

# Arctic Research Trends

## External Funding 2016–2022



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Contributions by **scite\_**

# **External Funding 2016–2022**

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# Content

Preface .....	1
Acronyms.....	2
Executive Summary.....	3
Scope & Objective .....	3
Key Findings .....	3
Outlook for the Future.....	4
1. Introduction.....	5
1.1 Arctic Research.....	5
1.2 University of the Arctic .....	6
1.3 Arctic Research Analytics and Bibliometrics .....	6
2. Methodology .....	7
2.1 Definition of the Arctic.....	7
2.2 Keyword Searches.....	8
2.3 Data Quality and Refinements .....	9
3. Analysis .....	9
3.1 Funding by Broad Research Areas.....	10
3.2 Annual Funding Trends.....	13
3.3 Funding by Countries .....	17
3.4 Funding by Arctic Council Observer States.....	19
3.5 Funding by UArctic Members and Countries.....	20
3.6 Funding by UArctic Member Institutions .....	22
4. Conclusion.....	24
5. References .....	25

## Preface

This work was conducted by the University of the Arctic (UArctic) Thematic Network on Research Analytics and Bibliometrics. It was supported by Global Affairs Canada through the Global Arctic Leadership Initiative. The aim of this work is to follow up on previous analyses presented by the UArctic Science & Research Analytics Task Force, i.e. the pilot report “International Arctic Research – Analyzing Global Funding Trends, A Pilot report” (Osipov et al 2016) covering the period 1996-2015 with a specific focus on 2006–2015.

The pilot report, published in 2016, and a close in time follow up report (Osipov et al 2017) were the first-ever attempts at creating a comprehensive view of global Arctic research funding using a dataset of such magnitude. This report is a “refresh” of these two original analyses, showing new data both from funding as well as time scope viewpoints.

As in the pilot report, special attention has been given to describing and partly analyzing trends in the countries of the Arctic Council – both members<sup>1</sup> and observers<sup>2</sup> – as well as their key funding agencies and institutional members of the University of the Arctic.

The results presented in this report share many similarities with those in the previous ones (Osipov et al 2016 & 2017). However, we consider the data more comprehensive, due to the maturing of Dimensions database used to identify funding sources over the years.<sup>3</sup> Still, due to large differences in funding systems between different countries, the interpretation of funding trends must always be done with caution.

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<sup>1</sup> Canada, Finland, Iceland, Kingdom of Denmark, Norway, Russian Federation, Sweden, United States of America.

<sup>2</sup> France, Germany, Italian Republic, Japan, the Netherlands, People's Republic of China, Poland, Republic of India, Republic of Korea, Republic of Singapore, Spain, United Kingdom.

<sup>3</sup> <https://www.digital-science.com/product/dimensions/>

## Acronyms

AEPS	Arctic Environmental Protection Strategy
AHDR	Arctic Human Development Report
AMAP	Arctic Monitoring and Assessment Program (a working group within the Arctic Council)
CAFF	Conservation of Arctic Flora and Fauna (a working group within the Arctic Council)
EPPR	Emergency Prevention, Preparedness and Response (a working group within the Arctic Council)
IASC	International Arctic Science Committee
IASSA	International Arctic Social Sciences Association
ICARP	International Conference on Arctic Research Planning
UArctic	University of the Arctic

# Executive Summary

## Scope & Objective

This report aims to provide an update to the two studies published in 2016 and 2017 (Osipov et al 2016 & 2017) with the primary task of assessing the global funding landscape around Arctic-related research. While the previous reports were focusing on the periods 2006-2015 and 2007-2016 respectively, this report covers 2016 to 2022, using the funding data from the Dimensions<sup>4</sup> dataset, which includes information from more than 600 funders and 7 million awarded grants with funding totalling \$2.4 trillion+ (in US Dollars).

## Key Findings

The key findings of the updated report, based on the available data, highlight the following trends:

- The fields of Earth Sciences (10.3 percent) and Environmental Science (5.5 percent) are the two largest recipients of Arctic research funding.
- The US is the largest Arctic research nation in terms of total spending and number of projects started. It also has the most comprehensive coverage of funding sources in the dataset.
- Canada and Russia are the second and third largest nations in terms of number of projects started, followed by Norway and Sweden.
- UArctic institutions are central actors in Arctic research globally.
- Researchers from Arctic Council Observer nations are financing a substantial amount of research on the Arctic. In particular, the UK and Japan finance a significant number of projects, followed by Germany and China with considerable numbers of Arctic-related research projects.
- Funding from the European Union holds the position of the eighth-largest funder based on the number of projects awarded. The European Union is characterized by a few projects with large funding.
- The analysis suggests that there is neither growth nor shrinkage in the relative volume of Arctic research funding over the period 2016–2022 in comparison with the growth of the general scientific community.

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<sup>4</sup> by ÜberResearch, a Digital Science portfolio company

- Private funders and foundations contribute little to Arctic research. Only one percent of the projects starting in 2016–2022 were funded privately.

In general, the largest sources of external public funding for Arctic research come from the United States (US), Russia, Canada, and Norway, with the US being the biggest net contributor. Other kinds of funding, such as base budgets, are not described in this report. In addition, data on the public funding and funding amounts of Arctic research in Russia, Canada, and the Kingdom of Denmark are not always provided by the funders in project profiles, and net value is sometimes not disclosed by the funders themselves.

## Outlook for the Future

This report specifically investigates projects initiated between 2016 and 2022, providing insights into the contemporary funding landscape of Arctic research. Understanding the geographical and institutional distribution of funding, as well as the specific areas of focus within this funding, holds significance for UArctic and Arctic Council officials. Such insights facilitate their ability to offer informed guidance to their respective members, aiding in the identification of strategic priorities.

Moreover, gaining insights into the entities funding Arctic research, and those not engaged in such funding, holds importance for UArctic and Arctic Council science officers. Armed with information about Arctic-focused endeavours they can engage with funding bodies, fostering dialogue aimed at enhancing support, and collaboration for such initiatives.

# 1. Introduction

## 1.1 Arctic Research

In recent years, a growing number of policymakers and industry leaders worldwide have shifted their focus toward the Arctic and the Circumpolar North. This heightened attention is driven by a range of critical issues, including climate change, competition for resources, the vulnerability of Arctic environments and Northern communities, the cultivation of local and indigenous knowledge, and the emergence of new transportation routes. While international collaboration in Arctic research dates to the 19th century and has persevered regardless of political conditions, it has become notably more pronounced in recent decades.

Following the conclusion of the Cold War, a host of initiatives aimed at fostering collaborative research in the Arctic materialized. Notable examples include the Arctic Environmental Protection Strategy (AEPS), active from 1991 to 1996, the establishment of the International Arctic Science Committee (IASC) in 1990, and the formation of the International Arctic Social Sciences Association (IASSA) in the same year, along with other collaborative entities.

The Arctic Council is an international organization that extends a standing invitation to the Indigenous peoples of the Arctic to participate as permanent members in this collaborative venture. Furthermore, the Council grants observer status to a diverse array of entities, encompassing non-Arctic nations, inter-governmental and inter-parliamentary organizations, both on a global and regional scale, as well as non-governmental organizations. Among these observers, UArctic, IASC, and IASSA play the vital role of representing the scientific community within the Arctic Council.

The UArctic task force initiated a thorough assessment of scientific collaboration and funding in the Arctic in 2016. This effort resulted in four reports spanning from 1996 to 2016, with a particular emphasis on funding analysis from 2006 onwards.<sup>5</sup>

Building upon this foundation, the objective of the present report is to further the prior efforts in mapping funding for Arctic research in recent times. This subsequent report will extend its coverage to encompass the years from 2016 to 2022, expanding on the groundwork laid in the previous reports.

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<sup>5</sup> <https://www.uarctic.org/activities/thematic-networks/research-analytics-and-bibliometrics/publications/>



## 1.2 University of the Arctic

The University of the Arctic (UArctic) is a network of universities, colleges, research institutes, and other organizations concerned with education and research in and about the North. UArctic has more than 180<sup>6</sup> members from over 20 nations. UArctic builds and strengthens collective resources and infrastructures that enable member institutions to better serve their constituents and their regions.

As a decentralized organization, UArctic has offices, programs and other functions hosted at member institutions across the Circumpolar North. As of 2023, UArctic included over 60 Thematic Networks<sup>7</sup>, and named over 20 UArctic Chairs<sup>8</sup>, engaging about 1000 scientists in international education and research collaboration. The daily operations are entrusted to a light and distributed administration.

## 1.3 Arctic Research Analytics and Bibliometrics

In May 2023, the UArctic Thematic Network on Arctic Research Analytics and Bibliometrics, hosted by Umeå University, was approved by the UArctic as a continuation of the previous UArctic Science and Research Analytics Task Force. The latter was established in 2015 following the UArctic Rector's meeting in Umeå, Sweden. The Thematic Network members include a small, but diverse international group of subject-matter experts who are willing to participate and contribute to this endeavour.

The main goal of the Thematic Network is to identify challenges and gaps in knowledge about the Arctic by using big-data analytics tools and bibliometric/scientometric approaches and methods, and to inform research-based solutions that are possible through the efforts of the UArctic Network. The Thematic Network will continue the work partnering and liaising with global data and information providers to improve the representation and visibility of Arctic research in the global indexed research output.

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<sup>6</sup> At the time of writing, membership of additional 55 institutions have been paused. See <https://www.uarctic.org/members/member-profiles/russia/> for details.

<sup>7</sup> Research activities within UArctic are organized through Thematic Networks. Read more: <https://www.uarctic.org/activities/thematic-networks/>

<sup>8</sup> UArctic Chairs implement and drive collaborative actions among UArctic members and Thematic Networks. Read more: <https://research.uarctic.org/highlights/uarctic-chairs/>

## 2. Methodology

The analyses in this report were conducted using data from the Dimensions database of Digital Science (<https://www.dimensions.ai/>). The Dimensions database is a commercial database containing information on funded research projects from over 600 grant funders worldwide. Data from Dimensions have previously been used to analyze research funding in many fields and countries (Loucaides et al., 2019; Schares, 2023), and was also the data source of the previous Arctic research funding report by UArctic. At that time the database was still under construction, while today it could be considered more mature.

### 2.1 Definition of the Arctic

There are many ways to define the Arctic. The definition applied in this report follows the general trend of the Arctic Council-related definitions of the Arctic (Figure 1). This choice is pragmatic; it acknowledges the general acceptance of the Arctic Council as the body representing the Arctic globally.

More specifically, the definition adheres to the Arctic Human Development Report (AHDR) boundaries, administrative boundaries on land areas when addressing socio-economic and human-related issues, while following the southernmost of either the Arctic Monitoring and Assessment Program (AMAP) or Conservation of Arctic Flora and Fauna (CAFF) boundaries for natural phenomena on land (Figure 1). Additionally, it uses the AMAP border for marine areas, but allows for flexibility by using the Search and Rescue Agreement when more appropriate for specific marine areas, the so-called Emergency Prevention, Preparedness and Response programme (EPPR).<sup>9</sup> This means that this study uses the broadest definition of the Arctic, combining the boundaries set forth by four Arctic Council working groups (AHDR, EPPR, CAFF, AMAP).

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<sup>9</sup> For AHDR, CAFF, AMAP lines, see <http://arcticportal.org/images/maps/small/1.0.jpg> and for the Arctic Search and Rescue Agreement see [https://en.wikipedia.org/wiki/Arctic\\_Search\\_and\\_Rescue\\_Agreement](https://en.wikipedia.org/wiki/Arctic_Search_and_Rescue_Agreement).

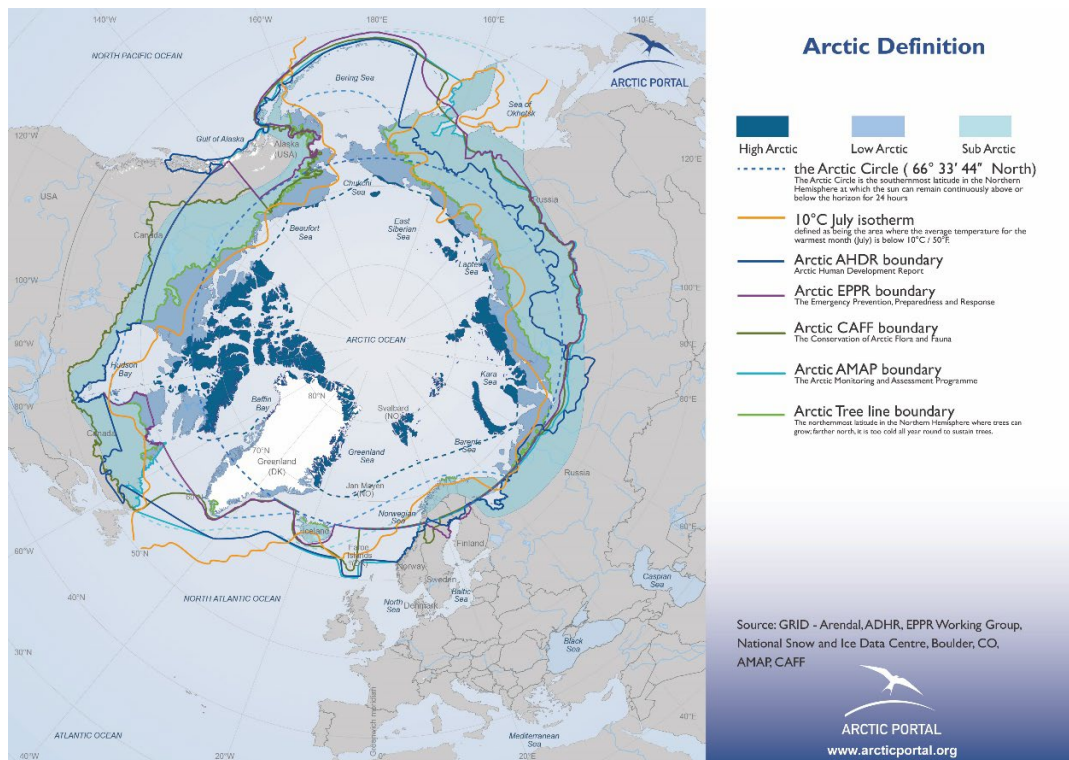


Figure 1. The Arctic according to the AHDR, CAFF, AMAP and EPPR lines.

## 2.2 Keyword Searches

The analyses in this report utilize a keyword search query approach in order to maximize the number of identified Arctic research projects. The method concentrates on two types of terms: geographical and indigenous peoples' names. In addition, a few general terms assumed unique to the Arctic (e.g. Arctic, "north polar") are included. The set of terms applied is identical to the set applied in the corresponding publication analysis (Aksnes et al. 2023), but additional post-processing of the retrieved records was carried out. Some top-level points to consider are:

- Currency conversion is based upon the exchange rate at the time of the start date of the project. No adjustment for inflation is used.
- 'Start year' means the calendar year in which the project started.
- The period of analysis is 2016–2022. Some data from early 2023 was also included in the totals. The incomplete data for 2021–2022 has been marked with dashed lines when showing results for individual years in figures.
- Funders sometimes provide support in countries other than their own, so the total funding a country gets may be a mixture of home countries, overseas, the European Union, and so forth.
- Not all funders globally are included in the database, and some do not provide data on funding amounts.

- Funding systems differ across countries and institutions. Some nations allocate most of the research funding through competitive project grants, whereas others tend to rely more on block funding. The latter source of funding is not reflected in the Dimension database.

## 2.3 Data Quality and Refinements

It is important to acknowledge potential sources of errors in the data, and what we were or were not able to address. First, it is possible that certain relevant projects have not been identified in the findings because the projects do not specify where the research was (is to be) carried out, or because geographical names other than those included in the study were mentioned.

Second, the method might still identify some irrelevant projects, i.e., projects which should not have been considered as Arctic research. This may be because some words have more than one meaning or are used in contexts other than Arctic research. We attempted to avoid this problem by excluding words with multiple meanings, and testing the dataset output based on various scenarios to identify problems of double meaning or words which trigger large numbers of false positive references without any relevance to Arctic research.

To assess the validity of the methodology, a set of 300 identified records were randomly selected to serve as the basis for a precision test. The records were assessed by two domain experts in Arctic research. Of the sample, 92 percent were assessed to have Arctic content by at least one expert, and 90 percent by both experts. From this estimation of precision, we conclude that the search methodology is adequate and has quite high validity. However, the test also shows that some non-Arctic projects are included, and conversely, some Arctic projects are likely not to be identified by our search methodology. Moreover, some projects may only partly address Arctic research. These limitations should be considered when interpreting the results.

## 3. Analysis

In the remainder of the report, we describe the results of the analyses conducted. Indicators showing different dimensions of Arctic research funding are described in sections covering topics such as overall funding, distribution by field of study, and national and institutional profiles. Each section includes tables, graphs, and explanatory text. Within the scope of this report, however, we are not able to provide a full analytical elaboration on all the issues presented. The period of analysis is 2016–2022. However, the year 2023 was not complete when the analyses were carried out. Therefore, 2023 is only included in the analysis of totals.

### 3.1 Funding by Broad Research Areas

Arctic research covers a variety of different fields and disciplines. To provide an overview of this width, the projects have been classified by subject areas. In the Dimension database, all projects are classified according to the *Fields of Research Classification system*, originally developed for analysis of research and experimental development (R&D) undertaken in Australia and New Zealand.<sup>10</sup> The advantage of this system is that it collapses academic classifications into 22 high-level areas. These are listed below.<sup>11</sup>

- 01 Mathematical Sciences
- 02 Physical Sciences
- 03 Chemical Sciences
- 04 Earth Sciences
- 05 Environmental Sciences
- 06 Biological Sciences
- 07 Agricultural and Veterinary Sciences
- 08 Information and Computing Sciences
- 09 Engineering
- 10 Technology
- 11 Medical and Health Sciences
- 12 Built Environment and Design
- 13 Education
- 14 Economics
- 15 Commerce, Management, Tourism and Services
- 16 Studies in Human Society
- 17 Psychology and Cognitive Sciences
- 18 Law and Legal Studies
- 19 Studies in Creative Arts and Writing
- 20 Language, Communication and Culture
- 21 History and Archaeology
- 22 Philosophy and Religious Studies

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<sup>10</sup> The Australian and New Zealand Standard Research Classification (ANZSRC) is the collective name for a set of three related classifications developed for use in the measurement, see: <http://www.arc.gov.au/rfcd-seo-and-anzsrc-codes>.

<sup>11</sup> For further information of the content of the categories and the underlying sub-disciplines, see: [http://www.uq.edu.au/research/research-management/era-for-codes#Built\\_environment](http://www.uq.edu.au/research/research-management/era-for-codes#Built_environment)

Looking at funding totals by subject, we see that Earth Sciences and Environmental Sciences are the largest recipients of Arctic research funding (Figure 2). The funding for Earth Sciences is twice as high as Environmental Sciences. These are followed by Biological Sciences and Health Sciences, while Law and Legal Studies rank fourth and Engineering rank fifth in funding. It is interesting to note that among the ten largest recipients of Arctic research funding, four subject areas belong to the social sciences. It should be noted, however, that the figures for Law and Legal Studies are largely influenced by one very large grant. Further inspections show that this grant does not have an Arctic research content.

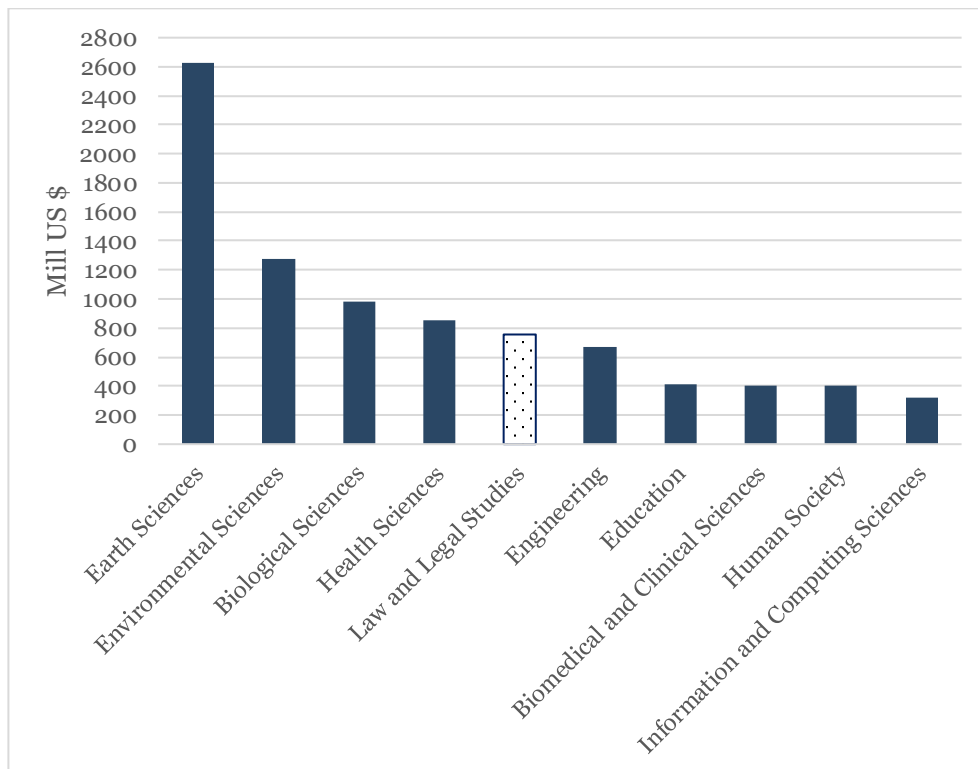


Figure 2. Top ten fields of Arctic research by category and their total funding for projects starting 2016–2023. The figures for Law and Legal Studies are largely influenced by one very large grant which does not have an Arctic research content.

By comparing the total amount of research funding within a subject category with Arctic research funding in the same areas we can examine the depth of Arctic research in each broad subject category, and how much that varies from the overall average of approximately 1 percent of all research funding focusing on the region (found in Dimensions). Measured as a percentage of overall funding we find that Arctic “Earth Sciences” research accounts for 10 percent of all funding in that category (see Figure 3). This is a clear indicator that a significant proportion of the global research within Earth Sciences directly relates to the Arctic. The proportions for the other research areas are lower. However, for Environmental Science as well as for

Law and Legal Studies the proportions are well above the overall average of 1 percent of all funding in Dimensions for several categories.

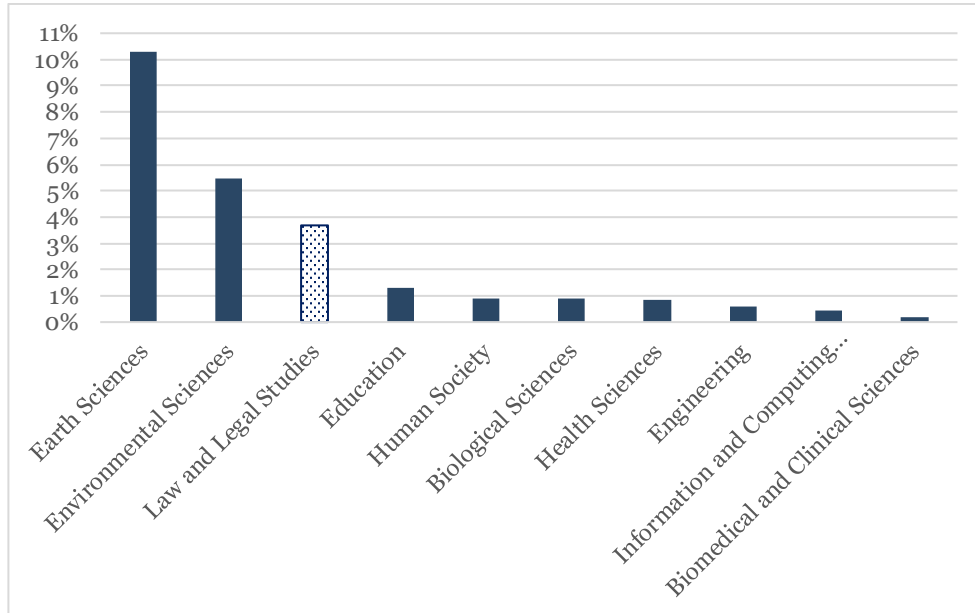


Figure 3. Top ten fields of study in terms of Arctic research funding amounts as a percentage of total global research funding for projects starting 2016–2023. The figures for Law and Legal Studies are largely influenced by one very large grant which does not have an Arctic research content.

As shown above in Figure 3, Earth Sciences is the research area with the highest proportion of Arctic research funding as a total proportion of the global research. As is shown in Figure 2 it also is the area that receives the most Arctic research funding overall.

In order to provide further insights into funding by subject area, we have analyzed the funding by subject sub-areas (Table 1). The top three areas in terms of the proportion of funding going to Arctic research are Oceanography, Physical Geography and Environmental Geosciences, and Health Services and Systems. Of these three, Oceanography and Physical Geography and Environmental Geosciences are related to the Earth Sciences heading.

A caution regarding the application of subcategories is such that multiple subcategories can be attributed to the same project. This is evident when the number of projects that fall under subcategories in the field of Earth Sciences which is summarized in Table 1. The most common subcategories are Oceanography, Physical Geography and Environmental Geosciences, and Geology, all likely combined within the main category of Earth Sciences.

It should be noted that the distribution of funding grants is very skewed. Some projects may account for a significant proportion of the overall Arctic

funding within a category. For example, one reason the Earth Sciences figure is so large is because of one very large grant, the “National Ecological Observatory Network (NEON): Operations Activities” given by the US Directorate for Biological Sciences in 2017 for \$380 million. The NEON infrastructure partly covers the Arctic via sites in Alaska.

Table 1. Top sub-categories (in terms of amount of funding) of Arctic Research Areas, 2016–2023.

Area	Arctic Funding (\$m)	Arctic Projects (N)*
Oceanography	932	1,816
Physical Geography and Environmental Geoscience	916	2,581
Health Services and Systems	648	759
Environmental Management	597	830
Ecology	560	1,536
International and Comparative Law	483	257
Geology	444	2,090
Geoinformatics	440	121
Atmospheric Sciences	358	991
Public Health	234	304

\*) Including projects where funding amount is not available.



## 3.2 Annual Funding Trends

The Dimension database contains annual data extending back many years. Based on these data, we analyzed the temporal funding aspects of Arctic research. It should be noted that information regarding research funding has certain limitations, especially concerning projects initiated in the later years of the study period. One limitation in conducting trend analyses is the time it takes to update a database, leading to a general decline in the number of projects for the more recent years. Another issue introducing uncertainty into the analyses is that both the update frequency and data availability vary among different research funders; in some countries, projects are reported, but information about funding amounts is missing. Additionally, a limitation pertains to the challenge of comparing the size and trends of project funding between different countries in US dollars, which does not account for currency exchange fluctuations and inflation. Observed drops of data towards the end of a time series is normal, and a consequence of delayed reporting into the database. A similar pattern was observed in the previous reports in 2016–2017. For data source disclaimers see paragraph 2.2.

When we look at Arctic research projects by the year they started, from 2007–2022, the trend is for linear growth. The drop in 2021 and 2022 is probably due to time lags in updating the database. For the period 2007 to 2021, the annual average growth rate is approximately 1.9 percent. Arctic projects share of the total number of projects in the database is fairly stable around a share of 0.8 percent. (Figure 4).

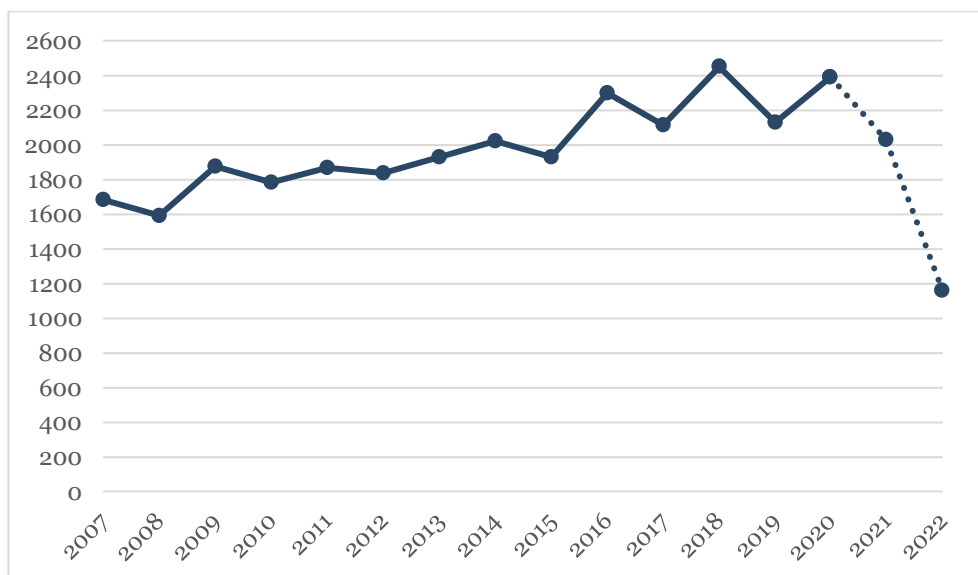


Figure 4. Number of Arctic research projects by year, started 2007–2022. The drop in data 2021–2022 is likely due to a delay in updating data.

Table 2a. Number of projects starting in 2016–2022 by funder. Top 20 Arctic research funders by number of projects funded.

	2016	2017	2018	2019	2020	2021	2022	Total
Natural Sciences and Engineering Research Council (Canada)	255	280	298	360	548	500		<b>2241</b>
Directorate for Geosciences (US)	289	243	231	230	275	284	256	<b>1808</b>
Russian Foundation for Basic Research	238	163	456	223	220	25		<b>1325</b>
The Research Council of Norway	185	165	170	146	183	203	157	<b>1209</b>
Social Sciences and Humanities Research Council (Canada)	76	64	93	69	71	81		<b>454</b>
Natural Environment Research Council (UK)	58	58	58	63	69	72	71	<b>449</b>
Japan Society for the Promotion of Science	76	43	56	74	71	48	36	<b>404</b>
Russian Science Foundation	38	80	50	93	48	8		<b>317</b>
European Commission/ European Research Council	43	44	54	42	38	36	44	<b>301</b>
Canadian Institutes of Health Research	47	45	40	48	26	30	37	<b>273</b>
National Oceanic and Atmospheric Administration (US)	43	38	43	44	46	51	4	<b>269</b>
United States Department of the Navy	67	35	46	27	33	36	18	<b>262</b>
National Natural Science Foundation of China	58	57	71	38	36			<b>260</b>
VINNOVA (Sweden)	41	41	40	33	34	29	32	<b>250</b>
National Aeronautics and Space Administration (US)	47	36	26	27	26	26	40	<b>228</b>
Deutsche Forschungsgemeinschaft (Germany)	45	30	26	35	43	28	20	<b>227</b>
Swedish Research Council	35	25	28	25	33	29	25	<b>200</b>
Fonds de Recherche du Québec – Nature et Technologies (Canada)	33	51	38	8	19	15	25	<b>189</b>
Swedish Research Council for Environment Agricultural Sciences and Spatial Planning	19	23	32	28	32	20	27	<b>181</b>
Northern Norway Regional Health Authority	31	27	26	33	27	23	10	<b>177</b>
<b>Total</b>	<b>2294</b>	<b>2116</b>	<b>2448</b>	<b>2130</b>	<b>2390</b>	<b>2027</b>	<b>1158</b>	<b>14563</b>

Table 2b. Funding amount for the funders shown in Table 2a. Projects starting in 2016–2022 in millUS\$ by starting year.

	2016	2017	2018	2019	2020	2021	2022	Total
Natural Sciences and Engineering Research Council (Canada)	19	27	33	27	32	45		183
Directorate for Geosciences (US)	131	95	174	171	170	165	169	1075
Russian Foundation for Basic Research								
The Research Council of Norway	94	65	125	85	61	118	45	593
Social Sciences and Humanities Research Council (Canada)	17	7	9	4	4	3		43
Natural Environment Research Council (UK)	36	21	18	17	18	20	24	154
Japan Society for the Promotion of Science	11	4	7	12	7	3	4	48
Russian Science Foundation								
European Commission/ European Research Council	112	59	86	94	169T	98	128	745
Canadian Institutes of Health Research	15	16	9	24	11	11	35	120
National Oceanic and Atmospheric Administration (US)	43	40	61	89	82	189	1	503
United States Department of the Navy	40	18	39	33	34	23	21	208
National Natural Science Foundation of China	6	6	13	2	3			29
VINNOVA (Sweden)	10	21	5	6	10	6	9	67
National Aeronautics and Space Administration (US)	7	3	1				1	11
Deutsche Forschungsgemeinschaft (Germany)								
Swedish Research Council	8	13	18	8	34	20	17	118
Fonds de Recherche du Québec – Nature et Technologies (Canada)	1	1	1	0	1	1	1	6
Swedish Research Council for Environment Agricultural Sciences and Spatial Planning	7	8	12	10	11	7	11	66
Northern Norway Regional Health Authority								
<b>Total</b>	<b>1101</b>	<b>1110</b>	<b>953</b>	<b>826</b>	<b>908</b>	<b>952</b>	<b>740</b>	<b>6589</b>

Tables 2a and 2b display the number of starting grants for the period 2016–2022 distributed over top 20 funding agencies. Tables 2a and 2b highlight gaps in funder records and explain the decline observed in Figure 4. For several of the major funders of Arctic research we do not have data for 2022. For the Russian Foundation for Basic Research there are no new projects registered for 2022, and only 25 new projects for 2021, which is likely due to a lack of database updates. However, for most funding agencies the data is reasonably solid between 2016 and 2020.

The funders listed in Tables 2a and 2b finance a significant portion of Arctic research projects, and the share of funding from the top funders has also increased over the years. In 2016, the top 20 funders supported 75 percent of Arctic projects, which increased to 78 percent in 2020. Information for the National Natural Science Foundation of China is missing for 2021, and the number of projects funded by the Russian Foundation for Basic Research is likely underestimated for that year. The Natural Sciences and Engineering Research Council of Canada, which funds the majority of Arctic projects, also shows the most substantial increase during this period. In 2016, they funded 11 percent of Arctic projects, and this share increased to 23 percent in 2020. When we combine the number of projects from the largest Canadian research funders, their share was 18 percent of Arctic projects in 2016, which grew to 28 percent in 2020.

Private funders and foundations contribute little to Arctic research, despite of the relatively wide coverage of private funding in the Dimensions database. Only 1 percent of the projects starting in the period 2016–2022 were funded by such sources (data not shown).

### 3.3 Funding by Countries

We analyzed Arctic research funding by country. In these analyses, the country of the entity receiving grants is used in the measurements. Usually, the funding country and the receiving country are the same, but this does not always hold true.

The chart below (Figure 5) shows both the funding and number of projects starting during the period 2016–2023 for the largest contributors. Not surprisingly, the US is the largest Arctic research nation both in total spending and the number of projects started, followed by Canada, Russia and Norway. There is also a significant number of Arctic projects from Sweden, the UK, and Japan, but compared with the larger nations, the figures are much lower.

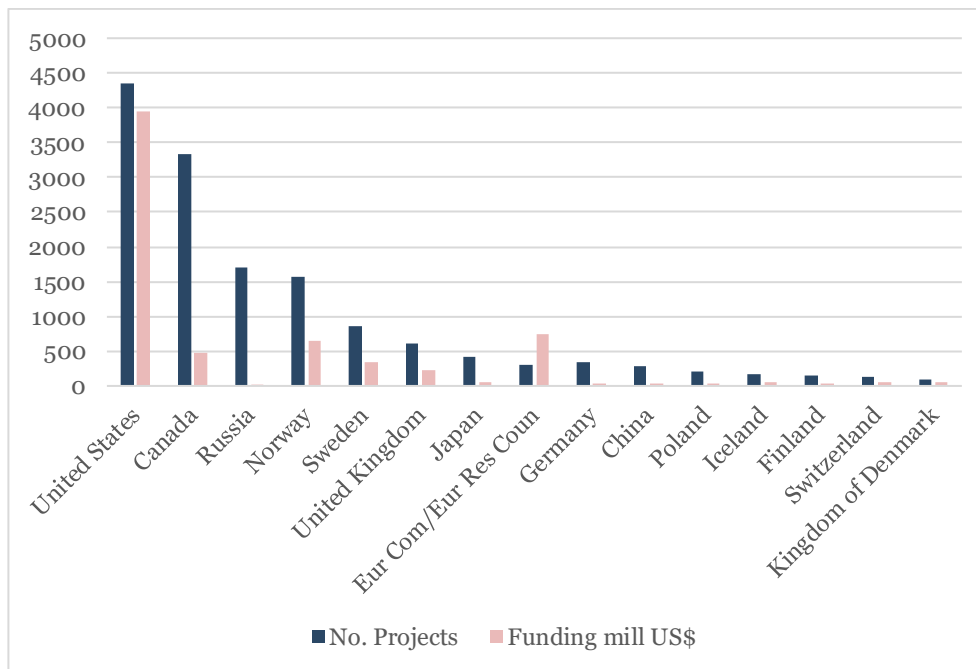


Figure 5. Arctic funding by country of funder. Grants starting 2016–2023.

In Figure 5, we see the number of projects and funding amounts by country. The US, Canada, and Russia are the top three actors when looking at the number of projects, but when looking at funding amounts, the US, the European Union, and Norway dominate. The patterns are very different for different countries. Canada, for example, has a lot of projects but low amounts of funding, and Russia has no amounts at all. This can partly be explained by the fact that some funders only report on the number of projects, but not funding amounts. Also, some funders support a few large grants and others have many small grants. It is interesting to compare a given country's funding rank with the one based on scientific publishing. We have therefore included a figure from the bibliometric report (Aksnes et. al. 2023), see Figure 6. In this figure, a similar picture emerges. The top three remain the same and China and Norway are important contributors.

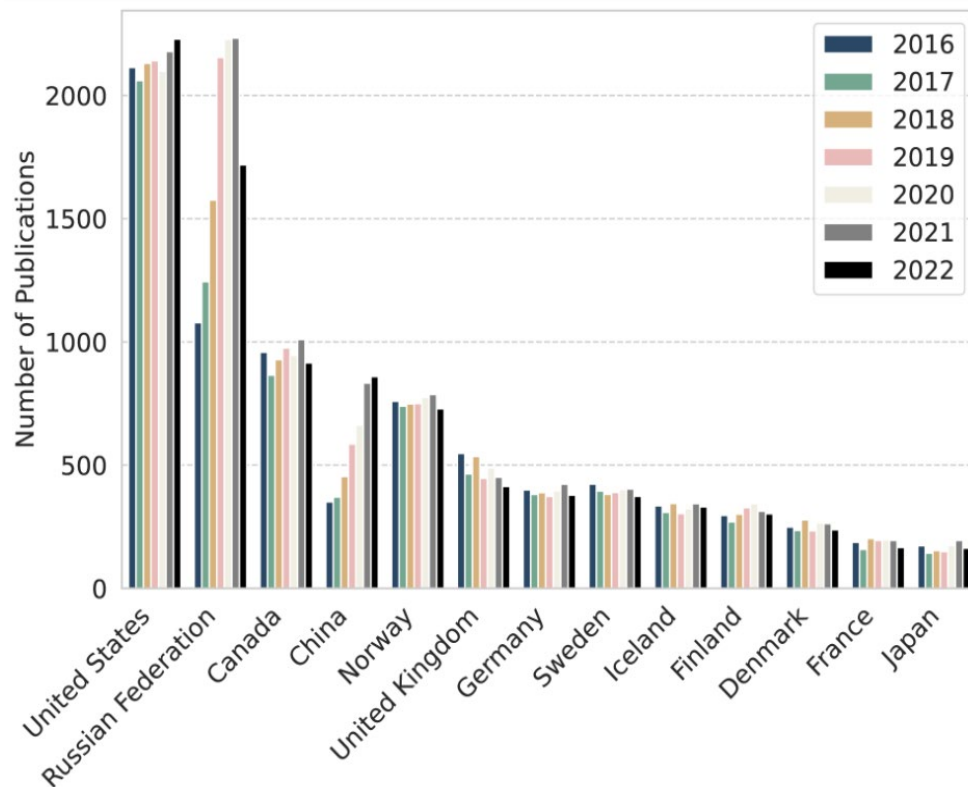


Figure 6. Total number of Arctic scientific publications by country, 2016–2022 (fractionalised counts).

Investments, or rather the number of funded projects, are generally correlated with the number of research outputs. However, there are large deviations. The differences are likely due to variations in the overall funding of Arctic research. Many institutions with high base funding will generally need less external funding; consequently, some countries may appear to have different profiles in project funding and the total volume of scientific output.

### 3.4 Funding by Arctic Council Observer States

Figure 7 shows values for the top seven Arctic Council observer countries, (based on number of Arctic projects). The UK has a considerable number of Arctic research projects, higher than for several Arctic Council member countries. Given new federal funding data from Japan, added to Dimensions after the last review, we can see the significant Arctic research funded by the Japan Society for the Promotion of Science. This makes Japan a significant Arctic research funder.

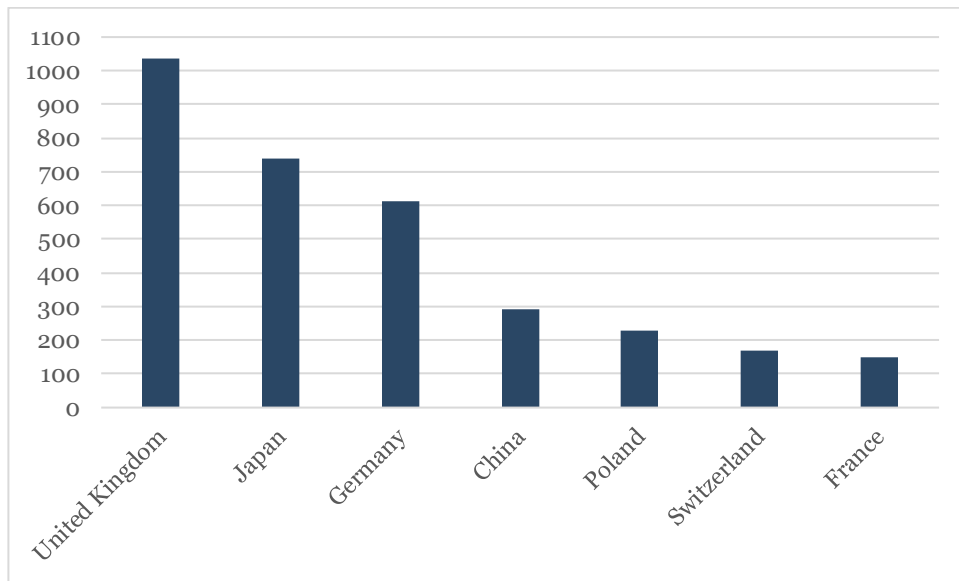


Figure 7. Top 7 observer states contribution to Arctic research by number of projects 2016–2023.

### 3.5 Funding by UArctic Members and Countries

In this section, we have analysed research funding for the UArctic member organisations versus institutions outside the UArctic network by country. The caveats to this analysis are identical to those described in the section above and it should be noted that the Russian data is not complete enough for a comparable analysis. The total number of Arctic grants by country received by UArctic members for the top seven countries are shown in Figure 8. This graph suggests that UArctic members are central actors in Arctic research for all countries, but that there are also significant contributions from non-members. For the US and Canada, the proportion of UArctic members is lower reflecting the profile of UArctic membership.

Figure 9 shows a similar picture as Figure 8 based on funding amount. Table 3 gives the underlying numbers for Figure 9.

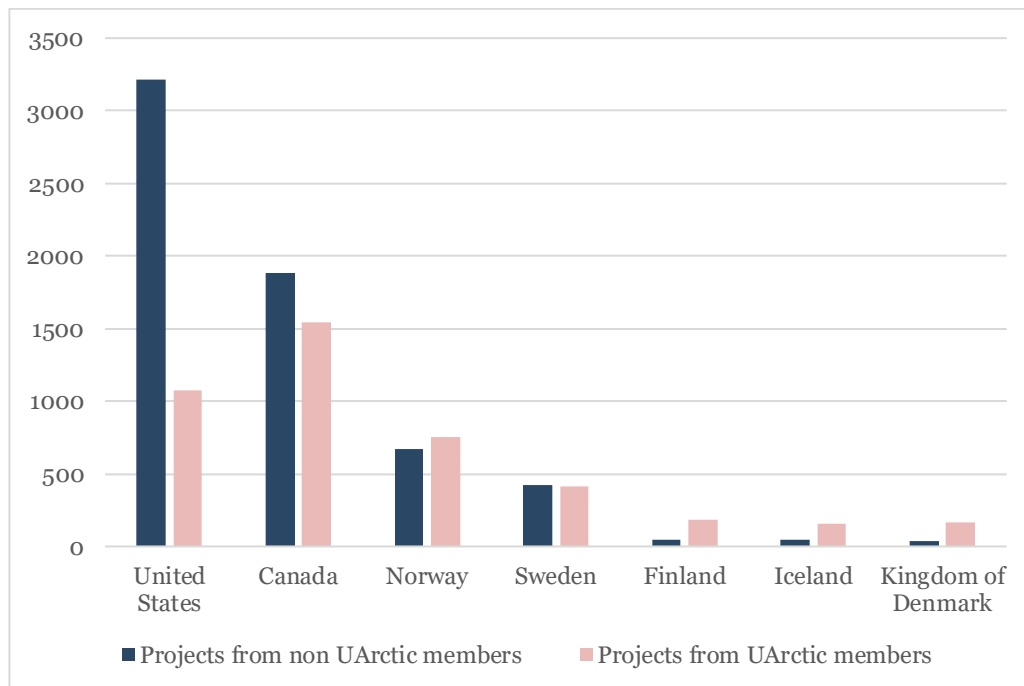


Figure 8. Number of Arctic research projects started 2016–2022 by researchers in UArctic member institutions compared to non-members.



Table 3. Number of Arctic research projects starting between 2016 and 2023. UArctic member institutions compared to non-member institutions by Arctic Council member countries.

Member country	Projects from non UArctic members	Projects from UArctic members	Sum Arctic projects
United States	3212	1073	4285
Canada	1881	1546	3427
Norway	673	757	1430
Sweden	422	409	831
Finland	42	183	225
Iceland	44	157	201
Kingdom of Denmark	40	161	201
Russia	335	X	335

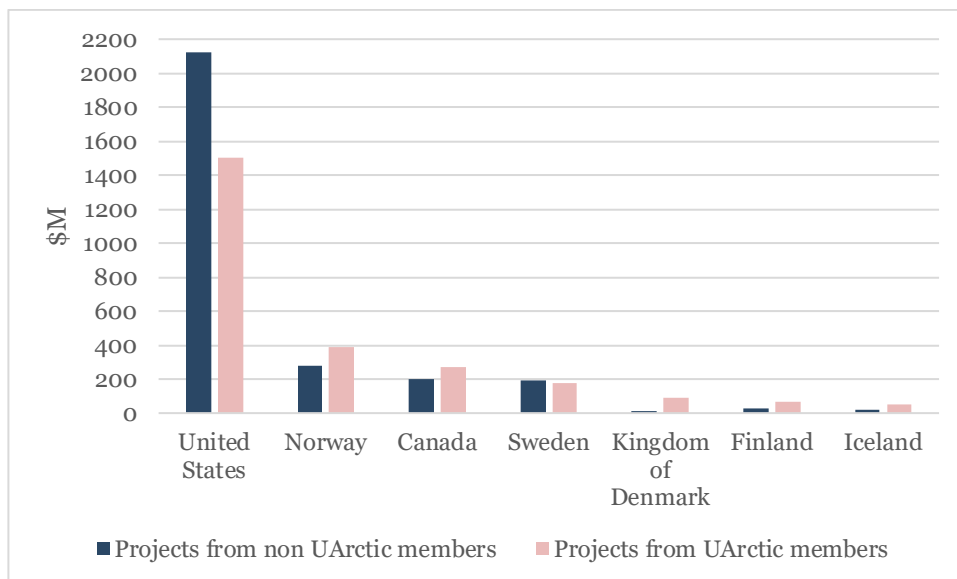


Figure 9. Funding amount for Arctic research projects starting in 2016–2023 at UArctic member institutions compared to non-members.

### 3.6 Funding by UArctic Member Institutions

Table 4 gives the funding amount and number of Arctic projects for the 25 largest member institutions, in terms of funding, from 2016 to 2023. The largest recipient of funding is the University of Alaska Fairbanks followed by UiT the Arctic University of Norway and Université Laval in Quebec, Canada. When interpreting this table, it should be recalled that the numbers include external grants only. Most institutions will have a considerable amount of basic funding in addition. The ranking of institutions would appear different if this funding had been included.

Table 4. Top 25 Arctic research by UArctic member institutions 2016–2022 by number of projects (declining) and funding amount.

Institution	Arctic projects (N)	Funding (mill US\$)
1. University of Alaska Fairbanks	384	385
2. UiT The Arctic University of Norway	296	176
3. Université Laval	271	150
4. McGill University	209	14
5. University of Washington	199	278
6. University of Alberta	195	22
7. Umeå University	161	67
8. Université du Québec à Rimouski	149	5
9. University of Toronto	143	10
10. University of Colorado Boulder	135	72
11. Norwegian University of Science and Technology	128	24
12. Memorial University of Newfoundland	123	8
13. University of Oslo	120	74
14. Alfred Wegener Institute for Polar and Marine Research	120	34
15. University of Iceland	117	41
16. Stockholm University	105	54
17. University of Quebec at Montreal	98	5
18. University of Alaska Anchorage	90	32
19. University of Bergen	85	67
20. Hokkaido University	84	7
21. Luleå University of Technology	81	23
22. University of Saskatchewan	80	10
23. University of Helsinki	71	27
24. University of Copenhagen	62	32
25. Aarhus University	60	30

## 4. Conclusion

In our 2023 update of the pilot report (Osipov et.al. 2016 & 2017), we examined Arctic research funding by utilizing funding indicators sourced from the Dimensions database. The data source has matured in both its methodologies and coverage compared to the initial study. Nevertheless, data completeness may vary by nation, which could potentially affect certain countries more than others. Utilizing the Dimensions database as a primary data source remains an efficient method for analyzing overarching funding trends. Leveraging this data, we have effectively identified significant trends that delineate Arctic research between 2016 and 2023:

- The fields of Earth Sciences (10.3 percent) and Environmental Science (5.5 percent) are the two largest recipients of Arctic research funding.
- The US is the largest Arctic research nation in terms of total spending and number of projects started. It also has the most comprehensive coverage of funding sources in the dataset.
- Canada and Russia are the second and third largest nations in terms of number of projects started, followed by Norway and Sweden.
- UArctic institutions are central actors in Arctic research globally.
- Researchers from Arctic Council Observer nations are financing a substantial amount of research on the Arctic. In particular, the UK and Japan finance a significant number of projects, followed by Germany and China who also support a considerable number of Arctic-related research projects.
- Funding from the European Union holds the position of the eighth-largest funder based on the number of projects awarded. The European Union is characterized by a few projects with large funding.
- The analysis suggests that there is neither growth nor shrinkage in the relative volume of Arctic research funding over the period 2016–2022 in comparison with the general scientific growth.
- Private funders and foundations contribute little to Arctic research. Only 1 per cent of the projects starting in the period 2016–2022 were funded by such sources.

Examining the allocation of funding for Arctic projects, as opposed to solely assessing publications, offers an alternative lens through which to comprehend developments in Arctic research. This approach enables a deeper understanding of where public investment is directed presently and in the foreseeable future.

The Dimensions database proves to be a valuable data source for this kind of analysis and is the most comprehensive data source for research funding available.

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