2018

R&D statistics and indicators

Research and experimental development

NIFU

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R&D-statistics and indicators

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Introduction

This booklet, containing tables and figures on R&D statistics and science and technology indicators, has been published annually since 1997. The web-edition can be found at *http://www.nifu.no/en/statistics-indicators/nokkeltall/*. Here you can also download tables and figures in Excel format.

A broader coverage of S&T input and output data is also published annually in the Report on Science and Technology Indicators for Norway by The Research Council of Norway. The 2018-edition will only be published digitally in two stages: In June and in October. The 2017-edition will included an abridged english version. The internet version of the report is regularly updated (*http://www.forskningsradet.no/prognett-indikatorrapporten/Home_page/1224698172612*). You may also find information at *www.foustatistikkbanken.no*.

All expenditures are given in current prices, unless otherwise indicated. In 2015 1.00 PPP US$ = 9.7 NOK (OECD, Main Science and Technology Indicators 201–2). By May 2018 1 Euro = 9.48 NOK.

Who prepares the R&D statistics?

NIFU and Statistics Norway carry out the statistical surveys on resources devoted to R&D in Norway. NIFU is responsible for collecting, processing and disseminating statistics and indicators regarding the institute sector (see classification on page four) and the higher education sector, while Statistics Norway is responsible for the industrial sector. NIFU is also responsible for compiling the information into national totals for Norway. In the industrial and institute sectors, and the health trusts, annual statistical surveys are carried out. In the higher education sector the survey is carried out every second year. For all sectors main figures are presented annually. Further information may be found at: *www.nifu.no/en/statistics/*.

How are R&D statistics compiled?

Norwegian R&D statistics are compiled in accordance with the international guidelines proposed by the OECD in the «Frascati Manual» (Frascati Manual 2015–Guidelines for Collecting and Reporting Data on Research and Experimental Development, OECD 2015).

R&D statistics for Norway are based on administrative registers and questionnaires sent to the R&D performing units in each sector.

The survey on R&D activity in the industrial sector covers all companies with 50 or more employees. In addition, the survey includes a sample of companies with a minimum of 10 employees. Prior to 1995, the survey only included companies with 50 or more employees. Statistics on the Industrial sector from 1995 onwards are therefore not directly comparable with previous years.

In the higher education sector each individual department or corresponding equivalent unit is surveyed. Supplementary sources of information include surveys on staff time distribution, information on personnel and expenditure from the institutions' central administration, information from the Research Council of Norway, and from medical foundations.

The institute sector is also fully covered by exhaustive surveys. Questionnaires are sent to research institutes and other institutions that are expected to perform R&D activities. R&D performed at museums is estimated.

Statistics on R&D resources in health trusts (university hospitals and other hospitals), are collected through a separate, national reporting system. Since the 2007 edition, the reporting system for health trusts has been integrated with that for national R&D statistics. In international R&D statistics, university hospitals are included in the higher education sector, while other hospitals are included in the government sector/ institute sector.

Basic definitions of research and experimental development (R&D)

Research and experimental development (R&D) comprise creative 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, which 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

Norwegian R&D statistics are generally divided into three sectors: Industrial sector, institute sector and higher education sector. The higher education sector, university hospitals included, corresponds to the OECD higher education sector. For international comparisons, business enterprise sector includes the industrial sector as well as non-profit research institutes serving enterprises. In national statistics, these business-oriented research institutes are included in the institute sector, which also covers the government sector and private non-profit sector (PNP). The PNP sector is relatively small in Norway, and is therefore included in the government sector in international statistics presentations. In this publication, health trusts are sometimes presented separately.

Other data sources

Norwegian R&D statistics comes from the national statistical producers NIFU and Statistics Norway. Statistics on R&D personnel in the higher education and institute sectors are based on NIFU's Register of Research personnel. The register is updated annually. International R&D statistics are extracted from the OECD's Main Science and Technology Indicators and the OECD online database. Information about doctoral students and awarded doctoral degrees in the Nordic and Baltic countries is from NORBAL, a database operated by NIFU. The doctoral degree statistics are based on NIFU's Norwegian Doctoral degree register, which is updated biannually. Bibliometric data are extracted from the database Web of Science of Clarivate analytics. This database contains worldwide publication and citation statistics.

Legend to tables

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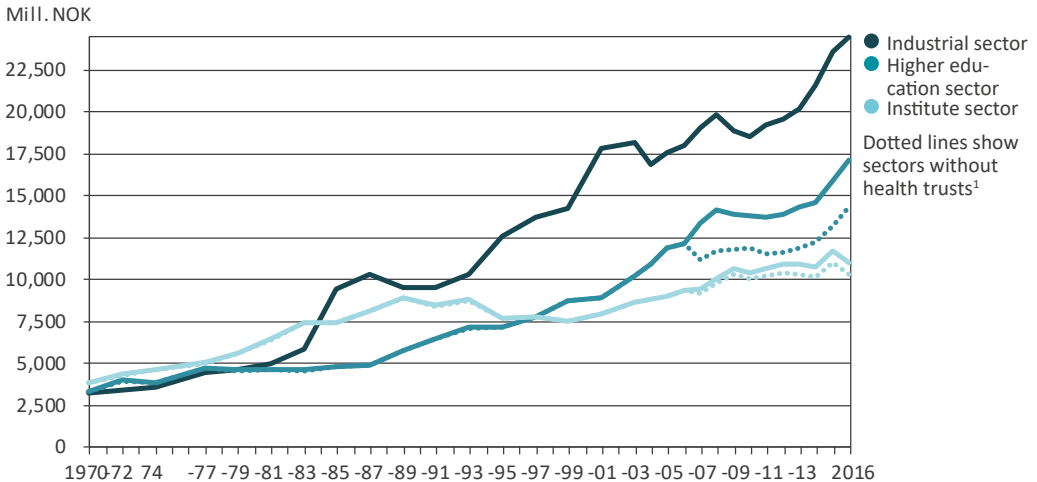
Highlights

- Total R&D expenditure in Norway amounted to 63.3 billion NOK in 2016, an increase from 60.2 billion NOK in 2015 and 53.9 billion NOK in 2014.
- Norwegian R&D expenditure in 2016 amounted to 2.03 % of GDP. In the OECD area the average R&D share of GDP was 2.35 % (2015), corresponding to 1.94 % for the EU 28.
- Norway spent 12 098 NOK on R&D per capita in 2016. Denmark and Sweden spent 14 252 and 16 118 NOK, respectively.
- From 2011 to 2016 Norwegian R&D expenditure (fixed PPP$) increased by 20 per cent. Finland's R&D decreased with 23 per cent, and China had an increase of 55 per cent.
- In the Norwegian institute sector, government sources provides 68 per cent of R&D funding.
- In 2016, the South-Eastern health region had the highest share of R&D costs in their total current costs; 6,6 per cent.
- In 2017, three ministries granted more than 4 billion NOK for R&D; Ministries of Education and Research, Trade, Industry and Fisheries, and Health and Care Services.
- In 2016, 80 684 persons were involved in R&D in Norway. Of these, researchers amounted to 68 per cent and support staff had a 32 per cent share. Total R&D personnel performed 43 918 FTEs, 45 per cent were related to industrial sector.
- Total R&D personnel performed 43 918 R&D full time equivalents, 45 per cent of these in the industrial sector.
- In 2016, 53 per cent of researchers in the institute sector in Norway had a PhD, 48 per cent in the higher education sector, and 10 per cent of researchers in the industrial sector.
- Slightly under half of doctorates defending their thesis in Norway between 1995 and 2016, worked at higher education institutions, research institutes in the institute sector, or in health trusts in 2016.
- In 2015, the Nordic countries' scientific publications were, relatively speaking, cited equally or well above the world average.

Table of contents

1 R&D expenditure by sector of performance: 1970–2016. Norway. Fixed 2010-prices. Mill. NOK.



[1] *Hospitals in the higher education sector (university hospital trusts) and institute sector (other hospital trusts).*
Source: NIFU, R&D statistics

2 R&D expenditure by type of institution and source of funds. Norway. 2016. Million NOK.

Type of institution	Total	Industrial sector		Government		Other[1]	Abroad	
		Total	Of which: Oil companies	Total	Of which Research council		Total	Of which: EU-comm.
Industrial sector	**29,489**	**22,461**	**..**	**1,362**	**699**	**1,649**	**4,018**	**141**
Institute sector[2]	**12,362**	**2,430**	**390**	**8,203**	**3,244**	**376**	**1,353**	**438**
Of which: Research inst. serving enterprises	4,254	1,747	310	1,795	1,188	168	545	245
Government sector	8,108	683	80	6,408	2,056	208	809	194
Universities and colleges[2]	**17,306**	**601**	**..**	**15,361**	**2,847**	**764**	**581**	**441**
Hospital trusts	**4,187**	**78**	**-**	**3,820**	**277**	**255**	**35**	**14**
Of which: University hospital trusts	3,330	47	-	3,039	262	213	31	13
Other hospital trusts	858	30	..	781	15	42	4	1
Total	**63,345**	**25,569**	**..**	**28,746**	**7,067**	**3,043**	**5,987**	**1,035**

[1] Includes private funding, own funds and tax deduction fund «SkatteFunn» in Industrial sector.
[2] Excluding hospitals.
Source: NIFU/Statistics Norway, R&D statistics

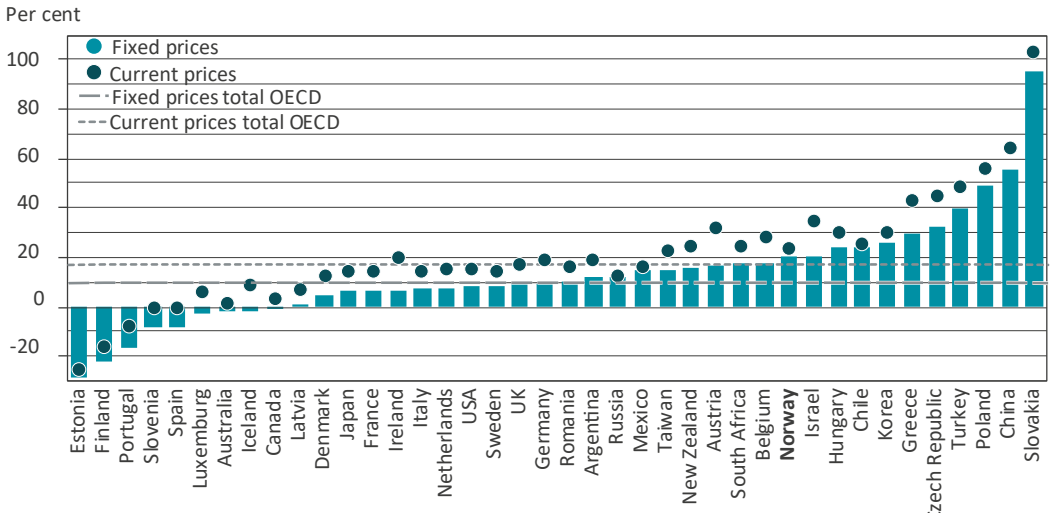
3 R&D expenditure as a share of the gross domestic product (GDP), by source of funds, and sector of performance. Selected countries. 2016.

Country	R&D expenditure as a percentage of GDP							R&D expenditure per capita NOK
	Total	Sector of performance			Source of funds			
		Business enterprise sector[1]	Higher education sector	Government sector	Government	Industry	Other	
Austria	3.09	2.20	0.73	0.16	0.95	1.65	0.49	15,786
Canada	1.60	0.82	0.66	0.13	0.53	0.65	0.42	7,275
China	2.12	1.64	0.14	0.33	0.42	1.61	0.08	3,304
Denmark	2.87	1.89	0.91	0.07	0.84	1.70	0.32	14,252
Finland	2.75	1.81	0.69	0.25	0.79	1.50	0.45	12,063
France	2.25	1.43	0.49	0.32	0.78	1.21	0.25	9,415
Germany	2.94	2.00	0.54	0.40	0.82	1.93	0.19	14,569
Iceland	2.10	1.32	0.68	0.10	0.72	0.74	0.65	10,644
Japan	3.14	2.47	0.39	0.28	0.47	2.45	0.22	13,467
Korea	4.24	3.29	0.39	0.56	0.96	3.20	0.08	15,680
Norway	**2.03**	**1.08**	**0.66**	**0.29**	**0.91**	**0.90**	**0.22**	**12,098**
Russia	1.10	0.64	0.10	0.35	0.75	0.31	0.04	2,761
Sweden	3.25	2.26	0.87	0.12	0.92	1.98	0.35	16,118
The Netherlands	2.03	1.16	0.64	0.23	0.67	0.99	0.37	10,401
United Kingdom	1.69	1.13	0.41	0.14	0.47	0.83	0.39	7,287
USA	2.74	1.95	0.36	0.43	0.69	1.71	0.35	16,003
Total OECD	**2.35**	**1.62**	**0.42**	**0.31**	**0.63**	**1.44**	**0.28**	**10,018**
EU - 28	**1.94**	**1.24**	**0.44**	**0.25**	**0.61**	**1.06**	**0.26**	**7,767**

[1] Where 2016 data is unavailable for source of funds, year of reference is 2013 (Sweden) and 2015 (Denmark, Finland, France, Norway, The Netherlands, United Kingdom, Germany, OECD, EU 28).

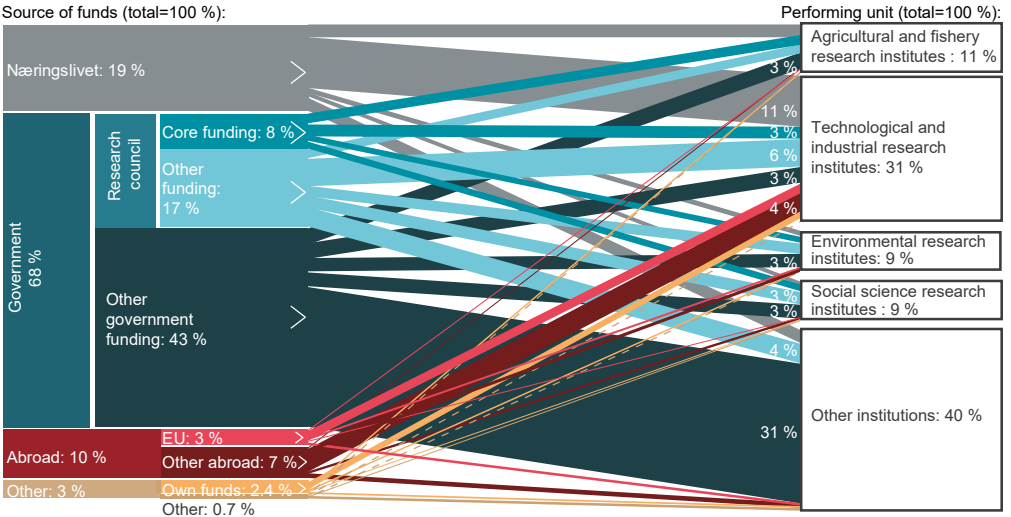
Sources: OECD – Main Science and Technology Indicators 2017–2 and national sources

4 Growth in total R&D expenditure in current and fixed PPP$. Selected countries. 2011–2016. Per cent.



Source: OECD – Main Science and Technology Indicators 2017

5 R&D expenditure in the institute sector by source of funds and type of performing institution. Per cent of total R&D expenditure. Norway. 2016.



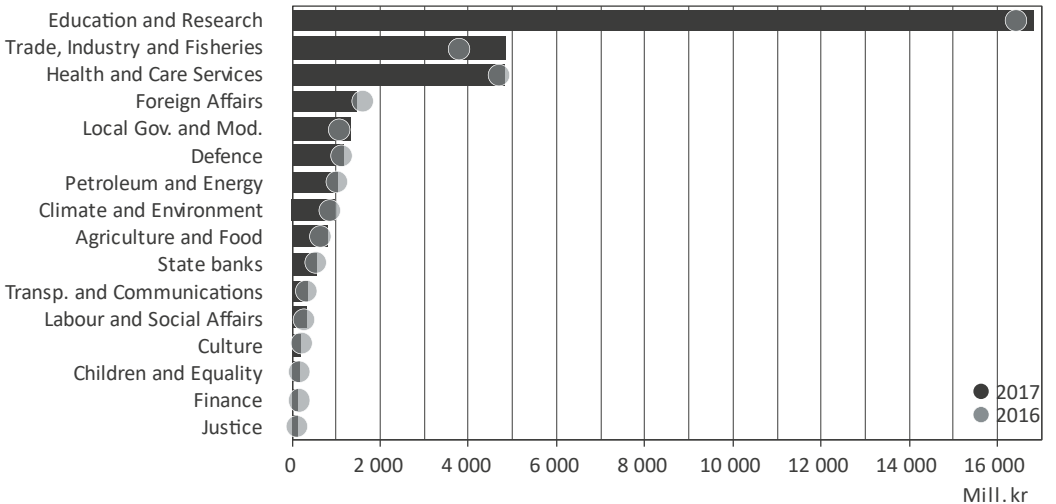
Source: NIFU, R&D-statistics

6 Total current expenditure and current expenditure[1] for R&D by type of health trust and health region (mill. NOK). Current R&D expenditure as a percentage of total current expenditure (per cent). Norway. 2016.

Health region	University hospital trusts[2]			Other hospital trusts		
	Total current costs	Current costs for R&D	% R&D	Total current expenditure	Current expenditure for R&D	% R&D
Mid Norway	10,052	280	2.8	10,404	63	0.6
Northern Norway	7,189	237	3.3	8,267	53	0.6
South-Eastern Norway	30,318	2,012	6.6	44,954	679	1.5
Western Norway	19,351	778	4.0	7,943	65	0.8
Total	**66,910**	**3,308**	**4.9**	**71,568**	**860**	**1.2**

[1] Current expenditure, including depreciation and externally funded R&D expenditure.
[2] Includes Oslo University Hospital HF, Akershus University Hospital HF, Bergen Health Trust HF, Stavanger Health Trust HF, St. Olav hospital HF and University Hospital Northern Norway HF
Source: NIFU, R&D statistics

7 Government budget allocations for R&D (GBARD) by ministry. Norway. 2016 and 2017. Mill. NOK.



Source: NIFU, State budget analysis

8 R&D personnel by type of institution. Head count and full time equivalents (FTE). Norway. 2016.

Type of institution	Head count by 01.10.2016			R&D full time equivalents	
	Total R&D personnel	Of which: Researchers/ academic staff	Tech. & supp. staff	Total	Of which: Researcers/ academic staff
Industrial sector	**33,495**	**20,729**	**12,766**	**19,616**	**13,396**
Institute sector[1]	**10,628**	**7,272**	**3,356**	**8,654**	**6,309**
Of which: Research inst. serving enterprises	2,776	1,984	792	2,555	1,934
Research inst. serving government	7,852	5,288	2,564	6,099	4,375
Universities and uiversity colleges[1]	**29,887**	**22,072**	**7,815**	**12,396**	**10,361**
Of which: Universities	21,729	15,327	6,402	..	..
Spec. univ. institutions etc.	2,655	2,211	444	..	..
State univ. colleges	5,503	4,534	969	..	..
Health trusts	**6,674**	**4,528**	**2,146**	**3,252**	**1,847**
Of which: University hospital trusts	5,061	3,466	1,595	2,541	1,434
Other hospital trusts	1,613	1,062	551	711	413
Total	**80,684**	**54,601**	**26,083**	**43,918**	**31,913**

[1] *Excluding hospitals.*

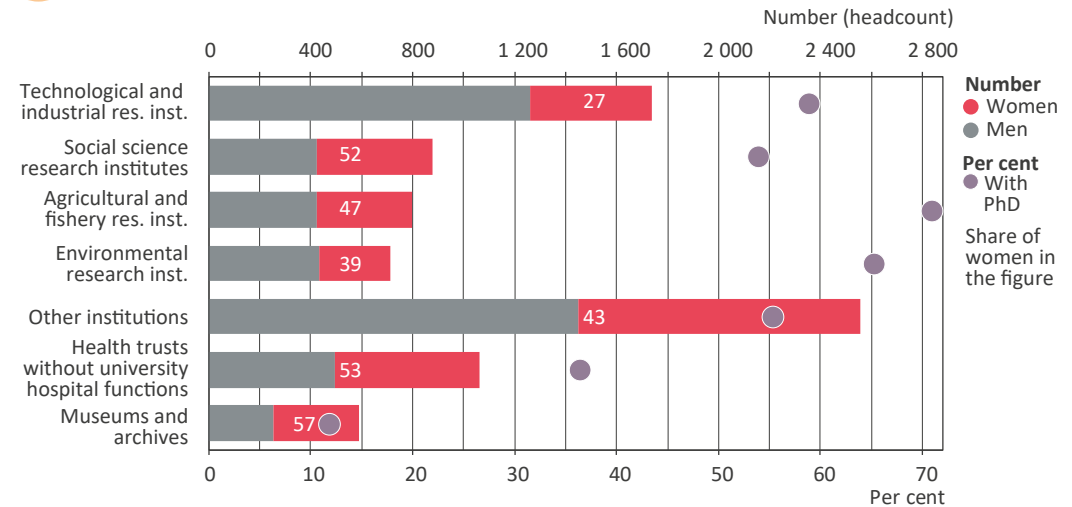
Source: NIFU/Statistics Norway, R&D statistics

9 Researchers/academic staff (head count) by type of institution. Doctorates and women. Norway. 2016.

Type of institution		Total			With a doctoral degree[1]			
		Total	Women		Total		Women	
		number	Number	%	Number	%	Number	%
Industrial sector		**20,729**	**4,622**	**22**	**2,135**	**10**	**540**	**12**
Institute sector[2]		**7,272**	**3,026**	**42**	**4,015**	**55**	**1,580**	**52**
Of which:	Research inst. serving enterprises	1,984	629	32	1,186	60	380	60
	Research inst. serving government	5,288	2,397	45	2,829	53	1,200	50
Universities and university colleges[2]		**22,072**	**10,558**	**48**	**10,264**	**47**	**4,155**	**39**
Of which:	Universities	15,327	6,902	45	7,891	51	3,067	44
	Spec. university institutions etc.	2,211	1,024	46	798	36	295	29
	State university colleges	4,534	2,632	58	1,575	35	793	30
Health trusts		**4,528**	**2,314**	**51**	**2,357**	**52**	**1,111**	**48**
Of which:	University hospital trusts	3,466	1,747	50	1,970	57	918	53
	Other hospital trusts	1,062	567	53	387	36	193	34
Total		**54,601**	**20,520**	**38**	**18,771**	**34**	**7,386**	**36**

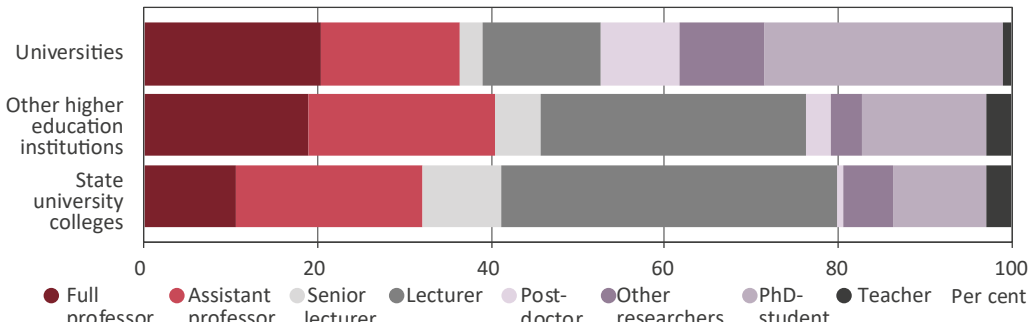
[1] *Also includes licenciates.*
[2] *Excluding hospitals.*
Source: NIFU/Statistics Norway, R&D statistics

10 Researchers in the institute sector by sex and share with PhD. Norway. 2016.



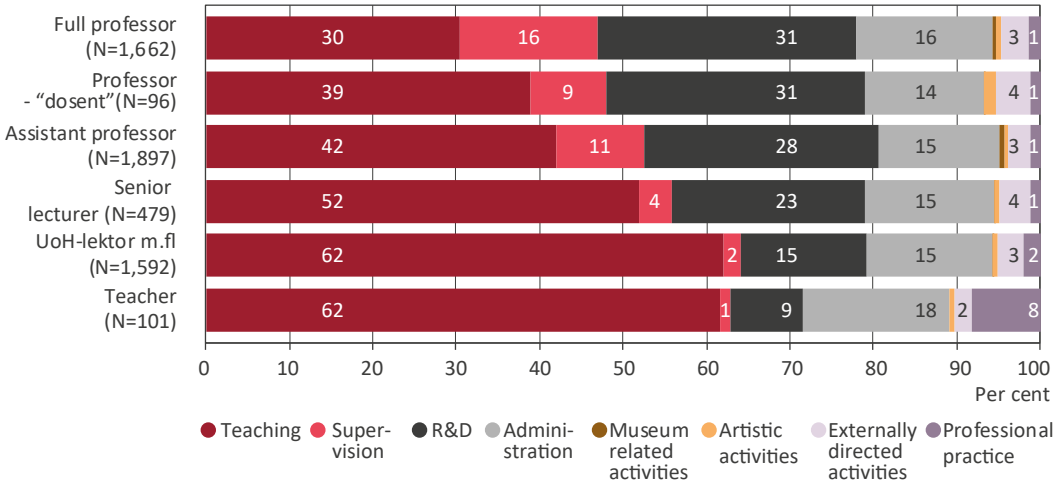
Source: NIFU, Register of research personnel

11 Researchers in higher education institutions by position and type of institution[1]. Norway. Per cent. 2016.



[1] *The presentations follows 2017-structure of institutions. OsloMet is categorised as state university college.*
Source: NIFU, Register of research personnel

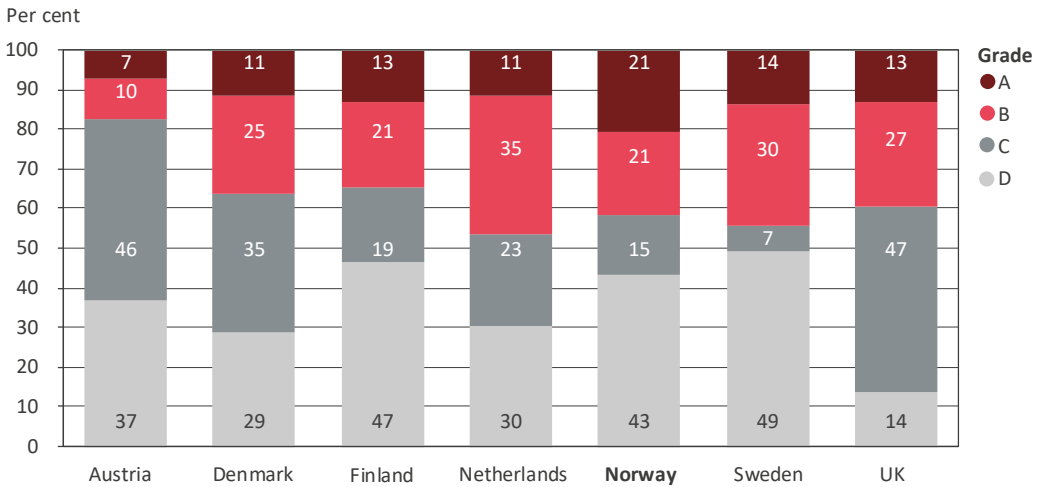
12 Distribution of working hours at higher education institutions for selected scientific posititons[1]. 2016. Per cent.



[1] *Note*

Source: NIFU, Time use survey 2017

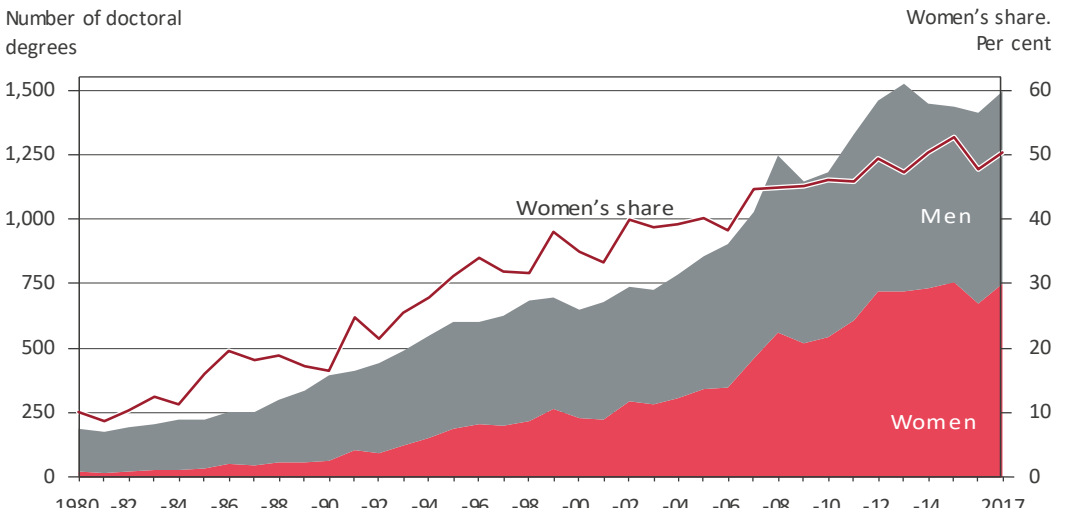
13 Academic personnel at universities in selected countries by seniority grade: A, B, C, D.[1] Per cent. 2015/16.



[1] *Grade A is the top academic level (typically professor level), while Grade D is the academic entry level.*

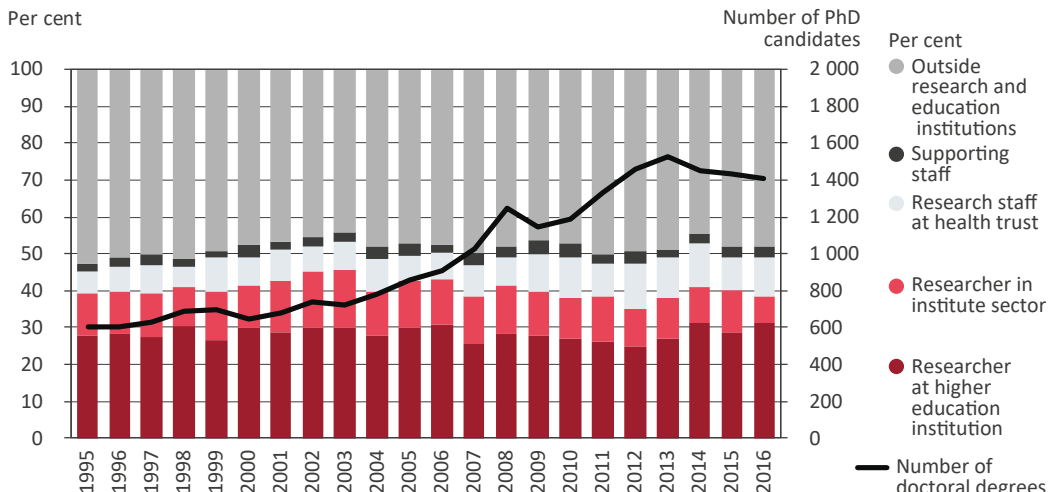
Source: National sources, official statistics, processed data. See details in Nicoline Frølich et al. 2018): Academic career structures in Europe, NIFU report 4/2018.

14 Awarded doctoral degrees in Norway by sex. 1980–2017.



Source: NIFU, The Doctoral degree register

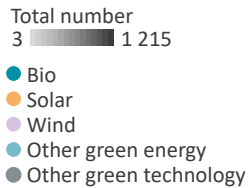
15 Type of employment for Norwegian PhD candidates graduated in the period of 1995–2016. Workplace 2016.

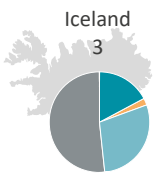


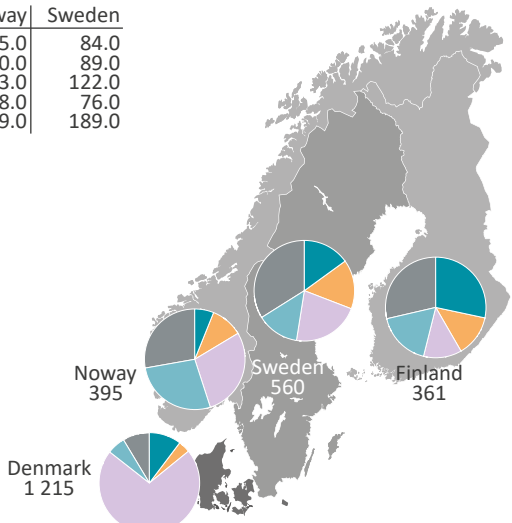
Source: NIFU/Statistics Norway

16 Nordic patenting[1] for selected green technologies[3] in Europe[2]. Patent applications 2000–2014.

	Denmark	Finland	Iceland	Norway	Sweden
Bio	126.0	103.0	0.5	25.0	84.0
Solar	49.0	48.0		40.0	89.0
Wind	865.0	44.0	0.1	113.0	122.0
Other green energy	73.0	63.0	0.9	108.0	76.0
Other green technology	102.0	103.0	1.6	109.0	189.0



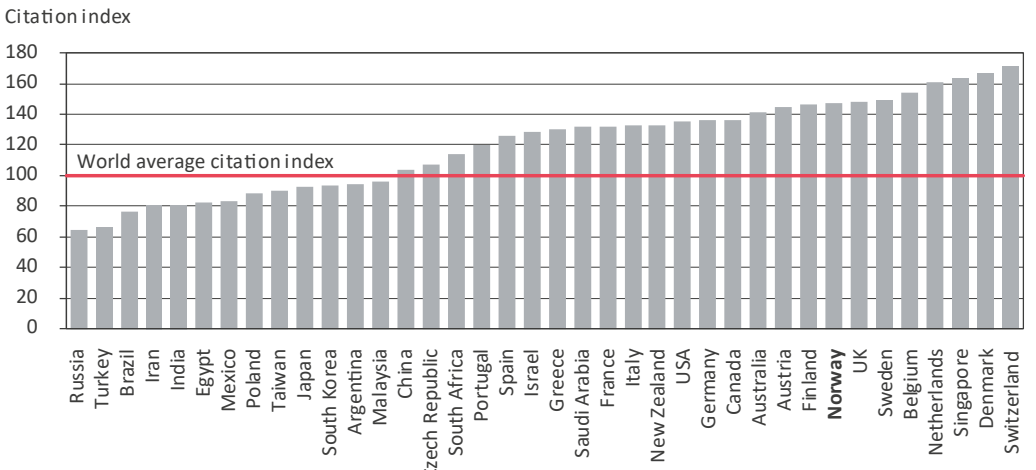




[1] Based on adress of patent applicant, normal count.
[2] Applications to EPO and/or directly to the Nordic patent boards.
[3] EN-TECH classification (OECD) based on CPC classes.
"Bio" (Biofuels, Fuel from waste), "solar" (Solar thermal energy, Solar photovoltaic PV energy, Solar thermal-PV hybrids), "Other green energy" (Geothermal energy, Marine energy, Hydrogen Technology, Fuel Cells), "Other green technology" (Combined combustion efficiency, Efficient combustion or heat usage,CO2 capture or storage CCS, Capture/disposal other greenhouse-gases, Energy Storage, Energy Tranmission and managment, Smart grids)

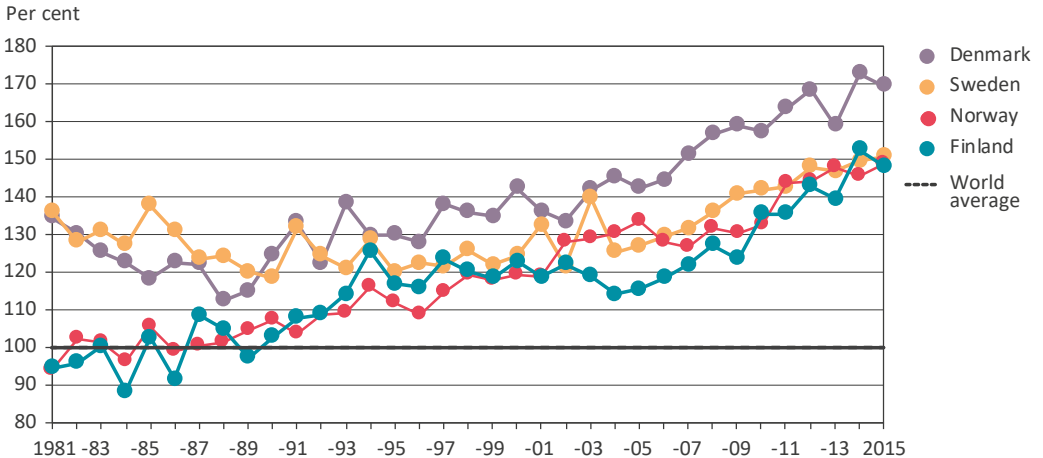
Source: PATSTAT 2017a. Compiled by NIFU

17 Relative citation index for selected countries. 2013–2015.[1]



[1] Based on publication year and accumulated citations related to these publications to 2016. Each year's index is weighted according to the country's relative distribution of articles on discipline. World average=100. Only countries with more than 25,000 articles are included.
Source: Web of Science. Computations: NIFU

18 Relative citation index for four Nordic countries[1]. 1981–2015.



[1] Based on year of publication and accumulated citations for these publications to 2016. Each country's index is weighted by the country's relative distribution of articles by discipline.
Source: Web of Science. Computations: NIFU