Norway as a Science Nation

Current Status

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Contents

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Summary

- **How well is Norwegian science performing?** In the past five years, Norwegian research has grown by more than 18%, exceeding the EU27 average of 13%. Norwegian science excels in terms of its impact on global science: it is frequently cited by scientists from all over the world; it is highly collaborative and stands out for its high-level of academic-industry partnerships.

- **What is the impact on policy?** Norwegian science demonstrably extends its influence beyond the realm of academia, shaping global policy decisions as well. Norwegian research is frequently cited in government policy documents, with a higher impact on these documents compared to the EU and world average.

- **What is the impact on sustainability?** Norwegian science also contributes to the UN's sustainability goals (the 'SDGs') particularly in the areas of Life Below Water (Goal 14) and Climate Action (Goal 13). Norwegian research in all topics of sustainability is particularly highly cited. Research in sustainable energy, AI, and key technologies constitutes a modest contribution in terms of scale but with high scientific impact.

- **Which disciplines contribute the most to research impact?** Medical Science is the second largest contributor in terms of volume (after Physical Sciences) and it is also the most cited subject area in Norway. Life Sciences and Social Sciences are also well performing both in term of size and citations levels.

- **Which Norwegian universities perform the best?** All Norwegian universities perform much better than the world average on scientific impact. The University of Oslo is the largest and most impactful in term of FWCI. NTNU is the second most research-intensive university in the country and Bergen is third. OsloMet is second only to University of Oslo for citation impact. The Norwegian University of Life Sciences is the most highly cited in policy documents, followed by OsloMet.

Key Data

- **Norway ranks 33 in terms of volume of Scholarly Output in the world, 15th in Europe.**
- **Norway scores 63% above the world average in scientific impact, above US, China, UK and EU average.**
- **62% of all Norwegian articles involve international collaborations. This is higher than the world average (20%) or the EU27 (42%) and UK (57%). These international articles have more than twice the world average impact, while national articles from Norway are only 20% above the world average.**
- **8.2% of all Norwegian articles involve academic and corporate institutions collaborating together. This is significantly higher than in most countries including US 4.8%, UK 5.7% Germany 6.8%, Japan 7.3%.**
- **Norwegian research is making a tangible difference by providing evidence to governmental policy: 14% of Norwegian articles published since 2013 are cited in policy documents. This is more than twice the EU average and well above the G7, China, and research-intensive countries.**
- **Norwegian scientific research is a strong contributor to the issues of sustainability we face today. Norway is particularly prolific in research within the UN Sustainable Development Goal 14: Life Below Water and Goal 13; Climate Action. Norwegian research in topics of sustainability is particularly well cited (above its national average)**
- **Norway is particularly strong in research related to Clinical and Health, both in terms of volume of research and in terms of Impact (citations levels)**

Introduction

How well is Norway performing in the realm of science? While a simple question, assessing Norway's standing in science can be complex. Analyzing the impact of Norwegian research publications on global scientific progress, innovation, policy, and sustainability offers valuable insights. This examination reveals a landscape of strengths in Norwegian science, and we'll explore the factors behind this success.

Chapter 1 covers the position of Norway in the global scientific landscape. In Chapter 2, we explore the success factors of Norwegian science in the global scale. Chapter 3 describes the impact of Norwegian research beyond science: on policy, sustainability, innovation and key technologies. Chapter 4 examines the scientific disciplines and universities that contribute the most to the success of Norwegian science. We conclude with summaries (Chapter 5) and definitions (Chapter 6).

This report is part of a series of reports that Elsevier has released over the years, including the international reports on Artificial Intelligence, on Net Zero, on Gender Gap in Science and many more.

Elsevier is a world's leading scientific publisher and data analytics company that have been serving the global research and healthcare communities for more than 140 years. It serves Academic and Government institutions, top research and development-intensive corporations, healthcare institutions, medical and nursing students in over 180 countries and regions. As a global leader in information and analytics, Elsevier helps researchers and healthcare professionals to advance science and improve health outcomes, striving to create a better future worldwide.

1 How Well Does Norway Perform Compared to Other Countries?

To answer the question of how Norway is performing in the field of science, we start by examining the publication output and citations levels of selected regions. Since Norway is a relatively small country, we've aggregated the data for the Nordics for a more meaningful global view.

The number of publications serves as a good measure of productivity (or output). These publications are cited by other scientists, which is a good indication of scientific impact. For this purpose, we use the Field Weighted Citation Impact (FWCI), which is normalized to 1.0 for the world average. An FWCI of 1.2 is 20% better than the world average, while an FWCI of 3.0 is three times better, and so forth.

In terms of productivity, we can examine the share of all publications worldwide. Larger countries such as China and the US contribute around 20% and the EU as a block of 27 countries 24%. Refer to the Definitions section (Chapter 6) for more information on publications, citations, FWCI, productivity, etc.

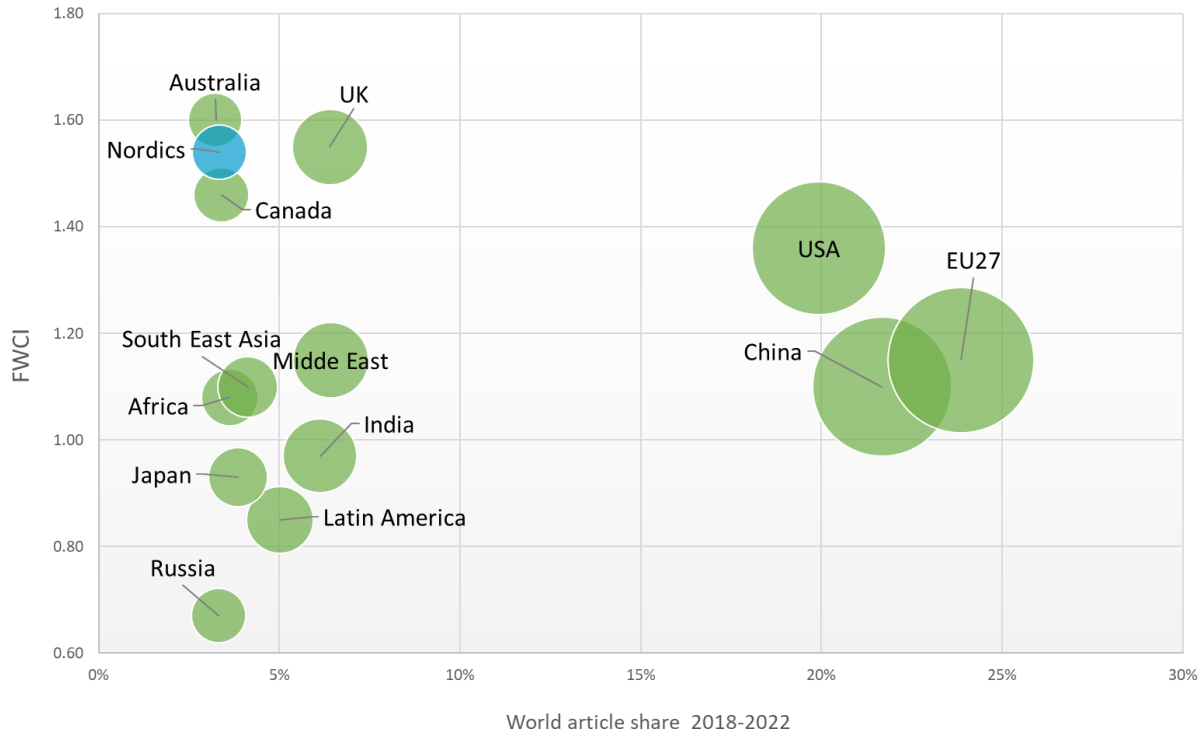


Figure 1: FWCI vs. Relative share of different world regions and countries.

As depicted in Figure 1, the Nordics appear with the top in terms of citation impact, measured by the FWCI, well above the EU average and US. (FWCI: Nordics 1.54; US 1.35; EU average 1.45).

In terms of the number of publications we find the Nordics as a whole to be of similar size to Australia, Canada and Russia, or just a little smaller than Japan.

Norway is a small country, and it comes in 33rd place in the world (15th in Europe) in terms of volume of Scholarly Output, similar to Mexico and the Czech Republic, and about half the size of Switzerland or Poland. However, its research is well-reputed and cited, and has been growing faster than most in recent years.

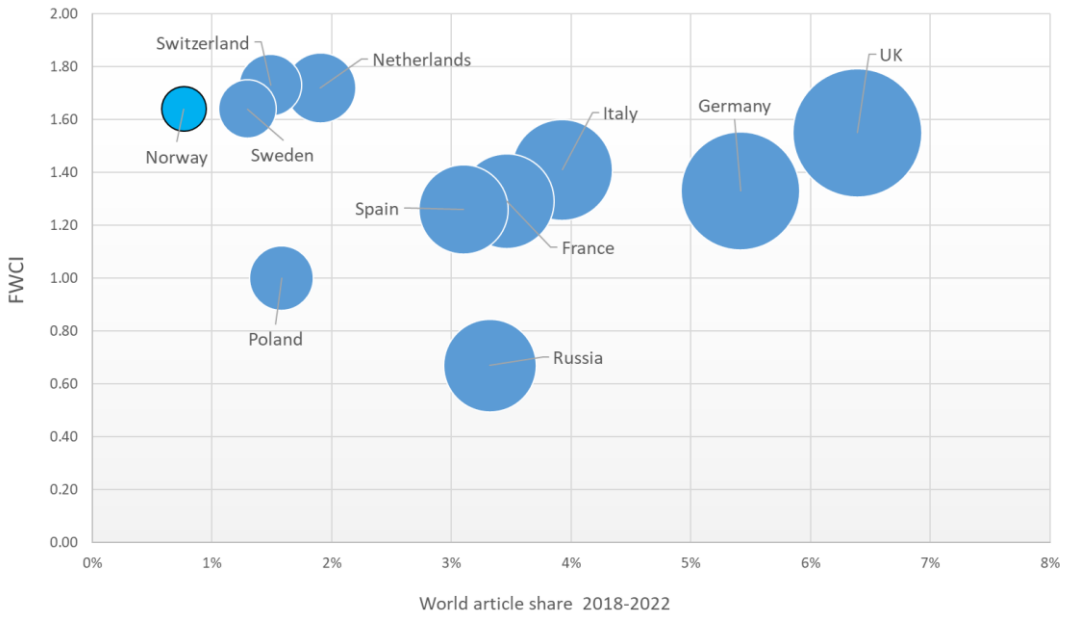


Figure 2: FWCI vs. Relative publication share of different European countries.

Country	FWCI	Scholarly Output	Authors	Scholarly Output (growth %)	Authors (growth %)	Open Access (all types*)
Sweden	1.64	242,317	118,593	10.2%	10.1	69%
Denmark	1.76	168,491	84,456	14.3%	17.0	65%
Norway	1.63	142,350	69,894	18.1%	17.4	66%
Finland	1.66	123,472	61,469	15.9%	17.0	68%

** By **Open Access** here it is meant all types: Gold, Hybrid Gold; Green and Bronze.*

Figure 3: The above table shows data on academic research published in the 5 years between 2018 and 2022 in the Nordic Countries.

Norwegian research output has been growing faster than others in Europe and in the Nordics**. In the last 5 years Norwegian research has grown more than 18%, well above the EU27 average of 13%.** We can see from the above table that he growth in scholarly outputs is supported also by a higher grow in authors' population.

This strong growth suggests that the influence of Norway in the science podium is likely to continue to increase particularly

considering that the world article share of US, UK and other research-intensive countries has been decreasing.

We observe a steady growth in scholarly output since early in the new millennium in all the Nordic countries, with an even steeper increase in recent years. However, a growth of 18% in the last 5 years alone is truly remarkable and has seen Norway overtake Finland yearly output.

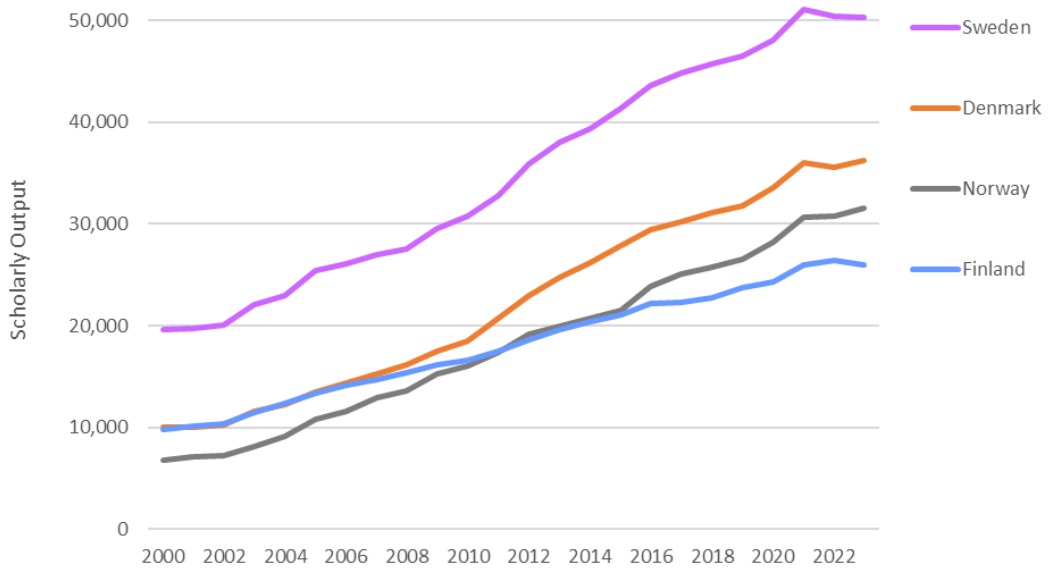


Figure 4: Trend of Scholarly Output in the Nordic Countries since the start of the Millenium.

As observed in Figure 4, we can see how at the start of the millennium Norway had the lowest number of publications per year than his neighbours. In 2012 Norway overtook Finland and is now in third place. **In the last 5 years Norway Scholarly Output has grown by more than 18%**. This compares to about 13% for the EU27 as a whole. In the same 5 years window The Netherlands has grown 12%, Germany 9%, the UK 4.5%.

2 Success Factors of Norwegian Science in the global scale

Three factors stand out immediately for Norwegian science: (1) the Nordics (and Norway) have higher citations than most not only within Europe but worldwide too; (2) Norwegian volume of publications has significantly increased in the last 2 decades; (3) The level of international collaboration is very high.

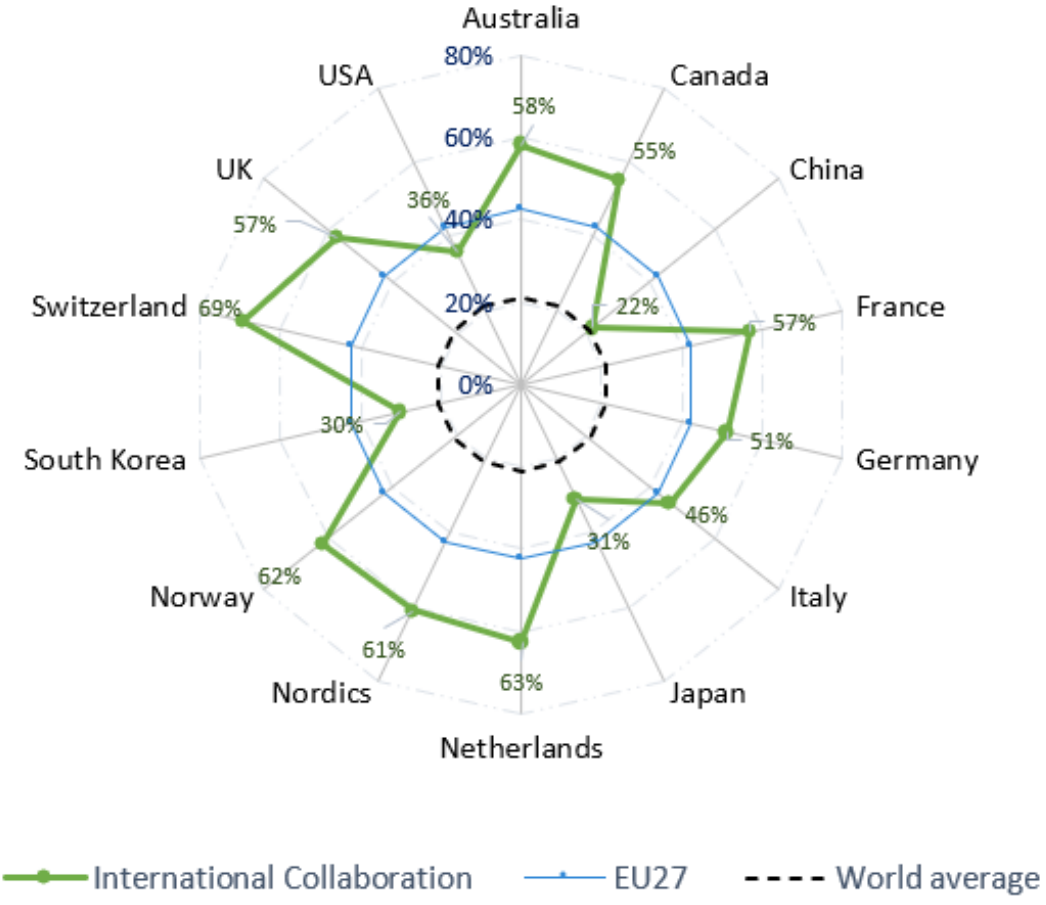


Figure 5: Internationalization of Scientific Research in Different Countries. The world average is 21%.

When research is conducted by a Norwegian researcher in collaboration with one (or more) scientists from abroad, it is considered international scientific collaboration. In Figure 5, we observe the degree of internationalization in Research in selected countries.

The world average is at 21%, the EU27 stands at 43%. **The Nordics lead with 61% and Norway on its own stands at 62%.** The UK and Australia come close but remain below 60%. Only the Netherlands and Switzerland have higher percentages. To get a sense of how these percentages compare with other world regions not included in the chart, note the following: India 20%, Latin America 38%, Middle East 41% and Russia 22%.

Given the high levels of international scientific collaboration involving Norway, the question arises: how does internationalization in Norway impact its overall performance?

Impact of research in Norway:

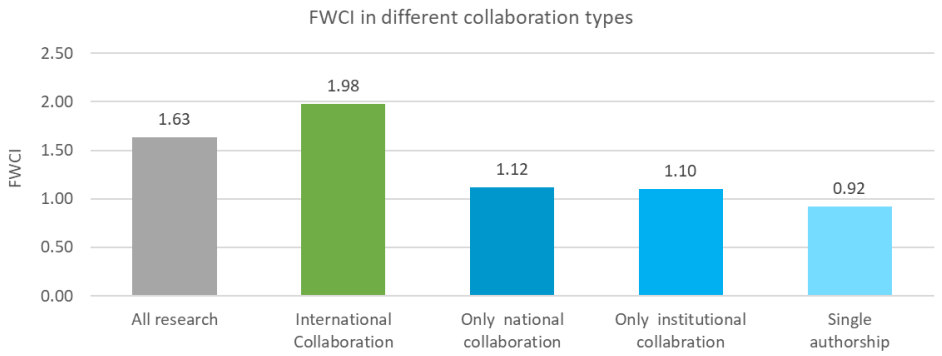


Figure 6: The research impact measured as FWCI for all Norwegian research (1.63), for international research (1.98) and for only national research (1.12)

In Figure 6, we observe how citation levels compare when research is collaborative internationally, vs only national collaboration, only institutional collaboration and single authorship. We can see that the average citation impact, measured as Field-Weighted citation impact, is much higher when Norway is collaborating internationally than when collaboration is within the national borders.

International collaboration per subject area:

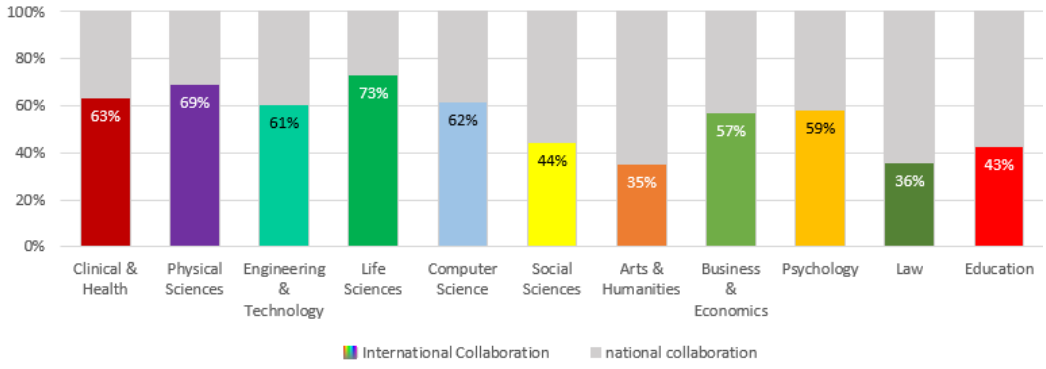


Figure 7: Share of International collaboration per subject area expressed as a percentage.

In Figure 7, we observe the degree of internationalization in research in different subject areas in Norway. Life Sciences have the highest percentage of international collaboration followed by Physical Sciences and Clinical & Health. Arts & Humanities and Law have the lowest share.

With which countries does Norway engages with the most?

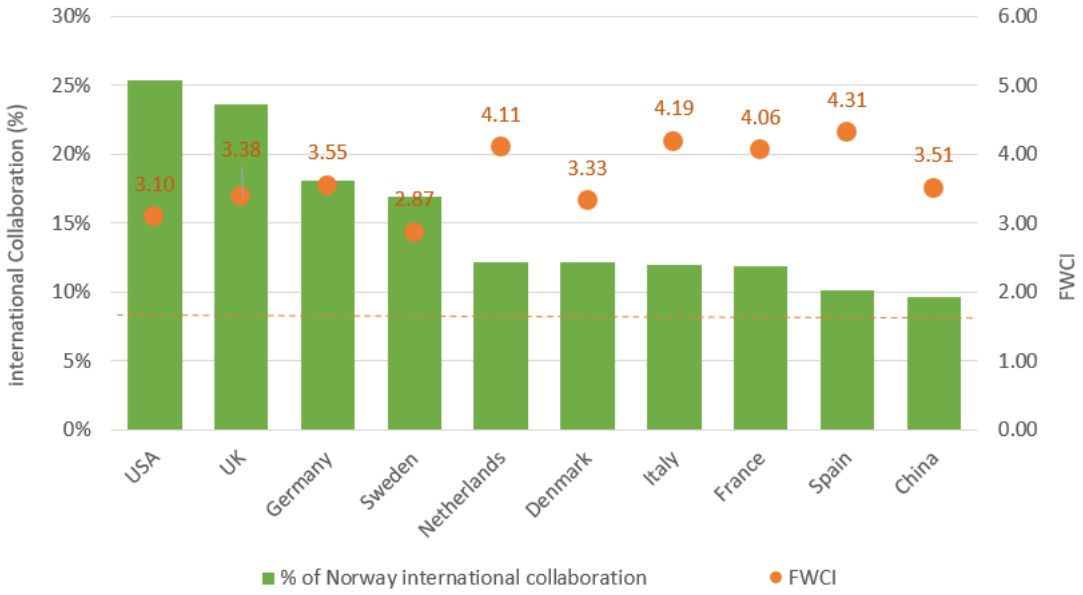


Figure 8: Most prolific countries Collaborating with Norway (shown as a percentage of Total Norway international publications) and citation impact measured as FWCI. The orange dotted line represents the average FWCI for all of Norway Scholarly Output (FWCI 1.63)

Figure 8 illustrates that more than a quarter of international collaborations involves the US. Collaboration with the UK is 24%, while with Germany and Sweden is around the 18% mark. 125 of international collaborations are with the Netherlands, and the same is for Denmark, Italy and France. Only 10% of international collaborations involve China.
The highest citation levels among the collaborations shown in the chart are with Spain (FWCI 4.31) and Italy (FWCI 4.19).

It is interesting to note that these most prolific international collaborations also produce higher than average citation levels. In fact, for Norway the average FWCI for International publications is 1.98, but when collaborating with the US we get FWCI 3.10; with the UK 3.38. We are also reminded of the overall Norwegian FWCI 1.40 indicated by the dotted line.

Academic-Corporate collaboration in Norway is also significantly higher than in most countries.

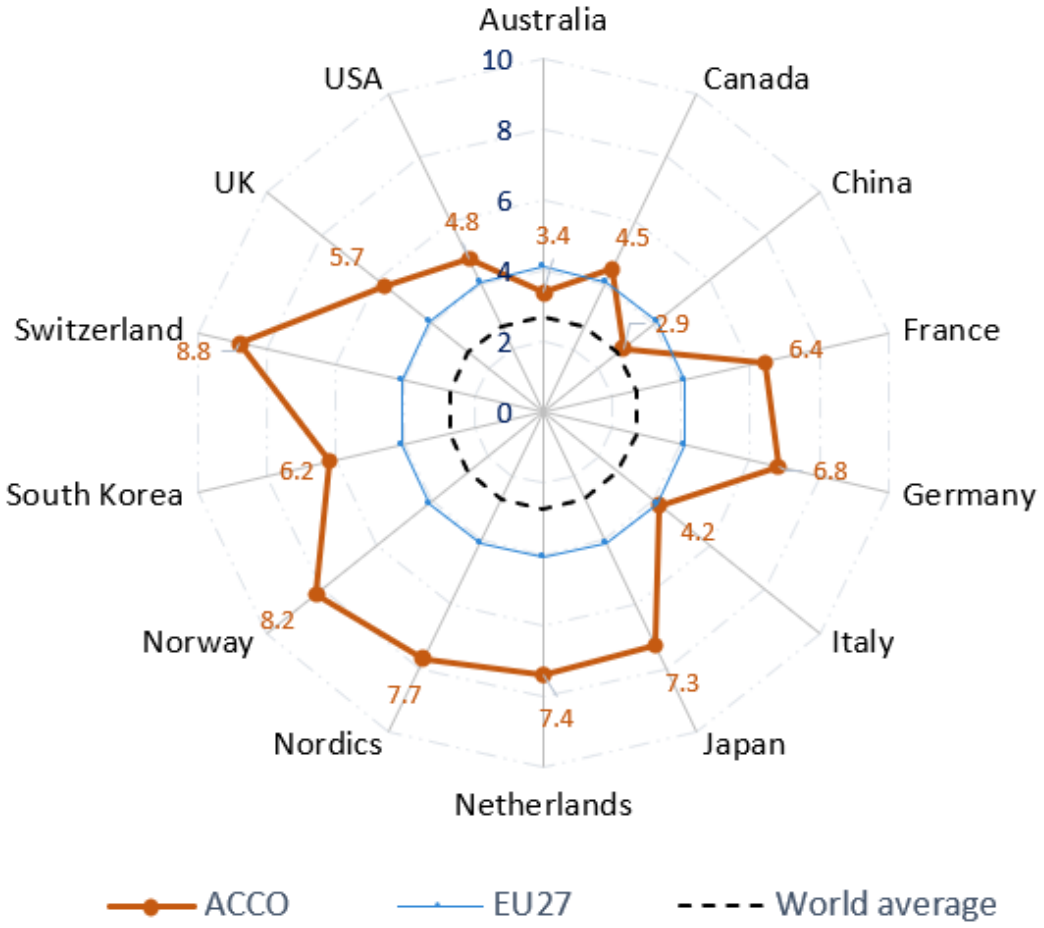
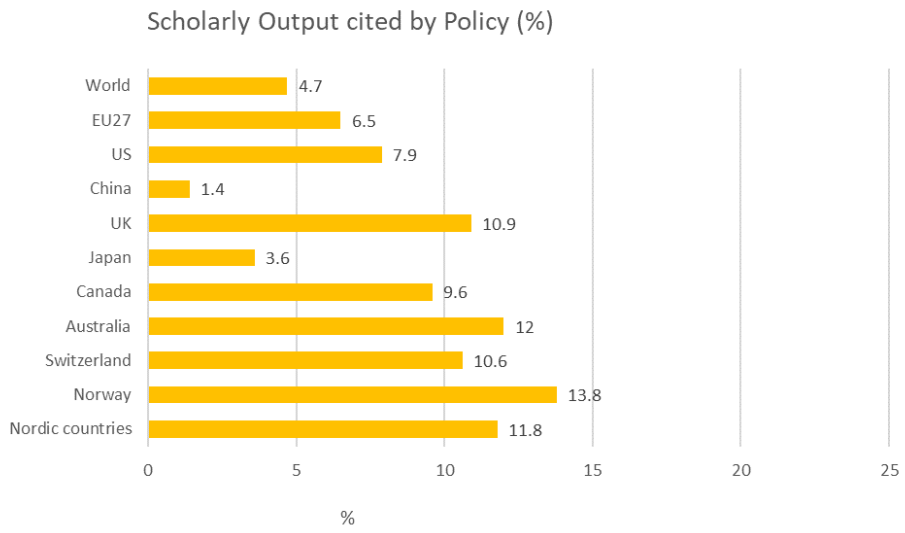


Figure 9: Academic-Corporate collaboration rates (ACCO) expressed as a percentage of total publication in selected countries.

Figure 9 illustrates the rates of collaboration between academia and the industry sector in the G7, China, and selected European and non-European countries for comparison. From the data spanning the five years between 2018 and 2022, it is evident that Norway stands out with 8.2% of its research conducted through academic-industry partnerships. This is much higher than EU average and higher than the average for the Nordics. UK, Netherlands, Germany and also Japan and South Korea have lower levels than Norway. Switzerland is the only exception with higher levels (8.8%). Academic-corporate collaboration serves as a means to combine diverse skills and resources to effectively address contemporary challenges and offer innovative solutions. Moreover, cross-sector research tends to yield higher citations and, therefore, greater impact.

3 Impact of Science on Policy, Sustainability and key technologies

Beyond its scientific merit, Norwegian research is making a tangible difference by influencing policy and contributing to real-world progress on global sustainability issues.



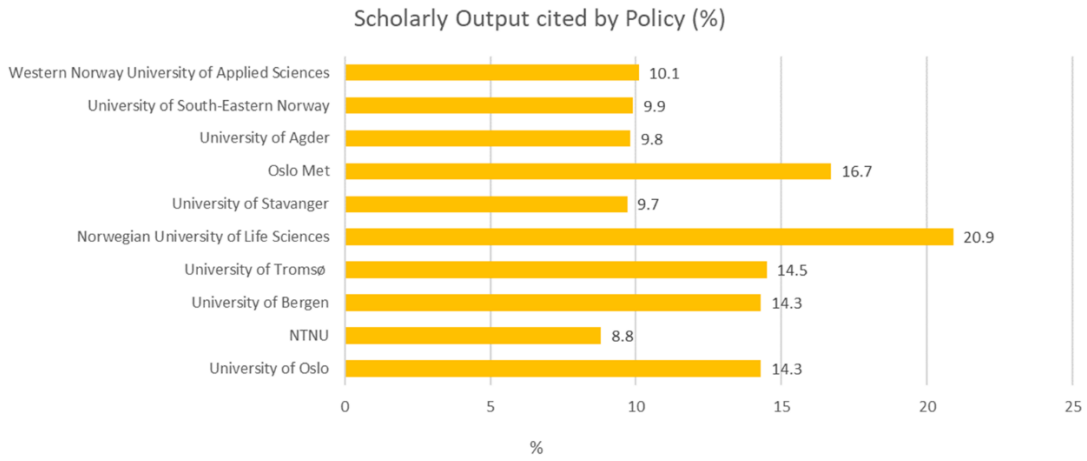


Figure 10: Scientific Articles Cited in Policy Documents (as a Percentage of All Articles from the Country, Region, or Institution). Publications 2013-2022

We can also examine the impact of Norwegian research on government policy worldwide. This is done by looking at how many scientific articles are cited in policy documents worldwide. We observe interesting results: **13.8% of Norwegian articles (published 2013-2022) are cited in policy documents: this is more than twice the EU average, and higher than all countries/regions shown in the chart.**

The Norwegian University of Life Sciences stands out positively with 20.9% of its articles cited in policy documents, followed by OsloMet with 16.7%.

Sustainability

The Sustainable Development Goals are a set of global goals adopted by all United Nations member states in 2015. They represent a collective effort to achieve a better and more sustainable future for all by addressing critical issues facing our planet and its people. The SDGs address a wide range of interconnected issues, recognizing that solutions to one problem can contribute to solving others. They are designed to be a universal call to action for all countries, developed and developing alike, to work together in a global partnership. In the chart below we have mapped Norwegian research to the SDGs and presented the data normalized so that it can be compared with the average for the EU and also in a global context.

RAI (Relative Activity Index)

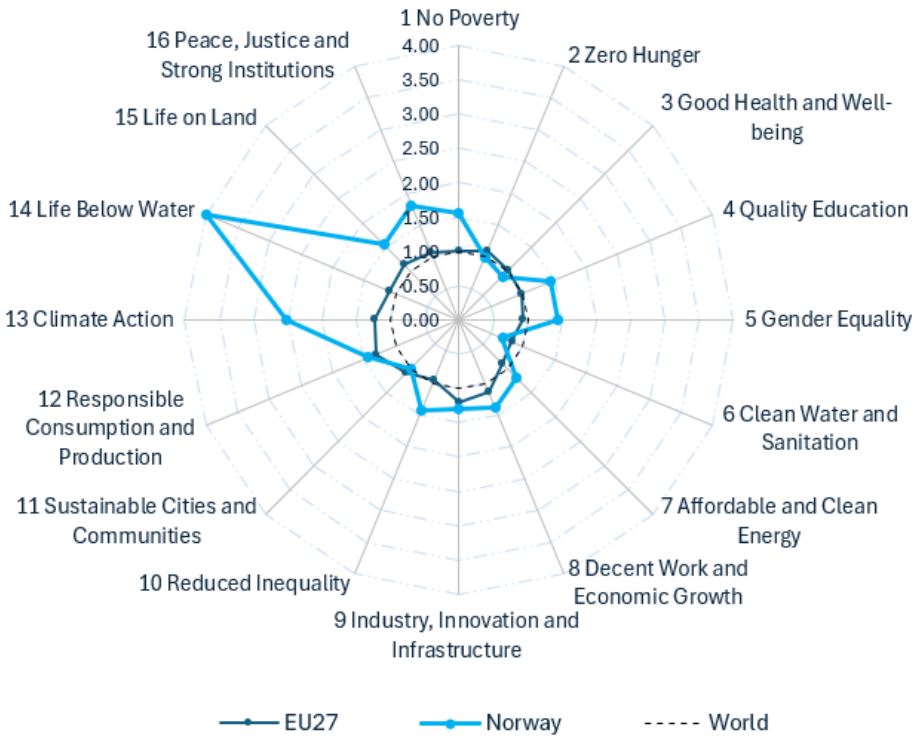


Figure 11: How Active is Norway in Research Related to the 16 SDGs, compared to the World (Normalized to 1.0) and the EU27. Norway is relatively more active than EU average in most SDGs, and exceptionally so in the areas of SDG 14: Life Below Water and SDG 13: Climate Action.

We can further analyse the distribution of Norwegian research focused on the Sustainable Development Goals (SDGs). To enable a fair comparison between regions of varying sizes, research output is normalized. As illustrated in Figure 9, **Norway demonstrates a higher research productivity (publishing more articles) in most SDGs compared to the global average (normalized to 1.0) and in twelve out of the sixteen SDGs compared to EU27 average**. Notably, Norway excels in areas related to SDG 14 (Life Below Water) and SDG 13 (Climate Action).

Key topics and technologies

Biodiversity

Concerns over loss of biodiversity have been increasing in recent years. A recent Elsevier report from 2023 demonstrates that biodiversity research tends to be highly cited, and it is very international. When we looked at Norwegian research in this topic, we found that Norway is particularly prolific in relative terms (RAI 1.40, has very high citation levels with FWCI 2.26 (Norway average is 1.63) and international collaboration of 82% (Norway average is 62%). University of Oslo and University of Bergen are the most active in this field and the most prolific international partnerships are with the *Swedish University of Agricultural Sciences* and with the *University of Copenhagen*. We also found that 25% of Norwegian Biodiversity research is cited in policy documents (Norway average is 10.6%).

Sustainable Energy – Net Zero

When we examine SDG 7 (energy) and SDG 13 (climate) and focus on sustainable energy, as per the Elsevier Net Zero report published few years ago, an interesting picture emerges. China heavily dominates research in this area with EU and USA failing to keep the pace. In relative terms we notice strong presence from India and also South Korea. The Middle East and Africa are also particularly prolific in this area in relative terms. Within Europe although the Germany and the UK have the highest number of publications, the Nordics are strongest in relative terms (RAI). Norway has very strong links with the industry in this area, in fact academic-corporate collaboration for NetZero is 19% (compared with 8% average and 10% for AI research)

Artificial Intelligence

Examining the landscape of AI research, we see a similar pattern as for Net Zero research: China dominates, India is growing rapidly and has become even more prolific than China in relative terms (RAI). Asia in general is prolific in this area while the US has not been keeping up with global trends and Europe is even more behind in this topic. When we look at citation levels the North America, UK, Switzerland and the Nordics do very well and significantly better than China and India.

Norway contribution is modest, but within Europe is among the most prolific in relative terms (RAI) and is very well cited. NTNU is by far the most prolific publishing twice as many articles than University of Oslo which follows in second place. Most international collaborations are with the UK (Oxford, UCL and Cambridge in particular)

Semiconductors

Research in this key technology has seen a big shift in the last ten years; in 2012 Scholarly Output in Europe was twice the amount of research output of China, and the US was also ahead of China. Ten years later the outlook is completely reversed, and China now dominates and publishes twice more than Europe and 3 times as much as the US. In terms of relative activity (RAI) Taiwan is the country showing the highest activity in the field of semiconductors, followed by South Korea, India, China, and Japan. Regarding collaborative research we find the highest levels of **international collaboration** in European countries (around 60%), the US sits at around 45%. In East Asia, we find lower levels of international collaboration: Taiwan, Japan and South Korea are at around 35%, and China is the lowest with 22%.

In conclusion:

- Norwegian research contributes significantly to research in topics of sustainability and is particularly focused on SDG 14: Life Below Water and SDG 13: Climate Action.
- We observe that Norway is highly prolific, impactful and collaborative in biodiversity research.
- Despite a modest scale of research activity in key technologies compared to, particularly, Asian regions, Norway is relative active within Europe (RAI higher than European average) and demonstrates high scientific quality. This is further bolstered by high levels of international collaborations.

4 Which disciplines and universities contribute the most to Norwegian success?

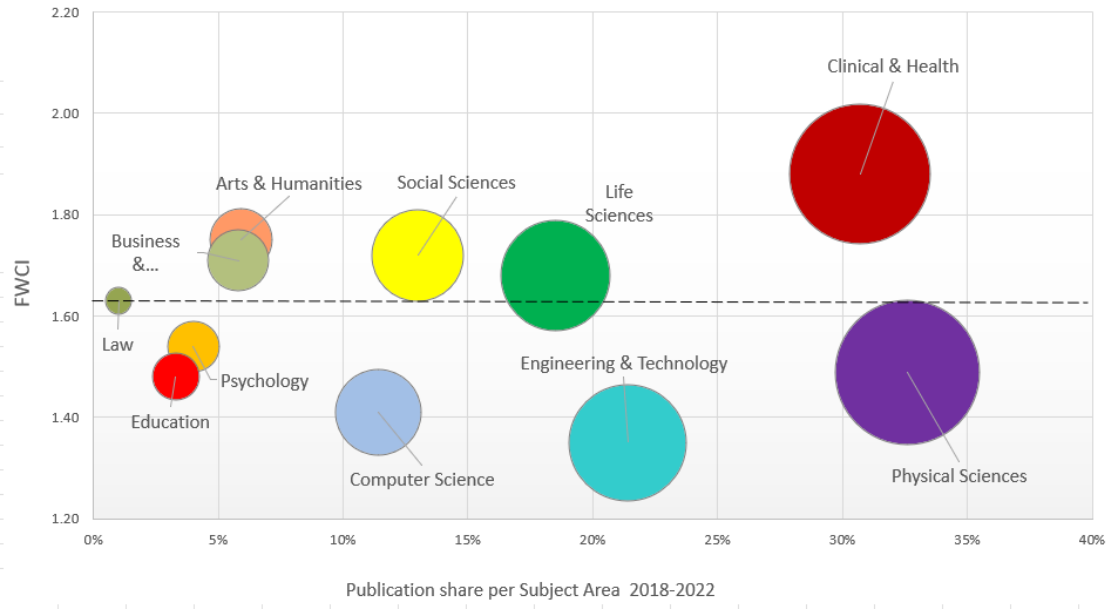


Figure 12: Relative contribution per discipline to Norwegian Science, in term of volume, share and FWCI.

The overall research impact measured as Field-Weighted Citation Impact (FWCI) for Norwegian research published in the five years period 2018-2022 is 1.63, represented by the horizontal dotted line in the above chart. FWCI 1.63 signifies 63% more citations compared to the global benchmark.
When we examine fields of study, we observe that **in Norway Clinical and Health, is most impactful (FWCI 1.88) and is also the second largest (after Physical Sciences with FWCI 1.49).** This emphasizes the significant contribution of medical research to Norway's overall scientific performance.
In the EU, the largest number of published research are also Physical Sciences (FWCI 1.12) followed by Clinical and Health (FWCI 1.22)

Prolific universities in Norway

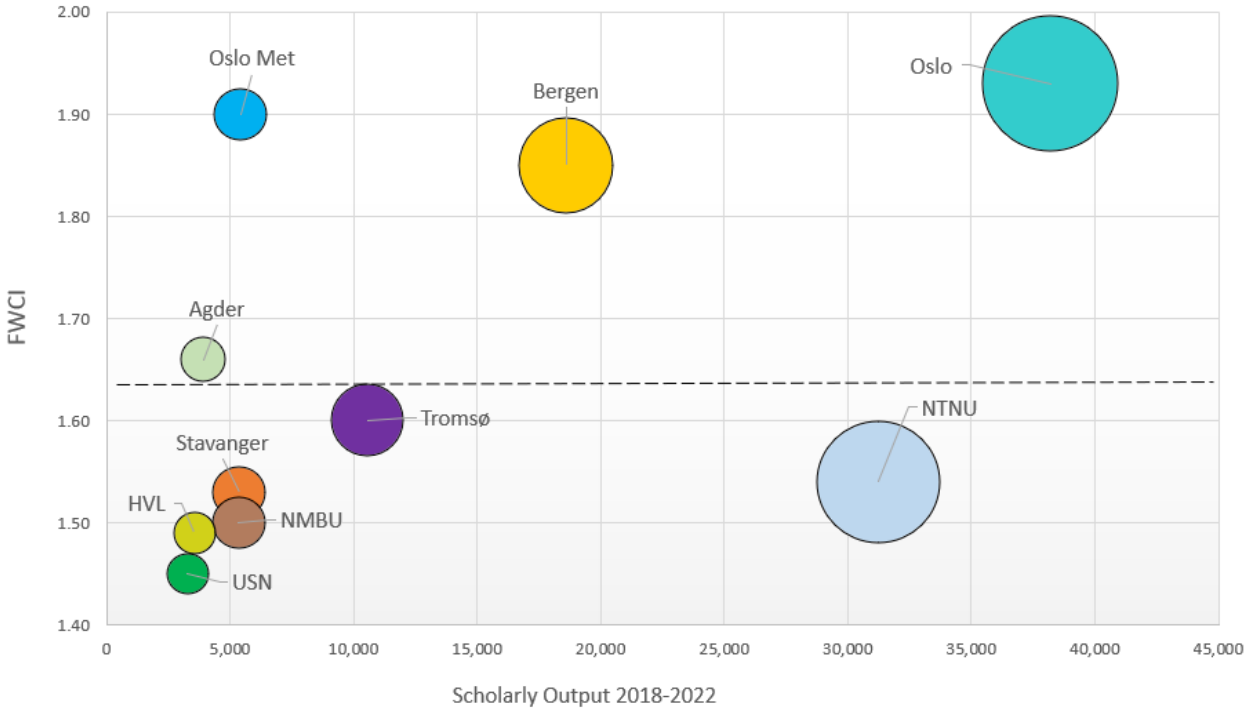


Figure 13: Most prolific Norwegian universities, output and the scientific impact (in FWCI).

Among Norwegian universities the University of Oslo takes the crown for productivity, boasting over 38,000 research articles published between 2018 and 2022. The Norwegian University of Science and Technology (NTNU) follows with just over 31,000 publications during the five-year period. University of Bergen is the third largest with almost 19,000 publications. The University of Tromsø is in fourth place with more than 10,000 publications. OsloMet University, University of Stavanger and the Norwegian University of Life Sciences (NMBU) are all very similar in size with over 5,000 publications each published in the five years between 2018 and 2022. The University of Adger comes short of 4,000 while the Western Norway University of Applied Sciences (HVL) has 3,500 publications and the University of South-Eastern Norway (USN) just over 3,200.

The University of Oslo is also the institution with the highest impact, achieving a Field-Weighted Citation Impact (FWCI) of 1.93 and it's closely followed by the small but impactful OsloMet (FWCI 1.90). The University of Bergen is in third place also for citations (FWCI 1.85) and is followed by Adger (FWCI 1.66) and Tromsø (FWCI 1.60). NTNU and Stavanger have similar citation impact (FWCI 1.54 and FWCI 1.53 respectively). Lastly, we find NMBU with FWCI 1.50; HVL with FWCI 1.49 and USN with FWCI 1.45. The dotted line is a reminder of Norway average (FWCI 1.63). The EU average is FWCI 1.15 well below each of the universities shown above.

Top **Academic International Collaborators** of the three most research-intensive universities in Norway
(papers with less than 100 authors)

With University of Oslo		Co-authored publications	FWCI
DKN	Copenhagen	1,573	2.85
SWE	Karolinska	1,555	2.92
FIN	Helsinki	975	3.08
USA	Harvard	947	3.13
GBR	Oxford	926	3.86
DKN	Aarhus	887	2.8
GBR	UCL	842	3.64
SWE	Gothenburg	778	2.64
SWE	Uppsala	749	2.17
SWE	Lund	745	3.04

With NTNU		Co-authored publications	FWCI
DKN	Copenhagen	704	2.94
SWE	Karolinska	501	2.54
FIN	Helsinki	476	2.28
DKN	Danmarks Tekniske	426	2.01
DKN	Aarhus	406	2.29
SWE	Uppsala	374	2.18
SWE	Gothenburg	324	2.66
SWE	Lund	310	2.49
GBR	Imperial	287	3.85
GBR	UCL	284	3.18

With University of Bergen		Co-authored publications	FWCI
SWE	Karolinska	651	2.09
DNK	Copenhagen	597	2.58
DNK	Aarhus	457	2.09
USA	Harvard	390	3.84
SWE	Gothenburg	382	1.88
SWE	Uppsala	379	1.82
FIN	Helsinki	335	2.61
GBR	Imperial	329	3.1
NLD	Utrecht	323	3.24
FRA	Paris Cité	304	5.1

Figure 14: The above tables show the most prolific international academic collaborators with the 3 research-intensive Norwegian universities measured.

Top **Corporate Collaborators** of the three most research-intensive universities in Norway
(papers with less than 100 authors)

With University of Oslo		Co-authored publications	FWCI
NOR	SINTEF	328	1.66
USA	Lockheed Martin	72	1.38
NOR	Volcanic Basin Petroleum	64	1.77
CHE	Novartis	62	12.93
GBR	AstraZeneca	60	2.89
DEU	Fresenius AG	60	7.48
NOR	Novo Nordisk	52	2.43
USA	DNV GL Group	45	1.61
NOR	Equinor ASA	37	1.61
USA	Amgen Incorporated	35	5.57

With NTNU		Co-authored publications	FWCI
NOR	SINTEF	2,535	1.35
NOR	Equinor ASA	165	1.11
NOR	DNV GL Group	49	2.6
NOR	Norconsult A/S	38	0.92
ISL	deCODE Genetics	31	5.13
CHE	ABB Group	30	0.94
NOR	Telenor ASA	28	1.44
DEU	E.ON	24	1.22
NOR	Aker ASA	22	1.32
ITA	EURAC Research	21	1.85

With University of Bergen		Co-authored publications	FWCI
NOR	Equinor ASA	116	1.35
NOR	Bevital AS	96	1.14
NOR	SINTEF	69	1.81
GBR	GlaxoSmithKline	25	1.92
GBR	AstraZeneca	21	3.53
DNK	Novo Nordisk	21	1.59
CHE	Novartis	19	3.1
NOR	BerGenBio ASA	16	2.23
USA	Zoetis Inc.	13	0.81
ISL	deCODE Genetics	12	6.65

Figure 15: The above tables show the most prolific corporate collaborators with the 3 research-intensive Norwegian universities measured.

When we then look at the 10 most productive international collaborations of the top three universities in Norway (Figure 12), several important points immediately stand out: All three universities have the most prolific collaborations with the University of Copenhagen and Karolinska Institutet. We also note that all foreign academic institutions are in the north of western Europe and US. Norwegian universities collaborate most with academic powerhouses in nearby countries (Nordics and UK mostly).
Overall, 8.2% of research in Norway see Academic and Corporate institutions collaborating together. 75% of this academic-corporate collaborations are also international. Despite this the list of industries is dominated by corporates from Norway, SINTEF and Equinor in particular.

5 Conclusions

Despite being a small country, Norway makes a significant impact in the field of science. Norwegian research is highly international, characterized by robust cross-sector collaborations, and it strongly emphasizes sustainability issues. Moreover, it receives high citation rates and is frequently referenced in policy documents.

Over the past two decades, there has been a profound shift in the global scientific research landscape. China has experienced a remarkable ascent, with its share of global scholarly output soaring from 4% to an impressive 26%. Similarly, developing nations, particularly India, have significantly increased their contributions. Conversely, the dominance of the US and Europe has diminished, with the US share decreasing from 28% to 18% and the EU27 declining from 26% to 23%.

Despite the declining shares of the US and EU, **Norway's trajectory has been the opposite, experiencing growth from 0.52% in the year 2000 to 0.75% in 2022.** This achievement becomes even more impressive when compared to the declining shares of traditionally research-intensive European nations like the UK (falling from 8% to 6%), Germany (from 6.7% to 5.1%), and Japan (from 8% to a concerningly low 3.5%).

The success of Norwegian research stems from two main factors: robust collaborative efforts, both on an international scale and across sectors—especially between academia and industry, and a dedicated focus on critical topics such as health and sustainable development.

The influence of Norwegian researchers extends beyond global science. Their work also demonstrably shapes policymaking, both nationally and internationally. This is evidenced by the higher-than-average citation rate of Norwegian research in policy documents across Europe and beyond.

Additionally, we note significant research impact in fields such as AI, Net Zero, and pivotal technologies, despite Norwegian research activity in these domains being relatively modest and trailing behind the global landscape.

6 Definitions and data source

This report is based on Scopus data. Scopus is a large citation database launched in 2004 by Elsevier. It's one of the most prominent tools for researchers to find relevant academic publications, track citations, and analyse research trends. It covers over 96 million documents from more than 24,000 active journals, book series, and conference proceeding papers by 7,000 publishers. For more information see scopus.com.

Subject Area classification

The subject area classification used in this report is that of the THE World University Rankings. It covers 11 subject areas mapped to the Journal Classification (ASJC) used in scopus database. Scopus uses a hierarchical structure with 27 main subject areas. Each of the 11 THE subject area is mapped to one or more ASJC's.

International collaboration

International collaboration in this report is indicated by papers with at least two different countries listed in the authorship byline.

Academic-corporate collaboration

In Scopus, institutions are classified into one of four main sectors (Corporate, Academic, Government, and medical sectors). In this report, academic–corporate collaboration is indicated when there is at least one author from an Academic institution and one author from a Corporate.

Citation

A citation is a formal reference to earlier work made in a paper or patent, frequently to other papers. A citation is used to credit the originator of an idea or finding and is typically used to indicate that the earlier work supports the claims of the work citing it. The number of citations received by a paper from subsequently published papers can be used as a proxy of the quality or importance of the reported research.

FWCI (Field-weighted citation impact)

Field-weighted citation impact (FWCI) is an indicator of mean citation impact and compares the actual number of citations received by a paper with the expected number of citations for papers of the same document type (article, review, or conference proceeding), publication year, and subject area. When the paper is classified in two or more subject areas, the harmonic mean of the actual and expected citation rates is used. The indicator is therefore always defined with reference to a global baseline of 1.0 and intrinsically accounts for differences in citation accrual over time, differences in citation rates for different document types (e.g., reviews typically attract more citations than research articles), as well as subject specific differences in citation frequencies overall and over time and document types. It is one of the most sophisticated indicators in the modern bibliometric toolkit.

All Open Access

For the purpose of this report all types of Open Access have been combined together (Gold, Hybrid Gold, Bronze and Green)

RAI (Relative Activity Index)

Relative Activity Index is defined as the share of an entity's publications in a subject relative to the global share of publications in the same subject. A value of 1.0 indicates that an entity's research activity in a field corresponds exactly with the global activity in that field; higher than 1.0 implies a greater emphasis while lower than 1.0 suggests a lesser focus.

Analysis conducted by Paola Barr, Research Network Analyst at Elsevier
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