



Research – the road to progress

Greenland's National Research Strategy

2022 — 2030



Front cover photo:

Launch of the last ozone balloon at Summit Station in 2018. For more than 30 years, regular measurements with balloons have recorded changes in the concentration of ozone in the atmosphere. This balloon marked the conclusion of many years of work at Summit Station. (Lars Demant-Poort, Ilisimatusarfik).





Students in JSEP, the Joint Science Education Project, drill a hole in the icesheet at point 660 to install an ablation stake. (Lars Demant-Poort, Ilisimatusarfik).

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LIFE
ON LAND





NAALAKKERSUISUT
GOVERNMENT OF GREENLAND

Research – the road to progress

Greenland's National Research Strategy

2022 — 2030



Ministry for Education, Culture, Sports and Church

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Foreword

When the world at large proclaims that it embraces lofty ideas like *sustainability* and *circularity*, they are referring to things that we have always known. Our ancestors taught us that all people, animals, lakes, mountains and plants are imbued with an innate soul, the *inua*, and when hunters kill an animal, it is important to release its soul so it can form a new life. This is the core of the sustainability message: that we must treat people, animals and the environment in such a way that we can regenerate naturally and allow the circle of life to remain unbroken.

This is also the aim of this research strategy. We have an obligation to use research to engender growth and enable people, wildlife and the natural world to thrive today, while ensuring the well-being of future generations. Greenlandic researchers and institutions are already doing high-quality work, and we need to continue to harness the potential of our human, technological and logistical resources to enhance our capabilities in research and sustainable development.

Global warming has put Greenland in a unique position. The impact of

climate change on our ice sheet means that the entire world faces major challenges and that it is essential to monitor Arctic ecosystems to aid global efforts aimed at achieving a stable climate. At the same time, this new situation provides an opportunity to plumb the depths of the ice cap and the heights of space, which hold many of the secrets of our planet's origins. The world has never been more interested in Greenland as a research destination, and we need to strengthen our position to continue to offer researchers ideal conditions and services to conduct research in and around our country.

But Greenland is about more than just ice and climate indicators. We are a modern people who have lived in harmony with this environment for millennia, and we have always adapted and coped with the challenges that nature has thrust upon us. With this research strategy, the Government of Greenland — Naalakkersuisut — intends to highlight the need to anchor research in the country and ensure that local and international researchers' understanding of our challenges and opportunities serves the people of Greenland.



We must be ambitious and visionary with innovative ideas, and the research community must work together with the business community to optimise the use of our human and natural resources in a sustainable way. Children and young people are our most precious resource and their development needs to be fostered through easy access to education and the latest knowledge. As we forge ahead, research must be based on Greenlandic ethical guidelines, researchers must include more indigenous and local knowledge in their studies, and the results must be made widely available and used to promote development and secure the future of our modern society in a globalised world.

The society of the future has already arrived. Everyday life is shaped by high-tech solutions and our lives are becoming increasingly digitalised. While research generates vast amounts of data about our behaviour and the world around us, we need to be highly ambitious about how we acquire the skills to understand, contribute to, parse and make use of this data ourselves. It is important that young and old alike realise

that knowledge is the way forward and the world of research should be accessible to us all, for generations to come.

Peter Olsen

Minister for Education, Culture,
Sports and Church



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Excavation of Norse hay-fields, Qunnermiut, South Greenland. (Ian A. Simpson).



The scope of the research strategy

Greenland's National Research Strategy lays out the vision and overarching research goals of Naalakkersuisut for the period 2022-2030. This is the first national strategy for research in Greenland.

It is based on the fundamental premise that research shall be conducted freely and independently. The aim of the strategy is to ensure a sound institutional, ethical and economic framework for research in Greenland — not to determine the substance of specific research or the priorities of individual types and topics of research.

The strategy covers all research activities carried out in the country. Within this context, research is defined as the systematic, objective study of a subject. This includes strategic research, applied research and basic research; see the fact box. The area of education is not covered by the strategy, which is limited to scientific studies carried out at a PhD level or above. It should be noted that research articles are often published on the basis of postgraduate theses.

The 17 UN Sustainable Development Goals (SDGs) are an integral part of

the work of Naalakkersuisut. Accordingly, the initiatives set out in the research strategy must contribute to achieving these objectives. There is no single SDG that addresses research, but knowledge and development are a prerequisite for achieving these goals.

The current research strategy has been compiled in collaboration with the Greenland Research Council and all research institutions in Greenland.

The local research community

The research community in Greenland is well established and conducts high-quality research. However, research institutions must continue to be developed and strengthened so that they can continue to serve as the foundation for high-quality, locally based research. There is considerable interest in conducting research in Greenland and inviting the Greenlandic research community to participate in international research projects.

The Greenlandic research community is primarily comprised of the University of Greenland, including



*Collecting plankton in Nuup Kangerlua with a bongo net.
(Mie HS. Winding, Greenland Climate Research Centre).*





the Centre for Health Research, the Greenland Institute of Natural Resources, the Greenland Climate Research Centre, Asiaq, Arctic DTU Sisimiut, Steno Diabetes Centre Greenland, the Greenland Research Council and the International Arctic Hub. Several other Greenlandic institutions also carry out research, including the Greenland National Museum & Archives, Statistics Greenland, the Greenland Language Secretariat (Oqaasileriffik), the Greenlandic Health Service and the work of the Greenland Government Authorities in the area of basic geoscience research.

There are a number of research stations scattered throughout Greenland, improving researchers' ability to access regions of the country that might otherwise be difficult to reach. Descriptions of the Greenlandic research institutions and stations can be found in the Appendix.

Coordination and cooperation are priorities

The research institutions have developed strong and well-functioning interdisciplinary collaborations, which provide a basis for further

development. In addition, collaborative research is well established within the Danish Realm and with researchers and research institutions in other countries.

Greenland Research Council

The Greenland Research Council was established in 2014 as an independent organisation for the purpose of advising on research in Greenland and granting research funds. Research institutions and relevant stakeholders in Greenland nominate candidates for the eight member positions on the council, which serve three-year terms. Council members must represent all areas of research.

The Greenland Research Council evaluates PhD and postdoc applications and annually allocates grants from the state budget for research projects and promotes research. The Research Council's annual reports list the projects that have received grants. The Research Council also collaborates with research institutions in other countries, and it helps to advise on the coordination and prioritisation of research activities in Greenland.



International Arctic Hub

Working together with the Danish government, Naalakkersuisut has established the International Arctic Hub (Arctic Hub) with the aim of providing a central platform for Greenlandic, Danish and international polar researchers and Arctic stakeholders.

The Arctic Hub builds bridges between research, communities, education, business, government and international stakeholders. Through a wide range of outreach activities, the Arctic Hub will ensure that knowledge from research is more visible and accessible, including:

- Contributing to the creation of local contacts and collaboration opportunities that pave the way for conducting international research in Greenland
- Facilitating the convergence of stakeholders from different countries, segments, disciplines and levels
- Facilitating dialogue and knowledge transfer between researchers and the general public

The objectives also include ensuring a clearer overview of research projects and activities taking place in and around Greenland. Furthermore, the aim is to raise awareness of funds and funding opportunities, and to guide good practice for citizen involvement in research activities.

Higher education

It is important that the research carried out in Greenland is also applied to social development and education.

At the University of Greenland (Ilisimatusarfik) in Nuuk, students greatly benefit from the expertise passed on by local researchers in health sciences, social sciences, humanities and technology. It can also be beneficial for education when other researchers who have projects in the country teach students while they are here, or when students are given an opportunity to participate in research projects and contribute to the knowledge generated in Greenland.

By establishing a basic natural science programme in Greenland, the



invaluable knowledge accumulated by scientists in Greenland and in research projects around the country will be passed on to our young people and students, who are to help lead us into the future. In addition, our students will have an opportunity to learn about Greenland in their own language and in their own country.

Fact box: strategic, applied and basic research

Strategic and applied research are original studies undertaken to acquire new knowledge and directed primarily towards a specific, practical aim or objective. Basic research is experimental or theoretical work undertaken primarily to acquire new knowledge without any particular application or use in view (OECD Frascati Manual, 2015).



Biodiversity of the ocean seabed in Disko Bay, at the rocky cliffs of Egedesminde Dyb. Colony of sea anemones and sponges. (David Blockley & Diana W. Krawczyk, Greenland Institute of Natural Resources).



The vision and goals for research in Greenland

Greenland's National Research Strategy outlines the political vision for research in Greenland. This vision is laid out in four overarching objectives and a series of initiatives for the period 2022-2030.

Fortunately for Greenland, there is great and growing interest in the country, and Arctic research can contribute both to maintaining sustainable social development here at home and to addressing challenges around the world.

Naalakkersuisut would like to highlight the importance of research, both locally and internationally. Hence, the vision of Naalakkersuisut is that:

Research must benefit Greenland and have an international outlook.

Research in and about Greenland must primarily be of benefit to Greenland. This is the case, for instance, when it stems from or involves the Greenlandic research community, or when it is based on indigenous and local knowledge. It is also essential that new knowledge be accessible and can be used by the business community, policy makers and the general public to address

social challenges, including the overall state of public health, both in physical and mental terms. Research in this area can help to lay the foundations for building resilience to future changes in the Arctic.

Research on children and young people must help to assess their health and well-being, and thus contribute to focusing on their everyday lives and future prospects in society.

Research must also address climate and environmental issues and provide a sound basis for new business pursuits that emerge from studies and scientific activities. This will allow us to improve our economy and extend prosperity to all segments of society.

Much of the research conducted in the Arctic focuses on issues of worldwide interest like climate change. This makes it important to consider the indigenous, local and international perspective. Our ambition must be to lead the way in ensuring high-quality Arctic research along with a framework that can help to address global challenges. We must continue to prioritise cooperation among local and international researchers, and we must ensure that



the results of research in Greenland can also be used outside the country's borders, so that they benefit other communities, especially in the Arctic, and thus contribute to safeguarding the interests of the peoples of the Arctic.

Based on this vision for the field of research, four overall objectives have been formulated that provide the framework for Naalakkersuisut's research policy:

- Research must be anchored in Greenland
- Research must foster sustainable social development
- Research results must be easily accessible for all
- Research efforts must be at an international level

The initiatives that Naalakkersuisut will prioritise to uphold and enhance these four overarching objectives are listed below and described in detail in the following chapters.

Goal 1: Research must be anchored in Greenland

It is inspiring that many people come to Greenland to conduct scientific studies, and Naalakkersuisut intends to ensure that research is more firmly anchored here in Greenland through closer cooperation with local stakeholders. Combining indigenous, local and specialist knowledge can benefit both domestic and international research. Enhancing the link between research and the local community requires that local research institutions possess the expertise and resources to define the course of research in Greenland and to participate in international research projects. It also requires ample opportunities for networking between researchers, industry, the general public and other stakeholders.

Naalakkersuisut aims to contribute to the ongoing development and consolidation of research throughout the country, and to the development of an effective framework for coordination and collaboration.



Initiatives:

1.1 Naalakkersuisut aims to strengthen local research institutions on an ongoing basis by expanding the physical infrastructure of research institutions, improving opportunities for collaboration and providing more resources for participation in local and international Arctic research.

1.2 Naalakkersuisut aims to create a more comprehensive overview of research activities in the country by the end of 2024 by requiring all research projects in Greenland to be entered into a central directory.

1.3 Naalakkersuisut aims to work with relevant research stakeholders to develop ethical guidelines for research in Greenland by the end of 2022.

1.4 Naalakkersuisut aims to support work to identify and expand the use of indigenous and local knowledge in local and international research.

Goal 2: Research must support sustainable social development

New knowledge is an important key to development. Intensifying our research efforts can help us to meet future social and environmental challenges and develop new industries that can generate economic growth. Society needs to evolve from being based on a few primary industries to exploiting more of the vast resources and potential we have in our country. In response, Naalakkersuisut aims to ensure that there are sound conditions for research that can contribute to the sustainable development of our society. Furthermore, the Government will strive to strengthen capabilities in cloud-based solutions to ensure long-term data protection and support our technological infrastructure. It is Naalakkersuisut's hope that a greater focus on the importance of research for society will also boost interest in education and in the opportunities to pursue a career in the sciences.



Initiatives:

2.1 Naalakkersuisut aims to enhance the conditions for basic, strategic and applied research and their use in developing sustainable solutions to our future social challenges and opportunities.

2.2 Naalakkersuisut aims to enhance the conditions for private-public research collaborations and to increase the focus on business development through applied research.

2.3 Naalakkersuisut aims to support Greenlandic research institutions in their efforts to get the word out about research careers and to increase funding for PhD and post-doc programmes for Greenlandic researchers.

2.4 Naalakkersuisut aims to optimise cooperation with research institutions and Statistics Greenland on the development and use of research statistics.

Goal 3: Research results must be easily accessible to all

Today, it can be difficult to gain an overview of the research carried out in Greenland and to access the results. To maximise the benefits of research, information must be accessible — to researchers, policy-makers, industry, public authorities, students and the general public. Naalakkersuisut will therefore work to increase the accessibility of knowledge on research projects in Greenland, and on the results of this research, and to actively disseminate this knowledge.

Initiatives:

3.1 Naalakkersuisut aims to establish a working group to present a proposal for a national research data policy.

3.2 Before the end of 2023, Naalakkersuisut aims to ensure that information on all research projects in Greenland is made available via a public online research portal.



Goal 4: Research efforts must be at an international level

High quality international research is already conducted in Greenland, but it will take commitment and resources to ensure that research activities are intensified, and that quality remains up to international standards. Naalakkersuisut aims to encourage both public and private stakeholders to prioritise funding for research. The Government also intends to make our country even more attractive as a research destination and as a recipient of international research funding.

For the Arctic regions, and Greenland in particular, it is extremely important to have in-depth knowledge of sea ice conditions. For many local communities, sea ice plays a major role in the development and maintenance of infrastructure, and in the pursuit of hunting and fishing.

Initiatives:

4.1 Naalakkersuisut aims to ensure that aggregate research funding from the Treasury, research

institutions and public and private companies amounts to at least 2.3% of GDP by 2030.

4.2 Naalakkersuisut aims to prioritise collaborative research with governmental and supranational bodies, and to take part in international research forums with a focus on research in the Arctic.

4.3 As a special initiative, Naalakkersuisut intends to give priority to supporting the UN Decade of Ocean Science for Sustainable Development (2021-2030) by establishing a 10-year ocean research programme.

An increase in expenditure is expected for certain initiatives (especially 1.1, 2.3, 3.2, 4.1 and 4.2), which may require prior analysis of anticipated resource allocation, with subsequent specification of a funding model to be submitted to Naalakkersuisut for approval.



1. Research must be anchored in Greenland

It is the Government's goal to forge closer ties between the research conducted in Greenland and the Greenlandic community. The expectation is that embedding research at the local level will both improve the quality of the science and provide value and relevance for society at large. Anchoring involves fostering local initiatives and grassroots participation in research projects and promoting the local use of findings, as well as encouraging more international research to take place in Greenland.

We can strengthen the connection between the research conducted here and our country by ensuring that Greenlandic research institutions have the resources and physical facilities to initiate and engage in international research projects. Furthermore, it must be easy for relevant local and international stakeholders to become involved in and collaborate on research — and this concerns everyone from researchers, research institutions and students, to policy makers, civil society organisations, the general public and the business community. This requires a solid framework and guidelines for coordination and

cooperation, including the means to safeguard and incorporate indigenous and local knowledge.

1.1 Research institutions must continue to expand

Naalakkersuisut will work to enhance and expand the Greenlandic research community over the coming years. This includes aspects such as the physical infrastructure, collaboration and resources to initiate and participate in research projects.

Ongoing enhancement of the Greenlandic research environment is necessary to ensure continued high-quality local work. This approach will also ensure that local bodies and institutions have the necessary resources to invite a growing number of external researchers to participate in projects — and it will allow local researchers to set the course for research in this country by pointing to the needs and potential that they are familiar with.

Planning to enhance research infrastructure is underway in several parts of the country. Examples include:

- The Greenland Research Council provides advisory services,





Students in JSEP, the Joint Science Education Project, look at glacial striations on bedrock in Kangerlussuaq. (Lars Demant-Poort, Ilisimatusarfik).



allocates grants for PhD and postdoc work and provides funding to promote research in Greenland

- The International Arctic Hub, which is dedicated to making knowledge from research in and about Greenland more visible and accessible, and to building bridges between research, local communities, education, businesses and government authorities
- At Ilimmarfik, the university campus in Nuuk, work is underway to enhance the physical infrastructure and design it in a way that promotes interdisciplinary and international cooperation
- The Steno Diabetes Centre Greenland is a new national knowledge, development and treatment facility that aims to establish itself as an internationally renowned research institution with expertise in chronic diseases like diabetes, chronic obstructive pulmonary disease (COPD) and cardiovascular diseases
- In Sisimiut, work is ongoing to boost technological education

and research, and Arctic DTU Sisimiut — Ilinniarfeqarfik Sisimiut is focusing on establishing new educational initiatives, strengthening cooperation with the technical college KTI (Kalaallit Nunaanni Teknimik Ilinniarfik) on joint campus development and enhancing cooperation with other Greenlandic research institutions. A research station will also be established within the existing campus facilities to attract more cross-disciplinary national and international research projects and serve as an important driver in fostering a vibrant and dynamic academic environment that can contribute to the overall Greenlandic research environment

- Ongoing agricultural experiments are conducted at the Upernaviarsuk Agricultural Research Station, which is located near Qaqortoq. An expansion of this institution is under consideration to intensify work in the field, as described in Naalakkersuisut’s Strategy for Agriculture (*Strategi for Landbrug*) 2021-2030



There is a potential to strengthen interdisciplinary collaboration and cooperation between the existing research community in Greenland and international partners and networks. A tight-knit and well-coordinated research community with the right physical infrastructure will be in a better position to attract outside attention, which would be in the form of research funding and international interest in engaging with Greenlandic researchers and local communities, including participation in Greenlandic research projects.

Initiative 1.1: Naalakkersuisut aims to strengthen local research institutions on an ongoing basis by expanding the physical infrastructure of research institutions, improving opportunities for collaboration and providing more resources for participation in local and international Arctic research.

1.2 An improved overview of research activities

From now on, research projects in Greenland will be registered to a greater extent to facilitate the monitoring of these activities. This will provide valuable knowledge of the ongoing research conducted in Greenland and improve opportunities for interdisciplinary collaboration and local anchoring. It will also give local research institutions greater insights into what projects foreign researchers are working on in the country, thereby paving the way for improved contacts and collaborations.

Accordingly, Naalakkersuisut will examine whether there is a legal basis for centrally registering all research projects with activities in Greenland. This would apply to both Greenlandic and international projects.

The registration requirement would ensure early contact between research stakeholders and regulatory authorities. This would make it easier for the authorities to ensure that all stakeholders involved are aware of and comply with the ethical





JSEP (Joint Science Education Project) student holding a small section of an ice core, with an age of approx. 50,000 years. EastGRIP camp (East Greenland Ice-core Project), Northeast Greenland, 2019. (Lars Demant-Poort, Ilisimatusarfik).



guidelines for research and the relevant legislation. In addition, it would allow the authorities to provide information on other general guidelines for research in Greenland, including expectations and options for sharing research results.

For many research activities, it will still be necessary to obtain a proper permit from the relevant authorities, i.e. from the ministries in Nuuk or from local municipalities. It is necessary to obtain permits for safety reasons and to protect the environment, safeguard cultural heritage, respect the rights of individuals and local communities, conserve resources, etc. Depending on the activity, it may be necessary to contact several agencies, and the authorities will be able to provide advice on this when an application is submitted for an individual research project.

It is necessary to establish which authority must be notified of a proposed research project. To facilitate the administration process, the registration of research projects could be done via a public research portal (see section 3.2). Naalakkersuisut will also explore the possibility of

creating framework agreements for local research institutions to streamline the registration process for their projects.

Initiative 1.2: Naalakkersuisut aims to create a more comprehensive overview of research activities in the country by the end of 2024 by requiring all research projects in Greenland to be entered into a central directory.

1.3 Ethical guidelines must define the parameters of research

With so much research activity taking place in our country, there is a need to ensure that research is conducted in an ethically responsible manner. Accordingly, Naalakkersuisut and the country's research institutions have a shared interest in developing general ethical guidelines for research in Greenland.

The ethical guidelines are designed to ensure that the public is not unduly burdened by research activities. The guidelines will draw researchers' attention to local cultural differences and ensure that participants in projects receive feedback on the



results and have a positive experience when contributing to research. This is particularly important because indigenous and local knowledge is increasingly incorporated into local and international research projects (see section 1.4).

This strategy calls for the establishment of general ethical guidelines for all research in Greenland. In the field of health, for example, ethical guidelines for research have already been developed, and biomedical and health projects must be approved by the Committee on Ethics in Science before they are allowed to commence.¹ This ensures that health research in Greenland and on Greenlandic patients abroad meets standards that safeguard the rights of participants.

Each research institution in Greenland can develop further specific ethical guidelines based on the general guidelines issued by Naalakkersuisut for this area. This ensures that all

¹ Retningslinjer ved sundhedsforskning og for forskning ved sundhedsvæsenets institutioner (Guidelines for health research and for research at healthcare institutions) and Vejledning om god forskningspraksis i Grønland (Guidance on good research practice in Greenland), both published in Danish.

who participate in research in Greenland is protected with regard to ethical issues, the Data Protection Act and other personal rights.

Initiative 1.3: Naalakkersuisut aims to work with relevant research stakeholders to develop ethical guidelines for research in Greenland by the end of 2022.

1.4 Increased use of indigenous and local knowledge

The knowledge of local people is often of great value for research. This makes it vitally important to anchor research projects at a local level. Naalakkersuisut aims to place greater emphasis on how indigenous and local knowledge can be integrated — on an equal footing — into local and international research projects.

Local empirical data in the form of registries are important sources for the social and health sciences, and this information makes it possible to examine relationships in greater detail than when working with publicly available data.

Indigenous knowledge comprises the profound knowledge of the Arctic that has been acquired by the Inuit



and other Arctic peoples throughout the millennia. It is knowledge that has been passed down from generation to generation and is bound to cultural, spiritual and linguistic values — and the harsh conditions of life in the Arctic. Local knowledge is the knowledge of population groups living within a specific geographical area. By hunting and gathering and pursuing other activities in the area, they have accumulated a wealth of linguistic and cultural information, along with in-depth knowledge of weather, ice and wildlife.

In recent years, Greenlandic research institutions have enhanced their efforts by applying local knowledge. For instance, the Greenland Institute of Natural Resources works hand in hand with fishermen and hunters to improve our knowledge of marine and land ecosystems. The Greenland Government Authorities make use of local knowledge to provide sound advice on managing biodiversity, for example, through the PISUNA programme. The aim of the programme is to optimise the monitoring of living resources through enhanced cooperation between fishermen, hunters, administrators and researchers.

The use of indigenous and local knowledge in research projects is growing as it fills an important gap and helps to provide answers to pressing issues. At the same time, national and international stakeholders are realising the many benefits of local, community-based research collaborations. These benefits include projects that are based on local needs, furnish more accurate data, allow for more in-depth analyses and a greater degree of understanding — all rooted in a rich indigenous and local context — and, last but not least, produce results that benefit local communities.

The anchoring of research must be based on international standards, including the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP), specifically Article 31, which Naalakkersuisut has endorsed.

Initiative 1.4: Naalakkersuisut aims to support work to identify and expand the use of indigenous and local knowledge in local and international research. This will be done in collaboration with the Greenland Research Council and stakeholders involved in research activities.

2. Research must support sustainable social development

We face a number of future challenges and opportunities, and research can contribute to the development of sustainable solutions. Raising education levels, enhancing the welfare of the population and developing new and existing industries are crucial for the country's economy. Initiatives are needed to make our economy more sustainable and diversified, while ensuring synergies between long-term economic development and our society, environment and culture. Just as research advances our general understanding of our common history and ourselves, it also helps us find solutions to the social challenges and opportunities that we will face in the future.

In Denmark there is a long tradition of seeking to underpin administrative practice and political policies with research and expert knowledge.² For example, the Greenland Institute of Natural Resources provides advice to the Government on matters within its area of expertise. Likewise, Ilimatusarfik has established several

² Danske Universiteters Hvidbog om forskningsbaseret myndighedsbetjening (The Danish Universities' White Paper on Research-Based Government Services) (2009).

research centres that contribute to knowledge in their fields of research, and this paves the way for establishing general guidelines for the conclusion of cooperative agreements.

Precisely defining the role of research-based government services in the Greenlandic context will contribute to a clearer understanding of the mission portfolio of research institutions, and thus their impact on society. Naalakkersuisut intends to review the basis for establishing the scope of contractual arrangements with Greenlandic research institutions.

2.1 Research must find solutions to future challenges

It will take basic, strategic and applied research to tackle the challenges faced by society. Research that delves into our history will engender a greater understanding of ourselves as a people. Using research in the natural sciences, social sciences, health sciences, humanities and technology, we can pave the way for innovative approaches to our social development, establish new sustainable sources of income and ensure greater prosperity for all.



...tjige og langsomme kollektion
 $R_{ik} (H_2O) + (Ox)$
 $71 \text{ mol} = 0,4197$

Students from GUX Nuuk are looking at Greenlandic fish larvae. (Caroline Bouchard, Greenland Institute of Natural Resources).



Much of Greenland's economy and cultural identity is rooted in our spectacular wilderness and the island's rich biodiversity. However, changes in climate and lifestyle mean that we need to be constantly aware of any new developments in our resources. Cutting-edge research in the natural sciences secures the future of our living and non-living resources, the environment and the climate, so we can continue to live in harmony with our surroundings and enjoy the bounties of nature. At the same time, we contribute to international research with invaluable long-term data on Arctic weather conditions as well as the ocean, the ice sheet and the cosmos. Our research in the natural sciences must always be at the forefront in order to meet Greenland's own requirements and the needs of the international community to acquire knowledge in these areas.

The population has remained fairly stable since 1990, but according to population projections by Statistics Greenland, it is expected to fall by 13% between 2020 and 2050.³

³ Grønlands Statistik, 2020, <http://bank.stat.gl/bedp20>.

The greatest loss will be among the young, working-age population, and the greatest growth will be among the older, retired population. This is the harbinger of a crisis for the Greenlandic economy, which urgently needs more workers, and for the Greenlandic Health Service, which provides essential services to the ageing population. Research in the social sciences and healthcare will help us to gain a better understanding of how to create a more fulfilling and supportive environment for young people, so that they see Greenland as a place where they would like to settle and work after completing their education. We also need a better understanding of how to ensure the best possible living conditions for our senior citizens.

By stepping up social science research in Greenland, we can develop welfare approaches that are ideally adapted to an Arctic context and help to reduce inequality. Research can be used to find effective solutions that improve the living conditions of socially disadvantaged people and provide educational and work opportunities for these segments of society.



Focusing on innovation is essential to the ongoing development of society. Technology has a clear role to play here, helping to link the past and the present with the future. Innovation is not a new concept in Greenland. Inuit all along the Arctic coast built kayaks and umiaqs to maintain contact with each other, and followed the migration of the animals that they hunted as the climate changed over time. Now, in addition to VHF radio repeater stations along the coast, we have high-speed internet via fibre-optic submarine cables that bring communities closer together – and we must continue to use research to improve our knowledge of technology and the use of advanced infrastructure. Through technology, we must upgrade our present and consolidate our future, while preserving the environment and our culture.

Greenland's future will be characterised by our having better access to the world – and the world having better access to us. This will provide outstanding opportunities for increased exposure to foreign cultures and languages, while challenging us to maintain and modernise our own distinctive identity.

Humanistic research that explores our historical and modern language and culture can help to foster encounters and the sharing of knowledge between local and international players, while opening up new business opportunities through local tourism for nature and culture enthusiasts. Humanities research can also strengthen our administration, psychiatric care, judicial system and the rule of law. By integrating our native tongue into diverse fields of research, we will further develop our terminology and scope of interpretation so that the Greenlandic language is always able to keep pace with the present and the future. This will empower us to express ourselves in our own language in all situations.

Initiative 2.1: Naalakkersuisut aims to enhance the conditions for basic, strategic and applied research and their use in developing sustainable solutions to our future social challenges and opportunities.

2.2 Research must contribute to business development

The overarching goal of the Government's economic policy is to create the conditions for a self-sustaining



A U.S. Air National Guard LC-130 unloads passengers and cargo at EastGrip camp (East Greenland Ice-core Project). (Lars Demant-Poort, Ilisimatusarfik).





economy. Our economy is dominated by a handful of large industries, with sales of fish and seafood accounting for over 90% of export revenues in 2019.⁴ Consequently, Greenland's financial situation is highly susceptible to fluctuations in the fisheries sector, specifically in terms of prices and the state of fish stocks.

We need collaborative research between private and public stakeholders that improves our existing industries and lays the foundations for new ones, thereby rendering our economy more robust.

Companies can greatly benefit from employing researchers who can contribute specific knowledge to boost a company's competitiveness, both locally and internationally. By enhancing our knowledge in areas where we have natural development opportunities, we can venture into new markets and diversify our economic base. This will make the Greenlandic economy more resilient to global economic shocks in the years to come.

Greenland has unique resources that are attractive to both local and international players. Intensifying research efforts in these areas can contribute to the development of new industries and increased output for additional spin-off industries. Unique resources include the ice cap, which can be used as a source of drinking water and renewable energy production, our mineral-rich subsoil, and the cold climate, which can be attractive for the IT industry as a location for naturally-cooled data centres.

In addition to innovative business development, research can also find ways to further improve working conditions in the fishing and hunting industries, to ensure sustainable and carbon-neutral mineral and energy production, and to strengthen our economic base in cities, towns and coastal areas.

More research will also generate business benefits in the form of more highly paid jobs and higher tax revenues, international co-funding of projects that can generate export revenues, spin-off effects in the service industry serving researchers' fieldwork, and inputs from external

⁴ Statistics Greenland.



researchers who during their stay in Greenland engage in teaching activities or perform clinical work in the healthcare system, to name but a few examples.

Initiative 2.2: Naalakkersuisut aims to enhance the conditions for private-public research collaborations and to increase the focus on business development through applied research.

2.3 Research must be an attractive career option

Education is a cornerstone of sustainable development. So it should come as no surprise that Naalakkersuisut is already working on a number of initiatives to raise the level of education. Of course, research also plays a key role in education. By encouraging more students to complete a master's programme, the research community will have a greater chance to recruit talented local researchers for PhD and post-doctoral programmes.

Research institutions are already committed to integrating research and researchers into teaching, as well as inspiring students to

engage in research. Local researchers also give back to the field of education, for example, by popularising and producing new evidence-based knowledge that can contribute to locally anchored teaching materials for all levels.

It is important that Greenlandic students at all levels are aware of the research opportunities in Greenland. They should be able to envision research as a potential and attractive career option and thus be motivated to achieve the highest possible levels of education. Furthermore, they should be given more opportunities to get involved in local research early in their education, for example, by creating attractive learning and study environments and mentoring schemes to raise completion rates for students at all levels of higher education, e.g. by creating more student research assistantships, including PhDs and postdocs.

A broader base of researchers and research students also improves opportunities for strong Greenlandic participation in international research, both in Greenland and abroad. Greater Greenlandic participation will ensure local anchoring of



research projects and further development of local expertise.

Initiative 2.3: Naalakkersuisut aims to support Greenlandic research institutions in their efforts to get the word out about research careers and to increase funding for PhD and postdoc programmes for Greenlandic researchers.

2.4 The scope of research must be documented

To underpin existing research, the scope of research must be documented, ideally by compiling

statistics in collaboration with research institutions and Statistics Greenland. This information should include quantitative indicators, such as funding, publications and the creation of knowledge networks. This information will improve the ability of institutions to expand their research activities, participate in more international projects, attract more funding, etc.

Initiative 2.4: Naalakkersuisut aims in 2022 to initiate a collaboration with Statistics Greenland on the development and use of research statistics.





3. Research results must be easily accessible to all

In order for research to be meaningful and make a difference, it must be disseminated to all relevant groups in society. Naalakkersuisut will work to make data from research in Greenland easily accessible to all. This requires that data be handled according to open science principles and that a national research portal be established to provide an overview of research projects in Greenland.

3.1 Data must be handled according to open science principles

Naalakkersuisut aims to make the results of research in Greenland available according to the highest international standards of open science. Accordingly, working in collaboration with the research institutions, Naalakkersuisut will establish a working group to develop a policy on research data.

Today, research permits granted for research in Greenland have diverse requirements for access to research data and results. Data from exploration for minerals, oil and gas, for example, must be uploaded to the databases of the Greenland Govern-

ment Authorities. When the Greenland Research Council allocates funds from the research promotion pool, it also requires that the grant recipient publish the results and register the project on the user-driven web portal *Isaaffik Arctic Gateway*.

The new policy on data must, to the greatest extent possible, establish uniform requirements for access to data from research in Greenland. The requirements of the policy must balance the rights of the local population and the international research community to data access and data protection against the rights of each individual researcher. In other words, the aim should be to make access to data as open as possible and only as limited as necessary. This means that data from publicly funded research projects should in principle be freely accessible, but that this access may be restricted to some degree to protect sensitive data, researchers' fixed-term copyrights and the like.

The process of developing the research data policy should also include assessing the extent to which Greenlandic ownership of data from research activities in Greenland can and should be secured.



Efforts to ensure access to research data are an important part of how Greenland fulfils its obligations under the Arctic Council’s Agreement on Enhancing International Arctic Scientific Cooperation.⁵

The policy on research data must be based on international standards. This includes the **FAIR** principles of data accessibility that define the characteristics that collected research data must have in order to be located and used by others, i.e. it must be **(F)** findable, **(A)** accessible, **(I)** interoperable and **(R)** reusable.

Initiative 3.1: Naalakkersuisut aims to establish a working group to present a proposal for a national research data policy.

3.2 A research portal will provide an overview and access to data

To provide the necessary overview of projects, data and publications, Naalakkersuisut will work to make information on research in Greenland available via a public portal.

This will contain metadata on all research projects that are being carried out – or have been carried out – in Greenland, including information on the title, topic, participants, status, geographical location of activities, etc. In addition, the portal will include information on where to find publications, data and results from individual projects — with links to sources like websites and databases. Data should be freely accessible unless it is not publicly available for specific reasons (see section 3.1).

The portal will thus only contain a general description of all research projects in Greenland. Detailed research data will not be stored on the research portal itself, but it will be accessible via it. Simply referring to the location of data avoids any undue use of resources on collecting, adapting and quality assuring large volumes of data. However, there will still be considerable work involved in the administration, updating, support and ongoing quality assurance and development of the research portal.

Development of the research portal will be carried out in close collaboration with local research institutions

5 Arctic Council (2017), Agreement on Enhancing International Arctic Scientific Cooperation.



already involved in the management of research data and databases.

Initiative 3.2: Before the end of 2023, Naalakkersuisut aims to ensure that

information on all research projects in Greenland is made available via a public online research portal.



Children and adults can play and discover more about the world of science at the annual Culture Night. Children create their own fictional 3D map in an 'Augmented Reality Sandbox' at the Greenland Institute of Natural Resources. By digging with their hands in a sandbox, they create small mountains, valleys and lakes that are displayed in 3D on a projector. This allows children to experience how scientists make 3D models to study changes in the ice sheet, glaciers and landscape. (Karl Brix Zinglensen, Greenland Institute of Natural Resources).



4. Research efforts must be at an international level

A significant increase in research activities in Greenland will of course require that Naalakkersuisut prioritise this area, both politically and financially. It would also only be natural for some of the funding to come from abroad, since research in Greenland often benefits the world at large, and there is considerable international interest in the research conducted here.

By giving priority to funding and participation in international forums, Greenland can help to boost efforts on the ground and maintain a high level of excellence, so that future research will maintain an international scope and outlook. This will not only attract more international projects and external funding but will also allow Greenlandic institutions to increase the number of international collaborations where Greenland is the lead partner and where the primary impetus comes from Greenland and attracts researchers from around the world to come and work here.

4.1 More funding must be allocated to research

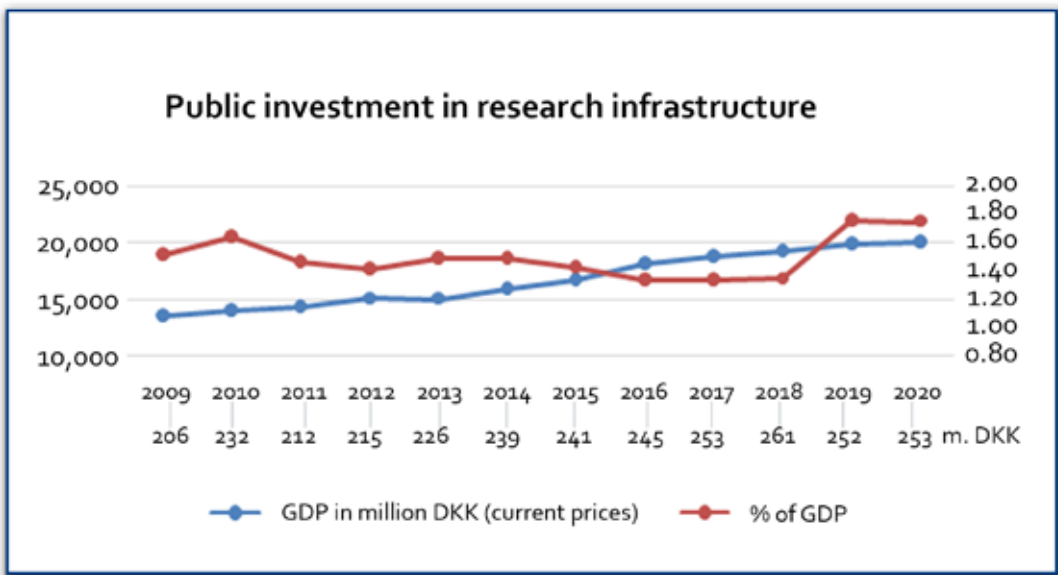
Many Greenlandic research institutions say that for every crown that they receive in local funding, they are able to attract another crown in external funding. This means that Greenlandic society gets a twofold benefit from every crown invested in research. So there are good reasons to support research financially — both with money from government coffers and from public and private companies. Public investment in Greenlandic research amounted to 1.4% of GDP in 2017 and 2018. The global average, according to the World Bank, was 2.1% of GDP in 2017.⁶ In its analysis, the World Bank includes the operational costs for Dronning Ingrid's Hospital, which are not included in the Ministry's own calculations for investments in research infrastructure.

The trend in public investment in research, expressed as a percentage of GDP, is shown in the graph below. As demonstrated here, the proportion of GDP devoted to research

⁶ Verdensbanken; <https://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS>.

declined throughout most of this period, although GDP was increasing. It should be noted that capital investments in research vessels are included for the years 2009, 2010, 2019 and 2020. In 2009, public investment was DKK 206 million and by 2020 it had risen to DKK 353 million, an increase of DKK 147 million.

and private companies amounts to at least 2.3% of GDP by 2030. Such a prioritisation of research funding will send an important signal to the local and international research community and make it clear that Greenland is highly committed to its role as a centre for Arctic research.



It is important that the local research community has sufficient resources, both to play an active role in international Arctic research activities and to carry out its own fieldwork. Hence, Naalakkersuisut aims to ensure that the aggregate funding from the Treasury, research institutions and public

This research strategy sets the overall course and objectives for development in this area. As work on each individual initiative proceeds, the necessary funding must be determined and secured through the Treasury, external sources, etc.



Naalakkersuisut anticipates that it will be possible to attract more international projects and external funding through the initiatives that are being launched. This includes most notably expanding the physical infrastructure of research institutions, developing the International Arctic Hub, pursuing opportunities to take part in international Arctic research and establishing a clearer overall picture and guidelines for research, not to mention stepping up international collaborative efforts (see section 4.2).

Naalakkersuisut also intends to encourage Greenlandic public and private companies to devote more funds to research and innovation and to engage in dialogue with the business community about the benefits of prioritising research and development in a wide range of commercial areas.

Initiative 4.1: Naalakkersuisut aims to ensure that the aggregate research funding from the Treasury, research institutions and public and private companies amounts to at least 2.3% of annual average GDP by 2030.

4.2 International research cooperation must be enhanced

Arctic research is an obvious priority for Arctic countries. However, decision-makers and researchers in countries outside the Arctic also have a vested interest in conducting research here and in contributing to a thriving and sustainable Arctic.

By enhancing its expertise and leadership in Arctic research, Greenland intends to take seriously its role as a natural hub for these endeavours and has for over a century collaborated with international institutions to establish research stations at strategic locations in Greenland (see Appendix).

It is important for this process, both at a national and global level, that Greenland continue to serve as a strong partner in international research collaboration. This can be achieved in large part by consolidating research networks with other nations.

Research partnerships in the Danish Realm focus on fostering effective interdisciplinary collaborative efforts between Greenland, the Faroe



Islands and Denmark. Furthermore, the North Atlantic countries coordinate their activities through the Nordic Council of Ministers to promote collective development throughout the region. In 2017, the Arctic countries, gathering under the umbrella of the Arctic Council, signed a binding agreement to strengthen research cooperation in and around the Arctic. The EU also places a strong emphasis on supporting research and development in the polar regions, in general, and with a particular focus on Greenland.

There is also considerable interest in Arctic research in countries outside the region such as Germany, the UK, China, Japan, India and South Korea. Several of these countries have formulated Arctic strategies, even though they are not geographically part of the Arctic.

By prioritising research cooperation with other countries, institutions and international forums for Arctic research, Greenland can benefit more effectively from international expertise and funding that is increasingly anchored in Greenland.

Initiative 4.2: Naalakkersuisut aims to prioritise collaborative research

with governmental and supranational bodies, and to take part in international research forums with a focus on research in the Arctic.

4.3 New research programme will focus on the marine environment

With the launch of Greenland’s new research vessel *Tarajog* in 2021, the country has provided a highly advanced platform for exploring the seas around Greenland. This state-of-the-art research vessel is Greenland’s largest investment in research infrastructure ever, and it serves as a cornerstone in the ongoing scientific work to ensure the sustainable use of marine resources. The ship has the potential to do far more than just basic tasks, and it provides substantial additional benefits to society through further investment in research and international cooperation.

A new 10-year research programme focusing on the ocean will be Greenland’s contribution to the UN Decade of Ocean Science for Sustainable Development 2021-2030. The programme will highlight Greenland’s capacity as an international

research partner and is expected to attract further investment from abroad through international collaborations, thereby accelerating the benefits for society.

The research programme will address a range of topics related to the marine environment and will encompass several scientific disciplines, including:

- Seabed and habitat mapping
- Ecosystem studies
- Oceanographic conditions
- New fisheries resources
- Biodiversity
- Sustainability

It will target issues of socio-economic importance and address issues related to MSC certification, the UN Biodiversity Convention,



sustainability targets, etc. The programme will also be a 'voyage of discovery' to new ice-free areas and include elements related to education and the involvement of indigenous and local knowledge, including the participation of young people.

Initiative 4.3: As a special initiative, Naalakkersuisut intends to give priority to supporting the UN Decade of Ocean Science for Sustainable Development (2021-2030) by establishing an ocean research programme.

Tarajooq — Greenland's new research vessel commissioned in 2021 — is the largest investment ever made in the country's research infrastructure. (Greenland Institute of Natural Resources — Balenciaga shipyard).





Two JSEP (Joint Science Education Project) students study snow layers in a snowpit at EastGRIP (East Greenland Ice-core Project). (Lars Demant-Poort, Ilisimatusarfik).





Swiss Camp.
(Morton Rasch, University of Copenhagen).



Arctic Station.
(Morton Rasch, University of Copenhagen).



Villum Research Station



*Station Nord.
(Morton Rasch,
University of Copenhagen).*

Zackenberg Research Station



*EastGRIP camp— East Greenland Ice-Core Project.
(Lars Demant-Poort, Ilisimatusarfik).*

Ittoqqortoormiit



*Sermilik Research Station.
(Morton Rasch, University of Copenhagen).*

Appendix — Greenland's research infrastructure

Greenland Research Council

Established in 2014, the Greenland Research Council is a national and independent agency working to promote Greenlandic research. The Council covers all fields of research and is composed of representatives from the natural sciences, health sciences, social sciences, humanities and technological fields.

The Greenland Research Council advises Naalakkersuisut on research, allocates funds to promote research, and evaluates and allocates funds for PhD and postdoc fellowships. The Council is also responsible for promoting the dissemination of research information.

The Council's eight members are appointed by Naalakkersuisut on the recommendation of Greenlandic research institutions, research centres, the business community and leading innovators. The Greenland Research Council does not receive instructions from Naalakkersuisut for its advisory work or other activities. However, the Council secretariat is managed by the government ministry that is responsible for research.

The framework for the work of the Greenland Research Council is stipulated in Inatsisartut Act no. 5 of 29 November 2013 on research advice and the allocation of research funds.

International Arctic Hub

The International Arctic Hub (IAH) was established by Greenland and Denmark in 2020. The secretariat aims to strengthen interdisciplinary international cooperation on Arctic research, education and innovation to anchor it more firmly in Greenland.

Focusing on outreach and dissemination, the core function of the IAH is to make knowledge from research in and around Greenland more visible and accessible. Furthermore, it seeks to bridge the gap between research, local communities, businesses, education and government, spanning the different levels from citizens to policy-makers, as well as throughout the Danish Realm and across the globe.

Research institutions

Research institutions in Greenland include Ilisimatusarfik — the University of Greenland, Pinngortitaleriffik — the Greenland Institute of Natural Resources, Silap Pissusianik Ilisimatusarfik — the Greenland Climate Research Centre, Asiaq, Ilinniarfeqarfik Sisimiut — Arctic DTU and Inuunerissaavik Steno — the Steno Diabetes Centre Greenland. This list is by no means exhaustive, and a number of other Greenlandic institutions are also involved in research.

Ilisimatusarfik — University of Greenland

Ilisimatusarfik — the University of Greenland was established in Nuuk in 1984. The university specialises in Arctic social, health and cultural studies and is striving to cover a wider range of academic disciplines.

There are four institutes at the university:

1. Institute of Social Science, Economics & Journalism
2. Institute of Culture, Language & History
3. Institute of Nursing & Health Sciences
4. Institute of Learning

Ilisimatusarfik offers academic bachelor and master programmes as well as profession-oriented bachelor programmes. In addition, continuing education courses are offered at the bachelor's and master's level for grade school teachers.

Over the past 10 years, student admissions have remained steady at between 150-200 per year. In 2019, there were 714 students at the university.

Ilisimatusarfik's aim is to strengthen the quality of education and promote new forms of education. In 2018, a new bachelor's programme in public law was launched. The aim is to train new administrative and public law experts who can play an integral role in the legal work of both the Greenland Government Authorities and the municipalities. The university is focusing on promoting education in the natural sciences and is currently developing a new degree programme in Arctic biology. Ilisimatusarfik is also working to develop a quality assurance system for higher education in Greenland. A quality policy has been implemented for accreditation purposes.



Ilisimatusarfik conducts research in the humanities, health sciences and social sciences, but it also intends to strengthen the research community and broaden its focus to other areas. Ilisimatusarfik's research strategy for 2019-2022 outlines goals and initiatives for developing talent, enhancing research quality, engaging in interdisciplinary collaborations, fundraising and the dissemination of findings. There are currently around 50 researchers affiliated with the university, and a total of 71 peer-reviewed articles were published in 2019. The research is funded through both the university budget and external sources.

The Greenland Centre for Health Research was opened on the Ilisimatusarfik campus in 2008 as an extension of the Institute of Nursing & Health Sciences. The vision of this relatively new institution is to improve the state of health in Greenland by initiating and coordinating health research, which is carried out in collaboration with the Greenlandic Health Service and Danish and Arctic universities. The centre works to strengthen cooperation between researchers from other countries and health professionals in Greenland, to

promote research cooperation within Greenland and to facilitate interactions between researchers from other countries and Greenlandic communities.

The legal framework for Ilisimatusarfik is laid down in Inatsisartut Act no. 12 of 12 June 2019.

Pinngortitaleriffik — Greenland Institute of Natural Resources

Pinngortitaleriffik — the Greenland Institute of Natural Resources is located in Nuuk. In 1989, Greenland assumed responsibility from the Danish state for monitoring and evaluating Greenland's fisheries. The institute later became the Greenland Institute of Natural Resources, and the area of research was expanded to cover all living resources.

The objective of the Greenland Institute of Natural Resources is to provide the scientific basis for the sustainable use of living resources in and around Greenland and to safeguard the environment and biological diversity.

The Greenland Institute of Natural Resources is responsible for collecting, processing and evaluating data on the use and protection of living



resources, and for providing advice and conducting research based on this information.

The Greenland Institute of Natural Resources advises the Greenland Government Authorities, municipalities and other bodies. This includes providing advice on setting fishing and hunting quotas and consulting services for the Danish Environmental Protection Agency on environmental and conservation issues in connection with projects in the extractive industries sector. Hence, the Greenland Institute of Natural Resources has an important role to play in ensuring that business activities are conducted in an environmentally sound and sustainable manner.

There are four departments at the Greenland Institute of Natural Resources:

1. The Department of Birds and Mammals
2. The Department of Fish and Shellfish
3. The Department of Environment and Mineral Resources
4. The Greenland Climate Research Centre

The Greenland Institute of Natural Resources conducts research on Arctic ecosystems and the impacts of climate and human activities. The institute monitors animal populations, flora and physical/chemical parameters to track changes in the natural habitat. Monitoring is an integral part of the institute's research. The Greenland Institute of Natural Resources also provides information on environmental issues and publishes its research results.

The Greenland Institute of Natural Resources has approximately 50 researchers and published 157 scientific papers in 2019, of which 69 were peer-reviewed. The institute has an extensive network of local data providers and collaborators, and it is represented in a number of international scientific forums. Its facilities include laboratories and guest accommodation, and it provides logistical support to international researchers.

The new Greenlandic research vessel *Tarajoq* has been providing new research opportunities since 2021. It is Greenland's largest ever investment in research infrastructure and, together with the second modern





A JSEP student (Joint Science Education Project) completes a survey of plant biodiversity in Kangerlussuaq. (Lars Demant-Poort, Ilisimatusarfik).



research vessel *Sanna*, it constitutes a unique platform for research throughout the seas surrounding Greenland. Both ships are significant assets for Greenland when it comes to international research cooperation.

The legal basis for the activities of the Greenland Institute of Natural Resources is Act no. 6 of 8 June 1994 and Act no. 6 of 29 October 1999.

The Greenland Climate Research Centre — Silap Pissusianik Ilisimatusearfik

The Greenland Climate Research Centre is an externally funded department of the Greenland Institute of Natural Resources. The Centre, which was opened in 2009, conducts interdisciplinary research on the impact of climate change on Arctic communities and ecosystems. Areas of focus include natural and social science research that contributes to a better understanding of the Greenlandic marine ecosystem, climate change and shifting conditions in the ecological basis for the living resources in the sea.

The Greenland Climate Research Centre coordinates the programmes for long-term monitoring of the

marine environment and oceanography along Greenland’s coasts, and it conducts studies of the socio-cultural and socioeconomic dimensions of resource utilisation.

The Greenland Climate Research Centre also develops and provides research-based training courses and advises the Greenlandic and Danish authorities.

Asiaq — Greenland Survey

Asiaq is a company owned by the Greenland Government Authorities that conducts surveys of the physical non-living environment in Greenland.

The approximately twenty employees at Asiaq are primarily engaged in data collection and consulting. Activities include mapping cities, towns and unpopulated areas, monitoring available water resources, studying the climate and meteorological conditions, and conducting geotechnical surveys for construction projects and infrastructure development.

Asiaq advises public institutions and the construction industry, including consulting work for infrastructure planning and environmental management.



Data from Asiaq’s hydrological measuring sites and climate stations are made available via a hydrology and climate database. Asiaq also operates NunaGIS, which collects and disseminates geodata from the public sector and is used for administrative purposes by the Greenland Government Authorities and the municipalities.

Asiaq participates in national and international research projects on climate, hydrology and the environment. Asiaq contributes data and utilises the integration of field surveying, modelling and remote sensing.

The legal basis for the activities of Asiaq is Act no. 18 of 28 October 1993.

Arctic DTU Sisimiut — Ilinniarfeqarfik Sisimiut

The collaboration between the Technical University of Denmark (DTU) — through Arctic DTU⁷ — and the Greenland Government Authorities was established in 2000. The vision is to strengthen and develop

technical education and innovation for the sustainable development of Greenland and to conduct and develop cutting-edge national and international technological research and research-based government services.

Today, this collaboration is manifested by a physical campus in Sisimiut that is part of the educational community of Tech College Greenland in Sisimiut and Ilinniarfeqarfik Sisimiut. Arctic DTU Sisimiut is run by Arctic DTU. The collaboration is based on a rolling framework agreement and a corresponding management organisation consisting of representatives from the Greenland Government Authorities, the technical college KTI and DTU management. The operation is financed by the Greenland Government Authorities and the DTU.

DTU offers Danish-language engineering courses of study in Arctic construction and infrastructure, fisheries technology and an international, English-language master’s degree programme in Arctic technology and, from 2022, a master’s degree programme in Arctic mineral resources. The engineering

⁷ Arctic DTU is a merger of the former Centre for Arctic Technology / ARTEK and Polar DTU.

programmes are structured so that approximately half of the course of study takes place in Greenland, while the other half is at DTU in Denmark and, in some cases, other countries abroad. The master's programme includes six months at Arctic DTU Sisimiut, with the remainder of the programme at Nordic universities in Norway, Finland and Denmark. New graduate education initiatives are being developed in collaboration with the business community and the Greenland Government Authorities in the fields of mineral resources, sustainable energy and telecommunications.

Steno Diabetes Centre Greenland — Inuunerissaavik Steno

With the opening of Inuunerissaavik Steno — the Steno Diabetes Center Greenland — on 1 July 2020, an important step was taken towards establishing an internationally recognised research institution that will serve as a nationwide knowledge, development and treatment centre for a more effective diabetes and lifestyle initiative. The centre is part of the Greenlandic Health Service.

In addition to treatment, the centre will serve as a hub for international

and Arctic-based research and education. The overarching vision is that all research into lifestyle diseases in Greenland will originate from here, with an emphasis on subsequent use of the findings in further treatment.

Additional research institutions

In addition to their primary functions, a number of other institutions are engaged in research, most notably the Greenland National Museum & Archives, Statistics Greenland, the Greenland Language Secretariat (Oqaasileriffik), Innovation Greenland, the Greenlandic Health Service and the mineral resources authorities of the Greenland Government Authorities.

The primary mission of the Greenland **National Museum & Archives (Nunatta Katersugaasivia Allagaateqarfialu)** is as follows:

- To safeguard Greenland's cultural monuments and landscapes *'as a cultural resource, as a scientific source material and as an enduring basis for the experience, identity, vitality and endeavours*

*Biodiversity of the ocean seabed in Disko Bay, at the rocky cliffs of Egedesminde Dyb.
Colony of shrimp (Northern Prawn).
(David Blockley & Diana W. Krawczyk, Greenland Institute of Natural Resources).*





*of present and future generations*⁸

- To safeguard the collection and preservation of Greenlandic cultural and natural heritage, the intangible cultural legacy and the archives of public institutions as well as private collections that are of social relevance

An essential part of this is cultural history research and dissemination — often in collaboration with international partners – with the aim of spreading knowledge of Greenland’s cultural and social history. Work is underway to make collections available for domestic and international research and dissemination at all levels. The Greenland National Museum & Archives is also working strategically to enhance the qualifications and skills of Greenlandic students by offering long-term student positions, participating in research and management projects, and conducting guest lectures at Ilisimatusarfik.

8 Inatsisartut Act no. 11 of 19 May 2010 on the conservation and protection of cultural heritage, Article 1 (2).

Statistics Greenland (Kalaallit Nunaanni Naatsorsueqqissaartarfik) collects, processes and publishes statistical information on social conditions in Greenland. According to the Statistics Act, Statistics Greenland is responsible for collecting data that can be used for research and other activities, and it can conduct its own social science research, particularly on the economy, business trends, as well as social and demographic issues that are of relevance to Greenland.⁹ Statistics Greenland rarely conducts research on its own, but it participates in some research projects by providing data.

Statistics Greenland does not expect to have sufficient personnel to conduct its own research in the near future. However, a number of improvements are planned for researchers who wish to use Statistics Greenland data, with improved descriptions of existing data and access to common Nordic data in cooperation with the other Nordic statistical offices.

The many statistical registries maintained by Statistics Greenland provide a unique opportunity

9 Inatsisartut Act no. 11 of 29 October 1999.



for research and analysis. A central statistical authority means that the scope for conducting cross-sectoral analyses of social developments is not limited by the administrative division of responsibilities within the public sector.

Greenland Language Secretariat (Oqaasileriffik) provides administrative services for the Greenland Language Board (Oqaasiliortut) and the Greenland Place Names Board (Aqqinik Aalajangiisartut). The Secretariat is responsible for documenting and raising awareness of the use of Greenlandic and other Inuit languages. The Greenland Language Secretariat takes an academic approach to its work, and linguistic research is integral to its mission.

The Greenlandic Health Service contributes to research activities by providing data extracts within the scope of its available financial resources. Research activities are carried out by healthcare employees, students affiliated with Ilisimatusearfik, students attending public Danish educational institutions and external researchers affiliated with public Danish research institutions or hospitals. Research activities

are conducted at Dronning Ingrid's Hospital in Nuuk and the four other regional hospitals, and generally coordinated by the Greenland Centre for Health Research at Ilisimatusearfik.

Greenland Government Authorities conduct mining-related research and generate new geoscience data, such as geological mapping, to facilitate mineral exploration investments. This is the responsibility of the Geology Division of the Ministry of Natural Resources and Justice. The Geology Division provides geoscience consulting services, manages geoscience data and databases, including drill-core repositories, and makes data available — free of charge — to the industry and other stakeholders. Furthermore, the Geology Division is responsible for the public dissemination of information on geology and earth sciences.



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*At EastGRIP (East Greenland Ice-core Project), a Joint Science Education Project student helps prepare a section of ice core for analysis.
(Lars Demant-Poort, Ilisimatusarfik).*





Research stations

There are a number of research stations in Greenland, as described below.

Zackenberg Research Station is located in North-East Greenland, 25 km from Daneborg. It is owned by the Greenland Government Authorities and operated by Aarhus University. Local and international researchers and students may stay at the research station. The main focus of research here is on ecosystems and the impacts of climate change. Activities since 1995 have included a major environmental monitoring programme.

The work of the Greenland Ecosystem Monitoring (GEM) programme is shared by the Zackenberg Research Station, the Arctic Station and Nuuk Basic.

Arctic Station is a field station near Qeqertarsuaq on Disko Island. The station is owned and operated by the University of Copenhagen. The aim is to promote Arctic research and education on biological and geological issues. The station's history dates back to 1906. It includes teaching

and accommodation facilities, laboratories, etc.

Nuuk Basic is a small research station in Kobbefjord near the Greenlandic capital. The station was launched in 2010. Activities at Nuuk Basic include monitoring and studying climate conditions and hydrology.

Villum Research Station is located at the military outpost Station Nord in North-East Greenland, only 900 kilometres from the North Pole. The research station was opened in 2015. It is owned by the Greenland Government Authorities and operated by Aarhus University in collaboration with the Joint Arctic Command. One of the main areas of focus is interdisciplinary research on the impact of climate change on Arctic regions in order to gain a deeper understanding of how it affects sea ice, glaciers, ecosystems and the atmosphere.

Sermilik Research Station is a field station in South-East Greenland, about 20 kilometres north of the town of Tasiilaq. The station was established in 1970 and is owned and operated by the University of Copenhagen. Sermilik Research



Station mainly serves as a base for studies of the Mittivakkat glacier, which includes glaciological, hydrological and geomorphological research.

Summit Station is located in the middle of the ice cap. The station was established in 1989 and is operated by the American organisation Battelle Arctic Research Operations (ARO), with support from the US National Science Foundation.

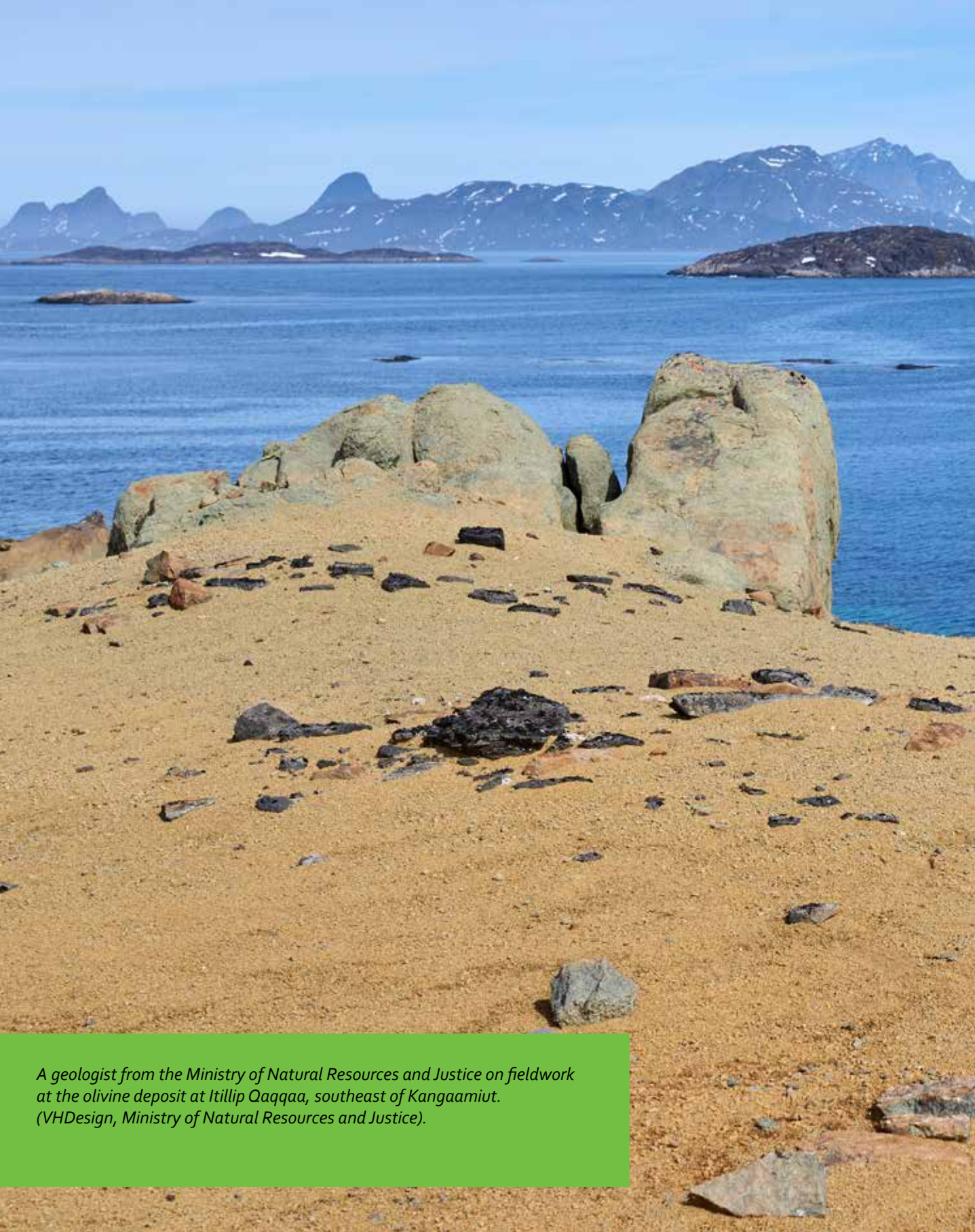
Arctic DTU research station is associated with Arctic DTU Sisimiut — Ilinniarfeqarfik Sisimiut. Interdisciplinary, international research is conducted in the area with the permanent presence of a team of researchers and PhD students. The research station provides outstanding opportunities thanks to its location in Sisimiut, next to Davis Strait and close to Greenland's largest continuous ice-free land area — the UNESCO World Heritage Site of Aasivisuit-Nipisat — and the Greenland ice sheet. The research station also has affiliated facilities in Kangerlussuaq.

Kangerlussuaq International Science Support (KISS) is a field office in Kangerlussuaq that serves as a base of operations for research activities in the area, particularly related to the ice sheet, which can be easily accessed from Kangerlussuaq.





On board the research vessel Sanna, cooperation between crew and researchers is essential for success, and everyone can contribute their knowledge, experience and hard work. Here, a GoPro underwater camera is being prepared for lowering to a depth of 300 metres. (Karl Brix Zinglersen, Greenland Institute of Natural Resources).



A geologist from the Ministry of Natural Resources and Justice on fieldwork at the olivine deposit at Itillip Qaqqaa, southeast of Kangaamiut. (VHDesign, Ministry of Natural Resources and Justice).



Photos:

- allu design
- Stig Andersen, Aalborg University Hospital, Denmark
- Caroline Bouchard, Greenland Institute of Natural Resources
- Sarah Cooley, University of Oregon, USA
- Lauren E. Culler, Dartmouth College, Hanover, New Hampshire, USA
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- Diana W. Krawczyk, Greenland Institute of Natural Resources
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- Morton Rasch, Arctic Station, University of Copenhagen
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- Ian A. Simpson
- Emil Stach
- VHDesign
- Mie HS. Winding, Greenland Institute of Natural Resources
- Karl Brix Zinglensen, Greenland Institute of Natural Resources

Back cover photo:

*Deployment of buoys to measure sea temperatures and salinity, Young Sound.
(Mie HS. Winding, Greenland Climate Research Centre).*

