

# Science and Technology Indicators

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NORWAY



## Introduction

This is the sixth booklet containing tables and figures on R&D statistics and other science and technology indicators. The first one was published in 1997, and the last four issues of the booklet are also available on <http://www.nifu.no/>. A broader coverage of S&T input and output factors is contained in the publication *Report on Science and Technology Indicators for Norway 2001, NIFU, Oslo, April 2002*. Below, we describe the R&D statistics and their data sources more in detail. All expenditures are given in current prices, unless otherwise indicated. 1.00 PPP US\$ = 10.82 NOK in 2000 (Main Science and Technology Indicators 2001/2, OECD).

### Who prepares the R&D statistics?

R&D statistics in Norway are prepared every second year on commission from the Research Council of Norway. The Norwegian Institute for Studies in Research and Higher Education, NIFU, is responsible for the statistics on the Higher Education Sector and the Institute Sector, while Statistics Norway does the statistics for the Industry Sector. NIFU is also responsible for aggregating total national R&D statistics. Further information may be obtained on the World Wide Web at NIFU's home page: <http://www.nifu.no/>, with links to the report mentioned above and the home pages of the Norwegian Research Council and Statistics Norway.

### How are R&D statistics compiled?

Norwegian R&D statistics are compiled in accordance with the international guidelines issued by the OECD. These guidelines are contained in the "Frascati Manual" (*The Measurement of Scientific and Technological activities: Proposed Standard Practice for Surveys of Research and Development "Frascati Manual 1993"*, OECD 1994). The sections of this manual dealing with basic definitions and conventions have been issued in Norwegian by NIFU.

Norwegian R&D statistics are compiled every second year through administrative registers and questionnaires sent to the concerning units in the three performing sectors.

The survey of R&D activity in the **Industry Sector** contains all companies with 50 or more employees. In addition, the survey includes a number of selected companies with a minimum of 10 employees. Before 1995, the survey included only companies with 50 or more employees. The statistics on the Industry Sector from 1995 are therefore not comparable with those of the previous years.

The **Higher Education Sector** is thoroughly surveyed. Each individual department or corresponding equivalent unit is surveyed. University hospitals are also included in this sector. Supplementary sources of information include surveys on staff members' time usage, information on personnel and expenditure from the institutions' central administration, the Research Council of Norway, and medical foundations.

The **Institute Sector** is also covered by complete surveys. Questionnaires are sent to research institutes and other institutions which are expected to perform R&D activities. In addition, this sector includes estimates of R&D resources at museums and non-university hospitals that are not included in the Higher Education Sector.

#### **Other data sources:**

The "Frascati Manual" also includes guidelines for **government budget appropriations or outlays for R&D (GBAORD)**. GBAORD are estimated annually by NIFU. Statistics on **R&D personnel** in the Higher Education and Institute Sectors are based on NIFU's register on research personnel, scientists and engineers. The register is updated every second year. Data on **international R&D statistics** are extracted from the OECD's *Main Science and Technology Indicators*. The **doctoral degree statistics** are based on NIFU's Norwegian doctoral degree register, which is updated biannually. **Bibliometric data** are extracted from the database *National Science Indicators* prepared by the *Institute for Scientific Information* in the U.S. This database contains worldwide publication and citation statistics.

## Basic definitions of Research and Experimental Development (R&D)

**Research and experimental development** comprises work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications.

Three types of R&D may be distinguished:

- **Basic research** is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundation of phenomena and observable facts, without any particular application or use in view.
- **Applied research** is also original investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards a specific practical aim or objective.
- **Experimental development** is systematic work, drawing on existing knowledge gained from research and/or practical experience, that is directed to producing new materials, products or devices, to installing new processes, systems and services, or to improving substantially those already produced or installed.

### Sector classification

In Norwegian R&D statistics, resources are classified in three performing sectors: *The Industry Sector*, *the Higher Education Sector*, and *the Institute Sector*. The Norwegian classification somewhat differs from the OECD's: OECD's Business Enterprise Sector includes both industry and private institutes that are business-oriented (However, these institutes are included in the Institute Sector in Norway). OECD's *Higher Education Sector* corresponds to the Norwegian classification, while its *Government Sector* and *Private Non-Profit Sector (PNP)* together cover the rest of the Institute Sector in Norway. The PNP Sector is rather small in Norway, and it is therefore included in the Government Sector of OECD's statistics.

## Highlights

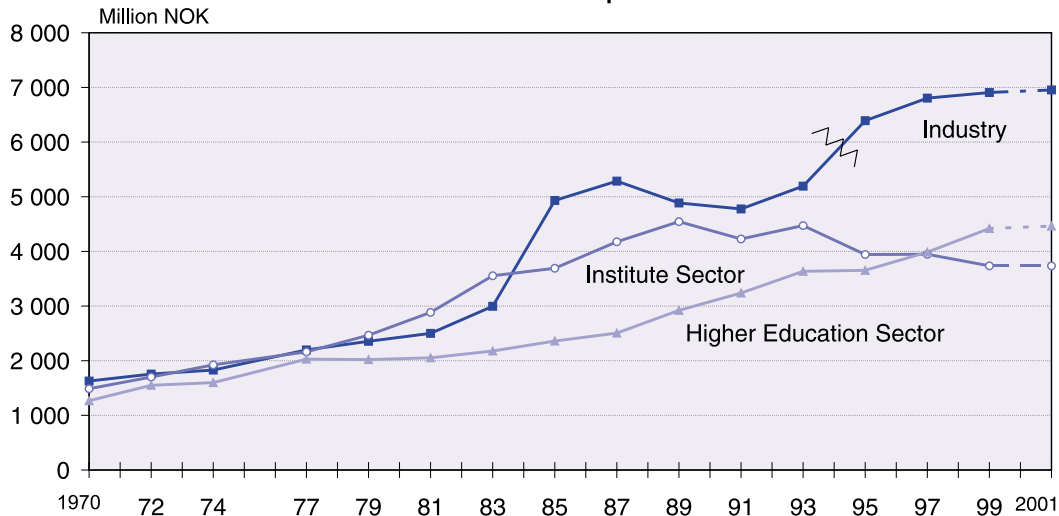
- 20 billion NOK were spent on R&D in Norway in 1999, compared to 18 billion NOK in 1997.
- As share of Gross Domestic Product (GDP), the R&D expenditure amounted to 1.70 per cent in 1999, compared to 1.66 per cent in 1997. Estimates for 2001 shows that the share will lie between 1.5 and 1.6 per cent. In 1997 the OECD average was 2.16 per cent and 2.21 per cent in 1999.
- Since the mid-1990ies R&D expenditure per capita has been lower in Norway than for most other countries with which Norwegian figures usually are compared.
- In 1999, 49 per cent of all R&D in Norway was funded by Industry and 42 per cent by Government.
- As a performing sector, Industry spent 47 per cent of total R&D expenditure in Norway. The Institute Sector and the Higher Education Sector accounted for 25 per cent and 29 per cent, respectively. Estimates indicate a moderate real growth in Industry and in the Higher Education Sector between 1999 and 2001, and status quo or slight real decrease in the Institute Sector.
- More than 4 billion NOK or 22 per cent of all R&D in Norway in 1999 were spent on R&D in information and communication technology. R&D on biotechnology and aquaculture amounted to 1 billion NOK or 5 per cent.
- In 1999 the number of researchers, scientists and engineers (RSE) was 44 000, of which 9 000 were women and 35 000 were men.
- 13 per cent of the professors were women in 1999, while the share of women among fellowship holders was 42 per cent.
- Government budget appropriations or outlays for R&D (GBAORD) are estimated to 12 billion NOK in 2002. This implies a real growth of 5 per cent from 2001.
- The number of annually awarded doctorates did not increase during the period 1998 – 2001.
- In the period 1996-2000 Norwegian researchers published more co-authored scientific articles with colleges from Nordic countries than from the US and Canada.

**Table 1 Total R&D expenditure in Norway by performing sector and source of funds: 1999 Million NOK**

Performing sector	Total	Source of funds					
		Industry		Public sources		Other	Abroad
		Total	"Of which: oil companies"	Total	"Of which: Research Council of Norway"		
Industry	9 540.0	8 419.1	906.4	487.7	109.3	-	633.2
Institute Sector	4 987.1	1 259.6	221.3	3 036.2	1 194.9	179.9	511.4
Higher Education Sector	5 819.4	295.6	40.5	5 049.0	753.7	306.7	168.1
Total	20 346.5	9 974.3	1 168.2	8 572.9	2 057.9	486.6	1 312.7

Sources: NIFU/Statistics Norway

**Figure 1 R&D expenditure in Norway by performing sector 1970–99, estimate for 2001  
Constant 1990 prices**



Sources: NIFU/Statistics Norway

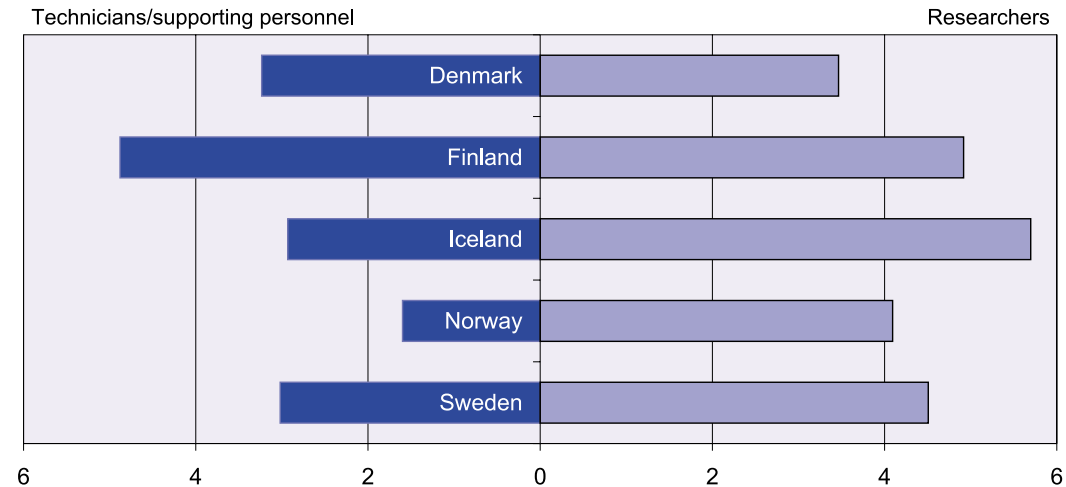
**Table 2 R&D expenditure in selected OECD countries: 1997 and 1999**

Country	Percentage of GDP		Per capita NOK		Share of public funding (%)	
	1997	1999	1997	1999	1997	1999
Austria	1.69	1.83	3 604	4 281	42	40
Denmark	1.94	2.06	4 472	5 302	36	33
Finland	2.72	3.22	5 182	6 904	31	29
France	2.22	2.19	4 225	4 619	39	37
Germany	2.29	2.44	4 742	5 507	36	33
Iceland	1.84	2.32	4 140	5 832	51	41
Japan	2.83	2.93	6 620	7 132	18	20
Netherlands	2.04	2.05	4 406	5 047	39	36
<b>Norway</b>	<b>1.66</b>	<b>1.7</b>	<b>4 129</b>	<b>4 558</b>	<b>43</b>	<b>43</b>
Sweden	3.67	3.8	7 202	8 320	26	25
United Kingdom	1.84	1.87	3 588	4 067	31	28
United States	2.58	2.65	7 405	8 518	32	29
EU	1.8	1.86	3 441	3 973	37	35
Nordic countries	2.62	2.79	5 566	6 624	31	30
OECD	2.16	2.21	4 222	4 770	31	30

Sources: OECD-Main Science and Technology Indicators 2001-2

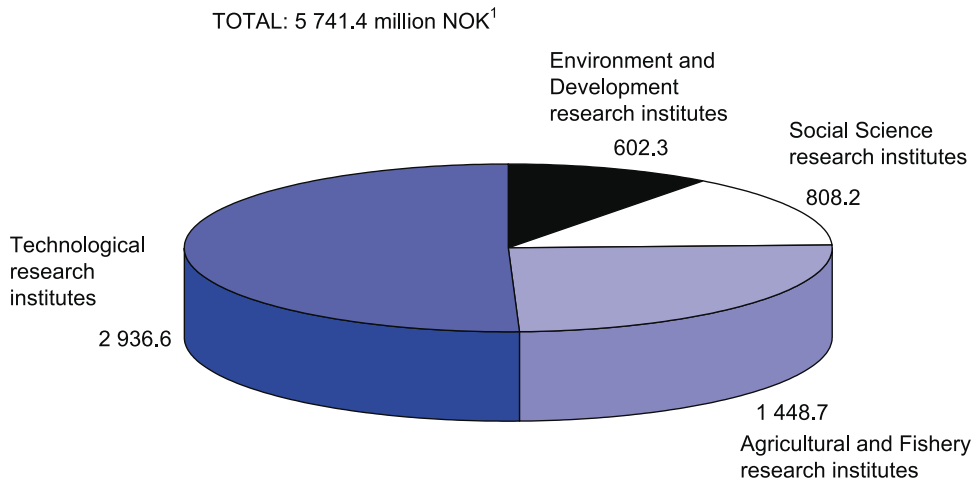


**Figure 2 R&D personnel (FTE) by personnel category per 1000 inhabitants in the Nordic countries: 1999**



Source: OECD Main Science and Technology Indicators 2001/2

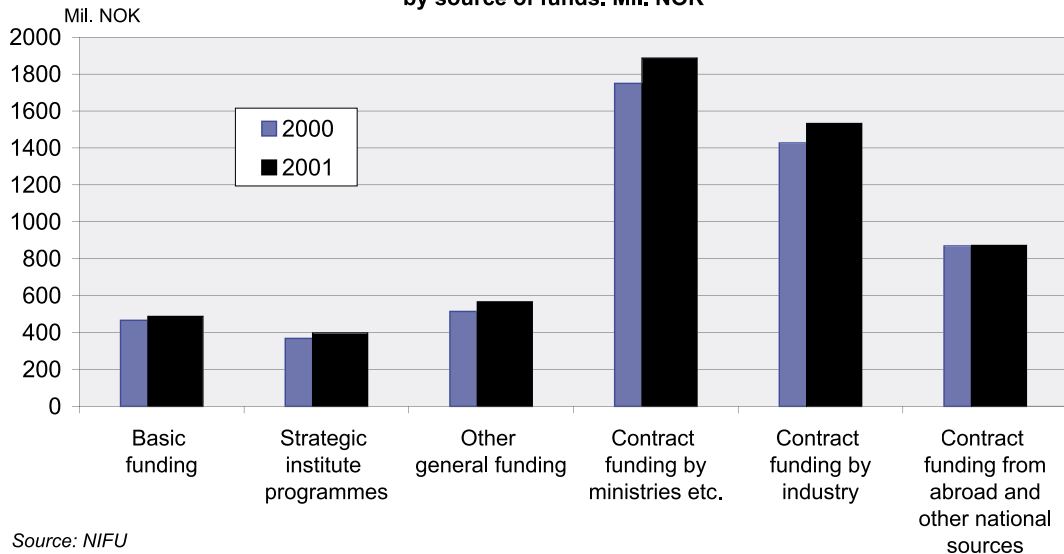
**Figure 3 Operating income at research institutes in Norway by field of science: 2001, mil. NOK**



<sup>1</sup> The total is adjusted for double entries and includes medical and health institutes.

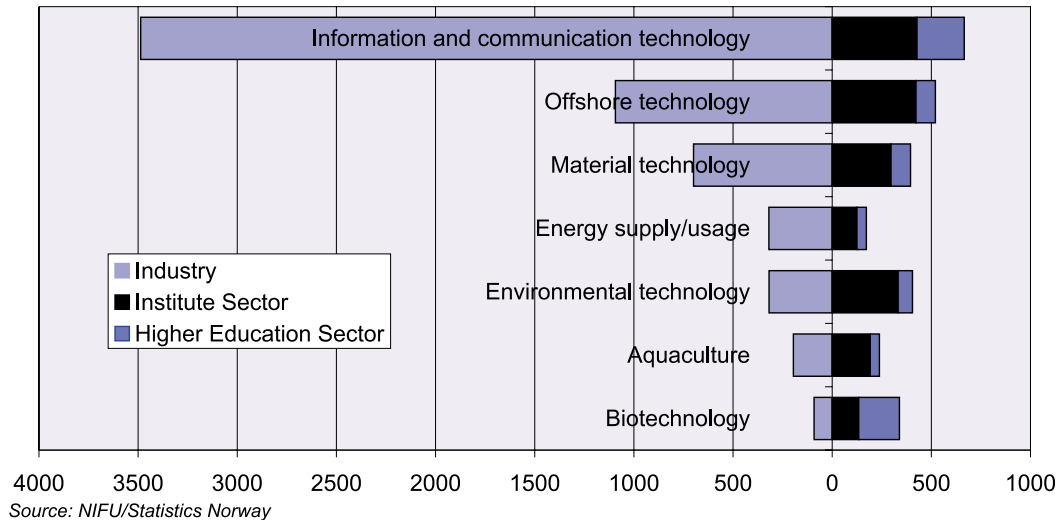
Source: NIFU

**Figure 4 Operating income at the research institutes in Norway in 2000 and 2001 by source of funds. Mil. NOK**



Source: NIFU

**Figure 5 Current expenditure on R&D in Norway by sector and selected R&D fields: 1999.  
Mil. NOK**



**Table 3 R&D personnel (FTE) in Norway by sector of performance: 1999 and 2001**

Sector of performance	1999			2001 <sup>1</sup>
	University graduates	Other personnel	Total R&D personnel	University graduates
Industry	10 710	3 835	14 545	..
Institute Sector	5 920	3 359	9 279	5 950
Higher Education Sector	14 364	5 705	20 069	14 900
<i>Of which Universities</i>	8 305	3 809	12 114	8 500
<i>Specialised university institutions</i>	1 577	639	2 216	1 600
<i>State university colleges</i>	4 482	1 257	5 739	4 800
Total	30 994	43 893	..	

<sup>1</sup> Preliminary figures

Source: NIFU, Statistics Norway

**Table 4 Academic staff members at Universities and Specialised university institutions in Norway by position: 1997, 1999 and 2001**

Position	1997		1999		2001 <sup>1</sup>	
	Total	% women	Total	% women	Total	% women
Professor	1 950	11	2 028	12	2 120	13
Associate professor	1 683	26	1 789	28	1 750	31
Other tenured positions	922	38	972	34	920	42
Sum tenured positions	4 555	22	4 789	24	4 790	25
Externally paid	683	34	714	36	750	37
Post doc.	170	36	261	42	410	45
Hospital paid <sup>2</sup>	1 096	21	1 115	22	1 040	26
Recruitment personnel	2 891	40	3 003	42	3 110	45
Total	9 395	29	9 882	31	10 100	33

<sup>1</sup> Preliminary figures

<sup>2</sup> Includes physicians performing R&D, whose main position is at a university hospital.

Source: NIFU

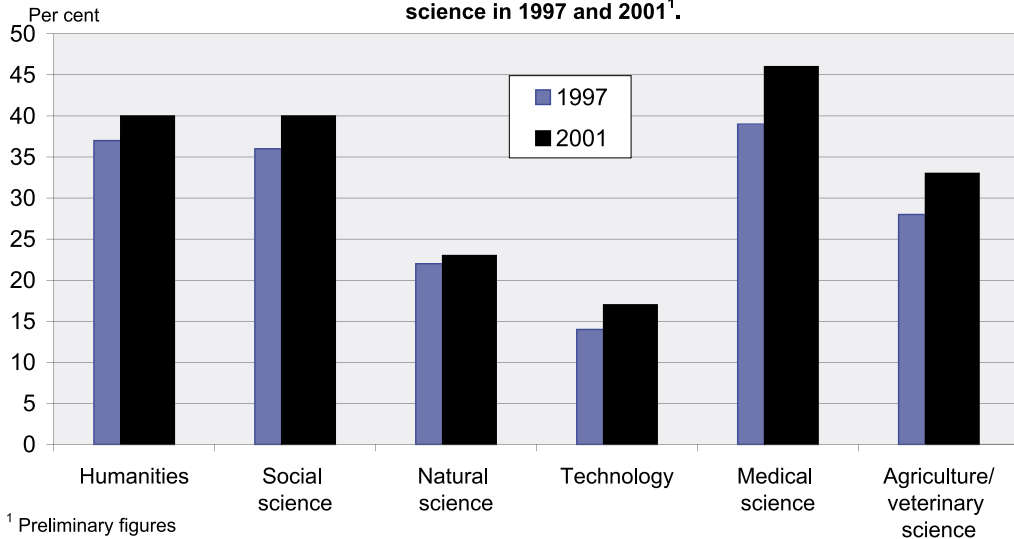
**Table 5 Academic and professional staff members at State university colleges in Norway by position: 1997, 1999, and 2001**

Position	1997		1999		2001 <sup>1</sup>	
	Total	% women	Total	% women	Total	% women
Professor	97	9	127	7	175	9
College reader	75	9	57	12	44	14
Associate professor	826	20	886	22	951	24
Senior lecturer	133	19	268	22	348	28
Assistant professor	300	23	221	25	188	24
College lecturer	2 573	47	2 702	52	2 878	53
Sum tenured positions	4 004	37	4 261	40	4 584	42
Externally paid	72	43	70	44	68	56
Recruitment personnel	112	43	151	38	153	42
Total	4 188	38	4 482	40	4 805	42

<sup>1</sup> Preliminary figures

Source: NIFU

**Figure 6 Percentage women of academic staff in the Higher Education sector in Norway by field of science in 1997 and 2001<sup>1</sup>.**

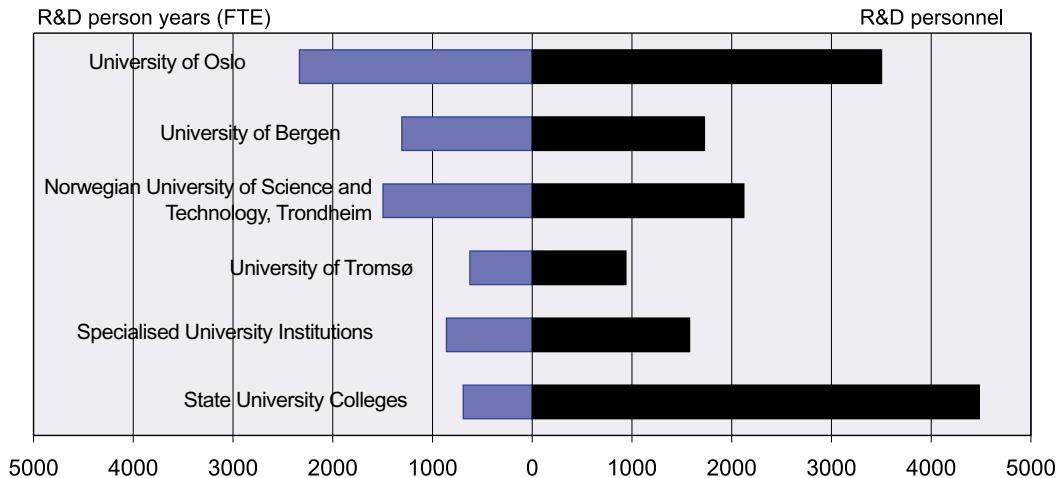


<sup>1</sup> Preliminary figures

Source: NIFU/Register of Personnel

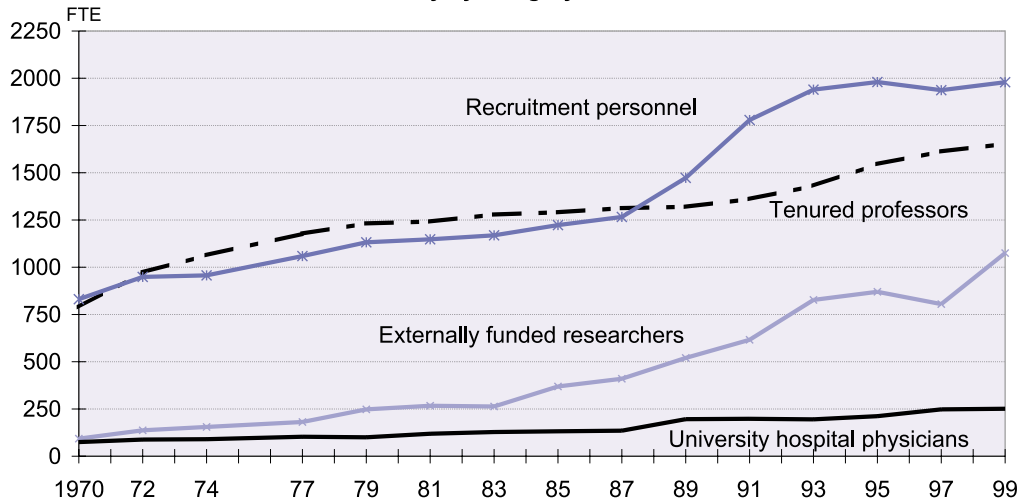


**Figure 7 R&D person years (FTE) and R&D personnel (head count) in the Higher Education Sector in Norway by institution :1999**



Source: NIFU/Register of Personnel

**Figure 8 Full time equivalent (FTE) R&D at Universities and Specialised university institutions in Norway by category: 1970-99**



Source: NIFU

**Table 6 Government budget appropriations or outlays for R&D (GBAORD)<sup>1</sup> in Norway by Socio-economic objectives. Final budget: 2000 and 2001, million NOK**

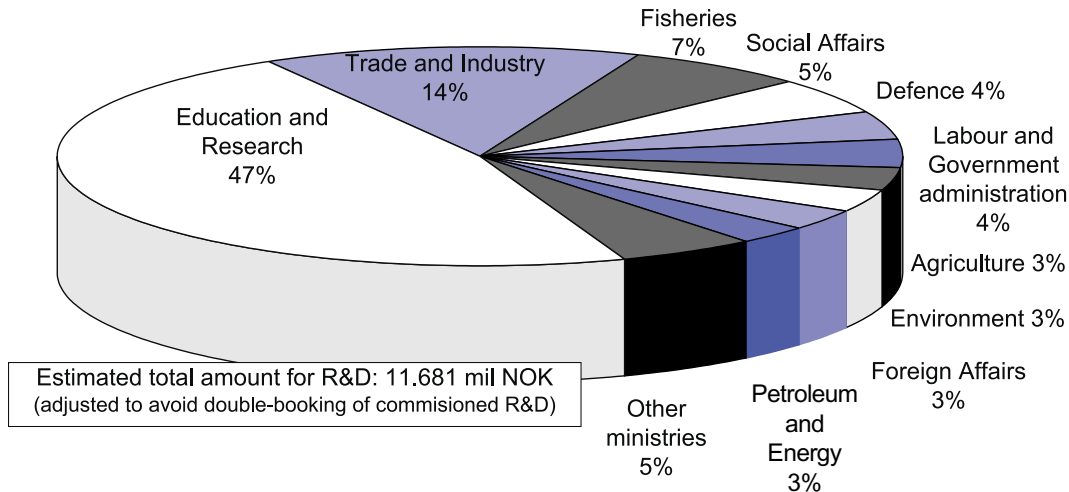
<b>Socio-economic objectives</b>	<b>2001</b>	<b>2002</b>
Agriculture, forestry and fishery	896	1 238
<i>Of which fishery</i>	524	850
Industrial development	1 403	992
Production and distribution of energy	210	244
Transport and telecommunications	210	224
Living conditions and physical planning	27	19
Environment	280	288
Health	700	738
Social conditions	129	140
Culture, mass media and leisure	117	127
Education	86	82
Working conditions	85	104
Economic planning and public administration	324	353
Exploration and exploitation of the earth and atmosphere	217	222
General advancement of knowledge	4 791	5 610
Space research	235	247
Defence	489	495
Not specified <sup>2</sup>	500	558
<b>Total</b>	<b>10 699</b>	<b>11 681</b>

<sup>1</sup> Includes resources for R&D performed in Norway and abroad.

<sup>2</sup> EU contingent

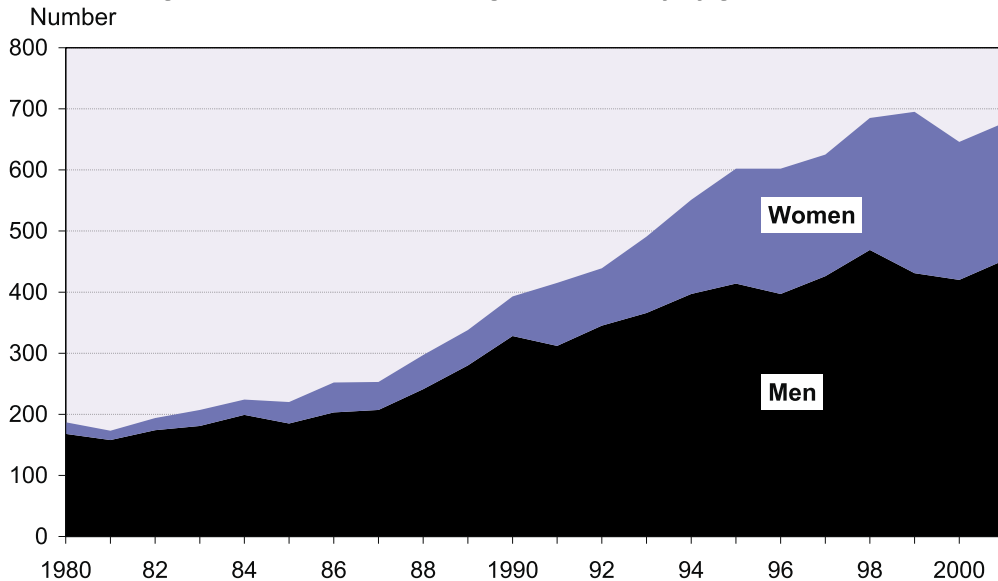
Source: NIFU

**Figure 9 Government budget appropriations or outlays for R&D (GBAORD) in Norway: 2002.  
Percentages per ministry**



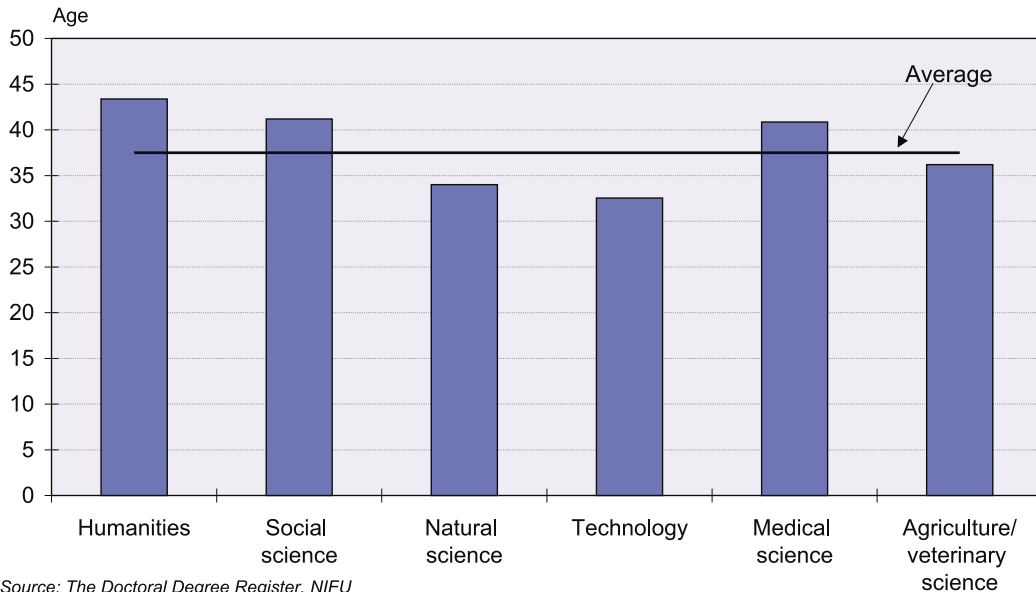
Source: NIFU

**Figur 10 Awarded doctoral degrees in Norway by gender: 1980-2001**



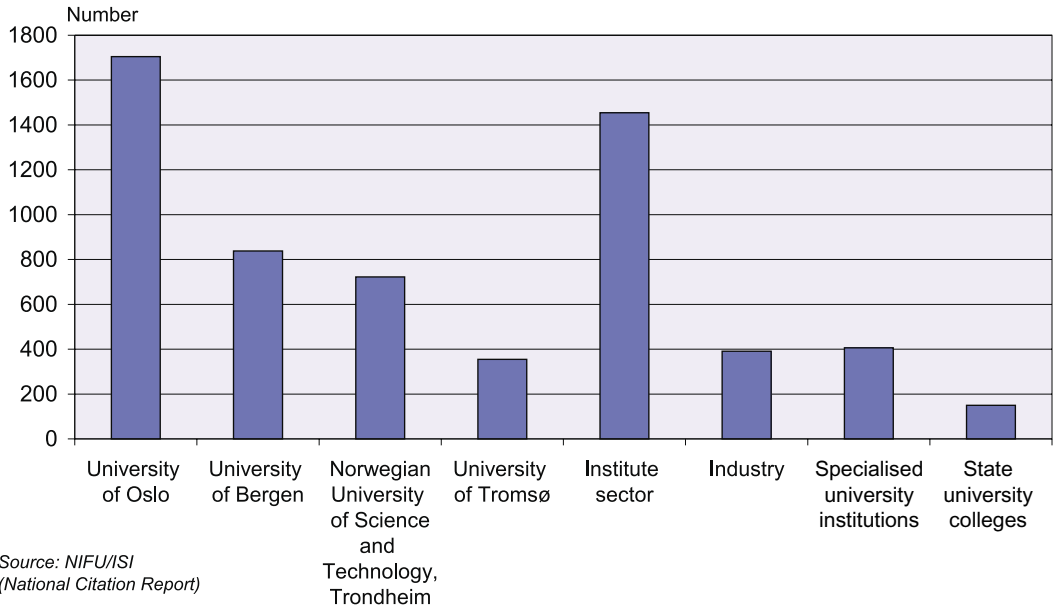
Source: *The Doctoral Degree Register, NIFU*

**Figur 11 Average age by the date of disputation in Norway by field of science: 1995-2001**



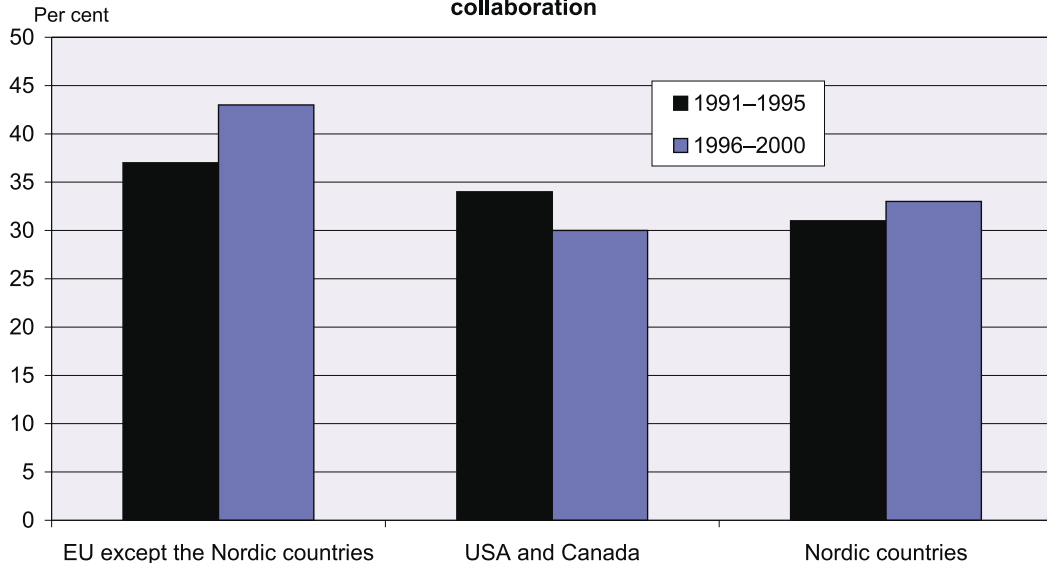
Source: *The Doctoral Degree Register, NIFU*

**Figure 12 Number of articles in scientific journals by institution in Norway: 2000**



Source: NIFU/ISI  
(National Citation Report)

**Figur 13 Share of Norwegian scientist's co-authored articles, 1991-2000, by region of collaboration**



Source: NIFU/ISI (National Citation Report)