

# A Norwegian pillar in Svalbard: The development of the University Centre in Svalbard, UNIS.

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## Abstract

The University Centre in Svalbard (UNIS) is a unique institution with a history that is closely related to Norwegian policy regarding Svalbard, and to clever development of a highly specialised Arctic university institution by all the Norwegian universities. In practical terms, Norwegian sovereignty on the archipelago as confirmed by the Treaty of Svalbard of 1920 and regulated by the Svalbard Law of 1925, is maintained by the presence of Norwegian civil authorities and communities. Today, the “capital” Longyearbyen with its 2100 inhabitants is a modern hub for industry, education, research, logistics and tourism. Founded in 1993, UNIS has become a main contributor to this community, generating some 20% of the total economic activity. A prime motivation for establishing UNIS was to provide a supplement and alternative to the unprofitable, heavily subsidized coal mining industry, by using the location for research based education. In 2015, the mining company Store Norske Spitsbergen Kullkompani (SNSK) met with deep crisis again and significantly downscaled its coal production and work force. Thus, UNIS may play an even more important role as a cornerstone of the local community in the future. This paper discusses the establishment and development of UNIS, its organisation, capacity, and academic production in terms of student graduation and its scientific output, just as its future potential for growth is evaluated. Finally, we discuss the increasingly important role of science and education in Norwegian Svalbard policy.

## Historical background and introduction

Since Willem Barentz' discovery of the archipelago in 1596, there has been more or less continuous human activity on Svalbard (Arlov 2003). Exploitation of biological resources started in the early 17<sup>th</sup> century with whaling, followed by hunting and trapping after 1700. Scientific exploration grew during the 19<sup>th</sup> century and revealed, among other things, valuable mineral deposits. Coal mining developed after 1900 and required a year-round presence, which resulted in the establishment of a few small, semi-permanent settlements. The Boston based Arctic Coal Company established Longyearbyen in 1906. Ten years later, the coalmine and the property was bought by the Norwegian company Store Norske Spitsbergen Kullkompani (SNSK). Throughout the 20<sup>th</sup> century, SNSK was the cornerstone of Longyearbyen, and as late as the 1970s, the community was still a “company town”.

In 1976 the Norwegian government nationalised SNSK and started a process of “normalisation”, or rather, modernisation of Longyearbyen. Coal production was unprofitable and required heavy subsidies. From the 1990s the government actively supported a diversification of the local activities to make Longyearbyen less dependent on coal mining (Grydehøj and others 2012). Tourism and service industries were stimulated, and also research and higher education (Arlov and Holm 2001; Kvello 2006). The decision to establish UNIS in 1993 was a direct result of this policy (Arlov 2003; Arlov 2008).

The Treaty of Svalbard of February 9<sup>th</sup> 1920, gave Norway sovereignty over the archipelago, which for three hundred years had been regarded as a *terra nullius*, a no man's land. Norwegian jurisdiction was formally established in 1925, when the Storting – the Norwegian parliament – passed the Svalbard law and put the treaty into force. In essence, the treaty recognises the “full and absolute sovereignty” of Norway (Article 1), ensures equal rights for the citizens of all signatory nations, that all taxation must be utilised locally, that Svalbard is a non-military area, and that Norway is responsible for environmental protection.

At present, there are five more or less permanent settlements on Svalbard (Longyearbyen, Barentsburg, Ny Ålesund, Sveagruva and Hornsund). Longyearbyen with its 2100 inhabitants

(Bjørnsen and Johansen 2014, Anon. 2016, Statistics Norway 2016) is the northernmost family community in the world, with a fully developed infrastructure – international airport, bank, church, hospital, hotels, school, shops, advanced telecommunications, and so on. The community is among the most international in Norway with a 25% foreign population representing 46 nationalities. There is 86% work life participation among the adult population (25–66 years), and 70% of the population is younger than 45 years of age. Mobility is high; average residency is around 7 years. Of the person-years produced in Svalbard in 2015, industry including mining, construction and transport represented 28%, the public sector 9%, education and science 12%, trade and services 9% and travel and leisure 39% (Statistics Norway 2016). Out of the total annual business revenue in 2014 of about 500 million EUR, coal mining alone contributed 45% (Bjørnsen and Johansen 2014). One year later the mining company suffered severe deficits due to a reduction in the World market coal price, and it was in practice bankrupt.

In addition to the Norwegian community in Longyearbyen there is a Russian settlement in Barentsburg. This settlement has primarily been based on mining, but is now diversifying with the expansion of tourism. The Russians used to produce coal in Grumantbyen and Pyramiden as well, but these mines were abandoned in 1962 and 1998 respectively. Also, Ny-Ålesund was a coal mine until 1963. Thus, mining has been a cornerstone not only for the Norwegian presence, but also for settlements in Svalbard generally. However, scientific activities have increased, particularly since the 1990s, and several Norwegian and foreign institutions have established research stations and installations on the archipelago. Russian research in Barentsburg has long-standing traditions that date back to the 1960s. Similarly, the Polish research station in Hornsund, that was established during the International Geophysical Year in 1957-1958, has operated on a year-round basis since 1978. Ny-Ålesund was transformed into a base for increasingly international research from the late 1960s. Currently, 14 institutions from 10 different countries have established permanent research facilities in Ny-Ålesund. In addition, there are a few other stations located in other areas in Svalbard. Thus, a significant amount of research is carried out on the archipelago. A survey in 2014 showed that research related visits, measured as a number of scientist days, amounted to some 61 000, of which Norway contributed approximately half (Aksnes and Rørstad 2015). Nevertheless, as a basis for permanent settlement, research still plays a limited role as most of

the activity involves short-term visits by scientists with the exception of UNIS staff in Longyearbyen and scientists and technicians based in Ny-Ålesund, Barentsburg and Hornsund, who all live in Svalbard year-round. During the polar night, there is generally less scientific research going on and most of the research stations are closed or have minimal staff.

For the better of the last hundred years, Norwegian presence on Svalbard has been dependent mainly on coal mining. SNSK has produced coal in different mines in Longyearbyen and Sveagruva continuously since 1916, except for a few years during the Second World War. However, production has varied substantially. In the years 1925–1941, production varied between about 150 000 and 320 000 tons of coal with up to 700 employees involved (Westby 2003). In the period 1945–1980, production reached 480 000 tons of coal annually from an overwintering staff of up to 1300 people. At the end of the 1980s, a combined market and resource crisis occurred, that threatened the coal company, and hence also the local community. This triggered the above mentioned business development and diversification process, which proved very successful. During the 1990s, more new jobs were created than lost in the coal mining industry. After 2000, the development was accelerated by the opening of the modern Svea Nord coal mine. The previously doomed SNSK became a profitable company with annual production volumes up to 4 million tons of coal (Bjørnsen and Johansen 2014, Mikalsen and Solberg 2009, Arlov 2008). Thus, coal mining remained an important factor in community development and accounted for a substantial component of the rapid growth in Longyearbyen.

The international coal market experienced a dramatic reduction in prices from 2014. SNSK then experienced grave difficulties, since coal prices were too low to sustain an economically viable production. In 2015 the government refinanced the company, partly by taking over its properties. The political will to support coal mining on Svalbard has waned, along with the growing realisation of the negative effects that burning fossil fuels has on the climate (Helgesen and others 2015). SNSK has therefore downscaled its mining activity, put the new Lunckefjell mine near Sveagruva on hold and reduced the number of employees from around 400 in 2014 down to about 100 in 2016. Norwegian authorities have expressed concern regarding the development in Svalbard and Longyearbyen in particular. This is reflected in

the recent White Paper on Svalbard approved in the Storting in autumn 2016 (Ministry of Justice and Public Security 2016).

In many ways, the present situation of the local community in Longyearbyen resembles the situation around 1990: a crisis in coal mining has caused concern for related activities and for the settlement in general. To sustain the size and quality of the community, new jobs and opportunities have to be created. In the 1990s, the introduction of higher education and an expansion of research activities provided one of the answers, and establishing UNIS. Today, many are once again hopeful that UNIS may take a larger role by increasing its activities. Evidently, UNIS has played an important part in the diversification of the local community since 1993, but how successful has the institution been from an academic point of view? And how realistic is it to believe that a further expansion of research and education may compensate for disappearing jobs related to coal mining? To answer this, it is necessary to study UNIS development so far. Our analysis of the development of UNIS is based on the quantification of activities (Aksnes 2013) during the first 20 years (1993–2013), with some updates also included.

## Methods

In the paper, the development of UNIS is partly described by quantitative indicators. To evaluate the academic merits of UNIS we focus on the scientific and educational outputs, and the staff and student growth during the first 20 years of operation. Below we describe the methodological basis for the indicators applied in the study.

The publication analysis is limited to *scientific* publications only, and does not include any other type of publications such as popular science contributions, reports, and text books. The analysis is based on bibliographic data sources such as the Web of Science (WoS) database, and the Scopus database. In addition, we used supplementary sources as the CRISTin database (which is a joint system for the registration of scientific publications applied by Norwegian higher education institutions, institutes and hospitals), UNIS annual reports, as well as the 10-year anniversary bibliography of UNIS (Lindner and Jakobsen 2003). We first applied the

Web of Science database and searched for publications with UNIS in the author address field for the publications (using spelling variants for the institution). We also searched for all publications with Svalbard or Longyearbyen in the address field to verify whether some relevant publications had been omitted by the first search method. Then we searched in the Scopus database, using the same search method. Finally, we identified publications missing in the publication list, based on Web of Science and Scopus, by using supplementary sources. Missing publications had to be checked manually to verify whether an UNIS affiliation had been used or not, and whether the publication channel was accredited as being scientific.

The analyses of collaboration are based on the Web of Science and Scopus subset only (n = 837). The reason for this is that we need complete bibliographic information of the co-authors' institutional affiliations, and this information is only available for the Web of Science and Scopus records.

The individual researcher represents the basic unit of the study, and the data were subsequently aggregated to the level of departments at UNIS. As the main bibliometric measure, we have used the number of publications, 'whole counts', and not derivative measures, such as publication points or fractionalised publications. This is the most common and simplest way of measuring publication output. It should be noted, however, that most publications are multi-authored, and are the results of collaborative efforts involving more than one researcher or institution. Thus, the UNIS contribution may in several cases be rather minor. The indicator may therefore be interpreted as the number of publications in which UNIS has 'participated'.

Finally, the analysis of the staff employed at UNIS from 1993–2015 is based on annual employee lists, with information on the length of each person's employment, appointment terms, position, age, etc. The analyses of students and PhD candidates at UNIS is based on data collected through UNIS archives.

## The Establishment of UNIS

Scientific and university-based excursions to Svalbard have been a tradition for decades, and ideas for a more permanent institution emerged in Norway during the 1980s. In 1992, Minister for Science and Education, Dr. Gudmund Hernes, attended a study tour around Svalbard, and became convinced that setting up a university centre might be feasible. With unprecedented and breathtaking speed, plans were developed and already by the following autumn, UNIS opened with the first 23 students (Arlov 2004).

In February 1993, the four Norwegian universities of Oslo, Bergen, Trondheim and Tromsø were invited to propose appropriate university programmes and courses, specifically relevant for Svalbard, to be offered at UNIS. The University of Tromsø was asked to review the propositions and form a curriculum. Based on this, it was decided to provide university education in Arctic geology and Arctic geophysics, starting from the autumn 1993 semester. Scientific staff at the Norwegian universities put considerable effort into designing the content of the courses and identifying lecturers. This ensured the scientific quality of the curricula and a link to the Norwegian universities, which was essential for a successful beginning. The educational programme of UNIS was designed as an addition to Norwegian university education.

In 1993 UNIS was located in an office building in central Longyearbyen, in anticipation of a new university building being completed. The four Norwegian universities and UNIS signed a cooperation agreement on January 18<sup>th</sup> 1994. This regulated issues concerning cooperation in education, research, lecturers, internationalisation and administrative services. In 1994, a new scientific department was introduced, Arctic Biology, and in 1996, the scientific department of Arctic Technology was opened, offering courses on topics such as engineering on frozen ground, ice mechanics, and pollution from industrial activities in the Arctic.

The first UNIS building was opened by King Harald V of Norway in 1996. Ten years later, His Majesty opened the Svalbard Science Park (MacKeith 2006), built in conjunction with the first UNIS building. UNIS still owns the first building and rents about 85% of the Svalbard Science Park from Statsbygg, a governmental body owning and operating public buildings in Norway. A department of the Norwegian Polar Institute (NPI), Svalbard Museum, and

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Svalbard Science Forum (a part of the Research Council of Norway) are the other main tenants, but several other research institutes and universities rent offices in the building. The Svalbard Science Park is a signal building awarded for its architecture.

In 2011 UNIS signed a renewed cooperation agreement with all the then eight Norwegian universities. An action plan for further development of the educational administrative systems, rules and regulations was adopted in 2013. Collaboration with Norwegian universities at all levels of the institution is important for UNIS; ensuring that the courses offered at UNIS are truly additional to the Norwegian mainland universities course curricula. A central mechanism in the cooperation with the universities on the Norwegian mainland is the annual dean meeting to approve the UNIS curriculum and progression based on course revision work at UNIS after hearings in the Norwegian universities. The first dean meeting in 2013 was attended by 8 delegates, in 2014 by 14 delegates, and in 2015 by 22 delegates. This is an indication of how the Norwegian universities recognise and put increasing effort into cooperation with and development of UNIS, which represents their joint Arctic branch.

## Staff and Capacity

The number of staff at UNIS has increased significantly during the period of 1993–2015. In 1993, the number of work years (full-time equivalents) amounted to only 3.2. In 2015, 115 work years were carried out (Fig. 1). This increase is a reflection of the fact that the government appropriations to UNIS had shown very strong growth during this period, thus allowing for more staff to be hired. UNIS in 2015 had a staff of about 130 persons, of which 75 held scientific positions.

UNIS has four scientific departments in addition to a central administration, a study administrative department, and a technical department. Figure 1 shows the number of work years carried out at each of the departments during 1993–2015. Clearly, there has been strong growth in the number of work years in all departments during this period. The growth is particularly strong in the Arctic Geology Department, which has increased from

approximately 6 person years in 2006 to 19 in 2015. The Arctic Geophysics Department has for a long time been the largest in terms of person years.

During the 1993–2012 period, 23 different people have been employed in positions as full professors, 51 in positions as associate professors, 22 as postdocs, 60 as PhD candidates, 51 as adjunct professors/associate professors, and 20 in other scientific positions. In addition, 64 people have been employed in administrative positions and 38 in technical positions.

Compared to universities in Norway, the proportion of professors is lower at UNIS, whereas the number of associate professors is higher. This is probably a consequence of the institution's young age, and the fact that until 2009 only three year contracts were provided. UNIS also has an unusually high proportion of personnel in adjunct positions, which reflects UNIS's strategy to hire external professors for teaching and research purposes, ensuring also good cooperation with Norwegian mainland universities.

The different groups of scientific staff have varied in size over the 20-year period. One notable change is the increasing number of person years carried out by PhD candidates, particularly after 2001, when UNIS was, for the first time, assigned PhD students as part of its funding from the Ministry for Education and Knowledge. UNIS cannot award PhD degrees (exams are taken at the home institutions), but has been the employer of a significantly increasing number of PhD candidates. Over the course of 2006–2008, the number of professors has also grown substantially.

UNIS is characterised by a very international profile both in terms of staff and students. Through time, numerous foreign scientists have been recruited for academic positions at UNIS; on average only 30% of the PhD candidates have been Norwegian. Of the work years carried out by professors during 1993–2012, 53% have been by Norwegian citizens. The proportion of Norwegian citizens working as associate professors is 63%, for the postdocs 60%, and adjunct professors/associate professors 80%. The greater majority of technical and administrative personnel have been mainly Norwegian (95%). Staff from Germany account

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for the largest number of work years carried out by foreigners (50), followed by Denmark (46), the UK (32), Sweden (29), Russia (25), France (14) and Finland (13). Staff from other countries has carried out a total of 60 work years.

UNIS only started offering permanent positions in 2009. Before 2005 staff was employed for a fixed term of 3 + 3 years. From 2005 and until the permanent positions were introduced, staff could apply for an unlimited number of additional three year periods. As a consequence, there has been a high turnover in the UNIS staff until the changes in 2005 and 2009. The number of new appointments is higher than the number of terminations for most years, thus the number of employees has grown. In recent years, the turnover has been much lower and there is more stability particularly in the scientific staff. In 2014, mobility of the staff of UNIS was calculated to be about 10%. Of the total staff, six scientists and six people in technical/administrative positions have been working at UNIS for more than 10 work years.

## Scientific Production

In total, almost 1,300 UNIS publications were published during the period of 1993–2015. The annual number has gradually increased to 124 publications in 2012, as well as in 2015 (Fig. 2). The main reason for this growth is that UNIS has increased considerably in size and number of scientific staff during this period. There is large interannual variation, but all departments have had a significant increase in the volume of publications.

During the period, UNIS has developed into a major contributor to Norwegian polar research. This was documented in a recent analysis of Norwegian polar research (Aksnes and Rørstad 2015). Among the Norwegian universities and institutes active in polar research, UNIS ranks as number five, after the University of Tromsø, the University of Oslo, the University of Bergen, and the NPI in terms of the number of polar research articles for 2010–2014. When considering the publications related to Svalbard only, UNIS ranks as number one.

The staff at UNIS has been active in research covering a variety of topics. Some indications of the content of the research can be obtained by analyzing the titles of the publications quantitatively. The results of analyzing the word frequencies in titles are presented in Figure 3, where the size of a word is proportional to the number of times the word appears in the titles. By far, the most frequently appearing words are *ice*, *Arctic*, and *Svalbard*, with frequencies in the range of 170 to 190 times. Then follow the words *sea* and *high* as the fourth and fifth most frequently appearing words.

Research at UNIS has not been limited to Svalbard only. Throughout the years, the scientists have been involved in research in many parts of the Arctic. An indication of this may be provided by identifying geographical terms in titles and abstracts of the articles (Fig. 4). Svalbard and Svalbard areas accounted for more than 420 unique publications or 45% of all UNIS publications (Fig. 4). This suggests that more than half of the publications are not specifically related to Svalbard. An important example here is the marine research carried out in seas and waters beyond the coastline of Svalbard. As an example, there are 67 articles in which Greenland appears in the titles or abstracts. It should also be taken into account that some publications may be based on observations or measurements in Svalbard without mentioning the archipelago in the titles and abstracts.

## Scientific Collaboration

Co-authorship is a commonly used indicator of research collaboration. When researchers from different institutions author a publication together, this indicates that the research has involved collaboration. On this basis, co-authorship can be used as an indicator of national and international collaboration. Increasing collaboration in publications is an international phenomenon, and is one of the most important changes in publication behaviour among scientists during the last decades, particularly within the natural sciences.

Of all of UNIS's publications (1994–2012), 68% had co-authors from other countries. Thus, the extent of international collaboration is wide, apparently involving the majority of UNIS research. The proportion of international collaboration has varied from 53% to 80% during

the 20-year period, with no systematic trend (Fig. 5). UNIS's high rate of international collaboration may be partly caused by the turnover of positions at the institution, and the fact that many researchers have been recruited from abroad.

The UK is the most important collaborating nation. More than a quarter (27% or 226 articles) of the UNIS articles had co-authors from the UK. Next follow the USA, Denmark, and Sweden with proportions of 20, 11, and 10%, respectively.

The universities in Tromsø and Oslo rank at the top of the list of institutions with collaborative articles (190 and 189 collaborative articles respectively during the period of 1994–2012). Thus, almost one quarter of the UNIS articles also had co-authors from each of these institutions. It should be noted, however, that when a researcher at UNIS reports dual address affiliations in the publications (e.g. due to an adjunct position at UNIS), this will be recorded as a collaborative article. If such articles had been removed, the figures would have been lower, particularly for the Norwegian institutions. The University of Bergen follows as the third most frequent collaborative partner with 120 articles. NPI ranks highest among collaborative institutes by being the fourth largest overall partner with 82 joint articles (Fig. 6). Thus, NPI seems to follow the strategy recommended for polar institute managers to aim for a close collaboration with the university sector (Summerhayes 2015). Likewise, institutes such as the Norwegian Institute of Nature Research, the Geological Survey of Norway and Akvaplan Niva have had productive scientific collaborations with UNIS. Of the foreign universities, the University of Copenhagen, the University of Alaska, and the University of St. Andrews appear with the highest number of co-authored publications (Fig. 6).

## Education

For the first semester, UNIS received 37 applications from Norwegian students, of which 23 were granted admission for the academic year 1993/1994. Five courses were offered at the basic level by the two scientific departments. 38 students, including a few international students, were admitted to nine courses in the academic year 1994/1995. From 1995, UNIS attracted the first master's students, who collected data and wrote their master's thesis at

UNIS. At the same time, the student population became increasingly international (about 25%). The number of courses offered increased to 15 in 1995, and it was decided that all teaching should be conducted in English. UNIS offers research based education at bachelor, master and PhD level.

Starting in 1997, UNIS has offered some specialized interdisciplinary courses and mandatory safety courses. In 1998 the first 24 students finished their master's theses, the number of international students exceeded 45%, and the course portfolio reached 33 courses in the four scientific departments.

Due to the insecure economic situation in 1999, the number of courses decreased; the number of students remained stable, but the proportion of foreign students reached approximately 50%. UNIS celebrated its 10-year anniversary in 2003. By then 279 students were admitted, of which 63 % were international, and representative of 28 different nations. UNIS became a member of The University of the Arctic (UArctic), and has since 2004 operated the UArctic Field School Secretariat. When UNIS facilities were expanded by moving into the Svalbard Science Park in 2005, the learning environment was significantly improved and the annual student number increased to 331. After a budget reduction in 2008/2009, the number of students and courses offered declined; this followed well into 2010. From 2011, the number of students increased and 459 students attended UNIS courses that year. The ratio of foreign students remained high (59%), and they represented 31 different countries.

In 2012, 467 students from 23 countries studied at UNIS (Fig. 7). The proportion of international students was 53%. There were several UNIS courses which then had a waiting list of students, as the maximum number of students attending each course is typically around 20 due to fieldwork and excursions. The number of applications increased by 21% from 2011, totalling 1,487 applications for the 61 courses offered in 2012. The increase from 37 applications for 9 subjects in 1993 is evident, and indicates that UNIS has established itself as a competent and reputable university institution in the Arctic. The increase in number of students has continued in recent years also, and by 2014 about 600 students studied at UNIS (Fig. 7).

The number of students at each scientific department has varied through time. It is closely related to the available courses, as several UNIS courses are offered every other year, due to limitations in the available teaching resources. Most students take more than one course and are therefore included for each course separately. Over the years there has been a shift in focus regarding the courses offered. Until 2005 more student credits were produced at bachelor's level. Recently, more courses have been offered at the master and PhD levels, and hence, more student credits are produced at this advanced level.

Over the years the number of international students has increased annually (Fig. 7). Since its establishment, UNIS has had very good collaboration with other academic institutions, primarily the Norwegian universities, but also with other universities within the circumpolar area. This, and the fact that all education at UNIS is in English, attracts large numbers of foreign students, despite no systematic marketing of UNIS study opportunities to students outside Norway. Allocations from the Ministry of Foreign Affairs and the Norwegian Centre for International Cooperation in Education (SIU) have partly contributed to the high numbers of international students by providing good scholarship schemes for Russian, Canadian and American students.

In total, 72 candidates have received PhD degrees during the period of 1996–2012 from studies at UNIS. The Arctic Geophysics Department accounts for the highest number of the degrees (27). These numbers include PhDs fully or partly conducted at UNIS, while the degrees themselves have been awarded by the students Norwegian or international home universities. In total, 53 of the PhD degrees have been awarded by Norwegian universities and 19 by international universities.

## Discussion

As UNIS is a unique institution as a high Arctic university centre relying on cooperation with the all the Norwegian universities on an equal basis, benchmarking its development and output with other organisations is not straightforward. However, there are more than 900 field

stations scattered around the world (Anon., 2014), so some comparisons are possible, even if UNIS is not to be considered a field station. The almost 1300 publications produced during the first 23 years of UNIS compares well with the over 3000 publications produced at the La Selva Biological Station during a fifty-year period from 1956–2007 (Michener and others 2007). Likewise, the total scientific production at UNIS is of the same level as that of the Rocky Mountain Biological Laboratory (RMBL) which by 2011 reported more than 1300 publications (Inouye 2013). The annual publication rate at UNIS of more than 120 publications a year lately is, however, higher than that of RMBL by about 35 scientific publications a year (Billick and others, 2013). The more than 70 PhD dissertations based on education and research at UNIS compares well with the about 100 based on the activities at RMBL (Inouye 2013).

To have produced approximately 1,300 scientific publications through the first 23 years of its operation, shows that UNIS is becoming an important Arctic institution. UNIS is recently identified as number 15 on the list of top 25 UArctic members in terms of size of funding for Arctic research for the period 2006-2015 (Osipov and others 2016), and the 32th largest in terms of number of Arctic scientific publications in the years 2011 – 2015 (Aksnes and others 2016). Scientific productivity, in terms of number of publications per researcher, is higher for UNIS than at comparable main universities in Norway (Aksnes 2013). A factor which is likely to contribute to this high productivity is that the scientific personnel at UNIS spends 40 % of their time on education and 60 % on research. For the main Norwegian universities there is generally a 50/50 distribution. In addition, the scientific staff at UNIS have the right to apply for sabbatical leave to focus on research every fourth year. Finally, UNIS provides basic financial research support to all scientific staff, thereby enabling an increase in research activity.

As we have outlined, science and education have become major pillars upon which the Longyearbyen community is based. Two of the three other Norwegian settlements in Svalbard are based mainly on scientific activity already. In Ny-Ålesund, the Norwegian company Kings Bay, facilitates research stations for institutes with polar interests from 14 nations. In winter, a staff of about 30 maintain the village with some scientists staying as well, and in summertime there are scientists in all stations and hectic activity. Cruise vessels are allowed



to enter, subject to permission. The mining company SNSK is still present in Sveagruva, but the board has decided to put the mining operations there on hold. This decision was recently supported by the owner, the Norwegian Government. Still, there will be some activity in Sveagruva to maintain the facilities. Sveagruva, with its access to the Van Mijen fjord that freezes regularly during winter, is also much used for scientific and educational activity. In fact, the use of the infrastructure at the settlement is also rapidly moving towards educational, research and tourism activities and away from coal mining.

Maintaining Longyearbyen as a modern, high-quality Arctic family community has long been one of the main priorities of Norwegian Svalbard policy. With the ongoing reduction in traditional coal mining, other public and business activities need to scale up to compensate for the loss of workplaces. In the strategic business plan for Svalbard (Longyearbyen Town Council and Svalbard Business Association 2014), developed by the Business Association of Svalbard in cooperation with the Local Board of Longyearbyen, it is suggested that education and research might double in the years to come. UNIS is specifically said to have the potential for such a development. However, it might be challenging for the further development of UNIS and other Norwegian research organizations such as NPI, to fully compensate the loss of work places in the coal mining industry (Misund 2017, Longyearbyen Town Council and Svalbard Business Association 2014). Other businesses like tourism, logistics and other services might also have to be developed further if the population number of Longyearbyen shall be maintained (Longyearbyen Town Council and Svalbard Business Association 2014). However, so far the population of Longyearbyen has not seen any large reduction. Indeed, tourism has expanded during the last few years and contributed to keeping the population number in Longyearbyen stable. However, the tourism industry is characterized by high work force turn-over, international recruitment and many young, single employees. This is not ideal in so far as the Norwegian authorities want to promote a stable family-based community, preferably with a high rate of Norwegian citizens. Lately, the number of school and pre-school children in Longyearbyen has been reduced, as well as the proportion of Norwegian citizens. Whether the growth of tourism also will result in higher population turn-over in the coming years remains to be seen. In comparison, UNIS staff represents a relatively stable family dominated element of the Longyearbyen community, whereas the students of course contribute to a higher general mobility rate.

In view of the downscaling of the coal mining industry and the expectations of the local community, the UNIS Board in December 2014 decided that UNIS could develop further to play a larger role in Longyearbyen. This should be based on maintaining high quality in education and research, high Arctic relevance and continued cooperation with the Norwegian universities.

Throughout 2015 the UNIS Board made further decisions concerning the development of UNIS. In September 2015, as input to the new White Paper on Svalbard, the Board communicated to the Ministry of Education and Research that UNIS could double in size in the coming years. This may be done by strengthening the existing scientific areas and/or adding new scientific areas, but is dependent on expanding the physical infrastructure, as Svalbard Science Park is fully used. Suggestions for new thematic areas included Arctic safety, tourism, climate change and energy transfer, and selected areas in the humanities and social sciences. At the request of the Ministry of Education and Research, UNIS outlined in December 2015 how further development could be carried out.

The field of Arctic safety is being developed on the basis of the existing safety courses given to all new students and external partners before doing fieldwork in Svalbard. Safety training and natural science observations already carried out at UNIS such as within meteorology, snow distribution for avalanche danger, glacier dynamics, biological threats and protection from freezing, navigation, first aid, snow mobile driving and polar bear protection (flare gun, rifle) are included in combination to obtain the best and safest Arctic field operations. The first grant for developing this field was provided by the Ministry of Foreign Affairs Arctic 2030 programme in autumn 2015 for a three-year planning project of an Arctic Safety Centre at UNIS with national and international partners. Increased human activity in the Arctic and improved technologies are expected in the years to come, and safe operations based on increased understanding of the processes involved are necessary to ensure the best conditions for life, infrastructure, research and education in the Arctic.

At Svalbard, tourism, research and governance seem to have developed in a symbiotic relationship (Viken 2011). For a long time, there has been a demand for qualified and experienced tourist guides. A two semester Arctic nature guide (ANG) study at Svalbard was started in 2009 through a cooperation between the Svalbard tourist industry, UNIS and the Finnmark University College in Alta, Norway. This study is now part of the University of Tromsø curriculum as Finnmark University College merged with University of Tromsø in 2011. The local tourist company organisation Visit Svalbard has suggested that the ANG study might get developed into a full bachelor's degree at UNIS.

As early as 1996, the UNIS Board appointed a committee of university representatives to draft courses within the humanities and social sciences. Its report the following year outlined several course opportunities within history, archaeology, political science, international law, and languages. The plans were never implemented, although some elements have been realised either as separate courses (e.g. "The History of Svalbard") or as individual lectures in other courses (e.g. on law in "Arctic Environmental Management"). Obviously, there might be potential to expand the scientific profile of UNIS to include selected fields in the humanities and social sciences that are particularly relevant for Svalbard and the Arctic.

As expected, the new White Paper on Svalbard (Ministry of Justice and Public Security 2016) gave rather clear indications about the further development of UNIS. The organisation should be strengthened based on the natural prerequisite of its location, in cooperation with the Norwegian universities, and a balance of 50% Norwegian and 50 % international students should be the aim. In these indicators there were both directions for the future development of the organisation, but also implicit criticism of the way the organisation has been developed so far. The government undoubtedly recognised the importance of the organisation, and suggested further development in cooperation with the Norwegian universities and in accordance with its location in the high Arctic, meaning that natural science themes, such as those already established (Arctic Biology, Arctic Geophysics, Arctic Geology and Arctic Technology), should be the basis for the research and education activity. But new topics, such as those suggested by the Board in autumn 2015, can also be interpreted to be included in the "natural prerequisite of its location".

The percentage of Norwegian students permitted to study at UNIS has become somewhat too low, according to the government (Ministry of Justice and Public Security 2016). This is being addressed by the quota system allowing Norwegian universities to have quota places for their students in UNIS courses since 2015. At the same time increasing cooperation between UNIS and the Norwegian universities has been initiated with the aim to have more Norwegian students study at UNIS. Thus, the strategic and political goals of the institution also become visible: UNIS is there to secure Norwegian interests at Svalbard, and civil presence through Norwegian students and staff remains important.

How to reach this balance between Norwegian and foreign students will be a central issue in the cooperation with Norwegian universities in the years to come, and was the main issue on the agenda for the dean meeting in August 2016. Most likely, the criteria for intake of students must be adjusted to give priority to Norwegian students. UNIS is financed by the Norwegian state, so the priority for Norwegian students is logical and justifiable. At the same time it is also very important to notice that such a small, but very specialised and unique institution has managed to attract so many international students, without any systematic effort and without much financial support for international students, to live and study at 78°N. This shows the need and value of developing UNIS.

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## Figures

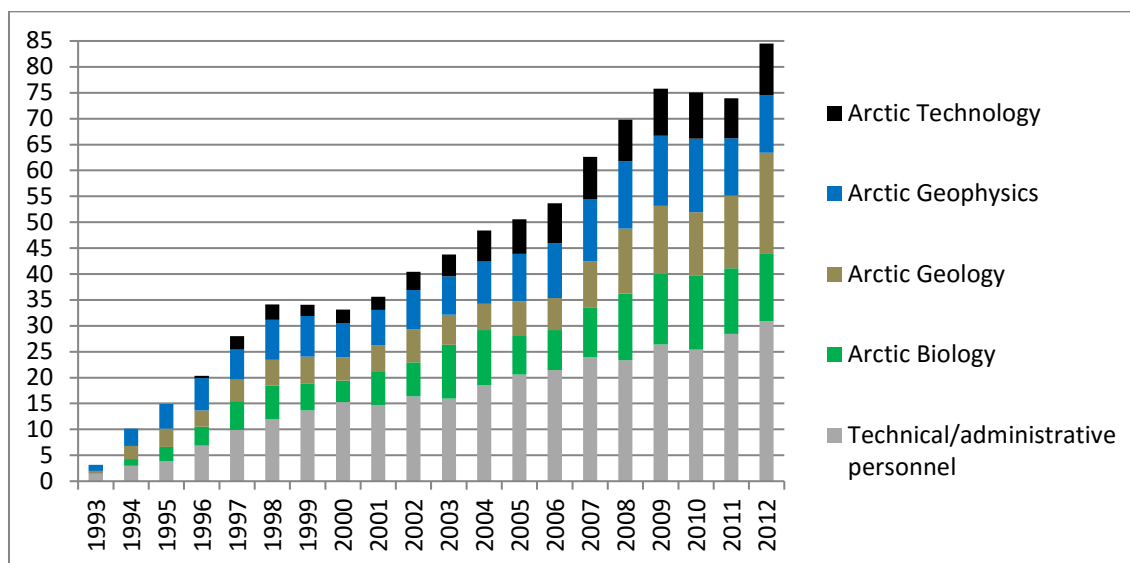


Figure 1. UNIS work years by departments

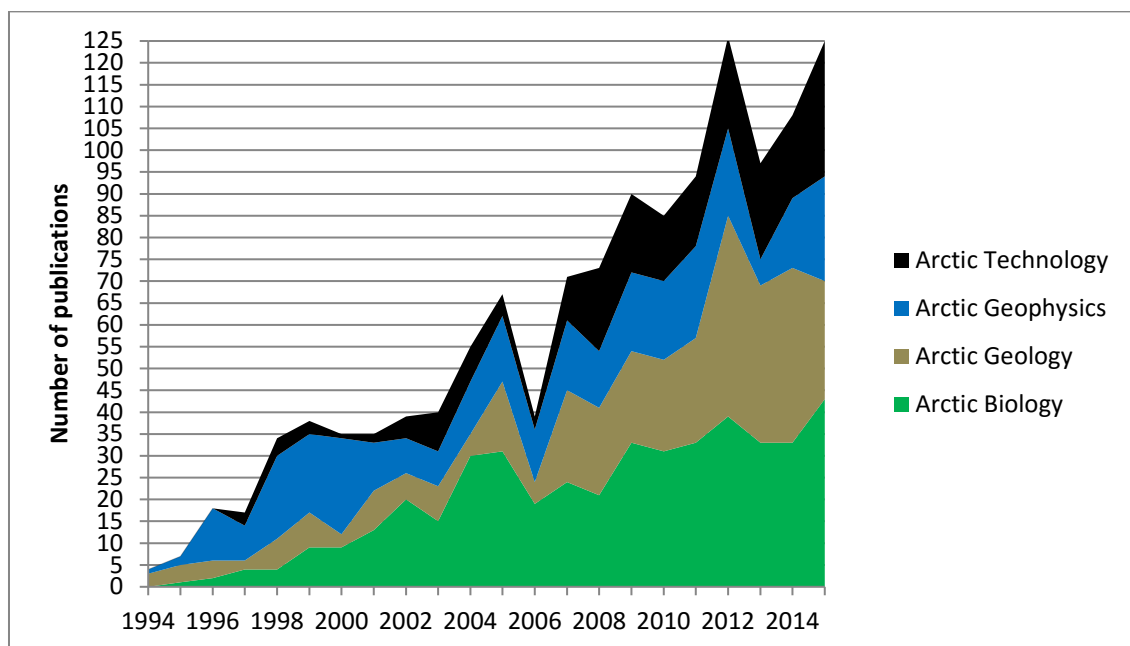


Figure 2. Publications by department 1994–2015\*

\* A few publications are co-authored by scientists from more than one UNIS department. These are multiply counted in the figure. From 2013, only publications listed in the CRISTin system have been included.



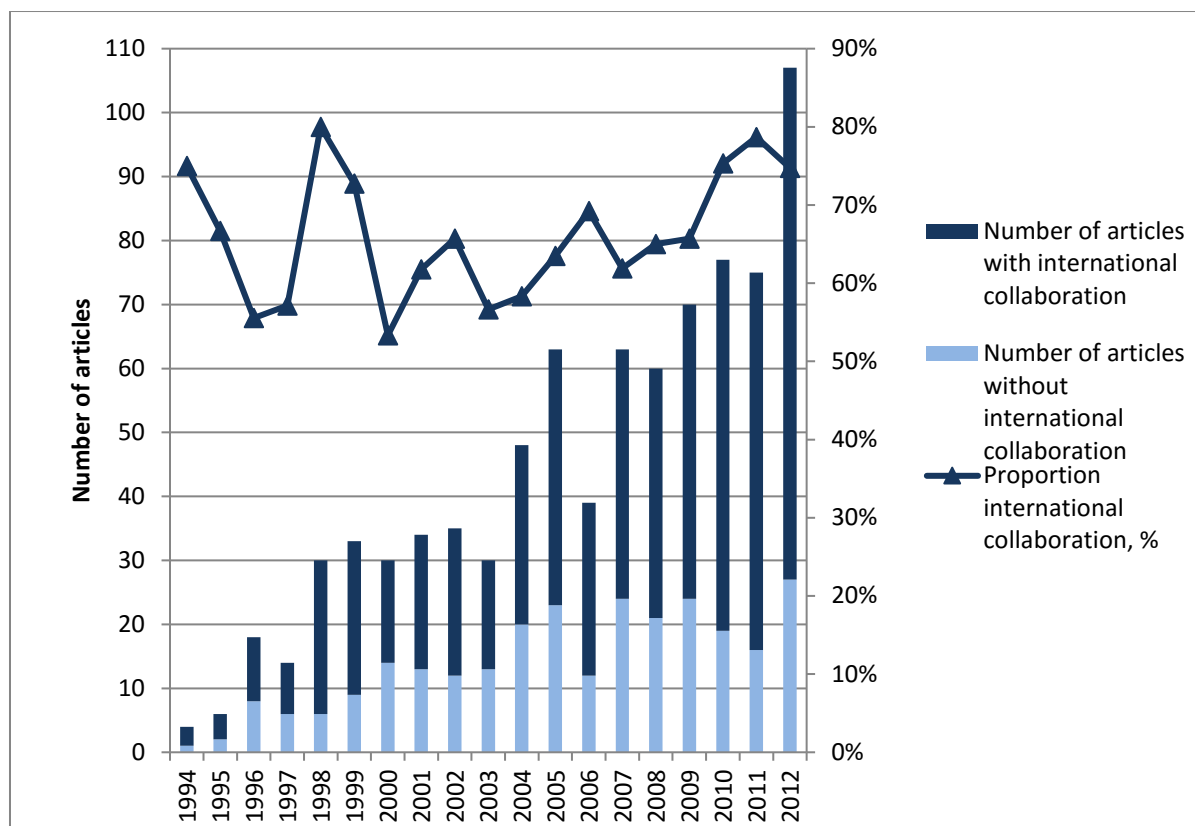


Figure 5. Number and proportion of UNIS articles with international collaboration, 1994–2012



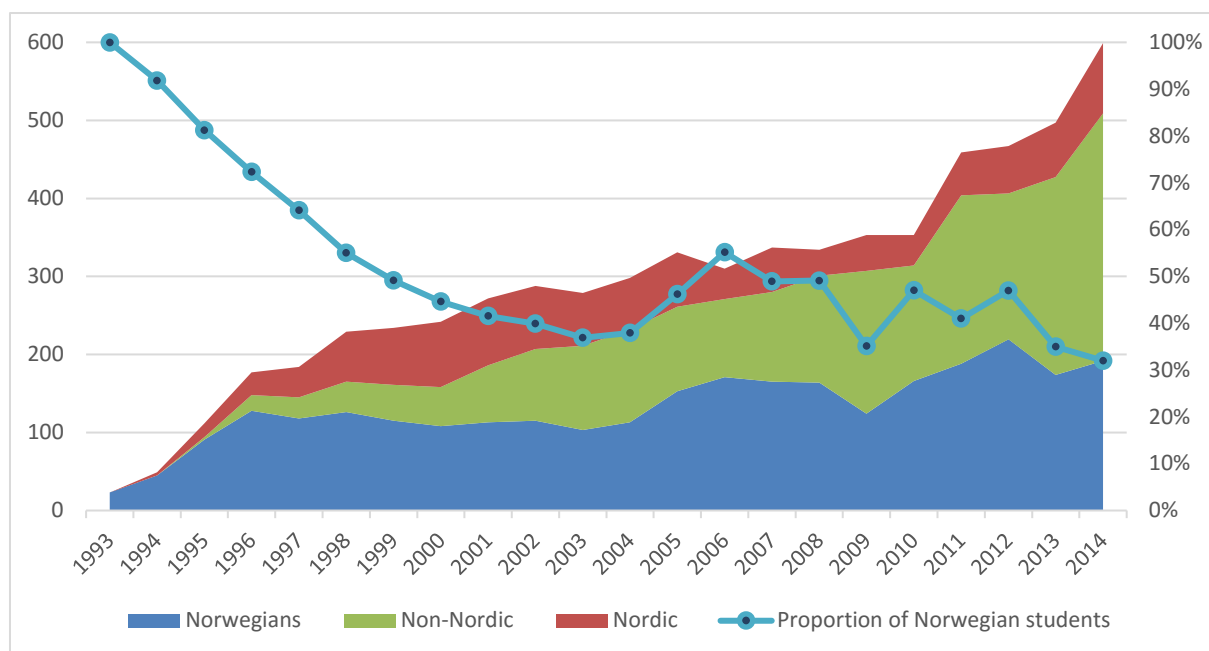


Figure 7. Number of UNIS students from Norway, the Nordic countries and non-Nordic countries, 1993–2014. This way of showing data means that international students studying in Norway, and applying from there to UNIS, will not be registered as from Norway.