Nordic co-operation

*Nordic co-operation* is one of the world’s most extensive forms of regional collaboration, involving Denmark, Finland, Iceland, Norway, Sweden, and the Faroe Islands, Greenland, and Åland.

*Nordic co-operation* has firm traditions in politics, the economy, and culture. It plays an important role in European and international collaboration, and aims at creating a strong Nordic community in a strong Europe.

*Nordic co-operation* seeks to safeguard Nordic and regional interests and principles in the global community. Common Nordic values help the region solidify its position as one of the world’s most innovative and competitive.
Content

Introduction
Who prepares the R&D statistics?
How are R&D statistics compiled?
Basic definitions of Research and experimental development (R&D)
Data sources
Symbols and country codes
Abbreviations
Key to the tables
Highlights
Statistics
Introduction
This is the first version of this booklet, “Nordic research – Key data 2012”, containing tables and figures on Nordic R&D statistics and science and technology indicators. It is created by the Nordic Institute for Studies in Innovation, Research and Education (NIFU) and published by the Nordic Council of Ministers.

The booklet together with all statistical material is also available electronically at www.norden.org/publications

Who prepares the R&D statistics?
In the Nordic countries the statistical surveys on resources devoted to R&D are carried out by the National Statistical offices for Denmark, Sweden and Finland. In Iceland RANNIS (the Icelandic Research Council) carry out the survey. In Norway, the preparation of R&D statistics is carried out by Statistics Norway (the business enterprise sector) and NIFU (government sector, higher education sector). Links to the national producers of R&D statistics are listed in the electronic version of this booklet at www.norden.org/publications

How are R&D statistics compiled?
Basic definitions of Research and experimental development (R&D)

Research and experimental development (R&D) comprises creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications. Three types of R&D may be distinguished: Basic research, applied research and experimental development.

Data sources

International R&D statistics are extracted from the OECD’s Main Science and Technology Indicators 2011-2 supplemented with national sources. The data source for educational level is Education at a Glance 2011, OECD. Information about doctoral students and awarded doctoral degrees in the Nordic and Baltic countries are taken from the NORBAL database, operated by NIFU. Bibliometric data are extracted from the National Science Indicators database, prepared by Thomson Scientific in the U.S. This database contains global publication and citation statistics. Data on patents are from the OECD.
### Symbols and country codes

<table>
<thead>
<tr>
<th>Country</th>
<th>Code</th>
<th>Colour</th>
<th>Key to the tables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denmark</td>
<td>DK</td>
<td>Green</td>
<td>.. Data not available</td>
</tr>
<tr>
<td>Estonia</td>
<td>EE</td>
<td>Dark grey</td>
<td>: Data may not be made public</td>
</tr>
<tr>
<td>Finland</td>
<td>FI</td>
<td>Blue</td>
<td>– 0</td>
</tr>
<tr>
<td>Iceland</td>
<td>IS</td>
<td>Purple</td>
<td></td>
</tr>
<tr>
<td>Latvia</td>
<td>LV</td>
<td>Light grey</td>
<td></td>
</tr>
<tr>
<td>Lithuania</td>
<td>LT</td>
<td>Grey</td>
<td></td>
</tr>
<tr>
<td>Norway</td>
<td>NO</td>
<td>Red</td>
<td></td>
</tr>
<tr>
<td>Sweden</td>
<td>SE</td>
<td>Yellow</td>
<td></td>
</tr>
</tbody>
</table>

### Abbreviations

- **GDP**: Gross national product
- **EPO**: The European Patent Office
- **EU-27**: The present 27 EU members
- **R&D**: Research and experimental development
- **GBAORD**: Government budget appropriations or outlays for R&D
- **ISCED**: International Standard Classification of Education
- **OECD**: Organisation for Economic Co-operation and Development
- **PPP$**: Purchasing power parity. A conversion to a common unit (US$) to enable comparisons of R&D between countries as to currency and purchasing power.
- **PNP sector**: Private non-profit sector

All expenditures are given in current prices, unless otherwise indicated. In 2011 1.00 PPP US$ = 9.62 NOK (Main Science and Technology Indicators 2011-2, OECD).
Highlights

• Total R&D expenditure in the Nordic countries amounted to 32 billion PPP$ or approximately 290 billion NOK in 2010.

• Sweden accounted for 39 per cent of total Nordic R&D expenditure, Finland 24 per cent, Denmark 21 per cent, Norway 15 per cent and Iceland 1 per cent.

• From 2001 to 2010 there was an average annual real growth in the Nordic countries’ R&D expenditure of 4.5 per cent. Denmark and Norway saw the strongest growth, followed by Finland, Iceland and Sweden.

• R&D expenditure per capita was highest in Finland in 2010, at 1415 PPP$, followed by Sweden, Denmark and Iceland. Norway spent least per capita among the Nordic countries, at 970 PPP$. However, all of the Nordic countries are ahead of the EU-27 and OECD on this measure, at roughly 600 and 800 PPP$ per capita, respectively.

• Norway had the highest proportion of R&D expenditure financed by public sources in 2009, while Finland had the highest proportion of private sector financing. Funding from other domestic sources was between 1 and 3 per cent in the Nordic countries and funding from foreign sources between 7 and 10 per cent.

• 2010 figures for R&D expenditure as a share of GDP show Finland with 3.9 per cent, Sweden on 3.4 per cent, Denmark on 3.2 per cent, Iceland on 3.1 per cent and Norway with 1.7 per cent. In the EU-27 and OECD the equivalent figures for 2009 were 1.9 and 2.4 per cent respectively.

• When R&D activity over various performing sectors is considered, the business enterprise sector is shown to account for about 70 per cent of R&D expenditures in Finland, Sweden and Denmark. This is in line with OECD figures. In Iceland and Norway, the level
was just over 50 per cent and in the EU-27 it is around 60 per cent.

- When government R&D allocations (GBAORD) are converted to PPP$, this reveals an increase from 2010 to 2011, of 5 per cent in Denmark, while a decline of around 3 per cent is apparent in Finland and Norway, and a decline of almost 1 per cent is shown in Sweden.

- As of 2010, the proportion of the population with higher education varied from 33 per cent in Iceland to 37 per cent in Finland and Norway. The OECD average proportion was 30 per cent.

- Finland had the highest proportion of higher-educated women in the population, at 43 per cent.

- The number of PhDs per million inhabitants is around twice as high in the Nordic countries as in the Baltics (in 2010). Finland leads with 326 PhDs per million inhabitants, while Norway has the lowest score in the Nordic region, at 242.

- In Sweden, there has been a decline in the number of doctoral degrees awarded each year since 2008.

- The percentage of PhDs awarded to women in Nordic countries in 2010 was highest in Finland (53 per cent) and lowest in Denmark and Iceland (both with 45 per cent).

- Sweden has a particularly high proportion of PhDs awarded in medicine (38 per cent), while Denmark and Latvia have the highest proportions in technology (both 23 per cent). Among the Nordic countries, Finland had the highest proportion of PhDs awarded within the humanities and social sciences (34 per cent).

- In 2010, the proportion of female researchers was highest in Iceland (42 per cent) and lowest in Finland (31 per cent). The proportion of female professors was highest in Iceland (27 per cent) and lowest in Denmark (17 per cent).

- The percentage of R&D personnel (full-time-equivalents, FTE)
in the business enterprise sector was highest in Sweden and lowest in Norway. The proportion of R&D FTE in the higher education sector was approximately 1/3 of total R&D FTE in all Nordic countries, except Sweden, where they accounted for 1/4.

• The number of scientific articles per 1 000 inhabitants ranged from 2.4 in Iceland to 1.9 in Finland and Norway.

• Growth in the number of scientific articles produced in the period 2006–2010 was highest in Iceland, followed by Norway, Denmark, Sweden and Finland.

• From 2009 to 2010, the trend in the number of scientific articles has been positive for Iceland and Denmark, while Sweden and Norway showed little growth, and there was a decline in Finland.

• In recent years, Danish articles were most cited among the Nordic countries, followed by those from Sweden, Norway and Finland.

• Icelandic scientists have the highest proportion of international co-authored articles in the Nordic countries, and the highest percentage of these articles written with researchers from other Nordic countries (33 per cent). Sweden had the lowest proportion (14 per cent) of international co-authored articles with other Nordic countries.

• Nordic researchers are more likely to have co-authored articles with researchers in non-Nordic EU-27 countries (47 per cent of all Nordic, co-authored papers) than with other Nordic researchers (at 16 per cent).

• The propensity to patent in the Nordic countries was highest in Sweden in the last decade (among selected countries, only Germany and Switzerland were more active), followed by Finland and Denmark, Norway and Iceland.
### Expenditure

#### R&D expenditure in the Nordic countries (Mill. PPP$) 2010.

<table>
<thead>
<tr>
<th>Country/region</th>
<th>DK</th>
<th>FI</th>
<th>IS</th>
<th>NO</th>
<th>SE</th>
<th>Nordic</th>
<th>OECD^1</th>
<th>EU 27</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mill. PPP$</td>
<td>6816</td>
<td>7589</td>
<td>356</td>
<td>4742</td>
<td>12536</td>
<td>32039</td>
<td>968108</td>
<td>304891</td>
</tr>
</tbody>
</table>

^12009.

Sources: National sources, MSTI 2011-2

#### R&D expenditure in the Nordic countries (Mill. PPP$) 2010.

![Bar chart showing R&D expenditure in the Nordic countries and EU/OECD.](image)

^12009.

Sources: National sources, MSTI 2011-2
**R&D expenditure in total and per capita by country (current PPP$).**

<table>
<thead>
<tr>
<th></th>
<th>DK</th>
<th>FI</th>
<th>IS</th>
<th>NO</th>
<th>SE</th>
<th>OECD¹</th>
<th>EU 27</th>
</tr>
</thead>
<tbody>
<tr>
<td>R&amp;D exp. per capita</td>
<td>1229</td>
<td>1415</td>
<td>1123</td>
<td>970</td>
<td>1337</td>
<td>790</td>
<td>608</td>
</tr>
<tr>
<td>R&amp;D expenditure</td>
<td>6816</td>
<td>7589</td>
<td>356</td>
<td>4742</td>
<td>12536</td>
<td>968108</td>
<td>304891</td>
</tr>
</tbody>
</table>

¹2009.
Sources: National sources, MSTI, 2011-2

**R&D expenditure in the Nordic countries (Mill. PPP$). 1981–2011.**

Sources: National sources, MSTI 2011-2
**Expenditure**

**R&D expenditure in the Nordic countries, EU and OECD, as a share of GDP and per capita. 2010.**

![Bar chart showing R&D expenditure as a percentage of GDP and per capita for various countries.](chart1)

![Bar chart showing R&D expenditure by country and performing sector.](chart2)

---

*R&D expenditure by country and performing sector (business enterprise sector, government sector, higher education sector and PNP-sector), per cent. 2010.*

---

Sources: National sources, MSTI 2011-2

---

12009.

12009.
R&D expenditure by country and source of funds. 2010.

Higher education

**Percentage of the population with higher education in 2009.**

<table>
<thead>
<tr>
<th></th>
<th>DK</th>
<th>FI</th>
<th>IS</th>
<th>NO</th>
<th>SE</th>
<th>EU</th>
<th>OECD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td>31</td>
<td>31</td>
<td>29</td>
<td>32</td>
<td>28</td>
<td>25</td>
<td>29</td>
</tr>
<tr>
<td>Women</td>
<td>38</td>
<td>43</td>
<td>37</td>
<td>41</td>
<td>38</td>
<td>29</td>
<td>31</td>
</tr>
<tr>
<td>Total</td>
<td>34</td>
<td>37</td>
<td>33</td>
<td>37</td>
<td>33</td>
<td>27</td>
<td>30</td>
</tr>
</tbody>
</table>

1 ISCED level 5 and 6.

*Kilde: OECD Education at a Glance 2011*

**Percentage of the population with higher education in 2009.**

![Bar chart showing the percentage of the population with higher education (ISCED 5-6) for different countries in 2009.](chart)

*Source: Eurostat*
Graduates in first and second stage of tertiary education (ISCED 5–6) in the Nordic countries by field of science. 2009.

Source: Eurostat
Number of Ph.D. students by country (the Nordic and Baltic countries) and field of science. 2010.

Source: NORBAL
Number of awarded doctoral degrees by country (the Nordic and Baltic countries). 1990–2010.

Awarded doctoral degrees

Source: NORBAL


Awarded doctoral degrees per mill. capita

Source: NORBAL
Awarded doctoral degrees by country (the Nordic and Baltic countries) and field of science. Per cent. 2010.

Source: NORBAL


Source: NORBAL
Researchers in the Nordic countries by gender and country. Number and per cent. 2009.

Number of researchers

Source: MSTI, 2011-2

Professors within academia (grade A) by gender and country. Per cent. 2010.

Proportion of men and women for professors (grade A)

Source: National contributors to Eurostat She Figures, She figures 2009
Researchers

R&D full time equivalents (FTE) by sector of performance and country. Per cent. 2010.

Proportion of full time equivalents (FTE)

1 2009.
Sources: National sources, MSTI, 2011-2

Number of articles per mill. capita

Sources: National Science Indicators/Thomson Reuters/NIFU

Scientific publishing per 1 000 capita in the nordic countries in 2010 and average annual change 2006–2010. Number and per cent.

Per capita/change

Sources: National Science Indicators/Thomson Reuters/NIFU
Scientific publishing

*Scientific publishing in the nordic countries. Number of articles. 1981–2010.*

Annual number of articles

1981 1983 1985 1987 1989 1991 1993 1995 1997 1999 2001 2003 2005 2007 2009 2010

Sources: National Science Indicators/Thomson Reuters/NIFU


Relative citation index

1981 1983 1985 1987 1989 1991 1993 1995 1997 1999 2001 2003 2005 2007 2009

Kilde: National Science Indicators/Thomson Reuters/NIFU
The share of Nordic co-publication as a percentage of all co-publications for each Nordic country. Per cent. 1984–2008.

Per cent with cooperation

Source: Nordforsk (2010) International research cooperation in the Nordic countries. A publication from the NORIA-NET

Co-publication with other Nordic countries for each Nordic country. Share of international co-publication by country. 1984–2008.

Per cent with cooperation

Source: Nordforsk (2010) International research cooperation in the Nordic countries. A publication from the NORIA-NET
### Co-publication

*Inter-regional co-operation between Nordic countries and other regions in the world. Share of the Nordic countries publications with international co-operation. 2004–2008.*

<table>
<thead>
<tr>
<th>Country</th>
<th>Per cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asia</td>
<td>5 %</td>
</tr>
<tr>
<td>South and central America</td>
<td>2 %</td>
</tr>
<tr>
<td>Other world</td>
<td>7 %</td>
</tr>
<tr>
<td>North-America</td>
<td>17 %</td>
</tr>
<tr>
<td>Other Europe</td>
<td>3 %</td>
</tr>
<tr>
<td>EU27, excl. Nordic countries</td>
<td>47 %</td>
</tr>
<tr>
<td>Nordic countries</td>
<td>16 %</td>
</tr>
</tbody>
</table>

*Source: Nordforsk (2010) International research cooperation in the Nordic countries. A publication from the NORIA-NET*

---

*Inter-regional co-operation between Nordic countries and other regions in the world. Share of the Nordic countries publications with international co-operation. 2004–2008.*

[Bar chart showing per cent for different regions: Asia, South and Central America, Others, North America, Other Europe, EU–27 ex. the Nordic countries, Nordic countries.]

*Source: Nordforsk (2010) International research cooperation in the Nordic countries. A publication from the NORIA-NET*
**Propensity to patent\(^1\) in the Nordic countries. Number of patents per 1000 workers. 1999–2008.**

![Bar chart showing patents per 1000 worker for Nordic countries, including Denmark, Finland, Iceland, Norway, Sweden, Austria, Belgium, France, Germany, Ireland, Luxembourg, the Netherlands, Portugal, Spain, and Switzerland.]

Source: OECD Statextracts 22 Jan 2012 year.

**Propensity to patent\(^1\) for selected countries. Number of patents per 1000 workers. 2008.**

![Bar chart showing patents per 1000 worker for selected countries, including Denmark, Finland, Iceland, Norway, Sweden, Austria, Belgium, France, Germany, Ireland, Luxembourg, the Netherlands, Portugal, Spain, and Switzerland.]

\(^1\)Propensity to patent is measured by the number of applications per 1000 in the workforce (civil). This applies to patent applications, provided the European Patent Office (EPO) by application.

Source: OECD Statextracts 22 Jan 2012 year.