6.2.2 Technology Foundation

NWO's Technology Foundation (STW) has a deviant selection procedure. The Technology Foundation funds university research projects which aim at exploiting scientific knowledge for utilisation, especially in the areas of science, engineering and medicine. Every year the Technology Foundation receives about 250 research proposals. The selection is done in a two steps procedure.

First, the proposal is evaluated by five experts from science, applied science and industry, according to a list of criteria. The comments from the experts are brought together by STW staff into one review report which is sent to the applicants. The applicants is invited to respond on the reviews.

Whenever for twenty proposals have been review reports and responses of applicants have come in, in a second step about eight proposals are selected by a jury. For every selection round a new jury is made with twelve members from the research world, in

trade and industry as well as the universities, and sometimes even research policy. Their own specialties are not important for the process. They are asked to select the best proposals on the basis of the discussions between the experts and the applicant. The jury does not meet and jury members do not know the other members. Each jury member receives twenty proposals and is asked to give two marks to each proposal: one mark for the scientific quality and one for utilization: the chance of actual application.

After the first round averages are calculated. Jury members are informed of the average scores of each project and have the opportunity to give final marks. Based on these final marks the STW ranks the proposals by given both scores equal weight.

### 6.2.3 SENTER, Technology Agency

SENTER is the agency of the Ministry of Economic Affairs for the implementation of taxation, credit and funding programs for technology policy, energy, environment policy, export and international collaboration.
There is no general evaluation and selection procedure for all the programs SENTER manages. Evaluation and selection procedures depend on the program and its aims. For innovation oriented programs which fund university projects in industrial relevant areas, selection procedures resemble to those of the NWO.
In programs for funding industrial and applied science projects, like the large program on Economy, Environment and Technology, which aim at development of technologies for a sustainable economy, projects are selected by the program committee.

In the program for technological development credits for SME's projects are developed in collaboration with SENTER staff and in a way nurtured towards acceptance by the program committee.

## 6.3 UK

All proposals for grants are peer reviewed by Research Councils for academic excellence and funded on a competitive basis. Decision-making processes include both round-table peer review, and remote peer review, where peers grade proposals and the final decision on awards may be administrative, with peer guidance. Relevance criteria are utilised when deciding between proposals for special 'initiatives' in key priority areas.

## 6.4 Finland

### 6.4.1 Academy of Finland

Decisions on research funding are made not only by the Board and the research councils, but also by sub-committees appointed by the Board: sub-committees are called upon in situations where funding decisions concern two or more research councils. Sub-committee membership is confined to Board and research council members.

All funding decisions made by the Academy are based on scientific evaluations of the applicants and their research plans. In this process the Academy consults distinguished domestic and foreign experts in their respective fields of study.

### 6.4.2 Tekes

Applications for funding are considered by an internal expert team at Tekes. Decisions are administrative and made largely on relevance criteria, rather than on the basis of scientific peer review.

## 6.5 New Zealand

The Marsden Fund (for basic untargeted research) and funds like NERF which are focusing on research-driven opportunities have the by now common peer & panel review approach. There may be a first round of expressions of interest (to reduce transaction costs for proposers and assessors). Final proposals are sent out for peer review, there is often opportunity for proposers to react. The package goes to a panel set up by the purchaser (with relevant composition) and is assessed according to a criteria scheme. This leads to numerical grades and a draft ranking. Discussion (especially for proposals around the cut-off point) leads to a final ranking. Decisions are made higher up (by the Marsden Committee, the Board of HRC or FoRST), but tend to follow the ranking.

FoRST has created a background analysis where it distinguishes between (1) assessing and contracting individual proposals (or small programme proposals) in areas where there is little or no over-arching strategic context, and (2) portfolio-level facilitation, negotiation and review in order to create promising portfolio outlines and negotiating (up to tendering) for a balanced portfolio of investments to be contracted. The former is applicable to NERF, to Post-Doctoral Fellowships schemes, but also to enterprise-identified opportunities submitted to Technology New Zealand and GPSRD. The latter (while being more directive) still has a reduced role for FoRST (its staff and the Reference Groups* formed for the various portfolios) in the sense that it facilitates, renegotiates with users and providers, sets up brokering arrangements, and monitors progress rather than intervening to determine the nature of the research and specify it in contracts. This is a new approach with which there is only little experience. Recently, Foundation staff have realized that to be effective in persuading providers to work towards "the benefit of New Zealand" they have to offer clear directions (and improve staff competencies to do so). For economic goals, a framework is in place in terms of the extent of change envisaged. The McKinsey 'three horizons' terminology is used (H1: extends and defends core business; H2: added-value work with a certain amount of stretch; H3: high-risk transformational work).

* *From a February 1999 internal paper (The Foresight-Based Investment Process):* "Reference group members, up to 4-6 per portfolio, will be expected to provide independent advice to the Foundation on the balance of work to be funded in each portfolio. They will need to be broad-thinking independent people who can provide both a science and relevance perspective. Many will be able to be drawn from our current PGSF Advisory Committees. Some reference groups may cover more than one portfolio.

Chairs of reference groups could be experienced Committee members or their equivalent, but in some cases it may be necessary to employ professional facilitators. The Foundation's Board will in future take on a more strategic role rather than chairing committees that assess portfolios and consider funding investment in detail. Foundation staff will draft Strategic Portfolio Outlines, select reference group members, facilitate the negotiation process, analyse portfolios, negotiate contracts, and where necessary initiate ongoing foresight.

In cases where the provider-user interaction has produced a strategy that is not particularly future-focussed, it may help to have an advocate role during the initial stages of the negotiation to put an alternative view. Having this role separated avoids the possibility of compromising Foundation staff who are trying to facilitate the process of negotiation."

Experiences with this approach (and adaptations) are still limited. There is discretion involved in such negotiations, but it is carefully documented so as to avoid legal action. And the phrasing of feedback is carefully crafted, for example: "Our investment decision can be improved if you do X or change Y."

## 6.6 Germany

*Peer review* is the predominant and highly accepted evaluation instrument of the research funding mechanism of the *Deutsche Forschungsgemeinschaft (DFG).* The DFG plays a central role in funding basic research at universities, distributing its budget as grants to university researchers; the grants are grouped along several programme lines. A significant part of the budget is spent in the form of individual project grants *(Normalverfahren).* Grant applications are evaluated by honorary peers who are elected on a 4-year rota by the entire scientific. In addition to the elected referees the programme director or the peers themselves may select ad hoc referees to ensure that the proposal will get a specialised review. Each reviewer is asked to evaluate the proposal on the basis of its scientific merit. There is no form for the reviewer to fill in, and only very general guidelines that serve as a listing of all possible criteria that could be taken into consideration.

Since the late 1990s, there are more and more peer reviews also of intra-university research funding (i.e. re-distribution of general university funds). Furthermore, there are also increasingly institutional evaluations (university institutes, non-university institutes, ...) based on peer reviews – as an effect, the system risks it run out of available peers ...

## 6.7 Switzerland

SNSF has strong peer review mechanisms.

In CTI, the selection of projects is the responsibility of the Commission (consisting of researchers, industrialists, policymakers).

# 7 Institutes

## 7.1 Sweden

Compared with most other countries, Sweden spends very little in 'intermediary institutions' such as applied research institutes. Rather, it is expected that the university and college sector will itself meet social and economic needs. This despite that the research institutes are important actors that provides a vast pool of qualified scientists and a vast contact net of companies.

In September the government issued a proposition regarding R&D and the collaboration within the innovation system. The aim is to create a strong, united structure with less but bigger institutes that are internationally competitive and have a strong link to the industry. [11]

The proposition suggests that the Institute for Research and Competence Holding AB (IRECO) becomes involved in the restructuring and strengthening of the Swedish institute sector. IRECO's main objective is to finance the development of competence. The state is a minority owner of the 16 of the Swedish industry research institutes through IRECO, the industry is the majority owner. [12]

The Industrial Research Institute in Sweden (IRIS) is another umbrella organisation of about 30 industrial research organisations. Its main objective is to serve as a link between industry and universities/institutes of technology. The State is an active owner of IRIS and strives to use the institutes as a tool in the Swedish R&D system.

## 7.2 Netherlands

Research organisations, or research institutes as I tend to call them, (research universities and research councils are a kind of research organisations as well in my vocabulary) are indeed a strange animal in the ecology of research systems. Their form and function differ as the finches that put Darwin on the track of evolution theory. More than universities, research councils or government policies as such, research institutes may be an entrance to understanding different histories of research systems and their effects on the institutionalisation of research.

In the Netherlands research organisation or research institutes can be categorised within five types of research organisations. Such categorisations reflect an ongoing pressure to tame the animal and might be stronger in some countries then in others. Germany for example tends to organise all research institutes under a few umbrella-organisations, named after famous German researchers: Max Planck, (Joseph von) Fraunhofer, Hermann von Helmholtz and Gotfried Wilhelm Leibnitz. In the Netherlands one can find these pressures to structuring as well (see below for discussion on para-university institutes), but still a rest category is needed to capture

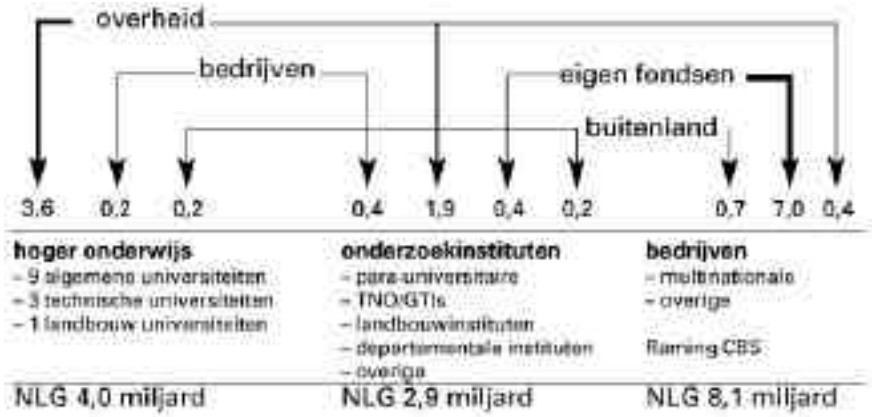
[11] Regeringens proposition, 2001/02:2, FoU och samverkan i innovationssystemet.17/09/2001.
[12] Regeringens proposition, 2001/02:2, FoU och samverkan i innovationssystemet.17/09/2001.

the variety and internal developments within each of the categories increase the variety.

The relative importance of the research institutes appears from the funding scheme in **Exhibit 13**. Most research is done by firms (54%). Of the public research efforts 58% is done within the universities and 42% within research institutes. Two-third of the funding for the institutes comes from the government, the other one-third comes from firms, abroad and from own funds.

Overheid = Government
Bedrijven= Firms
Eigen fondsen= own funding
Buitenland =International
Hoger Onderwijs= Universities
Onderzoeksinstituten = research instititutes
Bedrijven = Firms

**Exhibit 13 Funding of R&D in the Netherlands (in: NLG Billions)**




Source: Ministry of Education, Culture and Sciences, 2000

The five types are:

1. **The TNO institutes (technology) and DLO (agriculture) institutes**. Comparable to SINTEF and the institutes in the BF sector. Both TNO (Organisation for Applied Research) and DLO (Organisation for Agricultural Research) are 'mother organisations' for a range of institutes (at present 11 TNO institutes and 12 DLO institutes) aiming at the application of respectively technological and agricultural knowledge with the aim of strengthening the innovative power of industry, the agricultural sector and the government.

   The DLO institutes have recently merged with the Wageningen Agricultural University into the Wageningen University and Research Centre. TNO institutes are dynamic and reorganised now and then to respond to changing industrial needs and technological opportunities

   In the eighties TNOs close relationship with the Ministries was reconsidered, and instead of secure institutional funding, funding was linked to strategic research programs. In addition TNO was forced to innovate and become more market oriented. Over time TNO innovated itself and developed policies and practices to cope with new tasks within the knowledge society. While NWO and KNAW as overarching organisations dimmed the effects of the government pressures to change, the TNO Board, overarching the 14 centres implemented various management tools including port-folio management of TNO's research, management audits, quality assessment including user surveys, to emphasise the new mission and push institutional innovations.

Nowadays, TNO has 4,800 professional staff who generate, market and apply knowledge for private and public clients. R&D is carried out by 14 specialist research institutes located in various parts of the Netherlands. In the Netherlands, TNO leads the market in contract research

TNO has responded to the increasing complexity and size of private and public demands by intensifying the collaboration between TNO institutes in terms not only of marketing but also of developing and executing projects. In new, international growth sectors this collaboration is given a structural shape in the form of Business Centres. Currently the following centres operate: TNO Pharma, TNO Multimedia and Telecommunications, TNO Centre for Soil and Sediment Remediation Research, TNO Traffic and Transport, and TNO Centre for Ageing Research.

2. **The large technological institutes,** operating in the fields of energy research (ECN – which is also a European Joint Research Centre), maritime engineering research (MARIN), water management (WL), geodetics (GD), and aerospace (NLR). They are non-profit organisations with basic funding from the government for maintenance of the research infrastructure and doing contract research for industry and government. At the end of the eighties the relationships between government and these institutes have been changed, emphasising within the funding the mission orientation of the institutes and pushing them to increase levels of contract funding.

   The funding of the technological institutes mainly comes from contract-activities with public and private organisations. Institutional funding differs from a less then 10% to more than a third of their annual turnover (including non-research activities). . **Exhibit 14** gives the figures for 1998, but fluctuations over the years are negligible, indicating a rather stable position of the institutes after the changes at the end of the eighties in their relationships with the state.

**Exhibit 14 Annual turnover (in guilders) of technological institutes to funding source (% of turnover, 1998) (source: Institutes)**

| | TNO- Applied Research | ECN – Energy Research | MARIN- Maritime Research | GD – Geodetic research | WL- Water management | NLR – Air & space |
|---|---|---|---|---|---|---|
| Annual turnover ( x f 1 bln) | 853 | 172 | 48 | 37 | 65 | 153 |
| Institutional funding | 37% | 34 % | 23% | 9 | 12 | 24% |
| Contract total | 63% | 66% | 77% | 87% | 88% | 75% |
| Contract public | 17% | 22% | 15% | 33% | 36% | -- |
| Contract private | 46% | 45% | 63% | 54% | 52% | -- |
| Other | – | – | – | 4% | – | 1% |

The technological institutes have difficulties to develop appropriate missions in the changing research system. Their role in strategic research has been challenged by universities, esp. the three engineering universities, who moved more and more to the position of these technological institutes. At the same time GTI's were forced to operate on more actively on the market for contract research and consultancy. As such they became competitors of private engineering consultancy firms and had to balance mid term innovation interests with short term industry innovation needs. The competitive position also was at odds with their role as public knowledge institute, responsible for knowledge transfer to private industry. Recently the Advisory for Science and Technology policy has assessed each of the institutes positions and in generally advised the government to increase again institutional funding and enable the technological institutes to develop (again) their function as role as knowledge base for Dutch industry in mid term innovation processes.

3. Governmental research institutes, some of which are really large institutes within their fields, like the RIVM (on health and environment) and the economic and social "planning" bureau's CPB, SCP. These have the responsibility in providing planning data and analysis for health, environment, economic, financial and social policies of the government. Other institutes include those for of the Foreign Ministry (Clingendael) and the Ministry of Law (WODC). In the eighties there was policy pressure to place them at arms length within the TNO or DLO organisation or, for basic research institutes, within NWO and KNAW. This was only partially successful. The RIVM with support of its patrons, the ministries for Public Health and for Environment, resisted the pressure and required even the formal position of a planning bureau for the government, implying stronger links with policy making.

4. The fourth category is that of basic research institutes outside the university (para-university institutes), administratively placed under NWO (mainly sciences) or KNAW (mainly life sciences, humanities, collections and archives). These institutes operate within the academic sector. There are personal links with the universities (esp. through professorships of senior staff and directors) and collaborations in research programs and projects, as well as in education (research apprenticeships, PhD). Since the seventies, the ambition pops up within science policy to merge these institutes into a kind of Max Planck organisation. About four years ago, time seemed to have come for that operation, but the whole operation was in a way sabotaged. (see below)

   The para university institutes have different histories and each was established for specific purposes, most at a time when there were no explicit science and research policies, nor strong ideas how such institutes could be best located. Most institutes have a long-term research commitment with a multi-disciplinary approach. Some of the institutes are equipped to offer information and documentation services or biological collection services. Other institutes function as national centers for large scale and expensive apparatus. Most institutes closely co-operate with universities, through participation in graduate schools, research collaborations and professorships of institute researchers. Some of the institutes are even physically located at university campuses.

In the eighties, the Ministry for Education and Sciences initiated with advise from its Advisory Council a reorganisation, aiming at clear funding relationships and managerial responsibilities. The result was that most of the institutes were positioned within either the Royal Academy (KNAW) or the Research Council (NWO). Some were placed within a university. The Royal Academy oversees the work of para-university institutes in the fields of Science and Humanities which are administered by the Academy's Life Sciences Institute Board and Humanities/Social Sciences Institute Board. NWO oversees the work of the para-university institutes in the fields of Social Sciences and the Natural Sciences. The actual relationships between these organisations and the institutes imply a large autonomy for the institutes, although they are now evaluated every four year and obliged to develop strategic plans. In general the role of NWO and KNAW is facilitating rather then trying to impose specific policy objectives. While the role of the Academy was rather undisputed, NWO's responsibility for overseeing institutes is repeatedly questioned.

In the context of the restructuring and the debate afterwards on the institutes the Advisory Council for Science and Technology Policy has developed rules for deciding about the justification for the continuation of an institute and its place of the institute in the system.

1. The basic rule is that basic (academic) research should be located within an university.
2. Reasons for locating basic research in an institute are the (1) the maintenance and exploitation of large facilities for research; (2) the maintenance, development and scientific exploitation of collections; (3) creation of a home facility for Dutch researchers in international scientific programs; (4) basic research with specific societal relevance.
3. The governance of the institutes should be such that:
   - The question whether research should indeed be done in the institute and not in a university is central to decisions on funding and in evaluations of the institutes.
   - Institutes should continuously be under pressure to improve their relationship with universities

5. The fifth category is that of 'other research organisations', of which no full list is available. It includes small independent non profit research organisations, of which some are or were linked to professional organisations of pressure groups, as well as new institutes that operate in public/private research sector like:
   - the Telematic Research Centre, which being co- funded by universities, government and industry is a typical "Triple Helix" institute.
   - The institute for research into public health, which developed from a think tank of a public health organisation into a large independent contract research institute with close links with universities.

## 7.3 UK

The Association of Independent research and Technology Organisations (AIRTO) is an umbrella organisation for RTOs in different industry sectors. Contrary to other comparable organisations in Europe, it receives no Government financial assistance.

There are over 40 members of AIRTO, made up of research associations and contract research organisations, supplying services to more than 30,000 SMEs, most of the UK's largest companies, as well as the public sector. AIRTO includes members who were previously public research institutes who are now private contract organisations.

Significant members of AIRTO include Pera International (manufacturing and innovation consultancy), The Welding Institute, Pira International (printing consultancy), and the Laboratory of Government Chemists (LGC).

## 7.4 Finland

The Research Institutes play an important role in Finland in the implementation of sectoral research that supports economic and social development in the different policy sectors. Over twenty government research institutes working in nine administrative fields are funded from the state budget. Their combined research volume equals that of the universities. The institutes do not form a cohesive group and have not developed as an entity in the way that the university system has.

The VTT is currently the key research institute in Finland, carrying out technical and techno–economic R&D in its nine institutes and the Group for technology studies.

## 7.5 New Zealand

Two phases: (1) moving sectoral research into CRIs – with the added effect that research staff suddenly were financed with soft money, (2) moving CRI research to become more future-oriented. In the 1990s, this had to do with the neo-liberal ideology of not funding R&D that should be funded by industry (even if it didn't – partly because of the structural problem of New Zealand's economy being based on SMEs, and quite small SMEs at that). At the turn of the century, the new versus old economy debate had become important.

FoRST is the key actor with respect to funding institute research and monitoring output and outcome. Accountability (mainly financial) is to a separate monitoring agency set up by the Minister responsible for CRIs on behalf of their owners (Treasury and MoRST).

The CRIs and their Association pride themselves on having achieved what was expected of them, in particular having increased their external revenues and doubled their shareholders' fund. They insist that they do an appreciable amount of basic research (20%), and excellent research more generally. They accept the need for more risk taking, but also want some assurance of continuity. In the meantime, they have become leaner.

## 7.6 Germany

Germany disposes of a relatively large institute sector, ranging from basic to aplied research (see the description in section 1.1). Recent system level evaluations (1995-2001) showed several structural/managerial deficits (lack of international orientation, of interdisciplinarity, of inter-institutional co-operation, of care for young

researchers). As an effect, various attempts were made by the ministries and by institution's management to "modernize" funding and management procedures.

## 7.7 Switzerland

Compared with most other countries, Switzerland spends little in ‘intermediary institutions’ such as applied research institutes. Rather, it is expected that the Swiss Institutes of technology (ETH, EFPL), the universities and increasingly the technical colleges (Fachhochschulen), the latter supported by BBT/CTI, will meet social and economic needs.

# 8 Cross disciplinarity

## 8.1 Sweden

Formas stimulates activities aiming at cross-sectoral and interdisciplinary approaches within its area of responsibility. The government has recently allocated 20 millions SEK to Formas to promote cross disciplinary projects within specific areas of interest. VINNOVA also funds interdisciplinary research programmes.

In addition to the financial support of research, one of the most important aims of the Swedish Research Council is to promote interdisciplinary and multidisciplinary research. The council sponsors interdisciplinary research projects and has a special preparation group (beredningsgrupp) to decide on funding for this type of projects.

FAS does not yet have any clear strategy or specifically allocated funds to promote interdisciplinary research. The council is now preparing new research strategy that will include more of interdisciplinary aspects. However, FAS funds interdisciplinary research projects, research networks including researchers from different fields and promotes the creation of research centres that often have a multidisciplinary approach within universities. [13]

The Competence Centers aim to achieve a stronger industrial impact and enhanced concentration of resources by creating multidisciplinary academic research environments in which industrial companies participate actively and persistently in order to derive long-term benefits.

The Technology bridge foundations have an important role in promoting interdisciplinary research.

## 8.2 Netherlands

No information available.

## 8.3 UK

### 8.3.1 Government priority initiatives

A number of cross-Research Council initiatives exist in response to priority areas identified in the Comprehensive Spending Review. These include e-science, basic technology and genomics. Each joint project includes funds from all Research Councils, but one Research Council takes responsibility for the administration of the programme.

[13] Telephone talk to Kenneth Abrahamsson, head of programme at FAS.

### 8.3.2 Research Council initiatives

Research Councils are also increasingly addressing cross-disciplinary areas themselves with programmes at the interface of more than one discipline. For example, the EPSRC has a programme inviting proposals for research projects at the interface between engineering and the life sciences.

### 8.3.3 Cross-Council Research Forum

The Cross-Council Research Forum (CCRF) is an informal group of individuals committed to improving cross-Council working. It focuses on research/science programmes issues rather than any other aspects of cross-Council working and aims to identify common issues and problems relating to research and examine ways of resolving them. CCRF has no fixed membership but participants include all Research Councils and the OST. Via one of its members (David Brown, NERC), activities and interests are communicated to the Research Council Directors of Science/Research, who meet regularly – as do the Chief Executives and other groups at a variety of levels to deal with a wide range of issues.

The CCRF is currently concentrating on issues relating to Peer Review and visibility and clarity of Research Council funding opportunities/ schemes. CCRF is also examining the possibility of developing a road-map to enable applicants to navigate their way through funding opportunities.

### 8.3.4 Other initiatives

Councils to share information on best practice and they are jointly sponsoring a project addressing the feasibility of electronic submission of proposals.

A database also exists covering all UK Research Council funded research.

## 8.4 Finland

### 8.4.1 Centre of Excellence Programme

The Academy runs a Centre of Excellence Programme, together with other funders such as Tekes, the universities, Ministries, business enterprises and foundations. Twenty-six new centres of excellence started at the beginning of 2000, and receive funding for their activities for a six-year term.

### 8.4.2 Academy of Finland

During 2000 the Academy continued to expand its collaboration with other funding bodies, particularly in the funding of research programmes and targeted programmes.

The Academy of Finland and the National Technology Agency (Tekes) have close co-operation both in the field of research funding and in expert tasks on research and research funding. In 2000 the Academy had nine ongoing research programmes that were funded jointly with the National Technology Agency.

### 8.4.3 Tekes

Tekes runs a number of programmes in broad areas such as environmental issues that are cross-disciplinary. More cross-disciplinary programmes are planned.

## 8.5 New Zealand

There is little or no discipline-based funding, even in the Health Research Council (after it was changed from being a Medical Research Council). Outcomes and portfolios may still create compartments, but it is relatively easy to do cross-portfolio work. Funds cannot be shifted from one output class to another (these are the categories of the Science Vote), but the definitions are broad and actors can work around them.

If there is a problem of compartmentalisation, it is across the different funding schemes ranging from Trade New Zealand and Industry New Zealand at the uptake and transfer end, to Marsden Fund at the basic/undirected end. In particular, their number and often relatively small size.

## 8.6 Germany

Since the 1990s the number of policy initiatives stimulating interdisciplinarity has been growing continuously. Just as an *example*: For decades, the conditions for clinical research at German university hospitals have been regarded as unfavourable and underdeveloped, in an international comparison. By promoting interdisciplinary clinical research centres (ICRCs) the Federal Ministry for Education and Research (BMBF) wants to provide a lasting impetus to improve the situation. Within the framework of a competition, eight universities were selected which established pilot ICRCs in 1995/96. The federal funding is guaranteed for a time span of eight years, as decreasing kick-off financing; the ICRCs are supposed to be funded in the mid-term mainly by their universities and the responsible federal state government. The main targets of the BMBF programme are:

- the establishment of efficient interdisciplinary clinical *research structures*;
- the development of *specific research profiles* of the participating university hospitals,
- qualified scientific training conditions for *young clinical researchers*;
- qualitative and *competitive allocation* of public research funds;
- transparent *financial management* of research on the one hand and medical care on the other.

## 8.7 Switzerland

No information available

# 9 Administrative budgets

## 9.1 Sweden

The Research councils' administrative budgets represent between 5-11 percent of the total budget planned for the fiscal year 2001. (No information available on the EC R&D council).

The administrative and the total budgets of the Councils are presented below.

**Exhibit 15 Administrative and the total budgets of the Councils**

| | Administrative budget (SEK). | Total budget (SEK). | Percentage of the total |
|---|---|---|---|
| Swedish Council for Working Life and Social Research[14] | 24 212 000 | 261 655 000 | 9 % |
| Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning[15] | 43 744 000 | 478 971 000 | 9 % |
| Swedish Research Council[16] | 100 722 000 | 2 050 915 000 | 5 % |
| Swedish Agency for Innovation Systems (VINNOVA)[17] | 111 927 000 | 1 033 676 000 | 11% |

Administrative personnel:

- Formas has circa 50 administrative employees
- All of the personnel at FAS perform administrative tasks
- The Swedish Research Council has 120-140 administrative employees
- VINNOVA just moved into new offices and has no record of its personnel

## 9.2 Netherlands

For the evaluation in 1996, management costs of NWO funding for university research was calculated:

| | |
|---|---|
| As a percentage of the operational budget: | 7,34% |
| As a percentage of operational budget + investment | 6,43% |
| As a percentage of operational budget, investments and other income | 5,81% |

[14] The budget information was found on FAS' web site: http://www.fas.forskning.se/en

[15] The budget information was found in the Ministry of Environment's regulatory letter ("Miljödepartementets regleringsbrev för budgetåret 2001 avseende Forskningsrådet för miljö, areella näringar och samhällsbyggande") on FORMAS' web site http://www.formas.se

[16] The budget information was found in the Ministry of Education's regulatory letter on VR's web site http://www.vr.se/OmVR/regleringsbrev.pdf

[17] The budget information was found in the Ministry of Industry, Employment and Communications' regulatory letter on VINNOVA's web site http://www.vinnova.se/mynd/regleringsbrev.pdf

## 9.3 UK

Administrative budgets are counted differently by different Research Councils, with some including the costs of capital for institutes, others with no institutes etc. However, they appear to be typically about 5.5%. (See **Exhibit 16**)

## 9.4 Finland

### 9.4.1 Academy of Finland

The estimated percentage describing the administrative budget is 5,3 % of the total expenditure in 2001.

### 9.4.2 Tekes

The administrative budget for Tekes is approximately 6.4% of total expenditure.

## 9.5 New Zealand

FoRST in the earlier years had prided itself on its low administrative costs (1 or 2% of overall budget), but realizes now its broker role requires higher expenditure on competent staff – 5% at least, cf. also international trends. (Note: administration costs are covered in the management contract with MoRST.)
Marsden and HRC appear to work according to the traditional formula, where quite some costs are invisible because carried by peers and committee memers. HRC has a maximum daily fee of $ 400 for advisory committee members, while FoRST uses $ 500 and can go higher if it needs to attract the right people for a Reference Group.

## 9.6 Germany

No information available.

## 9.7 Switzerland

No information available.

**Exhibit 16 Administrative costs for UK Research Councils**

| Research Council | Total Expenditure | Admin costs | Number of administrative staff | % total | Source of information |
|---|---|---|---|---|---|
| BBSRC: | £230.7m | Staff and other operating costs £11.5m | 209 (Swindon) | 5% | Annual Report |
| EPSRC | £401.476m | Staff costs £7.236m<br>Other operating costs £12.848m<br>Cost of capital £1.108m | 287 | 5.3% | Annual Report |
| ESRC | £76.776m | Running costs £3.943m<br>Superannuation £0.191m | 97 | 5.4% | Annual Report |
| MRC | £367.7m | Administrative running costs 12.8m | 268 (Swindon) | 3.5% | Annual Report |
| NERC | | No figures given | 160 staff employed in Swindon offices | 3.5% (Swindon costs) | Annual Report |
| PPARC | No figures available | No figures available | No figures | No figures | |

# 10 How ministries buy research

## 10.1 Sweden

The law on public procurement regulates the purchase of research by Government Departments. The procurers within the Government administration are responsible for supervising the purchase of research by all the Departments. If a planned research purchase exceeds 148 000 SEK, the Department has to arrange for a call for tenders. A procurement with a minor value can be purchased directly from a preferred contractor.[18]

## 10.2 Netherlands

Ministries have their own policies for buying research.

For programmatic research aiming at basic research NWO is increasingly asked as partner. For more applied research programmes SENTER, other agencies (like NOVEM for energy research) or ad hoc bureaus at research institutes are managing the program. In most cases their is a the programmatic board with experts and the governance structure of the funding ministry. NWO programs cofunded by ministries often have a program council with representatives of NWO and the funding ministries, and a program committee responsible for the scientific development of the program, including selection of the projects.

Ministries have long term contracts for maintaining a knowledge base with the technological institutes, agricultural institutes, TNO institutes in which 'institutional' funds are related to programmatic objectives.

For monitoring research etc. for policy ministries may still have their own institutes like the institute for public health and environment, the and economic planning research institute.

Short term contract research is bought in the context of specific policies and often in case of small contracts through direct relationships with researchers or in the case of bigger contracts through invitations for tenders.

## 10.3 UK

Routine or urgent scientific advice is 'bought' by departments using their own institutes or contract laboratories. Many of the government departments own laboratories have now been privatised.

[18] Telephone talk with Peter Kock from the procurement section, Government administration, on 6/11/01.

Advice sources for longer-term problems may be found via open consultations, whereby any scientist may input advice, or via priority setting exercises in research councils – inviting proposals for funding for research in a particular area of need.

## 10.4 Finland

Research for immediate policy purposes is largely obtained via the 20 government research institutes working in nine administrative fields. Longer-term policy issues are tackled by channelling funds via the Academy or Tekes.

"The Ministry of Education and the Academy of Finland conclude a three-year performance agreement. It is a vehicle for implementing the objectives defined in the Government's Development Plan for Education and University Research, which also determines overall objectives for the Academy's activities and development, the financing of research and other projects, as well as the resources needed to this end." (84. Management by Results in Higher Education 2001, p.9.)

The sited report can be downloaded from the ministry of education web site for further information. *84. Management by Results in Higher Education*. Helsinki: Ministry of Education, 2001.
http://www.minedu.fi/minedu/publications/online.html

## 10.5 New Zealand

Ministries are allowed to buy (and buy) only so-called operational research which is immediately relevant to their policy development. Health research was shifted (in the early 1990s) from Ministry of Health to MoRST. Treasury and Ministry of Labour still have a large inhouse economic and social research capacity.
There is little attempt to influence the allocation of funds with the Science Vote, although there is prior consultation on the initiative of MoRST staff. With the recently increasing cross-agency interactions, there might be more de-facto influence. It might also work in the other direction, that MoRST can influence spending through the other Votes (as for example happened with the Education Vote setting up the Centres of Research Excellence programme).

## 10.6 Germany

In Germany, "departmental research" (or mission-oriented research) is defined as research (or research and development) that is aimed at obtaining *scientific findings that are directly related to the activities of a given government department or ministry*. These findings are used as a basis for decisions to be taken in due compliance with departmental duties. If the general level of knowledge is not sufficient for this purpose, the necessary research will be performed primarily by federal institutions (or Länder institutions when Länder ministries are involved). Most ministries run own targeted institutes ("Ressortforschungsinstitute"). Beyond, they buy research via contracts (with institutes of all types).

The R&D expenditure of the *52 federal institutes* that perform research functions amounts to some DM 1.3 billion (fully funded by the Federal Government). These

institutions perform their R&D functions in the framework of their governmental duties. The various activities are assigned to the federal ministries into whose portfolios they fall.

In addition, there are *84 Länder and municipal research institutions* (that are not part of the Leibniz Association), which are fully financed from Länder funds.

## 10.7 Switzerland

No information available.

# 11 University modernisation tools

## 11.1 Sweden

The universities and colleges account for almost 90% of state, non-defence R&D funding. According to what has become known as the 'Swedish model,' it is expected that the university and college sector will itself meet social and economic needs. This principle was made more explicit in 1996, when the universities and colleges were assigned a 'third task' of supporting socio-economic development, in addition to their two traditional tasks of teaching and research. Throughout the 1990s, there has been a wider series of initiatives to link industry and the university and college sector more tightly.

However, Swedish institutional structures are not particularly well adapted to fulfilling the 'third task'. The universities are fiercely independent and have long and honourable traditions in academic teaching and research. Largely lacking a cadre of post-doctoral researchers, they are tuned to education and research training but are not well placed to deliver the type of customer-directed and professionalised research services associated with applied research institutes. At the same time, the proportion of their research revenues coming from external funds has been rising. This has led to a perception of reduced academic freedom in the universities and colleges, and to a backlash against those funders whose mission is to promote 'relevant' research.

As an instrument for commercialization of research results some universities have had the chance to create holding companies. Those in their turn have created subsidiaries that handles e.g. patents. The government has now proposed that the holding companies' activities be expanded in order to have the possibility to create and their own subsidiaries that mediate training in commissioned education. [19]

The seven technology bridge foundations spread around the country are an important link between universities and external actors. They have a crucial role in promoting collaboration between universities and industry and in commercialising research results.

## 11.2 Netherlands

Main pressures for university modernisation have come through incentives to organise research in research programs and research institutes and through the implementation of an evaluations system for research.

In the eighties the two went together when funding of university research was made conditional to peer reviewed five year research programmes. Over time, this developed in the evaluation of university research by the Association of University, which evaluates university programs every four year.

[19] Regeringens proposition, 2001/02:2, FoU och samverkan i innovationssystemet.17/09/2001.

Concurrently the universities were forced at the end of eighties to organise PhD research in graduate schools, partly with the aim to identify/create networks excellent research groups. Because of the distribution of responsibilities and a related scheme to stimulate the development of new graduate schools, soon most research was organised in these schools with little differentiation in terms of quality.

Developments above, and the emphasis on larger research collaborations, on programming of research and the aim to organise of university research more stable within specific institutes, made universities to create research institutes within the university – with their own research directors. The University of Delft created innovative research programs at university level in which research groups could participate.

Because of reduction of institutional funding some universities actively sought for new research funds. The University of Utrecht for instance has at university level contracts with some major industries and public bodies for co-financing of research. The University of Twente developed the idea of an entrepreneurial university, e.g. by actively engaging in the market for contract research, rewarded European funding alike research council funding and above all by schemes for development of spin off companies around the campus.

## 11.3 UK

Universities have undergone extensive modernisation in recent years. Modernisation began with the Further and Higher Education Act 1992, which abolished the division between the universities and the former polytechnics and colleges. From 1 April 1993, the Act brought all the higher education institutions together in a single sector. The then Conservative government forced a massive expansion of the higher education sector, encouraging more people to enter higher education. This was driven both by a recognition that Britain must up-skill for competitiveness, but also by an urgent need to lower high unemployment figures. Very little new funding was provided to support the expansion forcing a squeeze on higher education and consequently rationalisation of departments. The expansion of the Higher Education sector was continued by the Labour government from 1997 onwards.

The Research Assessment Exercise was also initiated in 1992, as a basis for assessing quality and deciding the level of core funding allocated by the Funding Councils to each institution. In later years, questions on relevance were added to the exercise to encourage innovation.

## 11.4 Finland

In 1998, the Ministry of Education initiated a programme to expand education and research to meet the growing and changing needs of the information industry. The programme will run from 1998–2002. The number of new students in the fields of electrical and information technology, electronics, telecommunications and data processing technology grew rapidly in the 1990s. From 1993 to 1998, university education relating to the information industry almost doubled, and education in polytechnics almost tripled. In addition, adult education and further training was channelled to the fields linked to information industry.

The new programme covers graduate and postgraduate education in universities as well as the education given by the polytechnics. Students are recruited from neighbouring fields and given suitable additional education for approximately two years. The total costs of the programme in the years 1998–2002 is around FIM 1.5 billion (¤250million)

An additional FIM 1 billion was made available to Universities, polytechnics, and the Academy of Finland in a government decision on May 2000. The major part FIM 525million (¤90million) was directed to university core funding for 2001–3, in response to debate surrounding the inadequacy of core funding to the higher education sector. The sum is from a so-called 'future package' consisting of the income from selling state-owned companies.

## 11.5 New Zealand

Little attempt at modernisation in general. There is the notion that there are too many universities. And there is specialisation (due to pre-1960 situation of having only one multi-site University of New Zealand, where division of labour was natural), with its advantages and disadvantages.
Feelings of dissatisfaction are voiced by academics (as usual), and the extent of funding for basic research is on the agenda. The key problem is the teaching load, and the institutional invisibility of the research effort.

## 11.6 Germany

In Germany, the universities are under the responsibility of the Federal States (Länder). Attempts of the Federal government at modernisation of universities are necessarily limited. As a consequence, there is no coherent overarching university modernisation policy.

Since the 1990s, nevertheless, there are manifold *bottom up initiatives* striving for more flexible, effective, and internationally oriented institutional conditions for research and teaching in universities – partly initiated by individual universities, partly as policy initiatives of the Länder governments, partly as (funded) initiatives of independent charities, like the Volkswagen Foundation and the "Stifterverband für die deutsche Wissenschaft". Also, for decades, intermediary and/or advisory bodies (e.g. "Wissenschaftsrat") made many attempts towards modernisation of the university sector, and developed lelated recommendations or guidelines.

## 11.7 Switzerland

No information available.

# 12 Internationalisation

## 12.1 Sweden

As a small country Sweden is dependent on observing development in world science and participating in international research co-operation.

Swedish research has a wide network of international contacts. The international research collaboration is primarily conducted through collaborations between individual researchers or research groups with researchers in other countries. Sweden has also long been involved in a large number of international research organisations dedicated to the natural sciences and engineering. This collaboration is conducted within the framework of large-scale projects such as the scientific programme of the European space organisation (ESA), the fusion research of the EU, the European Organization for Nuclear Research (CERN) and the European Southern Observatory (ESO). [20]

Sweden's accession to the EU has produced new sources of funding for Swedish researchers and opportunities for collaboration within the EU framework programme for research and technical development. Swedish participation increased dramatically during the fourth framework programme (1994-1998), where it was twice as high as in the third framework programme (1990-1994). Approximately 2,000 Swedish researchers participated in some 1,100 projects in the fourth framework programme. 450 of these belonged to the higher education sector.[21]

During the Swedish EU presidency Sweden actively promoted the development of the EU's 6th Framework programme for research and development.

## 12.2 Netherlands

The international focus of the Dutch research system is reflected in the continuing participation of the Netherlands in international Big Science co-operations, in for instance nuclear physics, space research, biology, and environmental sciences. This international collaborative research is seen as necessarily to ensure that Dutch efforts in these fields are embedded in research structures of sufficient critical mass. Necessary investments in Big Science are too large to be made by a small country.

The science policy bodies (government, intermediate organisations) do not only try to ensure and facilitate participation, but also actively try to bring core activities, such as management offices, to the Netherlands. Remarkably, from the interviews with the intermediate organisations that, in the nineties, most of them had taken the initiative for international exchange and workshops with like-wise organisations. Chairmen and secretaries often are active in these international organisations and some of the offices are located in the Netherlands.

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[20] http://utbildning.regeringen.se/inenglish/educresearch/research.htm#International
[21] http://utbildning.regeringen.se/inenglish/educresearch/research.htm#International

Europeanisation, in the nineties issued by the Science Budget as a topic science policy, is generally left to the discretion of research organisations, and within the research performing organisations to the researchers. Some universities stimulate participation in the European Programme through transfer centres and premiums on European contracts.

The Ministry of Economic Affairs has set up a fine-branched network of committees, to ensure the inflow of Dutch expertise and interests in the management processes of the Framework Programme. Organisations involved in science policy are explicitly asked to come up their opinions on the European framework programme– of which the impact within the Dutch bureaucracy, let it be within the European arena – is hard to assess.

At the intermediate level responses to the European Union, differ substantially. Some organisations continue to identify themselves with the national science policy. Others consider European Union as a new arena for policy making that has to be 'served' or 'addressed' and have joined efforts with like wise organisations in other countries to do so. A third strategy is to move activities to the European level but separate from the EU. The Framework Programme is seen as a temporarily phenomenon that should not survive too long and is rather be replaced by European research programmes initiated 'bottom up'

## 12.3 UK

The Framework Programmes are heavily utilised by the UK. Currently the UK receives around 15% of total funds which amounts to around ¤2billion. We are the second greatest beneficiary of Framework funds, after Germany, and when analysed on the basis of how much we invest, the UK actually does better.

The British Council runs joint research programmes to promote links between British and other European HEIs research institutions and laboratories. The Royal Society also funds exchange schemes to allow researchers from the UK to spend time at a university elsewhere in the world and *vice versa*. While the Royal Society schemes do not fund joint projects, they are helpful in facilitating links, particularly with institutions in the developing world.

## 12.4 Finland

Tekes administers Finland's involvement with various international organisations and programmes, including the EU Framework programmes. In FPIV, there were around 1000 projects with Finnish participants, of which 163 were coordinated by Finnish partners. Finland also cooperates in the EU EUREKA programme, OECD's energy organisation IEA (International Energy Agency), European Cooperation in Scientific and Technical Research (COST), European Space Agency (ESA) and Nordic cooperation.

The VTT is a major user of EU funds, its participation in the 4$^{th}$ Framework Programme equals the combined input of the four next largest participants.

CIMO, the Centre for International Mobility administers scholarship and exchange programmes and is responsible for the implementation of a number of EU education, training and youth programmes at national level. CIMO operates under the ME.

Tekes is working to strengthen the bilateral cooperation with countries such as the USA and Japan. Tekes also hosts the Finnish contact points to European technology networks such as the Innovation Relay Centres.

The Academy of Finland funds a significant portion of researchers' international mobility. The Academy has several forms of funding for this purpose; the major part of the funding takes place through research projects, research programmes and the centre of excellence programmes. Bilateral researcher exchange is another form of funding. One type of funding is the personal researcher exchange grant. The Academy currently has exchange agreements with 37 partners in 25 different countries.

The Academy also supports the participation of Finnish researchers in international co-operation through the payment of membership fees and research costs to Nordic organisations, the European Science Foundation, the European Union, the United Nations and certain other organisations.

The Academy serves as the Finnish contact for several international organisations such as the European Union, the European Science Foundation and the United Nations, and provides advice to researchers on the funding available through these organisations.

The Academy of Finland is the **national contact party** for two thematic and two horizontal **programmes of the Fifth EC Framework Programme**. The duties of the Finnish Presidency of the EU are channelled to the Academy of Finland through these programmes.

**The Academy's international cooperation** with private funding bodies increased during 2000, which saw the launch of the Academy's first ever joint project that involves public and private funding bodies from two different countries. Administered by the Research Council for Culture and Society, Interaction across the Gulf of Bothnia is a three-year research programme in the humanities and social sciences, with funding provided by the Åbo Akademi University Foundation, the Foundation for Swedish Culture in Finland and the Society of Swedish Literature in Finland; and on the other hand by the Swedish Council for Research in the Humanities and Social Sciences (HSFR) and the Bank of Sweden Tercentenary Foundation.

The Research Council for Health launched a targeted programme for research in Type I Diabetes. This programme was additionally funded by the Sigrid Jusélius Foundation from Finland and the Juvenile Diabetes Foundation International from the United States.

The Academy published in 2000 its new science policy line. "Forward Look 2000". Key issues on the agenda for the next few years are to secure the supply of high-quality research staff, to develop creative research environments, to increase co-

operation with other funding bodies and to take the best possible advantage of international opportunities in all areas of research and science policy.

## 12.5 New Zealand

Stimulated – is part of the New Zealand problem definition (being small and far away from it all). One indicator is the willingness to fund conference visits and stays abroad from research budgets.
Concern about brain drain, but according to Davenport the data do not bear this out.

## 12.6 Germany

The Federal Government runs three closely interconnected "levels of action" that encompass the vast number of players, fields of action and instruments of international co-operation:

- *Bilateral relations* with European and non-European countries: German research institutions currently practise various types of scientific and technical co-operation with over 40 countries.
- *European co-operation*, in particular among EU countries but also going beyond the EU: The EU's Fifth RTD Framework Programme does not replace national research efforts; it rather reinforces them by adding the European networking component. In the course of the first three years of the Fourth Framework Programme alone, the EU activities led to approximately 112,000 co-operative links between a wide variety of players primarily in Europe, but also with non-European partners. In addition, EUREKA and COST provide a framework for co-operation, also for non-EU countries. The same applies, for instance, to ESA or CERN, the European Science Foundation (ESF) or INTAS, the International Association for the Promotion of Co-operation with Scientists from the Independent States of the Former Soviet Union.
- Co-operation within the framework of international and *multilateral organisations*: One important case in point is the OECD with its Committee for Scientific and Technological Policy (CSTP).

## 12.7 Switzerland

As a small country Switzerland is dependent on observing development in world science and participating in international research co-operation. Swiss research has a wide network of international contacts. The international research collaboration is primarily conducted through collaborations between individual researchers or research groups in public or industrial labs with researchers in other countries. Switzerland has also long been involved in a large number of international research organisations dedicated to the natural sciences and engineering. This collaboration is conducted within the framework of large-scale projects or institutions such as CERN, CIESM, EMBC, EMBL, ESA, ESO, ESRF, HFSP, ILL, JET, OECD.

Swiss government (as a Non-EU-member) stimulates actively Swiss participation in EU's Framework Programmes, COST, and EUREKA. Both the participation in the EU FPs and in COST were evaluated in 2001**. Exhibit 17** illustrates the increasing Swiss participation in the EU FPs.

**Exhibit 17 Swiss participation in EU Framework programmes**