Research Council
of Norway

Evaluation of natural sciences (EVALNAT) 2022-2023

RCN funding of natural sciences

Content

Preface

This report has been prepared as background material for the Evaluation of natural sciences (EVALNAT). It aims to summarise the Research Council of Norway's (RCN) funding of the research in natural sciences fields over the period 2011 to 2021.

The analysis is based on data from the RCN's internal database Datavarehuset. The research fields relevant for the EVALNAT evaluation are all found within the area of research *Mathematics and naturals sciences*. The following research fields are included in the analyses:

- *Physics*
- *Chemistry*
- *Geosciences*
- *Interdisciplinary mathematics/natural sciences*

In the following report these fields will collectively be referred to simply as the *natural sciences*.

1 Role of the RCN in Norwegian R&D funding

In 2021, the RCN distributed 31% of Norwegian public R&D expenditure.

The Research Council of Norway (RCN) is a national strategic body for research. It manages research funding from all of the Norwegian ministries and allocates funds to basic and applied research and innovation within all fields and disciplines.

The RCN has a strategic responsibility for the sector. The RCN advises the authorities on research and research policy and helps to ensure that research structures and policy tools are coherent. It aims to increase the quality of Norwegian research and is also responsible for research evaluations. The RCN creates venues where Norwegian researchers can meet, promotes collaboration between research communities and has a national responsibility for research-related communication[1].

The subject-spesific evaluations - for which this report is made – are expected to produce new knowledge and recommendations that may be of use in the development of the RCN's funding instruments and as a basis of advice to the government.

According to the Science and Technology Indicators for Norway, NOK 81.6 billion was spent on research and development (R&D) in Norway in 2021. Of this, NOK 26.9 billion (33%) was spent in the University and university college sector, NOK 16.4 billion (20%) in the Institute sector and NOK 38.3 billion (47%) in the Business sector. In the same year, public R&D funding amounted to NOK 37.8 billion (46% of total)[2].

Based on RCN data, RCN's total R&D expenditure in 2021 was NOK 11,9 billion, or 31 % of public spending. Of this, close to NOK 2 billion was basic allocations which are excluded from subsequent analyses (see Methods).

Over the period 2011-2021, the RCN's total expenditure on R&D projects was NOK 80 billion, excluding basic allocations. The area of research *Mathematics and natural sciences*, which encompasses all fields included in the Evaluation of the natural sciences (EVALNAT), has been and continues to be the second largest area in the RCN's portfolio (see Figure 1.1).

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[1] https://www.regjeringen.no/en/dep/kd/organisation/kunnskapsdepartementets-etater-og-virksomheter/Subordinate-agencies-2/the-research-council-of-norway/id426571/

[2] Indikatorrapporten, 2023

The area of research *Mathematics and natural sciences* has seen a real increase in funding over the period 2011 to 2021. The increase amounts to almost 60% compared to 2011 (after adjusting for inflation). Only *Social sciences* has seen a larger increase over the period.
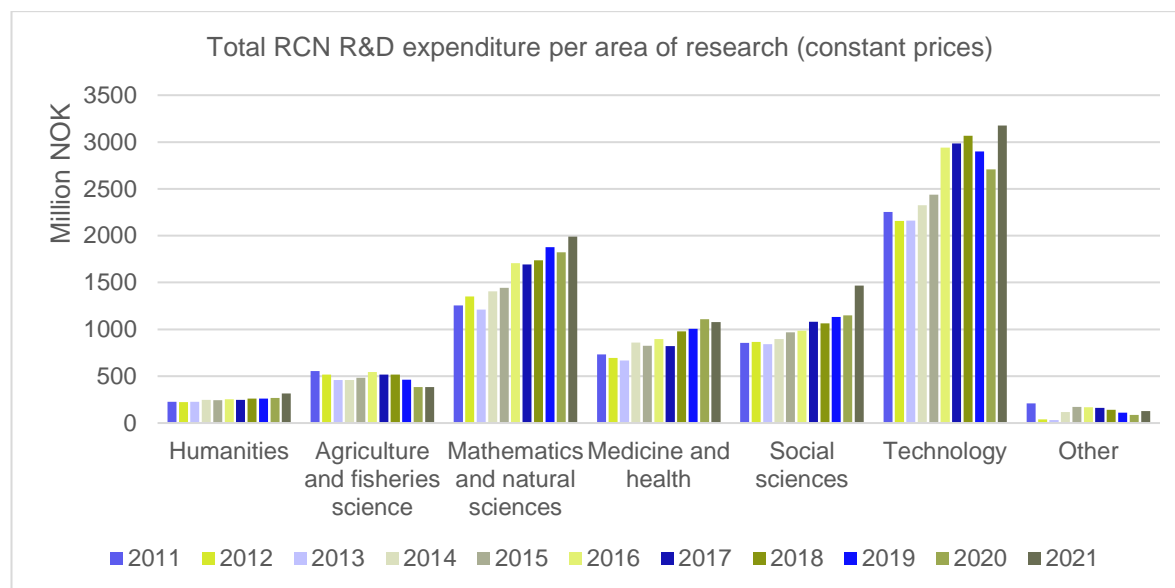

Figure 1.1. The graph shows total annual RCN R&D expenditure by area of research ("fagområde"). Data is based on annual revised budgets per project. Each project is assigned in its entirety to its main area of research. Basic allocations are not included. The numbers are given in constant 2015-prices using Statistics Norway's R&D adjustment.

The RCN has many funding schemes. These activities are for administrative and statistical purposes binned into what is called funding instruments. The RCN har six funding instruments for R&D projects:

1) Independent projects - bottom-up researcher-initiated projects. Projects are of medium size and often in basic science.
2) Programmes - strategic and targeted research efforts to generate new knowledge in a limited area.
3) Infrastructure and institutional measures - the largest funding schemes within this instrument are the national financing initiative for research infrastructure (FORINFRA) and the Centres of Excellence schemes (SFF and SFI). The projects funded in these schemes are few and large.
4) Networking measures
5) Public administration – funds administered by the RCN for external entities, i.e.not subject to RCN board decisions.
6) Diverse R&D-related activities – mostly publication and dissemination costs including science museum ("vitensentre") funding.

Over the period 2011 to 2021 53% of RCN's total expenditure (in current prices) was allocated through Programmes, 21% through Infrastructure and institutional measures, 15% through

Independent projects, 7% through Networking measures, 3% through Public administration and 1% through Diverse R&D-related activities.

Total RCN R&D expenditure per funding instrument (constant prices)
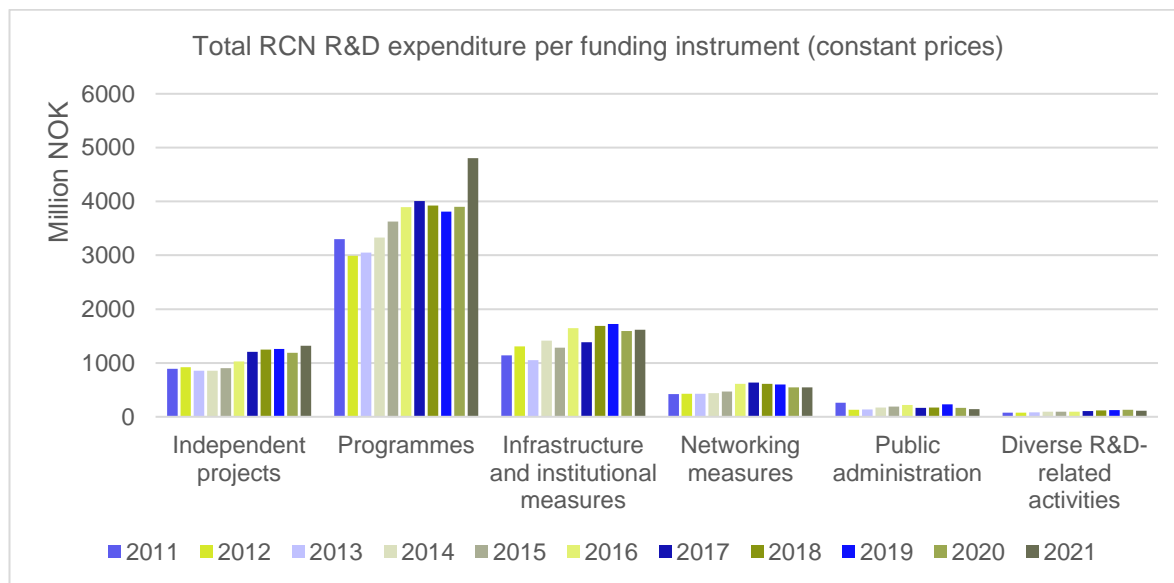
Figure 1.2. The graph shows RCN's total annual expenditure per funding instrument ("virkemiddel"). Data is based on annual revised budgets per project. Each project is assigned in its entirety to its main area of research. Basic allocations are not included. The numbers are given in constant 2015-prices using Statistics Norway's R&D adjustment.

While the Business sector is the largest R&D-performing sector in Norway, it is the University and university colleges sector and the Institute sector that are the largest recipients of funding from the RCN. Over the period 2011-2021 41% of RCN's R&D funds (in current prices) went to the University and university colleges sector, 30% to the Institute sector and 20% to the Business sector.

It is worth noting that both the University and university colleges sector and the Hospital sector receive basic allocations from their respective Ministries that are not channeled through the RCN. Although RCN administrates the basic allocation for a specific subset of Institutes, data on RCN funding in this report is limited to other funding. The Public sector designation is a recent addition. The large relative increase in this sector is thus likely a statistical artefact.
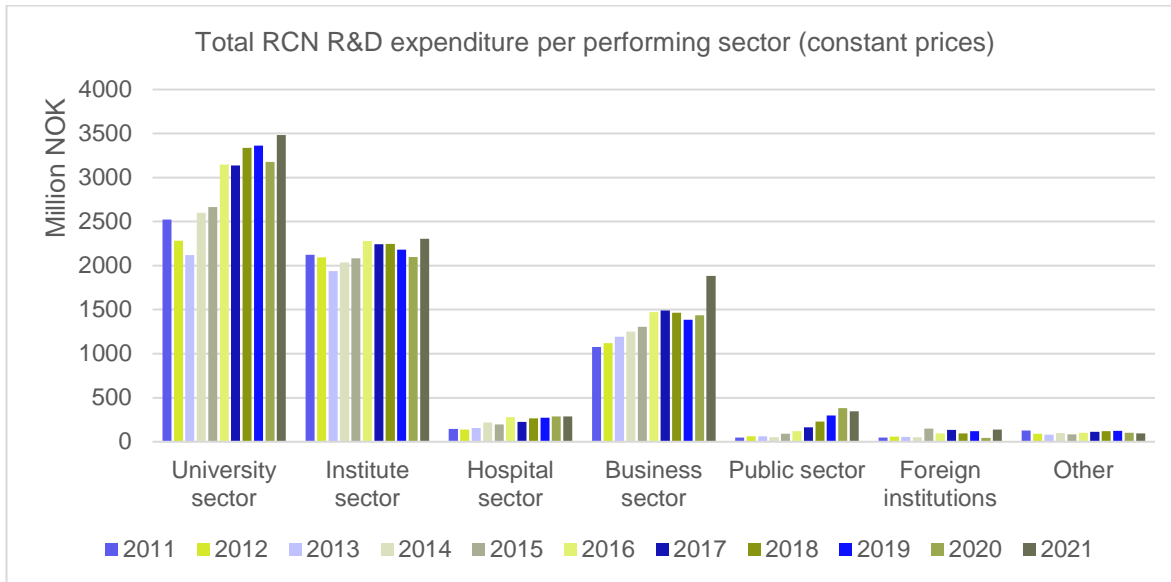
Figure 1.3. The graph shows RCN's total annual R&D expenditure in all areas of research by R&D-performing sector. Data is based on annual revised budgets per project. Each project is assigned in its entirety to its main area of research. University sector = University and university college sector. Basic allocations are not included. The numbers are given in constant 2015-prices using Statistics Norway's R&D adjustment.

The clearest trend is that the share of R&D funds received by the Institute sector has declined over the period. Some of this effect is due to structural changes in the sector (mergers of Institutes with HEIs), but these do not explain all of the decline.
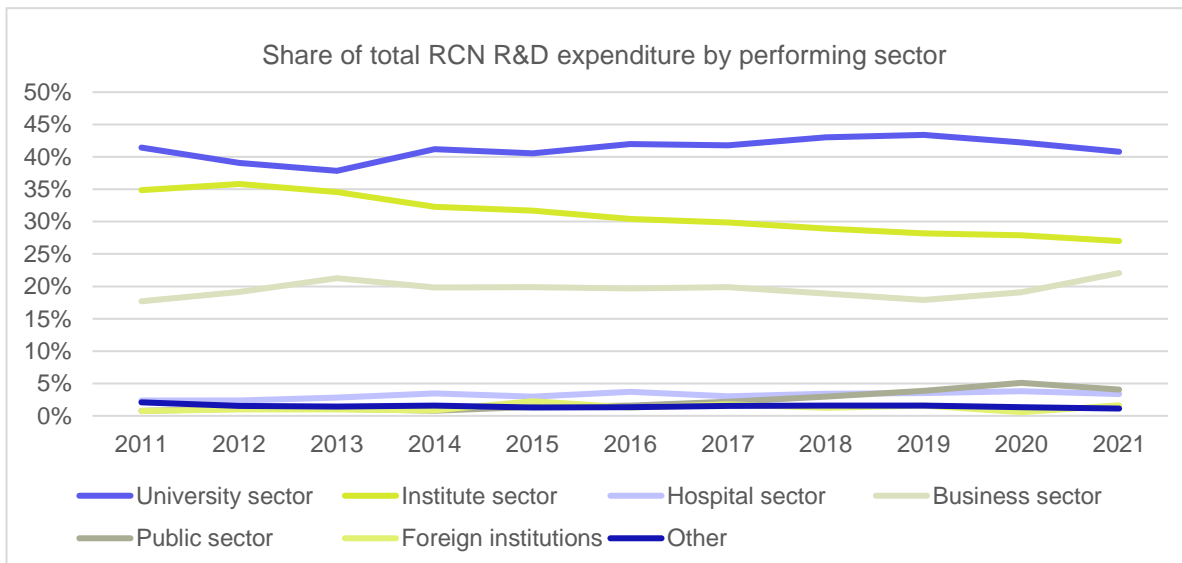

Figure 1.4. Share of total RCN R&D expenditure by performing sector. Data is based on annual revised budgets per project. Each project is assigned in its entirety to its main area of research. Basic allocations are not included.

2 RCN funding of natural sciences

2.1 Research fields and funding instruments

Over the period 2011-2021 RCN expenditure on projects within the research fields relevant for the EVALNAT assessment (*Physics*, *Chemistry*, *Geosciences* and *Interdisciplinary mathematics/natural sciences* – from here on collectively referred to as the natural sciences) amounted to NOK 10 billion (in current prices). This constitutes almost 13% of total RCN R&D expenditure over the period.

Whereas expenditure on projects within the field designated as *Interdisciplinary mathematics/natural sciences* has stayed relatively flat and expenditure on *Physics* has increased moderately, expenditures in *Geosciences* and *Chemistry* have increased markedly over the period.
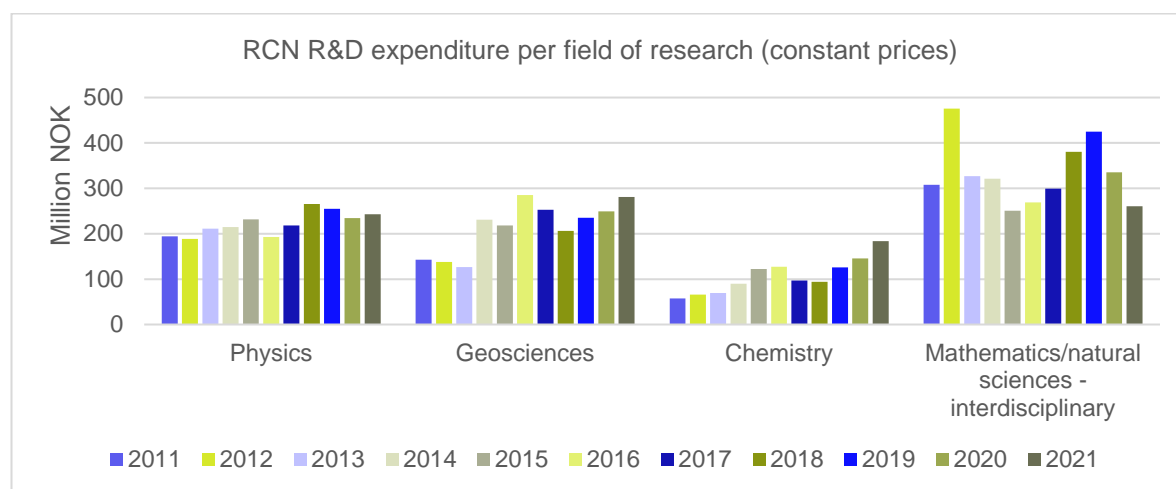

Figure 2.1. Graph shows RCN expenditure on all R&D projects within natural sciences fields. Data is based on annual revised budgets per project. Each project is assigned in its entirety to its main area of research. Amounts are shown in constant 2015-prices, adjusted according to Statistics Norway's R&D adjustment. Basic allocations are excluded.

Four of the RCN's funding instruments provide significant funding to the natural sciences. The largest amount is channeled through activities within Infrastructure and institutional measures. Calls within this instrument has provided NOK 4,1 billion to the fields (44% of the total) over the period 2011-2021. Of this, NOK 2,4 billion came from the national financing intitiative for research infrastructure FORINFRA and another NOK 1 billion from Centres of Excellence schemes (predominantly SFF). The large amounts of funding from the FORINFRA initiative is the main cause of variability in annual expenditure seen within this instrument because these grants typically are very large and expenses concentrated over few years (see Figure 2.2).

Over the same period, Programmes provided a total of NOK 2,7 billion (29% of the total), a figure that has remained relatively constant. The largest amount of funding within Programmes came from climate research (KLIMAFORSK), polar research (POLARPROG), space science (ROMFORSK) and CERN-related activities.

The largest increase in funding has come within Independent projects. This instrument contributed NOK 1,9 billion (21%) to the natural sciences over the period covered by the evaluation.

Compared to the overall picture (Figure 1.2), the R&D funding of natural sciences fields comes to a much larger extent from the instrument Infrastructure and institutional measures and much less so from Programmes. It is particularly the FORINFRA national financing initiative for research infrastructure that is important, but there have also been a significant number of Centres of Excellence within both *Physics*, *Chemistry* and *Geosciences*. Most of these centres have been funded by the SFF scheme that funds projects selected based on scientific excellence only. These grants are also few and large, but run for up to 10 years and therefore contribute less to the annual variability in the data.
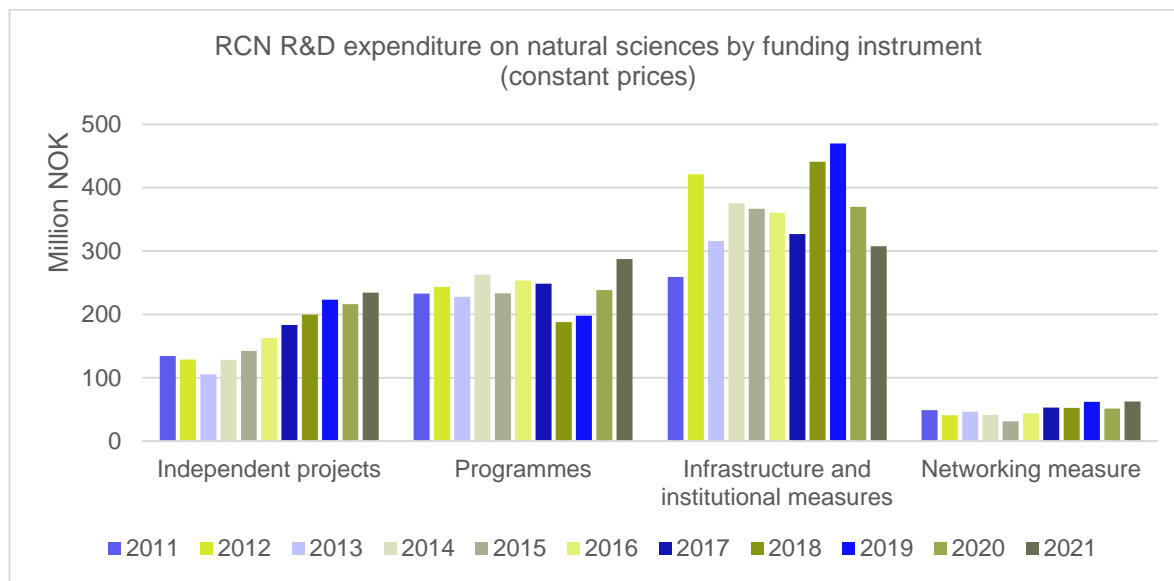

Figure. 2.2. Graph shows RCN R&D expenditure on the natural sciences (the four fields of research relevant for the EVALNAT evaluation) by funding instrument. Data is based on annual revised budgets per project. Each project is assigned in its entirety to its main area of research. Amounts are shown in constant 2015-prices, adjusted according to Statistics Norway's R&D adjustment. Basic allocations are excluded.

The significance of each funding instrument varies between the four research fields covered by the evaluation. In *Physics* the research funding is dominated by projects within the instrument Infrastructure and institutional measures. About half of the funding from this instrument is through the FORINFRA scheme. Until 2014 the nuclear reactor owned by Institute for Energy Technology (IFE) also received a large amount of funding through this instrument, and the SFF Centre of Excellence scheme has funded four centres in *Physics*. Among the Programmes, the *Physics* field has received most of its funding from the CERN programme as well as the space research programme ROMFORSK. There is relatively little funding from the Independent projects instrument.
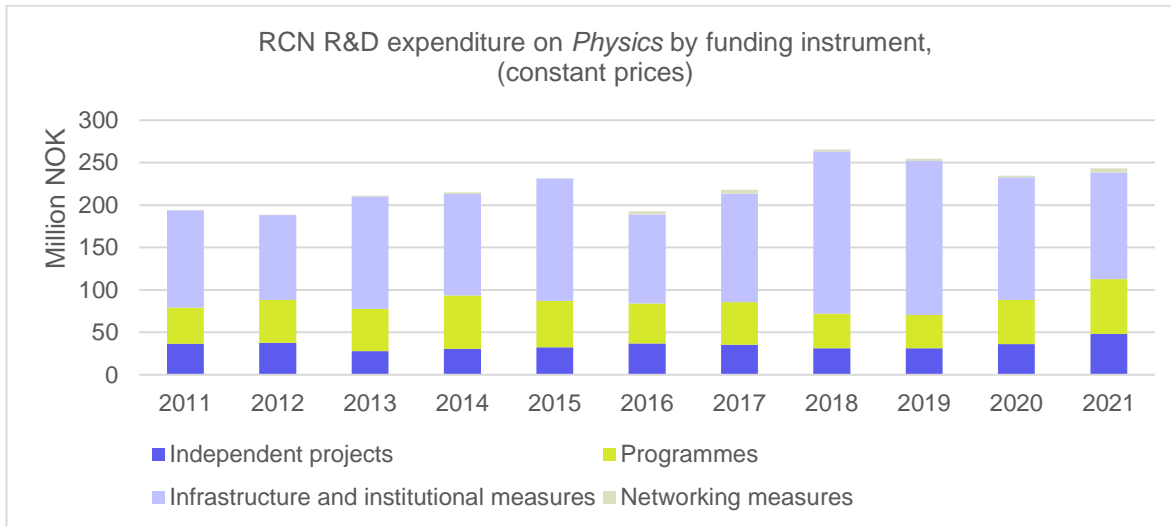
Figure 2.3. Graph shows RCN R&D expenditure on Physics by funding instrument. Data is based on annual revised budgets per project. Each project is assigned in its entirety to its main area of research. Amounts are shown in constant 2015-prices, adjusted according to Statistics Norway's R&D adjustment. Basic allocations are excluded.

In *Geosciences* research funding through Programmes is the largest. The activities that contribute the most are climate research (KLIMAFORSK) and polar research (POLARPROG). Funding within the instrument Infrastructure and institutional measures is almost evenly distributed between Centres of Excellence (five SFFs and one SFI) and the FORINFRA initiative. Both Programme funding and Independent projects have increased through the period.
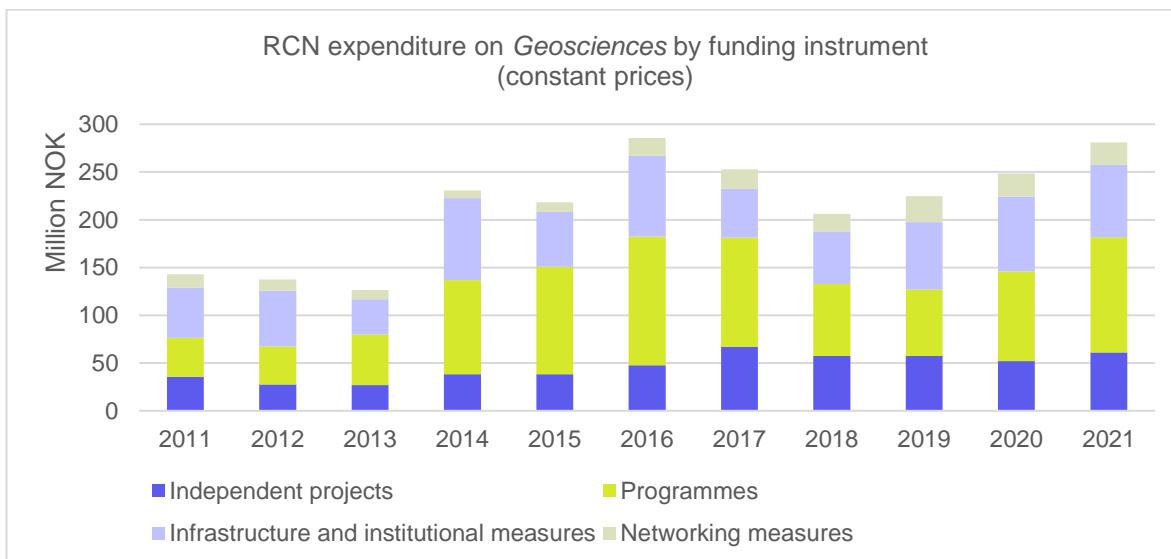

Figure 2.4. Graph shows RCN R&D expenditure on Geosciences by funding instrument. Data is based on annual revised budgets per project. Each project is assigned in its entirety to its main area of research. Amounts are shown in constant 2015-prices, adjusted according to Statistics Norway's R&D adjustment. Basic allocations are excluded.

Chemistry has seen a large increase in funding from Programmes recently. The most important activities within this instrument are BIA which supports innovation in the business sector, ENERGIX which supports energy research and MILJØ2015/MILJØFORSK which supports environmental science. In *Chemistry* the funding through the instrument Infrastructure and institutional measures is largely due to Centres of Excellence funding (three SFFs and one SFI) and to a smaller extent funding for the FORINFRA initiative. The large sums in 2015 and 2016 is due to an overlap of old and new generations of Centres of Excellence.

RCN expenditure on *Chemistry* by funding instrument
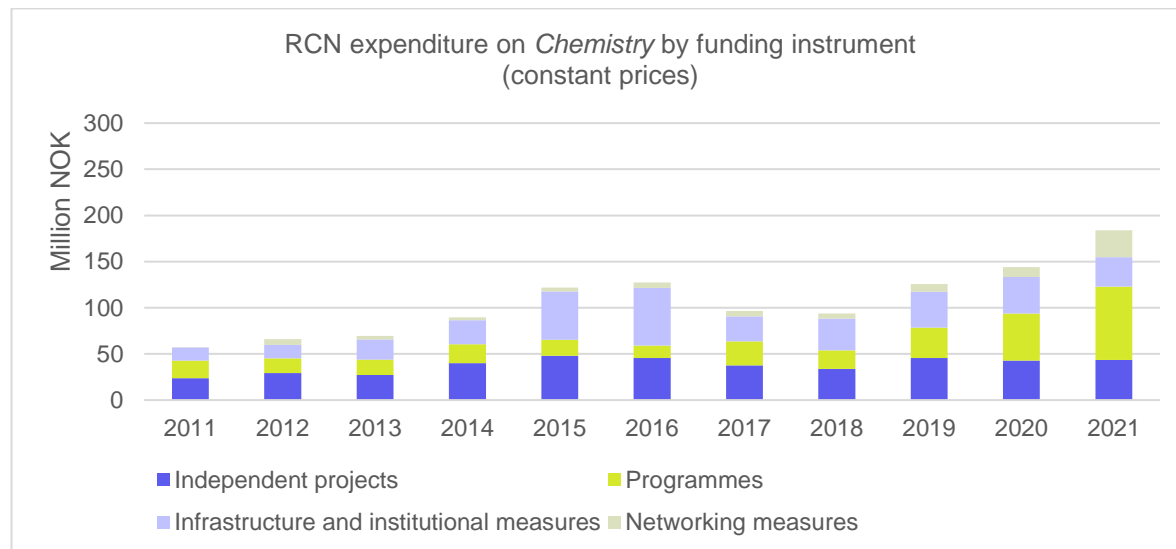(constant prices)

Figure 2.5. Graph shows RCN R&D expenditure on Chemistry by funding instrument. Data is based on annual revised budgets per project. Each project is assigned in its entirety to its main area of research. Amounts are shown in constant 2015-prices, adjusted according to Statistics Norway's R&D adjustment. Basic allocations are excluded.

Interdisciplinary mathematics/natural sciences covers a range of projects within the Natural sciences area that are interdisciplinary in nature and challenging to assign to a single field of research. The increase in Independent projects from 2018 and onwards is mostly due to a large interdisciplinary project called the Nansen Legacy ("Arven etter Nansen"), an arctic research project providing integrated scientific knowledge on the rapidly changing marine climate and ecosystem. The largest contributor to Infrastructure and institutional measures is FORINFRA, and the largest activites within Programmes fund climate research (KLIMAFORSK), environmental research (MILJØFORSK/MILJØ2015), energy research (ENERGIX) and polar research (POLARPROG).

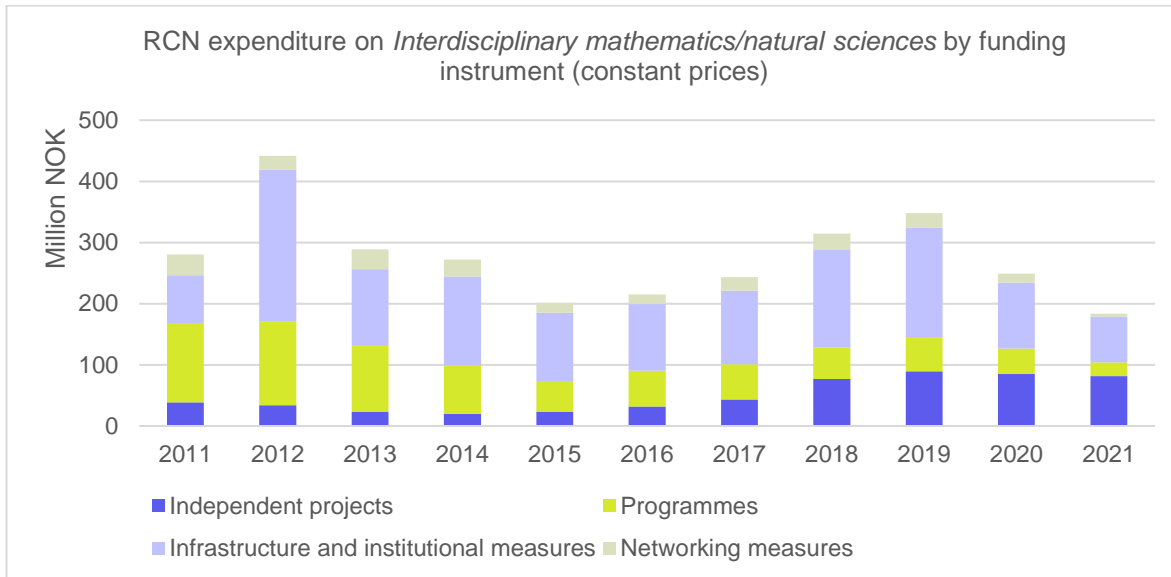RCN expenditure on *Interdisciplinary mathematics/natural sciences* by funding instrument (constant prices)

Figure 2.6. Graph shows RCN R&D expenditure on Interdisciplinary mathematics/natural sciences divided by funding instrument. Data is based on annual revised budgets per project. Each project is assigned in its entirety to its main area of research. Amounts are shown in constant 2015-prices, adjusted according to Statistics Norway's R&D adjustment. Basic allocations are excluded.

2.2 Sectors and institutions

In the rest of the report we will look at the RCN data from the point of view of recipient institutions. As for the RCN portfolio as a whole, it is the University and university colleges sector and the Institute sector that are the main recipients for RCN R&D funds within the natural sciences.

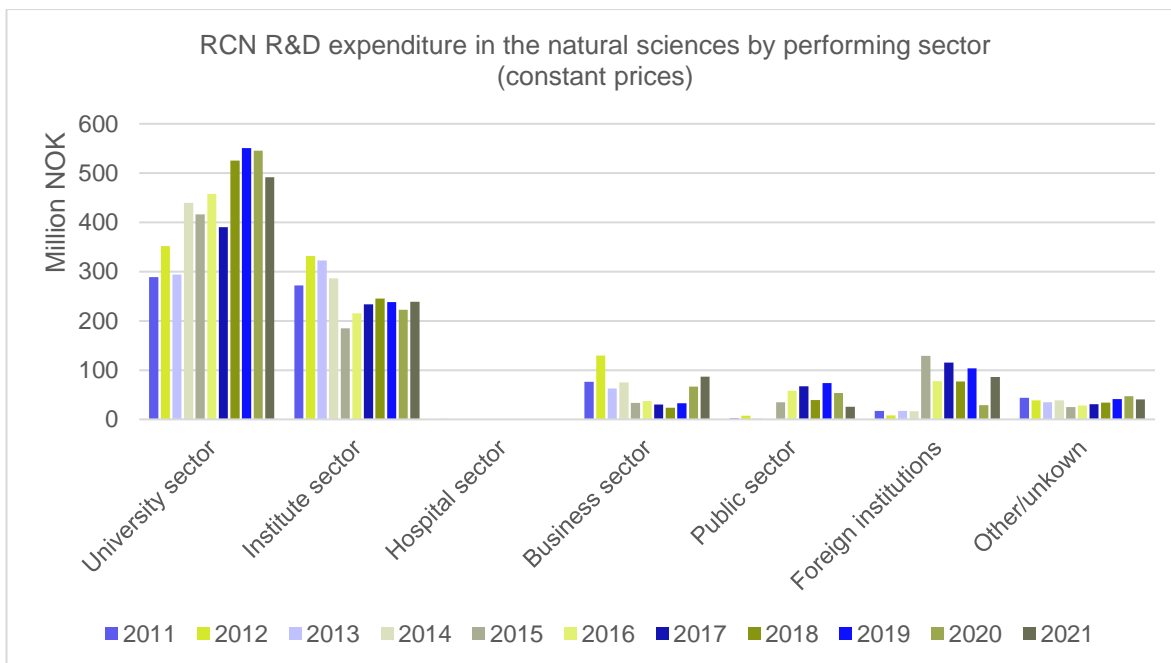RCN R&D expenditure in the natural sciences by performing sector (constant prices)

Figure 2.7. The graph shows RCN's R&D expenditure in the natural science fields by R&D-performing sector. Numbers are in constant 2015-prices, adjusted according to Statistics Norway's

R&D adjustment. Data is based on annual revised budgets per project. Each project is assigned in its entirety to its main area of research. University sector = University and university college sector. Basic allocation are not included.

The Institute sector's share of RCN expenditure within the natural sciences saw a marked decrease around 2014-2015. This is explained in large part by cessation of RCN funding for IFE's nuclear reactor (mentioned previously). The reactor was permanently shut down in 2018. Since 2015 the Institute sector's share has stayed relatively constant.
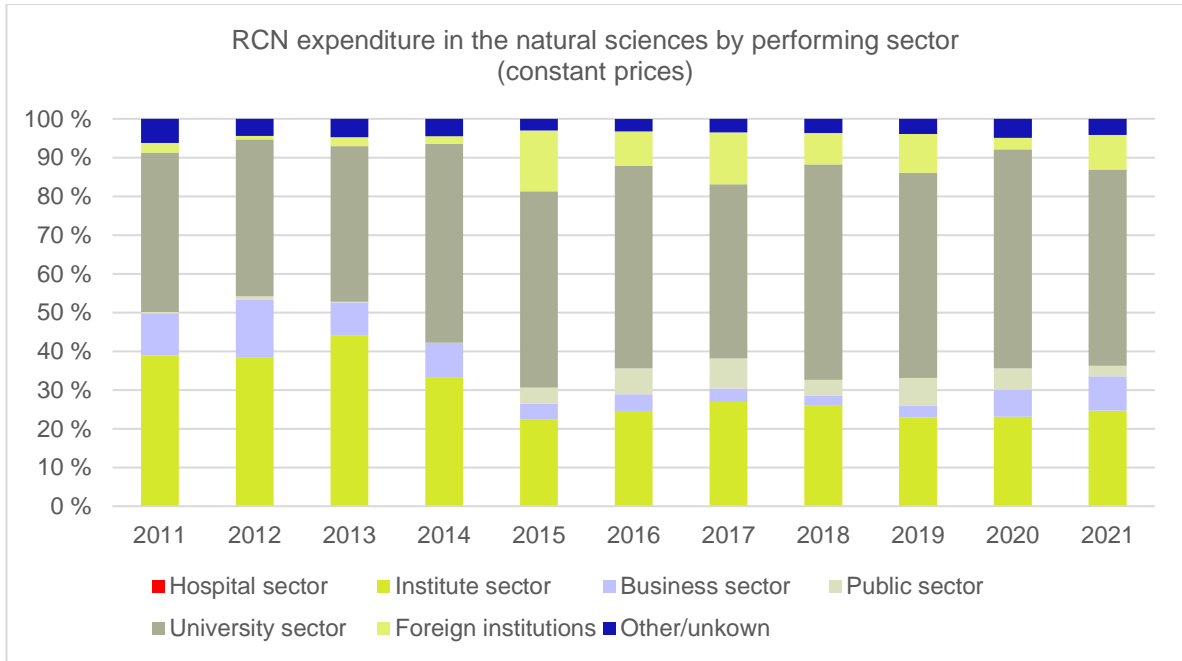

Figure 2.8. *The graph shows RCN's R&D expenditure in the natural sciences fields by R&D-performing sector. Same data as in Figure 2.7.*

The RCN database does not contain information that links research projects to the administrative units assessed in the EVALNAT evaluation, but it is possible to identify project affiliation at the highest organisational level. It is therefore only possible to identify the funding each organisation as a whole has received from RCN for R&D projects within the relevant research fields.

Please also note that there have been organisational changes affecting several of the organisations under assessment in the period covered by the evaluation that affect the data. For instance, the research institute NORCE was formally established in 2017 by a fusion of several smaller existing research institutes. Only research projects from the old institutions that were still ongoing in 2017 are picked up by this analysis as affiliated with NORCE. Hence there is a large apparent jump in funding received by NORCE around this time, presumably as a result of this organisational change.

The large jump in funding observed for SINTEF in 2012-2013 is due in large part to a FORINFRA grant. And none of NORSUS's RCN projects are marked as predominantly within the natural sciences fields and they are therefore not picked up in these analyses.

Based on the data from the last few years, it is clear that NORCE has been a major recipent of R&D funds from the RCN within the natural sciences. However, the institutes that are part of the EVALNAT evaluation are quite diverse in size and purpose. Some of them therefore will have a large portfolio of grants that are not picked up in this analyses that only looks at projects within the four EVALNAT-relevant fields.
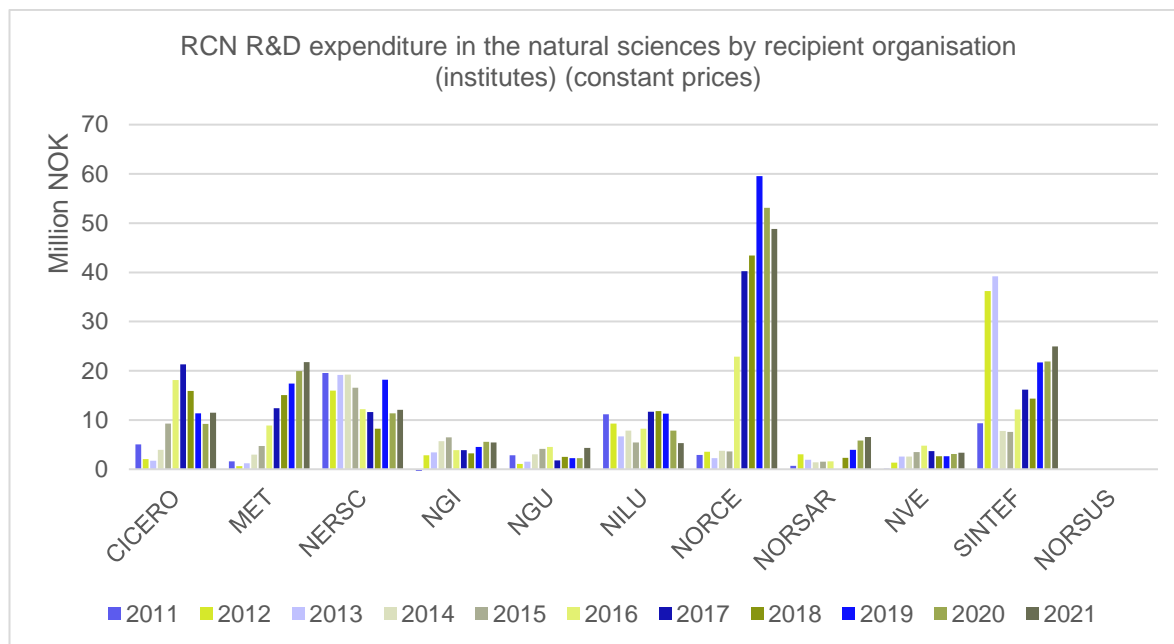

Figure 2.9. Graph shows amount of R&D funding received by relevant institutes (at the main organisational level) to projects in the natural sciences. CICERO = Center for International Climate Research, MET = Norwegian Meteorological Institute, NERSC = Nansen Environment and Remote Sensing Centre, NGI = Norwegian Geotechnical Institute, NGU = Geological Survey of Norway, NILU = The Climate and Environmental Research Institute NILU, NORCE = NORCE Norwegian Research Centre AS, NORSAR = Norwegian Seismic Array, NVE = Norwegian Water Resources and Energy Directorate, SINTEF = SINTEF, all units, NORSUS = Norwegian Institute for Sustainable Research. Data is based on annual revised budgets per project with institution as project owner. Each project is assigned in its entirety to its main area of research. Amounts are shown in constant 2015-prices, adjusted according to Statistics Norway's R&D adjustment. Basic allocations are excluded.

Among the universities the University of Oslo (UiO) has received the largest amount of funding in the natural sciences, but it is the Norwegian University of Science and Technology (NTNU) and University of Tromsø - The Arctic University of Norway (UiT) that have seen the largest increase in funding over the period 2011-2021. In the case of UiT, this is due to funding from the FORINFRA initiative and from the large interdisciplinary project the Nansen Legacy mentioned earlier. As for NTNU, the peak in 2018 is due to funding from FORINFRA, but the upward trend is otherwise explained by an increase in Independent projects as well as several Centres of Excellence.
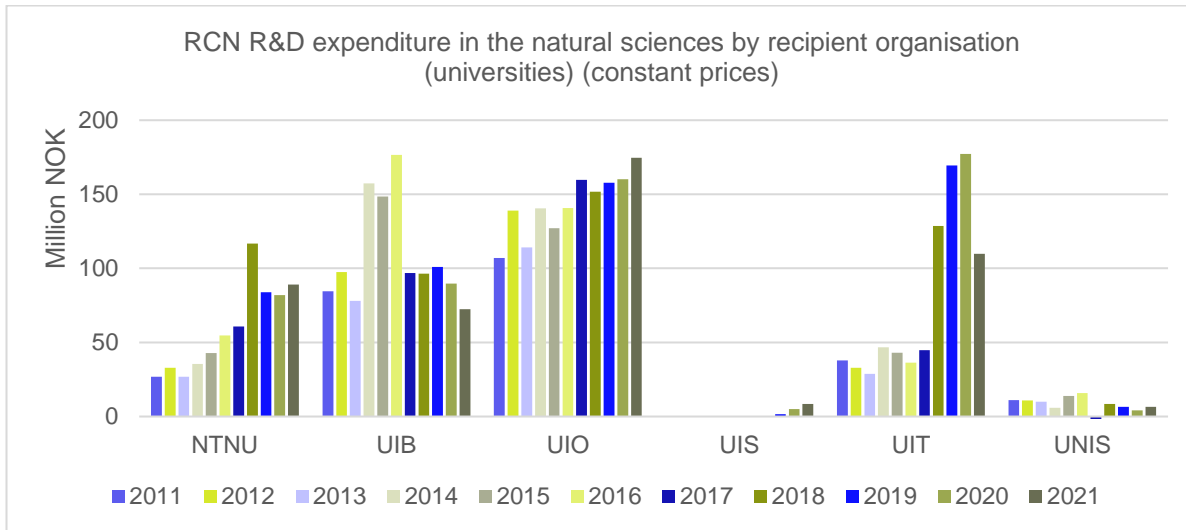
Figure 2.10. Graph shows amount of R&D funding received by relevant universities (at the main organisational level) to projects in the natural sciences. NTNU = Norwegian University of Science and Technology, UiB = University of Bergen, UiO = University of Oslo, UiS = University of Stavanger, UiT = University of Tromsø – the Arctic University of Norway, UNIS = University Centre in Svalbard. Data is based on annual revised budgets per projectwith institution as project owner. Each project is assigned in its entirety to its main area of research. Amounts are shown in constant 2015-prices, adjusted according to Statistics Norway's R&D adjustment. Basic allocations are excluded.

3 Methods

3.1 Data

The national data presented in this report is from Indikatorrapporten from 2023. The latest English version, from 2021, can be found here.

The analysis of RCN funding is based on internal data from the RCN database (Datavarehuset). It shows RCN funded R&D projects excluding basic allocations ("basisbevilgninger" as main activity).

The data shown is based on annual revised budgets for the years 2011-2021. Only previously or currently funded projects are included in the data set.

Only projects that are marked as predominantly within *Physics* (code 43F), *Chemistry* (code 44F), *Geosciences* (code 45F) and *Interdisciplinary mathematics/natural sciences* (code 40F) are included ("hovedfagmerking"). This means that interdisciplinary projects that are marked as mostly within a different field are not included in the data set, even if they have parts that are within the covered fields.

The Norwegian R&D system has undergone some structural changes in the period 2011-2021 that affect the RCN data. Projects owned by an organisation at the time of the organisational change were transferred in their entirety to the new organisation only if the project was still active/receiving funding at that time. This means that some of the projects that were already ongoing at the time of the transfer will be shown as owned by the new organisation even before the organisational change took place. Conversely, projects owned by the old organisational units that were finished before the organisational change took place, will not be included in the data set used here.

The RCN data is presented in constant 2015-prices. The adjustment from current prices is done according to Statistics Norway's R&D price index as shown here (c-tabeller-statistiske-basistall-2021.xlsx (live.com)).

Over the period that the report covers the value of the Norwegian currency has decreased relatively steadily, both in relation to the Euro and USD. In 2011 one Euro cost NOK 7,79 whereas in 2021 one Euro cost NOK 10,16. Similarly, one USD cost NOK 5,61 in 2011 and NOK 8,60 in 2021.

3.2 Field designations

The RCN uses a field designation that is based on, but not identical to, the FORD classification in the Frascati manual. The designation has three levels (from less to more detailed):

1. Area of research (corresponds to FORD level "Broad classification") = "Fagområde"
2. Field of research (corresponds to FORD "Second-level classification") = "Fag"
3. Discipline (third level) = "Fagdisiplin"

3.3 Funding instruments

The RCN has six funding "Instruments" ("virkemiddel") that fund R&D projects:

1. Independent projects = "Frittstående prosjekter"
2. Programmes = "Programmer"
3. Infrastructure and institutional measures = "Infrastruktur og institusjonelle tiltak"
4. Networking measures = "Nettverkstiltak"
5. Public administration = "Forvaltning"
6. Diverse R&D-related projects = "Diverse FoU-relaterte prosjekter"

3.4 Sector designations

The RCN's sector designation differs somewhat from OECD's classfication. In Norwegian national R&D statistics the following three basic sectors are used (see sti-report-2021.pdf (forskningsradet.no):

1. The Higher Education Sector ("UH-sektor") is comprised of universities, university colleges and other units providing higher education as well as university hospitals.
2. The Institute Sector ("Instituttsektor") is comprised of research institutes and other R&D-performing institutes mainly controlled and funded by the government, health trusts not conducting education, private non-profit hospitals as well as private non-profit research institutes mainly serving industry. The latter institutes are classified as business sector in the OECD classification.
3. The industrial sector ("Næringslivssektor") is comprised of companies and enterprises that provide commercial goods and services.

The RCN's sector designation is based on the same basic classification but is somewhat more fine-grained and uses the following classifications:

1. Universities and University Colleges Sector
2. Hospital Sector – all types of hospitals, with or without university affiliation / functions
3. Institute sector
4. Business sector
5. Public sector
6. Foreign institutions
7. Other