



Working Paper
2019:6

R&D statistical methodology in the Nordic countries 2015/2017

Based on Eurostat Quality Reports



Kaja Wendt, Ari Leppälähti, Jens Brodersen, Nils Adriansson
Martin Löwing Jensen, Arni Sigurdsson

NIFU

Working Paper
2019:6

R&D statistical methodology in the Nordic countries 2015/2017

Based on Eurostat Quality Reports

Kaja Wendt, Ari Leppälähti, Jens Brodersen, Nils Adriansson
Martin Löwing Jensen, Arni Sigurdsson

Working paper 2019:6

Published by Nordic Institute for Studies in Innovation, Research and Education
Adresse P.O. Box 2815 Tøyen, N-0608 Oslo.
Visiting Address: Økernveien 9, N-0653 Oslo.

Project No. 20947

Customer NIFU

Photomontage

ISBN 978-82-327-0388-3

ISSN 1894-8200 (online)



Copyright NIFU: CC BY-NC 4.0

www.nifu.no

Preface

R&D statistics is important input to national research and innovation politics. The quality of the data is important for international comparisons. Nordic producers of R&D statistics have for many years been cooperating closely on methodological issues. Although there are many similarities among the Nordic countries when it comes to country size and existence of registers and administrative data, there are also interesting differences in the production of R&D statistics that the group wanted to highlight and learn more about.

This stocktaking exercise has used metadata of the Eurostat Quality report 2015 as a starting point. The data are then edited and supplemented to highlight country and sector specific details in producing the national R&D statistics of each Nordic country. Where possible, the data has been updated with R&D statistical methodology of 2017.

The working paper has been prepared at NIFU by Kaja Wendt as project leader with contributions from all the Nordic statistical offices; Ari Leppälähti (Finland), Jens Brodersen (Denmark), Nils Adriansson (Sweden), Martin Löwing Jensen (now at the Swedish Higher Education Authority, UKÄ) and Arni Sigurdsson (Iceland). Mona N. Østby (NIFU) has compiled the data from the Quality reports and given technical assistance in completing the working paper. In addition to the authors of the working paper Kristine Langhoff (Statistics Norway), Mervi Härkönen (Statistics Finland) and Susanne L. Sundnes (NIFU) have provided valuable comments. Mark Knell at NIFU has proofread the report.

Oslo, June 2019

Sveinung Skule
Director

Michael S. Mark
Head of Research

Content

Summary.....	7
1 Production of R&D statistics in the Nordic countries.....	10
1.1 Business enterprise sector.....	10
1.1.1 Survey population.....	10
1.1.2 Data collection.....	12
1.1.3 Dissemination.....	12
1.2 The higher education sectors.....	13
1.2.1 Survey population.....	14
1.2.2 Data collection.....	15
1.2.3 Dissemination.....	17
1.3 The government sector	18
1.3.1 Survey population.....	18
1.3.2 Data collection and dissemination.....	19
1.4 The PNP sector	20
1.5 Overall dissemination	21
2 Nordic R&D resources and R&D system.....	22
2.1 R&D resources.....	23
2.2 Nordic R&D systems	25
References.....	31
Appendices.....	32
Appendix 1: Institutions covered in the 2017 R&D survey	32
Appendix 2: Stocktaking the Eurostat quality reports 2015	50
List of tables.....	70
List of figures.....	71

Summary

This working paper aims to give an overview of the methods for producing R&D statistics in the Nordic countries (Chapter 1). The purpose is partly to ease mutual learning between the R&D statistical producers and partly to inform stakeholders about the various methods currently in use. To give a more complete picture of R&D in the Nordic countries we also include an overview of R&D resources and the R&D system of the Nordic countries (Chapter 2).

According to the international guidelines for R&D statistics the OECD Frascati Manual (2015), there are several ways of producing high quality R&D statistics and all the Nordic countries are well within the recommendations. Different traditions and data sources have given rise to different approaches to producing these statistics in the Nordic countries.

Below we present some of the main differences between the Nordic countries productions of R&D statistics per R&D performing sector.

The Nordic countries use similar approaches to map R&D in the business enterprise sector – annual survey in 2 countries

In the business enterprise sector (BES), Finland and Norway conduct a full survey annually, while others collect data in odd-numbered years, which is the minimum required by statistical regulation. Each country has a R&D panel approach in the sample selection. Surveys of Manufacturing and R&D intensive services are in more detail than other services in all the Nordic countries. The response rate varies from 69% in Finland to 96% in Denmark and Norway (2015). Due to high response rates and the R&D panel approach, the sampling error in all countries is small.

All countries pay special attention to the measurement error, which is highly relevant in the R&D statistics. We put much effort on the functional aspects of the online questionnaire, on the clarity of the guidelines and on the interaction with the respondents.

The higher education sector is the most heterogeneous sector

In the higher education sector, an essential challenge is to extract the R&D part of total expenditures. In all the Nordic countries, there has traditionally been a binary system of higher education with universities more devoted to research and other institutions more into education. But recent developments have made the borders more blurred.

In Denmark, Finland, Iceland, and Norway the statistical level surveyed is the institute/department level, while in Sweden it is the legal entity, mostly an institution, that is the statistical unit.

There is substantial variation between the Nordic countries in terms of units covered in the government sector

In all countries the government sector includes public research institutions, hospitals, museums, and government agencies. Norway has the largest share of R&D expenditures in the Government sector compared to the other Nordic countries, but the data collection does not include a dedicated survey to regional level. Finland and Sweden surveyed both counties and municipalities.

The private-non-profit (PNP) sector has very little R&D activity

Finland and Denmark cover the PNP-sector units by the R&D survey conducted in the government sector. Finland and Sweden have a dedicated survey to PNP institutions that are supposed to perform R&D. Iceland, surveys the PNP-sector as part of the business enterprise sector. In Norway, there is no separate survey in the PNP-sector, PNP units are only covered by the R&D statistics as a funding source.

Processing and dissemination are important parts of the production of R&D statistics

In all countries, meetings with important stakeholders to accommodate user needs are part of the production of R&D statistics. All Nordic countries report data on time to international agencies (OECD and Eurostat).

Final R&D statistical data are disseminated in Statistical banks. Over the years there has been some variation in other R&D statistical products. The statistical organisations have produced newsletters, sectoral publications, Science and Technology reports. Both Sweden, Denmark and Norway have also had research barometers produced outside the statistical organisations. This working paper includes links to the current main publication of all the countries.

Future implications

For the Nordic producers of R&D statistics, this stocktaking exercise has provided valuable insight in coverage and methodology among the countries. It has also supplied ideas and advice for looking at new units to cover and new methods to implement.

1 Production of R&D statistics in the Nordic countries

The Nordic countries are in many ways similar; small, rich countries, with developed research systems and higher education institutions. And they have good access to administrative data and registers; both business registers, registers of higher education institutions and other available data sources.

In all the Nordic countries the production of R&D statistics is based on the guidelines in the 2015-edition of the OECD Frascati manual.¹ The production of these statistics is steered by regulatory framework of the EU (or EEA in case of Norway and Iceland).

The OECD revised the guidelines of the Frascati Manual several times since the first edition of 1963 to meet and address measurement challenges, new user needs, and best practices developed worldwide. Now the Frascati Manual serves as international guidelines for producing comparable R&D statistics. Reflecting the global differences in research systems, data availability and available resources, the manual opens for *several ways* to produce high quality R&D statistics. Among the Nordic countries there are indeed both similarities and differences in the production of the R&D statistics about methodological approach, frequency of data production, and details in coverage. This working paper highlights key elements of producing R&D statistics in each of the Nordic countries, sector by sector, looking at survey population, data processing and the dissemination of data.

1.1 Business enterprise sector

1.1.1 Survey population

Finland and Norway conduct a full survey annually, while others collect data in odd years, as required by regulation. In each of the Nordic countries the

¹ OECD (2015): [Frascati Manual 2015](#): Guidelines for Collecting and Reporting Data on Research and Experimental Development, The Measurement of Scientific, Technological and Innovation Activities, OECD Publishing, Paris.

responsible organization is the national statistical office. In Norway, NIFU is surveying research institutes serving the business sector (part of the business enterprise sector).²

Table 1 Characteristics of the BERD surveys in the Nordic countries, 2017.

Country	Size-classes	NACE	Number of firms in the survey
Denmark	Firms with 100+ employees: census. Sample from firms with 2–249 employees, cut off according to NACE classes likely to perform R&D or not	Excludes service industries that are not relevant.	3 321 (4 968 in 2015)
Finland	Firms with 100+ employees: census. Sample from firms with 10–99 employees	NACE 47, 55–56, 68–69, 75–88 and 96–99: only enterprises with 100+ employees as census. In NACE 72 1–9 employees also.	6 132 (6 731 in 2015)
Iceland	Census	Census	563 (1 012 in 2015)
Norway	Firms with 50+ employees: census. Sample from firms with 5–49 employees. Every second year 5+/10+ employees	A sample of 35 per cent for enterprises with 50–99 employees in NACE 41–43, 46, 49–53 Excludes NACE 41–43, 49–53 enterprises with 5–19 employees.	6 030 (5 646 in 2015) (both 5+ employees)
Sweden	Firms with 200+ employees: census. Sample from firms with 10–199 employees. RTOs regardless of size.	Covers all NACE activities. Census in NACE 72	7 756 (7 705 in 2015)

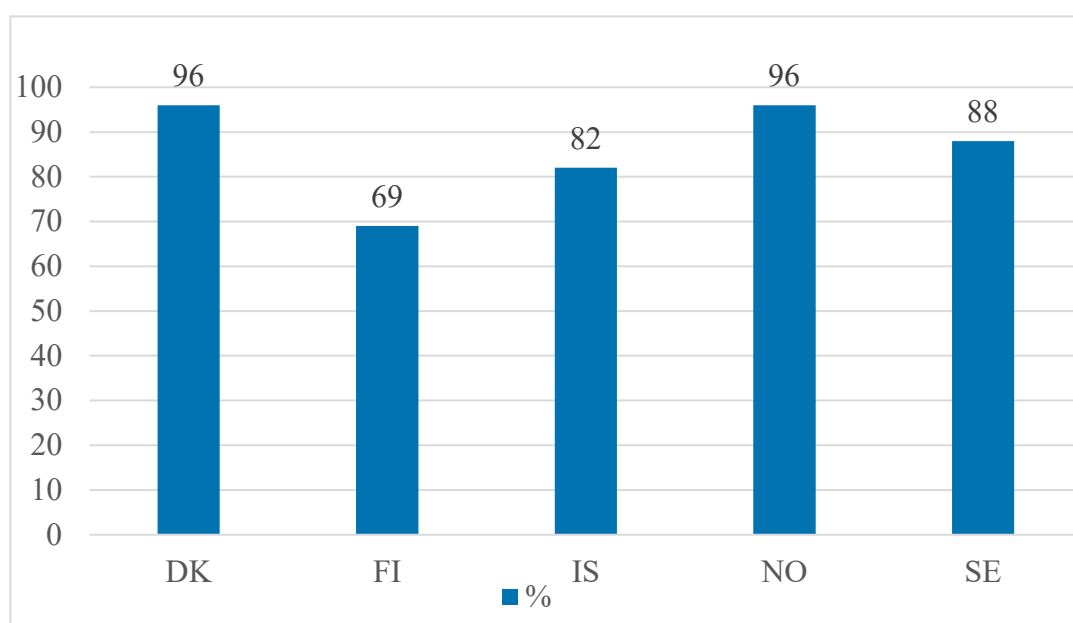
The target of the business enterprise research and development (BERD) survey is to measure R&D performing enterprises. Business surveys generally use a stratified random sampling (SRS) method, whereas BERD surveys usually use a panel approach. This is also the case with the Nordic countries. Each country adopts a kind of R&D panel approach in the sample selection (R&D in the previous survey, NACE 72), but some countries also use auxiliary information (FI Business Finland R&D grants, IS administrative sources indicating R&D). Denmark has tried to access R&D tax data on tax credits for R&D activities, but that has yet not been successful. Denmark has a register of businesses receiving funds for R&D activities. Norway explores the use of the R&D support data. Obviously, the R&D panel does not cover all the potential R&D performers and thus countries complement it with a sample.

² In national R&D statistics of Norway, research institutes and other public units mainly serving Government (in OECD statistics = GOV) plus research institutes mainly serving the business enterprise sector (part of BES) are gathered in a sector called the Institute sector.

Table 1 reveals quite similar methodological approaches among the Nordic countries in their respective BERD surveys. Manufacturing and R&D intensive services surveys require more detail than services with less frequent occurrence of R&D.

1.1.2 Data collection

Responding the R&D Survey is mandatory by national legislation in every country. Countries which actively implement penalties for non-respondents report extremely high response rates (DK and NO with 96 per cent). Finland had the lowest response rate at 69 per cent. However, the largest R&D firms are compliant in answering the survey.



¹ 2017: DK 97,7 %, FI 70,8 %.

Figure 1 Unit response rates (per cent) in the BES 2015¹.

Due to high response rates and the R&D panel approach, the sampling error in all countries is small. In weighting, the treatment of outliers is an issue as R&D is quite rare and one firm can stand out exceptionally.

All countries pay special attention to the measurement error, which is highly relevant in the R&D statistics. There is much effort put on the functional aspects of the online questionnaire, on the clarity of the guidelines and on the interaction with the respondents.

1.1.3 Dissemination

Eurostat collects preliminary data for major variables at the end of the October after the reference year (T+10). The Nordic countries release their figures around

that time. We communicate results through press releases, electronic publications, and databases on the internet sites.

Table 2 Date of publication of the results of BERD (months after reference year=T).

Country	Release of provisional data	Release of final data
Denmark	T+12	T+23
Finland	N/A	T+10
Iceland	N/A	T+10
Norway	T+10	T+14
Sweden	T+7	T+11

1.2 The higher education sectors

The higher education sector is the most heterogeneous sector in the research systems, and this is a challenge in the compilation of international comparable R&D statistics. An essential challenge is to extract the R&D part of total expenditures.³

Traditionally all the Nordic countries have had binary higher education sector systems (HES) with research-intensive universities and teaching-intensive university colleges. In recent years these distinctions have become more blurred as research has become a more important task for the university colleges.⁴ Substantial structural changes and mergers have changed the structure of the higher education sector, especially in Denmark and Norway where units from other R&D performing sectors (research institutes) have also been merged into HES. HES includes university hospitals in all countries

The Danish system of higher education is still binary, with research-intensive universities and teaching-intensive university colleges. There have been mergers of research institutes into the universities to strengthen the system in an international context. There are 31 higher education institutions with 8 universities, 22 university colleges (incl. 9 business academies/ erhvervsakademier) and 1 other institution (Probation Learning Centre).

Finland also has a binary structure with 15 universities (incl. the Finnish National Defence University) and 25 universities of applied sciences. The latter group is new and also have R&D tasks which makes the distinction between the institutions less strict.

In Iceland there are 7 universities, plus 2 research facilities and 1 university hospital that form part of the University of Iceland.

³ OECD (2015): Frascati Manual: 34. See also: Wendt, K., I. Söder, A. Leppälähti (2015): *A guide to understanding higher education R&D statistics in the Nordic countries*, [NIFU Working paper 9/2015](#).

⁴ See more in: Frølich, N. et al. (2018): Academic career structures in Europe: Perspectives from Norway, Denmark, Sweden, Finland, the Netherlands, Austria and the UK. [NIFU Report 4/2018](#)

In Norway, there are 32 higher education institutions in 2018, hereof 10 universities, 5 state university colleges, 9 universities of applied sciences and 8 other educational institutions (art, police, defence, nursing). The number of institutions has decreased since 2014 due to mergers between state university colleges and between universities and state university colleges. The aim has been to create more robust, higher quality institutions. The traditionally binary system of higher education is hence under large pressure.

In Sweden, all HEIs are subject to the same legislation, and receive their governmental funding in the same way – one amount for research and one for education. The share of research of the total funding differs significantly across institutions, with universities generally having higher shares of research than the others.

Today there are 35 higher education institutions; 14 public and 2 private universities, 14 university colleges and 5 university colleges of art. Sweden includes university hospitals only to some extent; only funding through higher education is included, while funding from the county councils (which own the university hospitals) is excluded.

1.2.1 Survey population

In all the Nordic countries the main input for R&D in the higher education sector (HERD) is a survey. Sweden carried out a survey at the institutional level, while other countries carried it out at the department level. In addition, administrative data from the HEI administration level are essential. Also, information from contact points at the institutional level is important, especially in Denmark and Norway. In Sweden and Finland, data collected by the Swedish Higher Education Authority (Universitetskanslerämbetet) and the Finnish Ministry of Education and Culture are essential to produce R&D statistics. All countries use time-use surveys, except Denmark.

Table 3 Characteristics of the HERD surveys in the Nordic countries, 2017

Indicator	Denmark	Finland	Iceland	Norway	Sweden
Types and number of institutions	Total: 31 HEI 15 university hospitals	Total: 46 HEI 15 universities, 6 university clinics, 25 universities of applied sciences	Total: 10 HEI 7 universities + two research facilities that are a part of the University of Iceland, and one University hospital	Total: 32 HEI 8 universities, 8 universities of applied sciences, 9 other higher education institutions, 7 state university colleges, <i>plus</i> 6 university hospitals	Total: 39 HEI 16 universities. 14 university colleges, 4 university colleges of the arts, 4 independent institutions, 1 research institute
Statistical unit	R&D performing HEI department, university hospital 550 units	University institute, university hospital or university of applied sciences. Calculation also on the university department level 1100 sub-units of the universities	University institute level, incl. separate institutions at main university, university hospital	University institute/centre, university college institute/department or university hospital 400 institutes/departments/centres	University, university college. Most units consist of one legal entity, but not all. 39 HEI, no sub units

1.2.2 Data collection

In all Nordic countries, the main HERD input is a survey. There are some variations in how central a time-use survey or administrative data are.

In Denmark, HERD rely heavily on the survey to department level, and on direct contact with each university. It does not use a dedicated time-use survey at national level and administrative data in producing HERD.

Finland produces HERD through a combination of an annual survey (on external funding) and administrative data. For universities, the survey is on department level, and data from the university administration and they use universities' time-use-monitoring records to compute the R&D coefficients. HERD production in Finland is taking advantage of a lot of administrative data collected by the Ministry of Education and Culture.

In Iceland, the annual survey on institutional level is the most important source of information when producing HERD.

In Norway, there is a combination of administrative data, survey (every second year), prefilled questionnaire with accounting data and there are contact persons at all the HEIs. Norway conducts a time-use-survey to individuals in HEI every fifth

year (from 2016, before that every 10th year). A register of research personnel is also important to produce HERD. The Norwegian R&D statistics of the sector has details at department/institute level (field of R&D and funding etc). They have made considerable efforts to make smart use of administrative data and ease the response burden by prefilling the questionnaires with accounting data.

Sweden produces its HERD figures with a survey (every second year on R&D expenditure) on institutional level (from 2015) and relies in addition on data collected by the Swedish Higher Education Authority, where HEI annually report economic figures derived from their accounting systems. Two registers, one of personnel in higher education and one of post-graduate students, are also important tools to produce HERD in Sweden.

Table 4 Main data of HERD survey in the Nordic countries.

Country	Administrative data source and use	Survey method and frequency	Time use survey (R&D coefficient)
Denmark	From university administration Data on R&D expenditure and funding	Annual survey, census Field of science (2-digit FOS) and type of R&D estimated by number of FTE	Not applicable. R&D coefficients not used at the national level
Finland	From university administrations, Statistics Finland, Ministry of Education and Culture, wage register of the Confederation of Finnish Industries Data on personnel, research expenditures, education registers	Annual survey, census (all) and register data (universities) Data on personnel, FTE, R&D field, funding source	Computed from universities' time-use monitoring records
Iceland	From university administrations	Annual survey	Time-use surveys
Norway	Central government accounting system, HEI administrations, financing bodies such as the Research Council of Norway, Directorate of Public Construction and Property Data on accounting, personnel, funding, investments	External R&D expenditure and -personnel, type of R&D, fields of science and technology, thematic priorities, and technology areas	Time-use survey of all relevant personnel at individual level. Planned for every 5 years from 2016

Sweden	<p>Derives R&D expenditures from data collected by Swedish Higher Education Authority where HEI annually reports economical figures derived from their accounting systems.</p> <p>Register of personnel in higher education register of post-graduate students (including salary data)</p> <p>R&D expenditure census: among HEI's R&D personnel (time-use) survey: among HES personnel Personnel data used to define statistical frame for time-use survey</p>	<p>R&D expenditure census: Revenues and depreciation (pre-printed) By FORD. Capital exp.(surveyed): By FORD</p> <p>R&D personnel (time-use) survey: share of working hours spent on different activities including R&D</p>	<p>Sweden does not use the time-use survey to derive R&D coefficients. (R&D Expenditure Methodology 2013)</p>
--------	--	--	---

1.2.3 Dissemination

Eurostat collects preliminary data for major variables at the end of October after the reference year (T+10). The Nordic countries release their figures around that time. Finland and Iceland release their final data similarly. The time lag to final data is longer for Denmark; they revise data at the same time as they deliver new data. This means that when they deliver 2017-data T+18, final 2016-data are delivered at the same time (T+30) for Denmark.

Table 5 Date of publication of the HERD results (months after reference year=T).

Country	Release of provisional data	Release of final data
Denmark	T+12	T+24
Finland	N/A	T+10
Iceland	N/A	T+10
Norway	T+10	T+12
Sweden	T+7 (from 2017)	T+11

1.3 The government sector

The size of the government sector R&D clearly varies between the Nordic countries. In Norway the government sector⁵ counted for 14 per cent of total R&D in 2017, in Finland the corresponding share was about 9 per cent, in Sweden and Iceland about 4 per cent each and in Denmark only 2 per cent of total R&D was performed in this sector. What kind of institutions that are included in the sector also differs, is shown in the appendix 2.

1.3.1 Survey population

Regarding government agencies and underlying units are these in lesser extent surveyed in Norway than in the other Nordic countries. This is partly due to the establishment of separate public research institutes in the 1980ies and 1990ies.

One clear difference among the Nordic countries is the counties: Finland and Sweden include this sector, while Norway does not.

The number institutions covered also varies; from 34 in Iceland, 67 in Finland, 85 in Denmark, 180 in Norway and 521 in Sweden. Compared with the R&D expenditure of the sectors the size of the units covered also varies a lot, with the largest units in Finland, followed by Norway and Denmark. Iceland and Sweden cover many units with low R&D expenditure. In Finland, an average unit in the government sector had R&D expenditure of 90 million NOK in 2017, in Norway the corresponding number was 53 million NOK, in Denmark 25 million NOK, in Sweden 12 million NOK and in Iceland 4 million NOK.

Table 6 Characteristics of the GOVERD surveys in the Nordic countries, 2017

Indicator	Denmark	Finland	Iceland	Norway	Sweden
Target population	Public institutes, hospitals, health administrations, libraries, archives, museums, collections funded by government	Known or supposed R&D performers in sector S.13 General government (including S.121 Central bank). PNP sector S.15. Nomenclature of the Classification of Sectors 2012	Legal unit	Public research institutes and other institutions with R&D outside HES. Hospitals other than university hospitals. Estimates for museums.	All government agencies, counties (including healthcare), municipalities, regional and local R&D units and government funded research foundations.
Types and number of institutions	Total: 85	Total: GOV: 67 PNP: 146	Total: 34	Total 180: Research institutes (44), institutions performing R&D	Total 521: Government agencies and government funded

⁵ The difference between national and international sectorial division in Norway is described in reference number 2.

				and government agencies (40); non-university hospitals (35); museums (60)	organisations (181), counties (20), municipalities (290), R&D units (24), research foundations (6)
Statistical unit	Smallest homogenous unit involved in a field of S&T and for which all factor input data can be obtained	Ministry, government agency, research institute or municipality, PNP organizations	Legal unit	Each institute or organization	

In the OECD NESTI group, there is currently ongoing work looking at how to increase comparability between countries about which units to include in the Government sector. The attribution of units to the “right” sector depends both on funding, control, and administration of the units as well as the organisation of the research and innovation system of each country.

1.3.2 Data collection and dissemination

All the Nordic countries conduct a survey to gather information on GOVERD. All the Nordic countries have extensive contact with central respondents and contact respondents when data are missing. Also contact with key users at ministries, and other central users are normal.

Table 7 Date of publication of the GOVERD results (months after reference year=T).

Country	Release of provisional data	Release of final data
Denmark	T+12	T+24
Finland	T+10	T+10
Iceland	T+10	T+10
Norway	T+10	T+12
Sweden	T+7 (from 2017)	T+11

Table 8 Main data of GOVERD survey in the Nordic countries.

Country	Administrative data source and use	Survey method and frequency	Quality measures, user contact
Denmark		Annual survey (census)	Contact with ministries, European Commission, NESTI, Nordic countries. Joint use/provider-group for public R&D statistics (HES+GOV+PNP)
Finland	Official business registers (incl. gov. organizations) to define frame population	Annual survey (census)	Use of official registers of high quality, high response rates, well-trained staff. 2 reminders by letter, phone contact to important missing units. Meetings with Ministries, key STI policy experts and researchers
Iceland	Business register	CAWI/CATI. E-mail questionnaires	Contact with ministries, Follow up by phone. Methodology tailored to the small number of R&D performing units. Improved questionnaire. All interaction with respondents through project manager
Norway	None	Annual survey (census)	Contact with ministries, meeting with key users. Recalls by email and phone. High coverage, extensive quality control during compilation, comparisons with earlier surveys
Sweden	Official business registers (incl. gov. organizations) to define frame population	Annual survey (census)	Contact with ministries, meeting with key users. Recalls; letters, email, and phone. High coverage, extensive quality control during compilation, comparisons with earlier survey

1.4 The PNP sector

In all the Nordic countries the PNP (private-non-profit) sector is small. Denmark and Finland cover the PNP sector by the R&D survey of the government sector. In Finland, the survey goes to PNP institutions supposed to perform R&D. In Norway the PNP-sector is diminishing as an R&D performing sector.

Table 9 Characteristics of the PNP surveys in the Nordic countries, 2017

Country	Target population	Survey method and frequency
Denmark	PNP organizations	Part of GOV survey
Finland	Supposed R&D performers in the PNP sector (60 units)	Part of GOV survey
Iceland	Survey in uneven years, estimates other years	Part of the BES survey following feedback from user needs
Norway	Very small as performing sector	No separate survey, incl. in GOV
Sweden	PNP institutions with R&D as main purpose	Separate survey

1.5 Overall dissemination

All Nordic countries have regular meetings and other contact with key users of the statistics; ministries, research councils and other key stakeholders. The table gives an overview of the central publication channels for R&D statistics.

Table 10 Producers of R&D statistics and main channel of publishing R&D statistics in the Nordic countries.

Country	Production of R&D statistics	Main publication	Statistical bank	Other
Denmark	Statistics Denmark	Innovation and Research 2018	StatBank Denmark , under Education and Knowledge	Research Development and Innovation
Finland	Statistics Finland	Science, Technology and Information Society	Statistics Finland's PX-Web databases , under Science, Technology and Information Society	Dataskyddsbeskrivning
Iceland	Statistics Iceland (Hagstofa)	Science and Technology	Database: R&D and Statistics	
Norway	Statistics Norway and NIFU	Annual S&T report , web-based since 2018	NIFU: R&D statistics bank Statistics Norway: Statbank : Technology and Innovation	About R&D statistics in Norway Booklet on R&D statistics
Sweden	Statistics Sweden	Education and research	Tables in statistical database , under Tables and graphs	

2 Nordic R&D resources and R&D system

This chapter presents some of the main findings when comparing R&D in the Nordic countries. First, we present a collage showing main features of the Nordic R&D at country level. This includes:

- R&D expenditure by performing sector
- R&D expenditure by source of funds
- Total R&D expenditure, both in a map and a figure
- R&D expenditure as percentage of GDP
- R&D personnel by type of staff.

For more information on the Nordic R&D statistics log on to [www.foustatistikbanken .no](http://www.foustatistikbanken.no) and find the Nordic R&D statistics there. Alternatively go to <https://www.nifu.no/fou-statistiske/fou-i-norden/>.

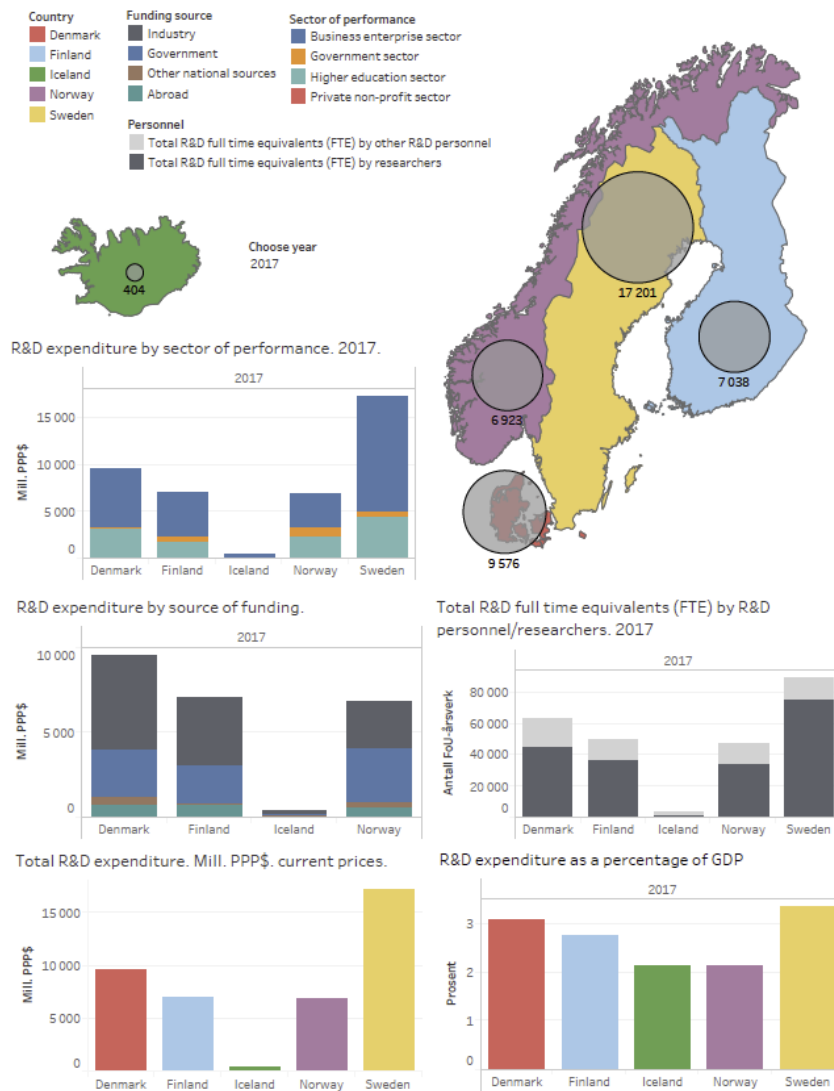


Figure 2 R&D statistical overview. Nordic countries. 2017

2.1 R&D resources

The Nordic countries' total R&D expenditure amounts to about 1.9 per cent of world R&D in 2015. The share is declining (2.3 per cent in 2007) as other countries (mainly in Asia) are increasing their share of world R&D.

Strong R&D intensity in the Nordic countries

The Nordic countries are characterised by one of the highest R&D intensities in the world, and this especially goes for Sweden, Finland, and Denmark. Sweden had R&D expenditure of 3.4 per cent of GDP in 2017, Denmark 3.1 per cent, Finland 2.8 per cent, Iceland 2.1 per cent and Norway 2.1 per cent, see the Figures above.

Table 11 Share (per cent) of population, GDP, R&D and researchers (FTE) in 2007 and 2017 in the Nordic countries.

Country	GDP		R&D expenditure		Total population		Researchers (FTE)	
	2007	2017	2007	2017	2007	2017	2007	2017
Denmark	20.1	21.3	18.7	22.6	21.9	21.4	21.3	25.2
Finland	18.8	17.8	23.4	16.9	21.2	20.4	27.6	19.5
Iceland	1.2	1.3	1.1	1.0	1.3	1.3	1.6	1.3
Norway	24.8	23.3	14.4	16.8	18.9	19.6	17.2	18.6
Sweden	35.0	36.3	42.3	42.7	36.7	37.3	32.4	35.4
Nordic countries	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: World development indicators, World bank, national R&D statistics

Large differences in level of GDP and R&D among the Nordic countries

Table 1 shows the division of GDP, R&D expenditure, total population, and researchers (R&D full-time-equivalents) between the Nordic countries. The Norwegian share of Nordic GDP is higher (23 per cent) than its share of Nordic R&D expenditure (less than 17 per cent). The situation is opposite in Sweden which has a higher share of Nordic R&D expenditure (43 per cent) than the share of Nordic GDP (36 per cent). In the other countries size of the shares is more balanced. For Finland there has been a dramatic drop in its share of both R&D expenditure and researchers, due to economic difficulties.

All the Nordic countries have a high share of researchers (R&D FTE full-time-equivalents) in the population compared to OECD average or EU 28. Denmark has the highest share of researchers in the population.

Comparing the share of R&D expenditure with researchers (R&D FTE) show that researchers are more expensive in Sweden than in the other countries. The salary level is not very different between the Nordic countries, so this is an interesting question for the R&D statistical producers that needs further investigation.

Sweden spent 43 per cent of Nordic R&D

Among the Nordic countries, naturally Sweden is the big brother with R&D expenditure amounting to 43 per cent of total R&D in the Nordic countries in 2017. During the last ten-year period, Norway's and Denmark's shares have increased, and Iceland's share is stable. During the last couple of years, the Norwegian business enterprise sector has reported the strongest growth among the Nordic countries, while there has been a strong decrease in Finland in all sectors due to the above-mentioned economic difficulties and the developments in the ICT sector in

the country. The development of Finnish R&D seems to stabilize in 2017 with an increase in current prices at 4 per cent. This is the first increase in R&D expenditure since 2011.

Different sectorial division among Nordic countries' R&D

The 2017 numbers show that the business enterprise sector stands for the majority of performed R&D in the Nordic countries; from 60–70 per cent, see Figures above. The share is the same as in other top R&D performers like the US and China. Norway stands out with 53 per cent of R&D in the Nordic business enterprise sector. Norway and Denmark have the largest higher education sector makes up 33 per cent of all R&D in the country. In Denmark, there were several mergers of research institutions into the higher education sector some years ago. Norway has the largest government sector, constituting 14 per cent. While in Denmark the Government sector share was only 2 per cent. Also, Sweden has a small share of R&D in the government sector at 3 per cent.

2.2 Nordic R&D systems

This section includes diagrams of each Nordic R&D and innovation system. The diagrams are based on several different sources (EU RIO Country reports, national S&T reports, Researchgate, internet) and is restructured and updated hence to new names and developments. The diagrams give an overall picture of the most important players in the system with arrows that shows funding and influence. The overall systems have clear similarities, but the number and roles of involved actors and research councils differs.

One of the main differences being the level of centralising among R&D and innovation funding actors. Whereas in Norway the funding actors are few and funding are centralised the opposite is the case in Sweden and to some extent Denmark and Finland. Another key difference is the level of private funds who play a significant role in Denmark and Sweden as oppose to in Norway.

The actual influence and role of the actors is of course difficult to capture in such a figure. To a varying degree the countries have dedicated councils for research policy advise and the role and size of research foundations vary. For all countries, the actual R&D and innovation systems are also influence from abroad (EU Framework programme for research), strength of the economy, historical traditions, and political priorities.

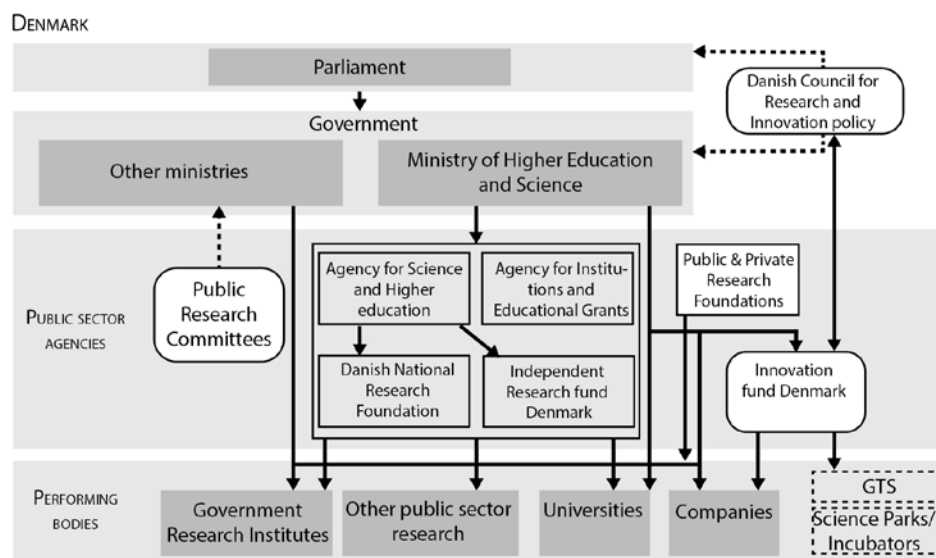


Figure 3 The Danish R&D and innovation system.

Source: NIFU

The Danish R&D and innovation system builds upon a centrally organised funding infrastructure. The main responsibility lies with the Ministry of Higher Education and Science. But other ministries also have tasks, e.g. The Ministry for Business and Growth have tasks related to innovation. The Ministry of Energy, Utilities and Climate, Ministry of Foreign Affairs and Ministry of Environment and Food all have research and innovation programmes. These ministries receive advise on R&D and innovation policies from The Council for Research and Innovation policy and a Public Research Committee.

To implement policies the above-mentioned ministries, have their specific agencies implementing the policies. The agencies for the Ministry of Education and Science are the agency for institutions and educational grants and the Danish Agency for Science and Higher education.

A third level in the system contains funding allocation entities. These includes the National Research Foundation, the Independent Council for Research and Innovation Fund Denmark. In addition, private funds play a significant role and increasing role as R&D and innovation financier. The fourth level consists of the performers, both public and private. Besides from higher education sector, PROs and companies there are also 7 GTS institutes delivering technological knowhow and expertise to private businesses and to public institutions, although their contribution is somewhat limited, less than 1 per cent of total R&D, compared to the Norwegian research institution sector.

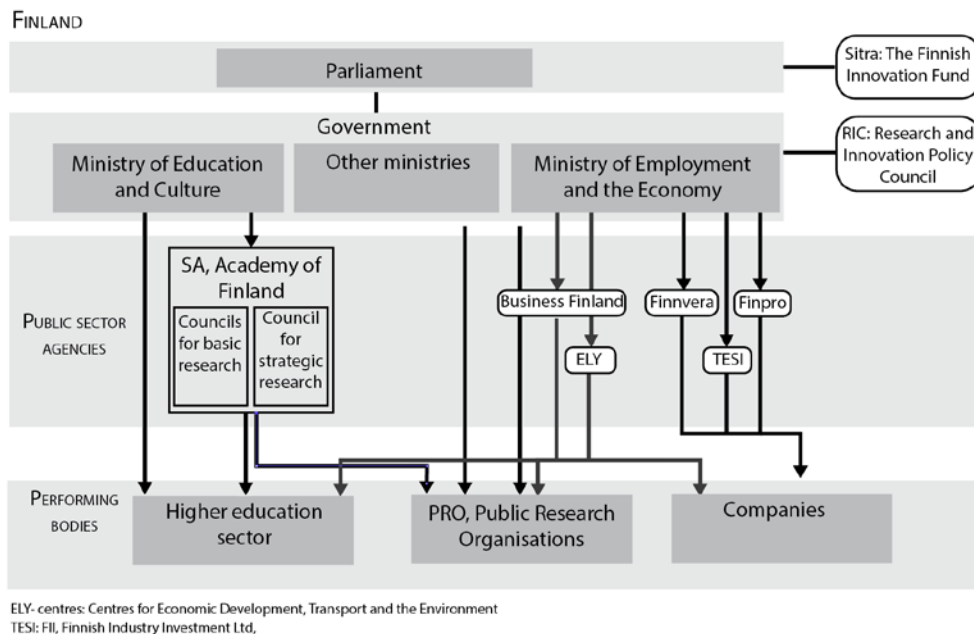


Figure 4 The Finnish R&D and innovation system.

Source: NIFU

The Finnish R&D system is somewhat centralised. National guidelines, strategies and funding are strong guidelines for national R&D policy. Yet a mix of national and local administration allows for regional differences and a relatively high level of autonomy.

The Finnish research and innovation system are divided into four strategic and operational levels. The Parliament of Finland and the Finnish government set the general guidelines and decides on national goals. In matters related to research, technology and innovation policy, the latter is supported by a high-level advisory body called the Research and Innovation Policy Council, though the role is not as well established as in the past.

The second level consists of the ministries, of which the Ministry of Education and Culture (MEC) and the Ministry of Economic Affairs and Employment (MEAE) play the main role in research and innovation policy. MEAE is responsible for planning and budgeting innovation policy. MEC is responsible for matters related to higher education and science policy.

On the third level of the Finnish R&D and Innovation system there are the competitive R&I funding and the R&D funding agencies, Academy of Finland, Tekes – the Finnish Funding Agency for Innovation, Sitra – the Finnish Innovation Fund and state-owned financing companies Finnvera, TESI and Finnish Industry Investment Ltd (FII). The fourth level is comprised of organisations that conduct research: both public and private, with a higher education sector containing a mix of public and private entities, PRO's and companies.

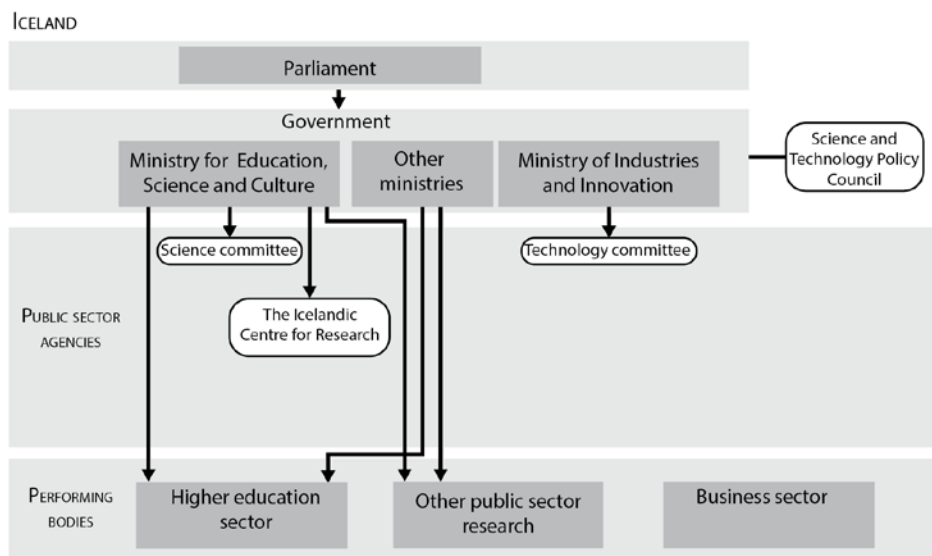


Figure 5 The Icelandic R&D and innovation system.

Source: NIFU

The Icelandic R&D and innovation system is addressed at the national level and only has a limited regional dimension. The Science and Technology Policy Council (STPC) is the main policy-making body developing and coordinating Icelandic R&D and innovation policy. The main ministry for R&D and innovation policy is the Ministry for Education, Science and Culture, but other ministries also play a role in the system.

The Icelandic Centre for Research (Rannis) plays a key role at an operational level in supporting research and innovation and reports directly to the Ministry for Education, Science and Culture. Rannis administers most of the competitive R&D and innovation funding available in Iceland as well as handling implementation of most research programmes.

Entities that conduct R&D at Iceland are both public and private, with a few large companies encountered for a large proportion of private R&D.

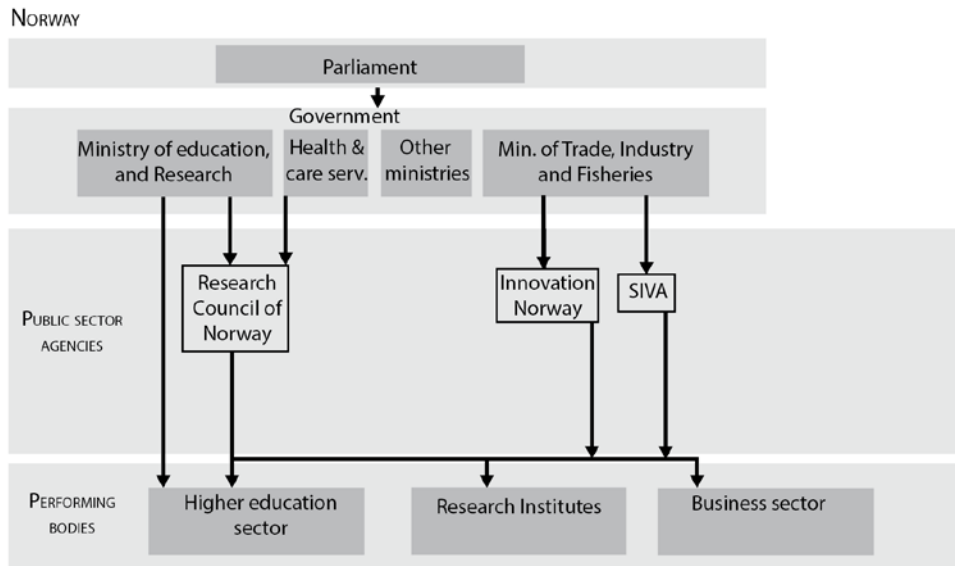


Figure 6 The Norwegian R&D and innovation system.

Source: NIFU

The Norwegian R&D system is dispersed at ministry level where a broad spectrum of ministries is involved. The main contributor of R&D in Norway is the Ministry of Education and Research. Other contributors are the Ministries of Trade, Industry and Fisheries and Health and Care Services. The Ministry of Defence also has a fairly large proportion of public R&D funding, although heavily concentrated around one performer (FFI, the Norwegian Defence Research Establishment).

At administrative level the R&I system is focused around fewer actors. The main actor is the RCN. They handle more than 25 per cent of public R&D funding, surpassed only by the funding of universities and state university colleges. Whereas the Ministry of Education and Research and the Ministry of Trade, Industry and Fisheries are the main contributors to RCN. In total RCN administrate funding from 15 ministries. One aspect of RCN is that the council covers all research disciplines and sectors including support to research-based innovation. In addition to funding research activities RCN also has a mandate to advise the government on research policy and to facilitate network and communication between various actors in the Norwegian R&I system.

Innovation Norway and the Industrial Development Corporation of Norway (SIVA) are the primary public institutions providing support for innovation. Innovation Norway's main objective is promoting innovation at the regional and national level, with a focus on small and medium sized companies. SIVA is involved in the provision of science parks, incubators and services mainly to start-up firms.

R&D and innovation performing sectors consist of both public and private entities. Yet a difference compared to the other Nordic Countries is a large research institute sector, which encountered for 20 per cent of total R&D in Norway in 2017.

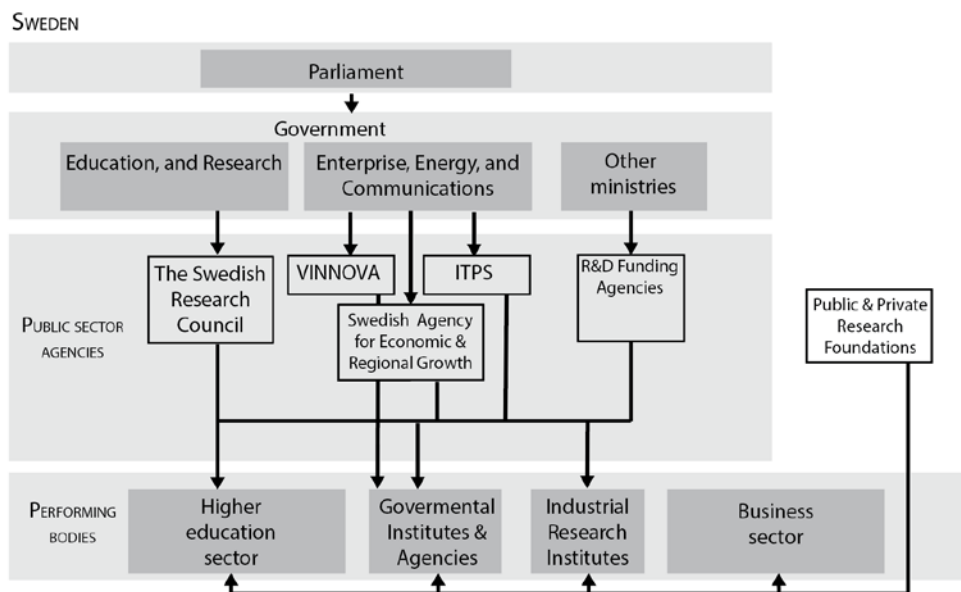


Figure 7 The Swedish R&D and innovation system.

Source: NIFU

In general, the Swedish R&D system is diverse when focusing on funders of R&D. The system is decentralised and lacks central coordination, with the academic sector in a dominating role on the performer side and a diverse policy formulation and implementation landscape. To systemise and align the research and innovation funding from government levels, the Research Bill and a National Innovation Strategy have been implemented. The main policy directives emanate from these. The development and configuration of the Research Bill and the National Innovation Strategy emerge as a complex backward and forward iterative process of upward and downward consultations between central bodies in the R&I system.

The government bodies are the Research Policy Council (part of the Ministry of Education) and the Innovation Policy Council (part of the Ministry of Industry, Energy and Communication). Other key actors are various funding ministries, as well as the central public agencies such as VINNOVA (the Swedish Governmental Agency for Innovation Systems), the Research Council, The Energy Agency and Tilväxtverket. Vinnova particularly focuses on innovations linked to R&D, and it carries out a series of programs targeted towards both academia and the business sectors.

In addition to the funding agencies it might be worth mentioning the broad range of R&D funding foundations, often semi-public. These include a diversity of foundations with different offsets and histories, e.g. the Knowledge Foundation supporting research and innovation in the smaller, non-university HEIs (de nya läroseter), the Foundation for Strategic Research funds research projects with an established potential for innovation. And finally, there are private foundations such as the Wallenberg Foundations.

References

Frølich, N. et al. (2018): *Academic career structures in Europe: Perspectives from Norway, Denmark, Sweden, Finland, the Netherlands, Austria and the UK*. NIFU Report 4/2018

OECD (2015): *Frascati Manual 2015. Guidelines for Collecting and Reporting Data on Research and Experimental Development*, OECD, Paris

Wendt, K., I. Söder, A. Leppälähti (2015): *A guide to understanding higher education R&D statistics in the Nordic countries*, NIFU Working paper 9/2015

Appendices

Appendix 1: Institutions covered in the 2017 R&D survey

Denmark

Institutions included in R&D-survey 2017

Business enterprise sector

Firms with 100+ employees: census. Sample from firms with 2–100 employees. 4 968 enterprises in survey 2015 and in 2017: 3 321 enterprises in survey. Names not published.

Higher education sector

There are 31 higher education institutions with 8 universities, 22 university colleges (incl. 9 business academies/erhvervsakademier) and 1 other institution (Probation Learning Centre).

Names not available

Government sector

There are 85 Government institutions: Public institutes, hospitals, health administrations, libraries, archives, museums, collections mainly funded by government.

Names not available

Finland

Institutions included in R&D-survey 2017

Business enterprise sector

Firms with 100+ employees: census. Sample from firms with 10–99 employees.
6 731 enterprises in survey. Names not published.

Higher education sector

Universities

University of Helsinki

University of Turku

Åbo Akademi University

University of Oulu

University of Tampere (later merged to foundation-based Tampere University)

University of Jyväskylä

Aalto University

Helsinki University of Technology

University of Vaasa

Lappeenranta University of Technology (later named to Lappeenranta-Lahti
University of Technology LUT)

Tampere University of Technology (later merged to foundation-based Tampere
University)

University of Eastern Finland

University of Lapland

University of the Arts Helsinki

National Defence University

University hospitals

Helsinki University Hospital

Turku University Hospital

Tampere University Hospital

Oulu University Hospital

Kuopio University Hospital

Clinical Research Institute Helsinki University Central Hospital Ltd

Universities of applied sciences

Arcada University of Applied Sciences

Centria University of Applied Sciences

Diaconia University of Applied Sciences

Haaga-Helia University of Applied Sciences

HUMAK University of Applied Sciences

Häme University of Applied Sciences
JAMK University of Applied Sciences
Kajaani University of Applied Sciences
Karelia University of Applied Sciences
Lahti University of Applied Sciences
Lapland University of Applied Sciences (former Kemi-Tornio University of Applied Sciences and Rovaniemi University of Applied Sciences merged)
Laurea University of Applied Sciences
Metropolia University of Applied Sciences
Novia University of Applied Sciences
Oulu University of Applied Sciences
Saimaa University of Applied Sciences
Satakunta University of Applied Sciences
Savonia University of Applied Sciences
Seinäjoki University of Applied Sciences
Tampere University of Applied Sciences
Turku University of Applied Sciences
Vaasa University of Applied Sciences
Police University College
Åland University of Applied Sciences
South-Eastern Finland University of Applied Sciences (former Mikkeli University of Applied Sciences and Kymenlaakso University of Applied Sciences merged)

Government sector

Bank of Finland
Finnish National Agency for Education (EDUFI)
Finnish Safety and Chemicals Agency (Tukes)
Ministry of Economic Affairs and Employment (MEAE)
Ministry of the Environment
National Bureau of Investigation
Prime Minister's Office
Senate Properties
Statistics Finland
Tekes (new name 1.1.2018: Business Finland)
The Centres for Economic Development, Transport and the Environment (ELY Centres)
The European Institute for Crime Prevention and Control, affiliated with the United Nations (HEUNI)
The Finnish Border Guard
The Finnish Centre for Pensions
The Finnish Defence Forces

The Finnish Forest Centre
The Finnish Heritage Agency
The Finnish Innovation Fund Sitra
The Finnish Medicines Agency Fimea
The Institute for the Languages of Finland
The National Audiovisual Institute (KAVI)
The Nordic Welfare Centre Finland
The Social Insurance Institution of Finland (KELA)
Yle, the Finnish Broadcasting Company
Largest municipalities (20)

Research institutes

Finnish Environment Institute (SYKE)
Finnish Food Authority (1.1.2019: merged into Finnish Food Safety Authority
EVIRA)
Finnish Institute of International Affairs (FIIA)
Finnish Institute of Occupational Health (TTL)
Finnish Meteorological Institute
Geological Survey of Finland (GTK)
National Institute for Health and Welfare (THL)
National Land Survey of Finland/ Finnish Geospatial Research Institute (FGI)
Natural Resources Institute Finland (LUKE)
Radiation and Nuclear Safety Authority (STUK)
VATT Institute for Economic Research
VTT Technical Research Centre of Finland Ltd

PNP sector

Names not published as they are private, 48 R&D performing units

Iceland

Institutions included in R&D-survey 2017

Business enterprise sector

Census. 537 enterprises (1 012 in 2015). Names not published.

Higher education sector

Universities:

University of Iceland

University of Akureyri

Bifröst University

Reykjavík university

Hólar University College

The Agricultural University of Iceland

Listaháskóli Íslands:

Iceland University of the Arts

Research institutions under Háskóli Íslands (University of Iceland)

Landspítali- The National University Hospital of Iceland

The Science Institute

Keldur: The Institute for Experimental Pathology

Government sector

Not available

Norway

Institutions included in R&D-survey 2017

Business enterprise sector

Firms with 50+ employees: census. Sample from firms with 5–49 employees. 5 646 enterprises in survey. Names of firms are not published.

Research institutes and other institutions

Akvaplan-niva
Christian Michelsen Research
International Research Institute of Stavanger
Nofima
Norwegian Geotechnical Institute
Norwegian Computing Center
Norwegian Institute of Wood Technology
RISE Fire Research
RISE PFI
SINTEF Energy Research
SINTEF Nord
SINTEF Ocean
SINTEF Petroleum Research
SINTEF Manufacturing
SINTEF Ålesund
SINTEF
Teknova
Uni Research Polytec

Higher education sector

Universities

University of Bergen
University of Oslo
University of Tromsø - The Arctic University of Norway
Norwegian University of Life Sciences
University of Stavanger
University of Agder
Nord University
Norwegian University of Science and Technology

Universities of applied science (vitenskapelige høyskoler)

The Oslo School of Architecture and Design
The Free Faculty of Theology
BI Norwegian Business School
Molde University College - Specialized University in Logistics
Norwegian School of Economics
Norwegian School of Sport Sciences
Norwegian State Academy of Music
VID Specialized University

State university colleges (statlige høyskoler)

Inland Norway University of Applied Sciences
Oslo and Akershus University College
University College of Southeast Norway
Østfold University College
Volda University College
Western Norway University of Applied Sciences
Saami University College

Other higher education institutions

Queen Maud University College of Early Childhood Education
The Norwegian Defence University College
Kristiania University College
Oslo National Academy of the Arts
Lovisenberg Diaconal University College
NLA University College
The Norwegian Police University College
The University Centre in Svalbard
Westerdals Oslo School of Arts, Communication and Technology

University hospitals

St. Olavs Hospital HF
The University Hospital of North Norway
The Akershus University Hospital
Oslo University Hospital
Helse Bergen

Government sector

Hospitals

Beitostølen helsesportsenter
Betanien Hospital
Betanien sykehus
Diakonhjemmet sykehus AS

Finnmarkssykehuset HF
Frambu senter for sjeldne diagnoser
Haraldsplass Diakonale Sykehus
Haugesund Sanitetsforening Revmatismesykehus AS
Helgelandssykehuset HF
Helse Fonna HF
Helse Førde HF
Helse Møre og Romsdal HF
Helse Nord-Trøndelag HF
Helse Vest IKT
LHL-klinikkene Glittre og Feiring
Lovisenberg Diakonale Sykehus AS
Martina Hansens Hospital
Modum Bad
NKS Jæren distriktpsikiatriske senter AS
NKS Olaviken alderspsikiatriske sykehus AS
Nordlandssykehuset HF
Rehabiliteringssenteret AiR
Revmatismesykehuset AS
Sjukehusapoteka Vest HF
Solli distriktpsikiatriske senter
Stiftelsen Catosenteret
Sunnaas sykehus HF, Sunnaas Rehabilitation Hospital
Sykehusapotek Nord HF
Sykehusapotekene i Midt-Norge HF
Sykehusapotekene i Sør-Øst HF
Sykehuset i Vestfold HF
Sykehuset Innlandet HF
Sykehuset Telemark HF
Sykehuset Østfold HF
Sørlandet Sykehus HF
Tyrilistiftelsen
Vestre Viken HF
Voss DPS - NKS Bjørkeli

Research institutes and other institutions

Agder Research
Labour Movement Archives and Library
The National Archives of Norway
Chr. Michelsen Institute
Norwegian Nobel Institute

Fafo Institute for Labour and Social Research
Institute of Aviation Medicine
Norwegian Institute of Public Health
Simula@UiB
Norwegian Defence Research Establishment
Fridtjof Nansen Institute
GenØk - Centre for Biosafety
Institute of Marine Research
Institute for Energy Technology
International Peace Research Institute, Oslo
Institute for Social Research
KIFO, Institute for Church, Religion, and Worldview Research
The Cancer Registry of Norway
Kriminalomsorgens Utdanningscenter
Norwegian Meteorological Institute
Museums
Møreforskning
Nansen Environmental and Remote Sensing Center
National Library of Norway
National Institute of Nutrition and Seafood Research
Norwegian Centre for Violence and Traumatic Stress Studies
NIFU Nordic Institute for Studies in Innovation, Research and Education
Nordic Institute of Dental Materials
Nordland Research Institute
Central Bank of Norway, Research
Geological Survey of Norway
Norwegian Water Resources and Energy Directorate
NORSAR
Norwegian Institute of Bioeconomy Research
Norwegian Institute for Cultural Heritage Research
Norwegian Institute for Air Research
Norwegian Institute for Nature Research
Norwegian Institute for Water Research
Norwegian Polar Institute
Norwegian Centre for Organic Agriculture
Norwegian Institute of International Affairs
Northern Research Institute
Northern Research Institute Narvik
NSD - Norwegian Centre for Research Data
NTNU Social Research
Norwegian Center for Child Behavioral Development (NUBU)

Centre for Child and Adolescent Mental Health, Eastern and Southern Norway
Ruralis - Institute for Rural and Regional Research
Institute for Research in Economics and Business Administration
Centre for Advanced Study
CICERO - Center for International Climate and Environmental Research - Oslo
Center for Studies of Holocaust and Religious Minorities
Centre for Economic Research at NTNU
Simula Research Laboratory
Simula School of Research and Innovation
National Institute of Occupational Health
Norwegian Radiation Protection Authority
Statistics Norway
Statped
Ragnar Frisch Centre for Economic Research
Norwegian Air Ambulance Foundation
Research Foundation TISIP
Stiftinga for folkemusikk og folkedans
Telemark Research Institute
Institute of Transport Economics
Trøndelag R&D Institute
Uni Research
Western Norway Research Institute
National Veterinary Institute
Oestfold Research Institute
Eastern Norway Research Institute

Sweden

Institutions included in 2017 R&D-survey

Business enterprise sector

Firms with 200+ employees: census. Sample from firms with 10–199 employees.
7 756 enterprises in survey. Names not published.

Higher education sector

All counties, municipalities and local and regional R&D units are included. Institutions presented on micro level are listed below.

Umeå University
Luleå University of Technology
Uppsala University

University of Gävle
Dalarna University
Mälardalen University
Örebro University
Stockholm University
Karolinska Institutet
KTH Royal Institute of Technology
Royal Institute of Art
Stockholm Institute of Education
Linköping University
Jönköping University*
University of Gothenburg
Chalmers University of Technology
Karlstad University
University of Skövde
University of Borås
Lund University
Halmstad University
Kalmar University
Växjö University
Kristianstad University
University College of Arts, Crafts and Design
Royal College of Music in Stockholm
University College of Film, Radio, Television and Theatre
School of Dance and Circus
University College of Opera
National Academy of Mime and Acting
Swedish University of Agricultural Sciences
Stockholm School of Economics
Sophiahemmet University
The Red Cross University College
The Erica Foundation
Blekinge Institute of Technology
University West
The Swedish School of Sport and Health Sciences
Mid Sweden University
KTH Royal Institute of Technology
Södertörn University
Uppsala University Gotland
Malmö University
Ersta Sköndal University College

Swedish National Defence College
Linnaeus University
Newman Institute
Stockholm Academy of Dramatic Arts
Stockholm University of the Arts
Swedish Institute of Space Physics

Government sector

This sector includes all counties, municipalities and local and regional R&D units. Covers about 550 institutions. We list institutions presented on micro level below.

The Swedish Labour Court
Swedish Agency for Government Employers
National Archive of Recorded Sound and Moving Images
National Institute for Working Life
National Centre for Architecture and Design
Swedish Labour Market Agency
The National Board for Consumer Disputes
Swedish Work Environment Authority
Swedish Accounting Standards Board
National Housing Credit Guarantee Board
The Ombudsman for Children
Swedish Companies Registration Office
National Board of Housing, Building and Planning
Swedish National Council for Crime Prevention
The Swedish Crime Victim Compensation and Support Authority
Swedish Trade and Invest Council
Swedish Rail Administration
Swedish Enforcement Authority
Swedish Transport Administration
Swedish Employment Service
Central Ethical Review Board
Centre for Flexible Learning
Swedish Board for Study Support
The Swedish Data Protection Authority
Animal welfare agency
Ombudsman against Ethnic Discrimination
Equality Ombudsman
The Swedish National Courts Administration
Judgments Board
Swedish Economic Crimes Authority
The Swedish eHealth Agency

Swedish Energy Markets Inspectorate
Swedish Export Credits Guarantee Board
Swedish National Electrical Safety Board
The Swedish ESF Council
The Swedish National Financial Management Authority
Swedish EU-R&D Council
Swedish Research Council for Health, Working Life and Welfare
Folke Bernadotte Academy
Swedish National Institute of Public Health
Swedish Defence University
Swedish Financial Supervisory Authority
Swedish Board of Fisheries
Swedish Social Insurance Agency
Swedish Armed Forces
Board of Supervision of Estate Agents
Swedish Defence Materiel Administration
Swedish Defence Research Agency
The Swedish Research Council Formas
Swedish Fortifications Agency
Swedish Fiscal Policy Council
National Defence Radio Establishment
Swedish Defence and Security Export Agency
National Rural Area Development Agency
Broadcasting Commission
Swedish Gene Technology Advisory Board
Swedish Agency for Disability Policy Coordination
Swedish Government Seamen's Service
Disability Ombudsman
Ombudsman against Discrimination because of Sexual Orientation
Medical Responsibility Board
Swedish National Agency for Higher Education
Swedish Agency for Marine and Water Management
Swedish Unemployment Insurance Board
Swedish Institute for Ecological Sustainability
Institute for Evaluation of Labour Market and Education Policy
Swedish National Debt Office
Stiftelsen för Institutet för internationell miljöekonomi
National Institute for Psychosocial Medicine
International Programme Office for Education and Training
Invest in Sweden Agency, ISA
Swedish Social Insurance Inspectorate

Inspectorate of Strategic Products
Swedish Institute for Growth Policy Studies
Swedish Integration Board
The Health and Social Care Inspectorate
Equal Opportunities Ombudsman
Office of the Chancellor of Justice
Parliamentary Ombudsmen
Swedish Rail Agency
Nuclear Waste Fund
Legal, Financial and Administrative Services Agency
National Library of Sweden
Swedish Emergency Management Agency
Swedish Coast Guard
Swedish Chemicals Agency
The Knowledge Foundation
National Council for Quality and Development
Swedish Competition Authority
Swedish Arts Grants Committee
National Board of Trade
National Institute of Economic Research
Swedish Consumer Agency
Komptetensrådet för utveckling i staten
Swedish Arts Council
Swedish Prison and Probation Service
Swedish Agency for Advanced Vocational Education
County Administrative Board of Blekinge
County Administrative Board of Dalarna
Living History Forum
Dental and Pharmaceutical Benefits Agency
Swedish Civil Aviation Authority
Air Navigation Services of Sweden
County Administrative Board of Gävleborg
County Administrative Board of Gotland
County Administrative Board of Halland
Swedish Gambling Authority
County Administrative Board of Jämtland
County Administrative Board of Jönköping
County Administrative Board of Kalmar
County Administrative Board of Kronoberg
Swedish Institute for Food and Agricultural Economics
The Swedish Mapping, Cadastral and Land Registration Authority

County Administrative Board of Norrbotten
County Administrative Board of Östergötland
County Administrative Board of Örebro
Royal Armoury, Skokloster Castle and Hallwyl Museum Foundation
County Administrative Board of Skåne
County Administrative Board of Södermanland
County Administrative Board of Stockholm
County Administrative Board of Uppsala
Medical Products Agency
County Administrative Board of Värmland
County Administrative Board of Västmanland
County Administrative Board of Västerbotten
County Administrative Board of Västra Götaland
County Administrative Board of Västernorrland
The Swedish Market Court
Swedish National Mediation Office
Swedish Intercountry Adoptions Authority
The Swedish Migration Agency
Swedish Foundation for Strategic Environmental Research
Swedish Agency for Cultural Policy Analysis
the Moderna Museet
Swedish Net University Agency
Swedish Civil Contingencies Agency
The Swedish National Agency for Education
The Swedish Agency for Health and Care Services Analysis
The Swedish Broadcasting Authority
Nordic Africa Institute
Nordic Genetic Resource Centre
National Museum of Fine Arts and Prince Eugens Waldemarsudde
National Board for Public Procurement
Nordregio
The Swedish Museum of Natural History
Swedish National Board for Industrial and Technical Development
Swedish Environmental Protection Agency
Nordic Welfare Centre
National Board of Appeal for Student Aid
Appeals Bord for the Total Defence
Foundation for Baltic and East European Studies
Postverkets avvecklingsorganisation
Court of Patent Appeals
The Swedish Pensions Agency

Swedish Polar Research Secretariat
The Swedish Police Authority
Swedish Patent Attorneys Board
Premium Pension Authority
Swedish Patent and Registration Office
Press Subsidies Council
Swedish Post and Telecom Agency
National Archives
Swedish National Heritage Board
Swedish Prosecution Authority
the Riksbank
Swedish Riksdag Administration
Swedish National Debt Office
Swedish National Audit Office
Government Offices
National Board of Forensic Medicine
Supervisory Board of Public Accountants
National Police Board
Swedish National Space Board
National Public Transport Agency
Radio and TV Authority
Swedish Exhibitions Agency
Sami Parliament
Swedish agency for development evaluation
Swedish Commission on Security and Integrity Protection
Sami Education Board
Swedish Security Service
National Board of Film Classification
Dictionary of Swedish National Biography
Statens bostadsnämnd
Swedish Agency for Health Technology Assessment and Assessment of Social
Services
Statistics Sweden
The Swedish Institute of Educational Research
National Swedish Museums of Military History
National Property Board of Sweden
Swedish Geotechnical Institute
Geological Survey of Sweden
Swedish Accident Investigation Board
National Historical Museums
Swedish Institute

Swedish International Development Cooperation Agency
Swedish Institute for European Policy Studies
Swedish Institute for Transport and Communications and Analysis
Stockholm International Peace Research Institute
The Swedish National Board of Institutional Care
Swedish National Attendant's Service
Swedish Institute for Special Needs Education
Statens inspektion för försvarsunderrättelseverksamhet
Swedish Maritime Administration
Swedish Board of Agriculture
Public Art Agency Sweden
Swedish Nuclear Power Inspectorate
Swedish National Agency for Education
Swedish Schools Inspectorate
Swedish Tax Agency
National Food Agency, Sweden
Swedish Meteorological and Hydrological Institute
Swedish Institute for Infectious Disease Control
Swedish Performing Arts Agency
National Museums of World Culture
Institute for Language and Folklore
National Board of Health and Welfare
National Board of Psychological Defence
Specialskolemyndigheten
National Agency for Special Needs Education and Schools
National Government Employee Pensions Board
Swedish Rescue Services Agency
National Government Service Center
Swedish Foundation for Strategic Research
National Maritime Museums in Sweden
National Radiation Protection Institute
Swedish Radiation Safety Authority
Signalspaningsnämnden
Swedish Commission for Government Support to Faith Communities
Swedish Energy Agency
The Swedish Foundation for International Cooperation in Research and Higher
Education
Swedish Agency for Public Management
The Swedish Media Council
Swedish Seed Testing and Certification Institute
National Veterinary Institute

Swedish Board for Accreditation and Conformity Assessment
National Plant Variety Board
Swedish Forest Agency
Swedish Tourist Authority
Swedish Agency for Economic and Regional Growth
All government agencies
Swedish Agency for Accessible Media
National Service Administration
Transport Analysis
Swedish Transport Agency
Board of Customs
Swedish Agency for Growth Policy Analysis
The National Agency for Public Procurement
The Swedish Council for Higher Education
The Swedish Higher Education Authority
Aliens Appeals Board
Försvarsunderrättelsesdomstolen
Swedish Agency for Youth and Civil Society
Swedish Institute of International Affairs
Election Authority
National Commission on Validation
National Water Supply and Sewage Tribunal
Vårdal Foundation
Swedish Administrative Development Agency
Swedish Agency for Higher Education Services
Vinnova
Swedish Research Council
Swedish National Road and Transport Research Institute
Swedish Road Administration
Swedish National Agency for Higher Vocational Education

Appendix 2: Stocktaking the Eurostat quality reports 2015

Business enterprise sector

Indicator	Denmark	Finland	Iceland	Norway	Sweden
Organization responsible for the survey	Statistics Denmark, Business Dynamics	Statistics Finland, Business Statistics / Innovations, Transport and Tourism	Statistics Iceland, Business trends and structure	Statistics Norway, Division for Manufacturing and R&D Statistics	Statistics Sweden, ICT, Business cycle and R&D, Economic Statistics Department
Target population	Known or supposed R&D performers, 17 389 enterprises. 2017: 18 472 enterprises	Known or supposed R&D performers, 16 059 enterprises (legal units).	R&D performing legal units/enterprises operating in Iceland, 1 012 legal units.	All active enterprises in the Business Enterprise sector, 17 640 enterprises	All enterprises with at least 10 employees and all research institutes (regardless of size) serving the enterprise sector, approx. 42 000 enterprises.
Number of units in the survey	3 321 (4 968 in 2015)	6 132 (6 731 in 2015)	536 (1 012 in 2015)	5 646	7 756 (7 705 in 2015)
Frame	Business register	Business register	Business register	Business register	Business register
R&D panel approach: R&D (t-1) / other sources	Yes / Yes	Yes / Yes	Yes / Yes	Yes / No	Yes / Yes
Identification of the R&D panel	R&D in the earlier R&D survey (5 mill. DKK). Reported innovation expenditures in the earlier CIS (5 mill. DKK). Belongs to the Advanced Technology Group (GTS) NACE 72.	R&D in the earlier R&D survey (no monetary limit). Reported continuous R&D in the earlier CIS. Business Finland (former Tekes) R&D funding. Another small public R&D funder. NACE 72.	R&D in the earlier surveys (R&D, CIS). Grant applications or other administrative data showing R&D. NACE 72.	Known R&D performers from last R&D survey (above a certain threshold for R&D activity; < 3 million NOK in R&D expenditure).	R&D in prev. (5 MSEK, extramural + intramural) if num. employed > 10. Census in NACE 72, research institutes surveying BES and enterprises with employees >199.
NACE and size coverage	All enterprises with 100+ employees. Sample for 2–100 employees. Service industries considered not relevant excluded.	All NACE covered. NACE 47, 55-56, 68-69, 75-88 and 96-99: only enterprises with 100+ employees as census (=less R&D intensive NACE). Other NACE: sample 10-99, census 100+. As for the R&D panel there is no cut-off size.	All NACE and size-classes	Census survey for enterprises with 50 employees or more, exceptions: a sample of 35 per cent were drawn for 50-99 employees in NACE 41-43, 46, 49-53 (large number of enterprises). 5-49 employees: - all enterprises with large R&D expenditures (< 3 mill NOK)	Covers all NACE activities. All research institutes serving the enterprise sector included. All enterprises with 199+ employees. Sample for 10-199 employees.

Indicator	Denmark	Finland	Iceland	Norway	Sweden
				reported in the earlier survey. All enterprises in NACE 72. Random sample among other enterprises. In NACE 41-43, 49-53 enterprises with 5-19 employees were excluded.	
Regional breakdown	Nuts-2 by code in business register based on main address.	Nuts-3 Enterprise divides total personnel, FTE and expenditure into municipalities (local kind of activity, LKAU units). Distribution of researchers estimated.	No regional breakdown.	Nuts3 Enterprise divides FTE and expenditure into local kind of activity, LKAU units.	Nuts-3 In Sweden, NUTS3 = county/"län". Among BE w/ > 199 emp.; BE divides HC, FTE and RSE FTE by NUTS3. Among BE w/ < 200 emp.; Imputed distribution on NUTS3 based on no. of emp. in each NUTS3-region.
Frequency	Full R&D survey for reference period odd years	Annual	Every second year (odd years)	Annual	Full R&D survey for reference period odd years
Combined to CIS	Yes until 2017 survey which is separate R&D	No	No	No	No
Statistical unit	Enterprise	Enterprise, group level reporting allowed	Legal units used initially for surveying, but then legal units united into enterprises at later stages.	The enterprise is the main statistical unit, but the enterprises are asked to specify intramural R&D and R&D person-years for each local kind of activity unit (LKAU) (if more than one) as well.	Enterprise
Legal basis	Mandatory, enforced by penalties by central data collecting unit who run a legal procedure when enterprises do not answer to two or	Mandatory by Statistics Act, not enforced	Mandatory by Statistics Act, not enforced.	Mandatory, enforced by penalties.	Mandatory, currently not enforced.

Indicator	Denmark	Finland	Iceland	Norway	Sweden
	more surveys from Statistics Denmark				
Weighting	Stratum by number of employees, turnover, NACE and region. SRS, weights by number of units (N/n), calibration by CLAN.	R&D panel updated by a sample. Compensation for the non-response only, i.e. weighting not expanded to the sampling frame. Stratum by NACE and size class, weights by turnover.	No weights. Survey aimed to catch all R&D performers, with imputation used in cases of non-responses.	Statistics Norway uses the inverse of the sampling fraction i.e. using the number of enterprises, to calculate how many enterprises that have R&D activity (all variables that are number of units, yes or no questions etc.). For all the numerical variables such as R&D expenditure, R&D personnel etc. number of employees was used as weight. Calibration by SAS-macro developed in-house.	Neyman allocation, weight N/n, by number of enterprises. Stratum: the frame stratified by NACE, size (number of employees) and "type of enterprises". The "type of enterprises" stratification was done as "ordinary enterprises", "research Institute" and "enterprises that had more than 5 million SEK in total R&D expenditure 2011".
Communication with users and respondents	Ongoing cooperation key users (Ministry of Science, Innovation and Higher Education). Respondents' experiences with the questionnaires are monitored specifically. This is done by including a few questions at the end of the electronic questionnaire. The answers given by the respondents are fed into the ongoing process to raise the quality of the statistics.	Continuous monitoring of the feedback from the major users. The current online questionnaire (FM 2015 adopted) has been tested by the Survey laboratory. In the spring 2018 data collection response burden will be measured.	We have not done a user satisfaction survey, but we have presented the results to some ministries.	Statistics Norway does not undertake a national user satisfaction survey per se. Instead, regular meetings are held with key users. At these meetings the users are encouraged to evaluate previous surveys, as well as suggest changes or amendments to future surveys.	Statistics Sweden arranges regular meetings with our primary users to take into account their suggestions for improvements. Also, in 2012 a user survey was conducted that covered all R&D surveys and the innovation survey.
Sampling error	Coefficients of variation calculated by CLAN. Based on the CVs the impact of sampling error is small.	Not estimated as there is only compensation for non-response. There might be some underestimation as the sample which updates the panel is not weighted to	N/A, census	A model-based prediction variance was estimated. The sample design and weighting has been taken into account. Impact small, relevant	Based on the CVs the impact of sampling error is small.

Indicator	Denmark	Finland	Iceland	Norway	Sweden
		the frame but the magnitude of error can safely be assumed small.		only for the enterprises with less than 50 employees.	
Actions to reduce measurement error	Guidelines in the web-questionnaire, put validation rules in the data entry fields, when errors are found the respondents will be contacted by phone to clarify the errors. Guidelines and questions in the survey questionnaire will be adapted accordingly.	Detailed instructions accompany the survey questionnaire, respondent support by phone and email. The online questionnaire assists the respondent by alerting logical inconsistencies, missing items etc. Most recent enterprise interviews on the understanding of the R&D definition were conducted in 2017 in the context of FM 2015 implementation.	Survey was designed with close attention to clarity, basing on feedback from testers and experience from last data collection. During the data collection period, there were follow-up interviews to respondents in cases of high R&D expenditure and in cases of software developers.	There are several measures to try to limit the possibility of wrong values: <ul style="list-style-type: none"> - Automatic controls/checks in the Web questionnaire when filling by the enterprises - Checking consistency over time - Going through questionnaires with experienced auditors - The reported data is also checked against the annual reports of the enterprises - Checks for each NACE and employment group, which tell us if there are some "odd" values in the data. Extended information in the introduction letter	<ul style="list-style-type: none"> - Questioner tested by methodological dept. via cognitive interviews. Focus on clarity and availability of necessary information. - Automated controls, a few "hard"; forcing the respondent to change/comment the oddity, but most "soft; asking the respondent to confirm oddity and comment. - Extensive "education" of data-collection personnel. - Weekly meetings w/ data-collectors to assess oddities. Results from these recorded to ensure equal handling of similar cases. - Telephone contact w/ top ~ 40 performers.
Unit response rate (un-weighted)	96%	71%	77% (82% in 2015)	96% (2015)	87%
Recalls / Reminders	5 reminders were sent out to non-responding enterprises, followed by a telephone reminder.	Two reminders (letters). Biggest missing units contacted also by phone.	Repeated reminders in the form of phone calls, with non-respondents being prioritized with consideration to administrative data and responses of similar enterprises.	Two reminders.	Two reminders (letters). Important units telephoned.
Item non-response	Very small, imputation by It procedure and expertise evaluations	Expenditure 2%, and personnel (FTE) 7%, researchers (FTE) 14%	18% - same as unit non-response rate	In most variables: non-existent, but some variables have a small amount of	In most variables: non-existent, but some variables have a small amount of item non-response.

Indicator	Denmark	Finland	Iceland	Norway	Sweden
				item non-response.	
Date of final release of provisional national data	T+12	N/A	N/A	T+10	T+9
Date of final release of final national data	T+23	T+10	T+10	T+14	T+12
Dissemination	<p>A separate press release is given for R&D-expenditure and –personnel, and for R&D-expenditures as share of GDP. The statistics are published in Focus on Statistics Denmark (Nyt fra Danmarks Statistik) and are available from Statistics Denmark's website at www.dst.dk/fui and from the database StatBank Denmark (www.dst.dk/statistikbanken). The statistics can also be found at the Eurostat databases (under the STI-domain). For the years 2012-2017 Statistics Denmark published a more extensive publication concerning R&D and innovation: "Innovation og Forskning 2017" (Innovation and research 2017). The publication is available (Danish only) on www.dst.dk</p>	<p>Online publication and databases. No separate press release (which in practice is the front page of the online publication).</p>	<p>In accordance with the code of conduct of Statistics Iceland, release of official statistics included a press release. Statistical yearbook of Statistics Iceland, for 2017.</p>	<p>The release of the data is made public through a press release on Statistics Norway's web pages. Online database for R&D that include the most important variables back in time.</p>	<p>Only press release, no press conference. Electronic publications and tables are published online, Statistics Sweden's home page</p>

Higher education sector:

Theme	Indicator	Denmark	Finland	Iceland	Norway	Sweden
Contact	Organization responsible for the survey	Statistics Denmark, Business Dynamics	Statistics Finland, Business Statistics / Innovations, Transport and Tourism	Statistics Iceland, Business trends and structure	Nordic Institute for Studies in Innovation, Research and Education (NIFU), unit for Statistics and Indicators	Statistics Sweden, ICT, Business cycle and R&D, Economic Statistics Department
Population	Target population	According to FM recommendations. All universities, university hospitals and tertiary education institutions performing R&D	According to FM recommendations (from 2016 also the National Defense University)	All universities and their associated research institutions, along with teaching hospitals	All HEI with R&D above a certain level (based on bibliometrics, number of professors, PhD's etc.)	FM15 definition, except for university hospitals* (see below). Frame population: All HEIs with revenues of research and post-graduate education according to the data collection of Swedish Higher Education Authority
	Types and number of institutions, including university hospitals (see also FM Table 9.1)	Total: 10 universities, 540 departments, 15 university hospitals	Total: 46 (2017: 15 universities, 6 university clinics, 25 universities of applied sciences)	Total: 10	Total: 53 higher education institutions (8 universities, 8 universities of applied sciences, 13 other higher education institutions, 18 state university colleges and 6 university hospitals) (2017: 38 units, due to several mergers between universities and state university colleges) 43 public and 10 private	Total: 39 Higher education institutions. Universities (16), University colleges (14), University colleges of the arts (4), independent (4), Research institute (1). * University hospitals are only included to the extent where the research is funded through Higher Education. The county councils (which own the university hospitals) own funds are not included.
	Statistical unit	R&D performing HEI department, university hospital	University institute, university hospital or university of applied sciences. Calculation also on the	College, university, university hospital etc.	University institute/center, university college institute/department or university hospital	University, university college. Most units consist of one legal entity, but not all.

Theme	Indicator	Denmark	Finland	Iceland	Norway	Sweden
			university department level			
	Number of sub-units surveyed (department/institute)	550 units (approximately)	1100 sub-units of the universities		400 institutes/departments/centers	Not available. HEIs report data on the highest level.
Administrative data	Data source	University administrations	University administrations, Statistics Finland, Ministry of Education and Culture, wage register of the Confederation of Finnish Industries		Central government accounting system, HEI administrations, financing bodies such as the Research Council of Norway, Directorate of Public Construction and Property	R&D expenditures are derived from data collected by Swedish Higher Education Authority where HEI annually reports economical figures derived from their accounting systems. Register of personnel in higher education, register of post-graduate students (including salary data)
	Type of data	Data on financing (detailed national data on funding sources on transfer funds and exchange funds) and R&D expenditure	Data on personnel, research expenditures, education registers		Data on accounting, personnel, funding, investments	R&D expenditure census: Data on funding and depreciations. R&D personnel (time-use) survey: Personnel data used to define statistical frame for time-use survey
	Frequency	Annual	Annual		Annual	Annual
Survey	Data collection method	Census	Census (all) and register data (universities)	Census (Excel questionnaire)	Census	R&D expenditure census: among HEI:s R&D personnel (time-use) survey: among HES personnel
	Data source/provider	All HEI and university hospitals	All HEI and university hospitals	All HEI and university hospitals	All HEI and university hospitals	All HEI with revenues of research and post-graduate education Individuals in HES

Theme	Indicator	Denmark	Finland	Iceland	Norway	Sweden
	Type of data	Field of science (2-digit FOS) and estimated amount, by FTE	Data on personnel, FTE, R&D field, funding source,	All variables	Type of R&D, fields of science and technology, thematic priorities and technology areas, external R&D expenditure and -personnel	R&D expenditure census: Revenues and depreciation (pre-printed) By FORD. Capital exp.(surveyed): By FORD R&D personnel (time-use) survey: share of working hours spent on different activities including R&D
	Frequency	Annual	Annual	Annual	Biennial	Biennial
Derivation of R&D coefficients	Data collection method	Not applicable. R&D coefficients not used at the national level	Computed from universities' time-use monitoring records	No need for derivation	Time-use survey of all relevant personnel at individual level	The time-use survey is not used to derive R&D coefficients, see separate document (R&D Expenditure Methodology 2013)
	Data aggregation level		R&D coefficients per main FORD and postt		R&D coefficients per higher education institution, FORD and position group	R&D coefficients per FORD on 1 digit level.
	Frequency		Every 3-4 years		Time-use assessment every 5 years (as from 2016)	Annual
Regional break-down	Level of NUTS	NUTS 2	NUTS 3		NUTS 3	NUTS 3
Quality measures	Methodology		From 2010: more data collected from the Ministry of education and culture (less in questionnaires)		Use of accounting data, contact with respondents and HEI administrative bodies, comparisons with previous surveys	High coverage, extensive quality control during compilation, comparisons with previous survey
Communication with users and respondents	Key users	Ministries and Parliament, universities, researchers and students, national media, European	Ministries: Education and culture; Employment and economy. The Academy of Finland	Various ministries, universities	Ministries of Education/Research and Trade, Industry and Fisheries. Research Council of Norway	Ministries; Finance, Education, Enterprise and innovation. Research Council of Sweden, Swedish Higher Education Authority

Theme	Indicator	Denmark	Finland	Iceland	Norway	Sweden
		Commission, Nordic countries, OECD				
	Assessment of user relevance	Combined use/provider-group for public R&D statistics (HES+GOV+PNP)	Close co-operation with key users	Results presented to some ministries. Results seem to have met user needs	Upstart meeting with key users	Meetings with user council
	Recalls/reminders	Reminders by post, e-mail and phone	Reminding letters, e-mails	By phone	By e-mail and phone. To all respondents and/or special groups (new, large units)	Letters, e-mail and phone
	Assessment of respondent satisfaction	Combined use/provider-group for public R&D statistics (HES+GOV+PNP)	Annual seminar with universities and universities of applied sciences. More administrative data sources ease the data delivery burden	Survey developed in collaboration with key respondents	-	-
Accuracy and reliability	Unit response rate (un-weighted)	1.0	1.0	1.0	0.83	R&D expenditures survey: 1 Time-use survey: 0.49 (2015)
	Item non-response	Not available			Item response rates: total intramural R&D 80 %, total R&D personnel FTE 85 %, researchers in FTE 90 %	In time-use survey; some logical corrections.
	Errors	Challenge when the form of adm.data doesn't correspond to the R&D statistics. Errors reduced by a data management package (from 2009), data validation to respondents, manual check of tables	Errors reduced by minimum standards for interviewer experience, training, questionnaire testing, questionnaire instructions, respondent support etc.	Few errors, as respondents have a good understanding of the concepts. Data collected through Excel-files	Errors minimized by contact with respondents, testing, quality control	Error minimized through testing questionnaire prior to survey, quality control and contact with respondents.
Timeliness and punctuality	Release date of provisional national data	T+12	T+10	T+10	T+10	From 2017 onwards: T+7

Theme	Indicator	Denmark	Finland	Iceland	Norway	Sweden
(T=reporting period just ended + number of months)	Release date of final national data	T+24	T+10	T+10	T+12	T+11
	Delay final data release (months)	1	-3	-8	-6	-7
Comparability	Comparability over time	University hospitals included in government sector until 2002. 2007: major public sector reform – several units moved from government to HES sector	Comparable time series from 1971 (exceptions for 1981, 1983)	2013 (R&D statistics moved to Statistics Iceland, not comparable to earlier years)	Complete time series from 1970 (-70, 72, 74, 77, then every second year)	Complete series from 1995 for totals. Breakdowns have changed over the years.
	Geographical comparability		Regional comparisons, also over time		Regional comparisons, also over time	Regional comparisons, also over time
Accessibility	Dissemination through publications	Results published with GOV and PNP sectors in annual publication for R&D and Innovation Statistics. Press release	Annual online publication	Annual statistical yearbook. Release of official statistics includes a press release	Annual "Report on Science & Technology Indicators for Norway" and annual folder to respondents, users etc.	Online report published every second year
	Dissemination through online database	Yes (StatBank Denmark). A sample of Excel tables available on the website, specific tables upon request	Main results available online through the national statistical authority	Yes	Online R&D statistics data bank for all sectors, including time series and international R&D statistics	All results available in the Statistical Database of Statistics Sweden
	Documentation on methodology	Questionnaire and methodological notes on the website. Quality report (statistics documentation) available in English (www.dst.dk)	Quality descriptions, classifications, concepts and definitions	Definitions in questionnaire updated in line with Frascati 7. Not available in English	The annual S&T report describes methodology. Metadata, including contact information, is accessible in the R&D data bank	Available on Statistics Sweden's webpage www.scb.se/uf0301
	Measures to ensure clarity	Little feedback on clarity due to detailed information published. Assist all users, sometimes for a fee if more resources are needed	-	Does not seem to be a problem	Clarifications upon request, continuous updates on website	Clarifications upon request, continuous updates on website

Theme	Indicator	Denmark	Finland	Iceland	Norway	Sweden
Challenges and future developments			Quality and availability of the time-use monitoring data		Response burden (detailed questions on institute level) reduces response rate	Develop estimate of head counts in HES according to FM2015. Estimate transfer/exchange funds.
Further information	<i>Please insert link</i>	Documentation			General R&D: https://www.nifu.no/fou-statistiske/fou-statistikk/om-fou/	

Government sector

Theme	Indicator	Denmark	Finland	Iceland	Norway	Sweden
Contact	Organization responsible for the survey	Statistics Denmark, Science, Technology and Culture	Statistics Finland, Business Statistics / Innovations, Transport and Tourism	Statistics Iceland, Business trends and structure	Nordic Institute for Studies in Innovation, Research and Education (NIFU), unit for Statistics and Indicators	Statistics Sweden, ICT, Business cycle and R&D, Economic Statistics Department
Population	Target population	Public institutes, hospitals (from 2002: excluding university hospitals) and health administrations, libraries and archives, museums and collections mainly financed by government. PNP: PNP institutions with R&D as main purpose	Known or assumed R&D performers in central government, local government and social security funds. PNP: Known or assumed R&D performers in the SNA sector S.15	R&D performing units. Population determined from previous data collection and administrative information	Research institutes and other public institutions performing R&D to some extent. Includes hospitals other than university hospitals. Estimates done for museums with minor R&D activity. PNP sector included since 1989	All government agencies, counties (including healthcare), municipalities, regional and local R&D units and government funded research foundations.
	Types and number of institutions, including hospitals	GOV: 85 PNP: 10	Total: GOV 79, PNP 67	Total: 34	Research institutes, institutions performing R&D, government agencies (number of units: 80); non-university hospital trusts (30 units); museums (60 units)	Government agencies and government funded organizations (181), counties (20), municipalities (290), R&D units (24), research foundations (6)
	Statistical unit	Smallest homogeneous unit involved in a field of S&T and for which all factor input data can be obtained	Ministry, government agency, research institute or municipality, PNP organizations	Legal unit	Each institute or organization	Each organization (legal entities for all sectors except R&D units)
Administrative data	Data source		Official business registers (including government organizations)	Business register (Statistics Iceland)	None	Official business registers (including government organizations)
	Type of data		Used to define frame population	List of government institutions with R&D activity, project lists	-	Used to define frame population
	Frequency		Annual		-	Biennial

Theme	Indicator	Denmark	Finland	Iceland	Norway	Sweden
Survey data	Data collection method	Census	Survey (census)	CAWI/CATI. E-mail questionnaires	Survey (census)	Census
	Data source/provider	Individual R&D unit. When several units in one institution, some information is provided from central institution office	Ministries, government research institutes, other government agencies (incl. defense units), some municipalities, PNP organizations	All units	All R&D performing units (non-university museums: estimates)	Legal entity
	Type of data	Field of science (2-digit FOS) and estimated amount of FTE	R&D activities, R&D expenditure by field or R&D, personnel, FTE, funding sources	All R&D data	Type of R&D, fields of science and technology, thematic priorities and technology areas, R&D expenditure and -personnel and FTE	Type of R&D, field of science, thematic priority, expenditure and funding source, personnel and FTE.
	Frequency	Annual	Annual	Annual	Annual (until 2007: every two years)	Biennial
Derivation of R&D coefficients	Data collection method		Not relevant	Not relevant	Not relevant	Not relevant
	Data aggregation level				-	-
	Frequency				-	-
Regional breakdown	Level of NUTS	NUTS 2	NUTS 3, Published on the level GOV+PNP		NUTS 3	NUTS 3
Quality measures	Methodology		Use of official registers of high quality, high response rates, well-trained staff	Methodology tailored to the low number of R&D performing units on gov. level. Improved questionnaire. All interaction with respondents through project manager	High coverage, extensive quality control during compilation, comparisons with previous surveys	High coverage, extensive quality control during compilation, comparisons with previous survey
Communication with users and respondents	Key users	Ministries and Parliament, universities, researchers and students, national media, European	Ministries: Education and culture; Employment and economy. The Academy of Finland	Various ministries, universities	Ministries of Education/Research and Trade, Industry and Fisheries. Research Council of Norway	Ministries; Finance, Education, Enterprise and innovation. Research Council of Sweden, Swedish Higher Education Authority

Theme	Indicator	Denmark	Finland	Iceland	Norway	Sweden
		Commission, nordic countries, OECD				
	Assessment of user relevance	Combined use/provider-group for public R&D statistics (HES+GOV+PNP)	Meetings with key STI policy experts and researchers	Results presented to some ministries. Data seems to have met user needs	Meetings with key users	Meetings with user council
	Recalls/reminders	Reminders by post, e-mail and phone	2 reminders by letter, phone contact to important missing units	Follow-up by phone	By e-mail and phone	Two letters, e-mail and phone
	Assessment of respondent satisfaction	Combined use/provider-group for public R&D statistics (HES+GOV+PNP)			Not measured	-
Accuracy and reliability	Unit response rate (un-weighted)	0.98 (0.96 including PNP)	0.92	1.0	0.94	0.98
	Item non-response		Very small		Non-response rates in practice non-existent	Very small
	Errors	Challenge when the form of adm.data doesn't correspond to the R&D statistics. Errors reduced by a data management package (from 2009), data validation to respondents, manual check of tables	Follow-up of government research policy initiatives and possible new R&D units, questionnaire instructions, respondent support etc.	Possible failures in separating R&D from other related activity which should be excluded. All possible errors checked with respondents by phone	Errors minimized by contact with respondents, testing, quality control	Counties have trouble estimating R&D for university hospitals, inconsistencies between years for agencies.
Timeliness and punctuality (T=reporting period just ended + number of months)	Release date of provisional national data	T+12	T+10	T+10	T+10	T+7
	Release date of final national data	T+24	T+10	T+10	T+12	T+10
	Punctuality	No delays	No delays	No delays	No delays	No delays
Comparability	Comparability over time	University hospitals included in government sector until 2002.	Government R&D statistics available from 1971 (exceptions for 1981, 1983)	2013 (R&D statistics moved to Statistics Iceland, not comparable to earlier years)	Complete time series from 1970. PNP sector included from 1989 (does not affect	Data available from 1995 on the website. Latest data comparable from 2005. Implementation

Theme	Indicator	Denmark	Finland	Iceland	Norway	Sweden
		2007: major public sector reform – several units moved from government to HES sector			comparability due to small size)	from FM15 definition from 2017.
	Geographical comparability				Regional comparisons, also over time	Regional comparisons, also over time
Accessibility	Dissemination through publications	Results published with HES sector in annual publication for R&D and Innovation Statistics. Press release	Online publication	Annual statistical yearbook. Release of official statistics includes a press release	Annual “Report on Science & Technology Indicators for Norway” and annual folder to respondents, users etc.	Online publication: full report and database update even years, forecast odd years.
	Dissemination through online database	Yes (StatBank Denmark). A sample of Excel tables available on the website, specific tables upon request	Yes	Yes	Online R&D data bank for all sectors, including time series and international R&D statistics	Yes
	Dissemination through other formats	Questionnaire and methodological notes on the website. Quality report (statistics documentation) available in English (www.dst.dk)	Main results available on the national statistical authority’s website. Data prepared for individual ad hoc requests	Data prepared for individual ad hoc requests	Data prepared for individual ad hoc requests	On request
	Documentation on methodology	Little feedback on clarity due to detailed information published. Assist all users, sometimes for a fee if more resources are needed	Quality descriptions, classifications, concepts and definitions	Definitions in questionnaire updated in line with Frascati 7. Not available in English	The annual report describes methodology. Metadata, including contact information, is accessible in the R&D data bank	Quality descriptions, classifications, concepts and definitions
	Measures to ensure clarity		-	Aware of clarity issues relating to key concepts, including R&D, researcher.	Clarifications upon request, continuous updates on website	Clarifications upon request, continuous updates on website
Challenges and future developments			Update of the R&D panel, catching the potential new R&D performers		Response burden (detailed questions on institute level) reduces response rate	Issues attached to county reporting, discussions with the users and respondents on minimizing the response burden.

Theme	Indicator	Denmark	Finland	Iceland	Norway	Sweden
						Streamlining the production process and continuing the implementation of FM15. External R&D personnel to be included and FRIBS compliance to be improved.
Further information	<i>Please insert link</i>					

FM 2015 issues GOV

	Denmark	Finland	Iceland	Norway	Sweden
Extramural R&D	No plans for collection	Yes		Yes	Yes
Internal / external R&D personnel	No question to separate external personal doing intramural R&D	In principle internal but in practice close to total in GOV, HES and PNP. More important issue in the BES		All personnel considered to be internal	Internal
Transfer / exchange funds	Already in place	Can be estimated (reported to Eurostat and OECD)		Can be estimated	For extramural R&D by recipient
Internal R&D funds	Yes	Yes: distinction between budget funds and funds from own business operations, from own foundations and the like in GOV, HES and PNP. In the BES funds from the domestic enterprise group are considered as internal.		-	Can be estimated
Deviations from Frascati	Internal and external personnel no distinction.	Internal personnel is considered total. Insignificant deviation in GOV, HES and		The concepts internal/external are not identical in national and international R&D statistics. International	Internal personnel is considered total.

		PNP. More important issue in the BES.		R&D statistics: Only funds from own sector are considered internal, all persons employed by the institution are internal, independent of funding.	
--	--	---------------------------------------	--	---	--

PNP sector

Theme	Indicator	Denmark	Finland	Iceland	Norway	Sweden
Contact	Organization responsible for the survey	Statistics Denmark, Business Dynamics	Statistics Finland, Business Statistics / Innovations, Transport and Tourism	Statistics Iceland, Business trends and structure	No separate survey/ estimation R&D in PNP sector in Norway. Very small as R&D performing sector. R&D is part of government R&D.	Statistics Sweden, ICT, Business cycle and R&D, Economic Statistics Department
Population	Target population	PNP institutions with R&D as main purpose	PNP organizations			PNP institutions with R&D as main purpose
	Types and number of institutions, including university hospitals (FM Table 9.1)	10				
	Statistical unit	PNP institutions with R&D as main purpose	PNP organizations	Legal unit		Legal unit
	Number of sub-units surveyed (department/institute)		60			Samplet units: 197 Total population: 1 600
Separate survey	Separate, or integrated into other sector surveys?	Part of government sector R&D survey	Part of government R&D survey	Part of business enterprise R&D survey	Part of government R&D survey	Separate survey
Administrative data	Data source					
	Type of data					
	Frequency					
Survey data	Data collection method			Survey in uneven years (starting 2013). Estimates for current year.		Survey in uneven years (starting 2013). Estimates for current year.
	Data source/provider			PNP's		PNP organizations
	Type of data			Figures		
	Frequency			Biennial		Biennial
Derivation of	Data collection method					

Theme	Indicator	Denmark	Finland	Iceland	Norway	Sweden
R&D co-efficients	Data aggregation level					
	Frequency					
Regional break-down	Level of NUTS					No regional break-down
Quality measures	Methodology			PNP's now surveyed as part of BES (earlier GOV and HEI), following feedback on user needs. Low R&D share of GERD.		
Communication with users and respondents	Key users					
	Assessment of user relevance					
	Assessment of respondent satisfaction					
	Recalls/reminders					
Accuracy and reliability	Unit response rate (un-weighted)					48 %
	Item non-response					
	Errors					
Timeliness and punctuality (T=reporting period just ended + number of months)	Release date of provisional national data			T+10		No provisional national data
	Release date of final national data			T+10		T+12
	Punctuality			No delays		No delays
Comparability	Comparability over time			2013 (R&D statistics moved to Statistics Iceland, not comparable to earlier years)		
	Geographical comparability					

Theme	Indicator	Denmark	Finland	Iceland	Norway	Sweden
Accessi- bility	Dissemination through publi- cations			Annual sta- tistical year- book. Release of official sta- tistics in- cludes a press release		Online publication: full report and da- tabase update even years, forecast odd years.
	Dissemination through online database			Yes		Yes
	Documenta- tion on meth- odology			Data pre- pared for in- dividual ad hoc requests		Quality descrip- tions, classifica- tions, concepts and definitions.
	Measures to ensure clarity			Aware of clarity issues relating to key concepts, including R&D, re- searcher.		
Chal- lenges and fu- ture de- velop- ments						Methodological changes will be in- vestigated during 2019.
Further infor- mation	<i>Please insert link</i>					

List of tables

Table 1 Characteristics of the BERD surveys in the Nordic countries, 2017.....	11
Table 2 Date of publication of the results of BERD (months after reference year=T).....	13
Table 3 Characteristics of the HERD surveys in the Nordic countries, 2017.....	15
Table 4 Main data of HERD survey in the Nordic countries.....	16
Table 5 Date of publication of the HERD results (months after reference year=T).....	17
Table 6 Characteristics of the GOVERD surveys in the Nordic countries, 2017.....	18
Table 7 Date of publication of the GOVERD results (months after reference year=T).....	19
Table 8 Main data of GOVERD survey in the Nordic countries.....	20
Table 9 Characteristics of the PNP surveys in the Nordic countries, 2017	21
Table 10 Producers of R&D statistics and main channel of publishing R&D statistics in the Nordic countries.....	21
Table 11 Share (per cent) of population, GDP, R&D and researchers (FTE) in 2007 and 2017 in the Nordic countries.....	24

List of figures

Figure 1 Unit response rates (per cent) in the BES 2015 ¹	12
Figure 2 R&D statistical overview. Nordic countries. 2017	23
Figure 3 The Danish R&D and innovation system.....	26
Figure 4 The Finnish R&D and innovation system.....	27
Figure 5 The Icelandic R&D and innovation system.....	28
Figure 6 The Norwegian R&D and innovation system.	29
Figure 7 The Swedish R&D and innovation system.....	30

Nordisk institutt for studier av
innovasjon, forskning og utdanning

Nordic institute for Studies in
Innovation, Research and Education

www.nifu.no