Kalaallit Nunaanni USA-milu ilisimatusartut akornanni suleqatigiinneq annertuneq ineriartortinneqarnissaa

Facilitating increased engagement between the research communities of Greenland and the U.S.

Lauren E. Culler
Sten Lund
Josephine Nymand
Ross A. Virginia

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# Table of Contents

4  **EQIKKAANEQ // EXECUTIVE SUMMARY**

AALLARNIINEQ // INTRODUCTION

6  Tunuliaqut // Background
10  Naapeqatigiinnermi anguniakkat // Workshop Objectives and Overview
12  Pilersaarusiut // Schedule

**USA-P KALAALLIT NUNAATALU SULEQATIGIINNERULERNISSAANNUT INNERSUSSUTIT // RECOMMENDATIONS FOR INCREASED U.S.-GREENLAND COLLABORATIONS**

14  Ilisimatusarneq // Research
24  Pilersitseqatigiilluni ilisimatusarneq // Co-Produced Research
26  Innuttaasunut saqqumiisarnerit // Public Outreach
34  Illinniartitaaneq // Education

40  **NALUNAARUMMIK ALLAGAQARTUNIK NAGGASIUMMIK OQAASEQAATIT // CONCLUDING REMARKS BY AUTHORS**

**ILANNGUSSAT // APPENDICES**

42  Ilanngussaq A – Kalaallit Nunaanni USA-milu Ilisimatusarneq
   Appendix A - Greenland and U.S. Research
46  Ilanngussaq B - Suleqatigiilluni ilisimatusarnermi assersuutit
   Appendix B - Examples of Co-Produced Research
50  Ilanngussaq C – Peqataasut nalunaasorneqarneri
   Appendix C - Participant List

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Kalaallisut nutserneqarnera Mitdlarak Lennert-imik suliarineqarpoq.
Greenlandic translation by Mitdlarak Lennert.

Nalunaarusiap ilusilersorneqarnera Natalie Stephenson-imik suliarineqarpoq.
Report layout and design by Natalie Stephenson.
Eqikkaaneq

Kalaallit Nunaanni USA-milu ilisimatusartut annertuunik isumalluutinik atuisarpit nunarsuarmi avatangiisinilu allangorgiortnererit inuiaqatigiginnilu kulturikkut unammillernartut Kalaallit Nunaannut sunniuteqartartut pillugit. Issittumi allangorgiortnoeq ilitigalu qulequttat taakkua iluanni ilisimatusarnererup pisariaqartinnerata annertusiaortnererani ilisimatusartut sulatqatigissinnaanernik isumalluutinik ilisimasaallu ilisimatuuniuk, aalalangisartunik inuiaqatigiginnillu pigineqartunik atorluasaunuk jutartuippul. Suleqatigiiqinnik ilisimasanik nutaanik pilersitsineq tapertaralugulu inuiaqatigiiqinnik peqataatitsineq ilinniartunillu ilinniartitsineq ilitigalugit USA Kalaallit Nunaalu Issittumi ilisimatusarnermut saarpiaanat inissinniqrarsinnaappu tullii piareersarlugit.


Naaapeqatigiiqinneriik Kalaallit Nunaanni USA-mik Kalaallit Nunaallu attaveqatigiiqinnerat nukitinarsavavaa, Issittumilu unammilligassat suliarinissannu kuinguaritulii tullii piareersarlugit.


Naaapeqatigiiqinneriik Kalaallit Nunaanni USA-mik Kalaallit Nunaallu attaveqatigiiqinnerat nukitinarsavavaa, Issittumilu unammilligassat suliarinissannu kuinguaritulii tullii piareersarlugit.

Executive Summary

The Greenland and U.S. research communities invest substantial resources towards understanding global processes, environmental change, and social-cultural issues in Greenland. As the need for this research intensifies along with the rate of Arctic change, both research communities seek new and stronger bilateral collaborations that leverage resources and expertise held by researchers, stakeholders, and community members. The production of new knowledge through these collaborations along with increased community engagement and student education will place the U.S. and Greenland at the cutting edge of Arctic research. It will strengthen U.S.-Greenland relations and prepare a future generation for taking on the challenge of navigating the new Arctic.

A two-day workshop was held 27-28 August 2018 at Pinngortitaleríffik (Greenland Institute of Natural Resources, GINR), in Nuuk, Greenland, where diverse participants from the U.S. (19) and Greenland (29) research communities explored possibilities for strengthening U.S.-Greenland collaborations. Participants set priorities for future work and funding related to: Research & Co-Production of Research, Public Outreach, and Education & Student Training. This workshop report captures many thoughtful, creative, and overwhelmingly enthusiastic ideas and recommendations for improving the way that the U.S. and Greenland researchers collaborate on important Arctic projects.

The key finding from the workshop was that U.S.-Greenland collaborations will strengthen if researchers work together intentionally and continuously. This includes starting collaborations early to co-define project questions and objectives and allowing adequate time to develop trusted partnerships with defined roles. The report contains specific ideas, mechanisms, and contacts that we hope will be helpful to U.S. and Greenland researchers as they consider the following recommendations in their future work:

- Host workshops, symposia, and scholar exchanges year-round that bring researchers together in person
- U.S. universities with significant research presence in Greenland should pursue self-funding for workshops and student and scholar exchanges
- Use online networks and websites to describe research projects based in Greenland and seek collaborations
- Co-develop research priorities, codes of conduct and best practices for collaboration and research co-production
- Engage potential research partners and Greenland communities early and often during research
- Make public outreach and training of U.S. and Greenland students an explicit goal of all research projects

Research in Greenland is of substantial relevance to Greenland society and will continue to shape our understanding of global processes and rapid Arctic change. The representatives of the U.S. and Greenland research communities present at the Nuuk workshop acknowledged that we can do better research by working together, considering more diverse perspectives as we conduct our research, articulating the benefits of research to Greenland society, and training the next generation in a collaborative framework. We are excited that the workshop has already led to the development of joint proposals, revised project plans related to education and outreach, and plans for future events that will emphasize the growth and potential of U.S.-Greenland collaborations on Arctic research. We hope that this report is helpful to the broader Arctic research community and will help funding agencies understand the opportunities and challenges of interdisciplinary and international collaborative research in Greenland.
Aallarniineq

**Tunuliaqut**


USA-mi Kalaallit Nunaanilu ilisimatusunik apeqqutoq nunarsuami avatangiisit allanggoriartornerannut inuiaqatigiillu pisuariaatannan tunngasut suliaqatigiinnissaq annterumuki soquttigineqarpoq. Ineriartortitsinissaq ilisimatusarnerrmi nukittuumik nunallun assigiiingitsut peqattigalgulit anguniagaqatigalgulit toqqammagigulit Kalaallit Nunaanni anguniagaavoq inuiaqatigiinni. Kalaallit Nunaanni Inatsisartut inatsiisaaninu nr.5 29. Novemberip 2013-imeersoq ilisimatusartut annerpaartaat toqqaannartumik inuiaqatigiinnerut tunngassuteqartarput tamatigungajallu sinneriammi ingergiinnererlua nunap pissarititaanuq tunngasunut unammillernartut sammiveqartarlutik. Akerlianik, USA-mi ilisimatusartut, ingammik pingortitamut fysiksimillun tunngasunut ilisimatusartut, sermermuarmittarput imalunnuq illoqarfinni ungasissuni tupeqarfinni. Taakkua paassissutissanik katersueriarlutik aallartaruq, annikitsumuq, taamaatqoqarsimassappat, Kalaallit Nunaanni ilisimatusartut inuiaqatigiillu attaveqarfigisarneruniq. USA-mi suliffeqarfiit ilisimatusarnermut aningaasalisartut ilagaat: the National Science Foundation (NSF), the National Aeronautics and Space Administration (NASA), the National Institutes of Health (NIH), the National Oceanic and Atmospheric Administration (NOAA), the Smithsonian Institution (SI), and the Smithsonian Astrophysical Observatory (SAO).

Suleqatigiinnernik pitsasununik assersuuteqarpooq, ingammik Kalaallit Nunaanni ilisimatusartut USA-mi ilisimatusartut akornanni Kalaallit Nunaanni inuiaqatigiinni kulturikkullu allanggoriartornerit nunasiaataasimanerup, nutaanngorsaanerit nunarsuarmiqataanerup silaanallu allanggoriartornerata kingunaressanik suliaqartartunik. Ineriartortitsinissaq ilisimatusartut aningaasaliisartut ilagaat: the National Science Foundation (NSF), the National Aeronautics and Space Administration (NASA), the National Institutes of Health (NIH), the National Oceanic and Atmospheric Administration (NOAA), the Smithsonian Institution (SI), and the Smithsonian Astrophysical Observatory (SAO).

Issittumi ilisimatusarnermi periuutsit nutaat ilisimatuut, inuiaqatigiit aalajangiisartullu suleqatigalugit ineriartortinneqarnissaat tassaavoq periarfissaq immikkuullarissoq National Science Foundation-ip isumassarsiaata qulit ilagisaat tassaasoq “Navigating the New Arctic” anguniarneqarnissaanut. Kalaallit Nunaannut ilisimatusarnermut aaqqissuusiaq makkuninga imalik: 1) USA Kalaallit Nunaallu ilisimatuut akornanni pilersitseqatigiilluni ilisimatusarneq, aamma 2) inuiaqatigiinnik peqataatitsineq ilinniartunillu pikkorissaaneq annertunerusoq, USA Kalaallit Nunaallu Issittumi ilisimatusarnermi saarpiaannut inississavaat. Tamanna annertuumik iluaqutaassaaq Nunarsuup aaqqissuusaaanerata ingerlassusaatalu; Kalaallit Nunaanni inuiaqatigiinni kulturikkut inuiaqatigiinnilu peqqissutsimut sunniisartut, atugarissaarneq, nalimmassarneq inuuniarnelu; aammalu Issittumi allanngoriartorneq sukkasoq misissornerani avatangiisit aningaasaqarnermilu sunniutissat paasilluarnissaanut.

Assit Lars Demant-Poort-imik assilineqarput.
Introduction

Background

Greenland is an important research site for scientists from around the world. As the Arctic warms at twice the rate of the rest of the world, the Greenland Ice Sheet is discharging significant amounts of freshwater to the oceans. This makes Greenland a critical research site for understanding feedbacks to the climate system and sea level rise. The Greenland Ice Sheet also contains essential information for understanding Earth’s past and present climate. It serves as a pristine and remote laboratory for astronomy and astrophysics research and year-round observations of climatic and atmospheric variables. Greenland’s social-ecological and coupled human-natural tundra ecosystems are also bellwethers of climate-driven social, cultural, environmental, and ecological change. Greenland is rich in historical, cultural and sociological information that can contribute to how human beings and the communities they live in thrive and adapt to environmental conditions. With recognition of the importance of research in these and other disciplines, institutions in the U.S. and Greenland sponsor a significant amount of scientific research in Greenland (Appendix A).

There is significant interest from the U.S. and Greenland research communities in working together to address questions related to global processes, environmental change, and social response. Greenland’s policy is to promote the development of its society with a strong and sound international research program based on shared objectives. Greenland’s Parliament Act no. 5 of 29 November 2013 addresses research consultancy and the allocation of research funding. The Act emphasizes coordination and prioritization of research efforts and enhancing Greenland’s participation in international cooperative research initiatives. Most work by Greenland researchers has direct relevance to society and is located almost exclusively along de-glaciated coastal areas on issues related to natural resources. In contrast, most U.S. researchers, particularly natural and physical scientists, are based on the ice sheet or in remote field camps away from population centers. They collect data and then depart, having had little, if any, contact with Greenland scientists and communities. The U.S. institutions that fund this research include the National Science Foundation (NSF), the National Aeronautics and Space Administration (NASA), the National Institutes of Health (NIH), the National Oceanic and Atmospheric Administration (NOAA), the Smithsonian Institution (SI), and the Smithsonian Astrophysical Observatory (SAO).

Examples of successful collaborations exist, especially between Greenland researchers and U.S. social scientists who are working to understand the vast cultural and societal
changes that are taking place in Greenland as a result of colonialization, modernization, globalization, and climate change (Appendix B). If natural and physical scientists wish to engage with communities on research and outreach, they must cultivate the skills and expertise held by social scientists. These include understanding and overcoming language barriers, cultural competency, and training in the ethical conduct of research with human subjects. These steps will make U.S. research in Greenland less of a unilateral, foreign pursuit that it is invisible to the public and can resolve questions and concerns that local citizens have regarding U.S. scientific presence in Greenland.

Both research communities seek a network and other mechanisms for sharing interests and ideas, co-developing research questions, and learning about existing research infrastructure and institutions. Collaborative efforts will help produce research and knowledge that is relevant to and communicated with communities and key stakeholders in Greenland. Working on collaborative research endeavors with students through education exchanges and training, with particular emphasis on civic collaboration, will prepare a future generation for working in this updated framework. The Greenland-U.S. relationship will strengthen if projects are tailored to meet the needs of local communities and Greenland citizens can better understand U.S. scientific presence in Greenland. This is especially important given that Greenland is still in the process of emerging from its colonial past.

Developing new approaches to Arctic research, through cooperation with scientists, communities, and stakeholders in Greenland, is a unique opportunity to contribute to “Navigating the New Arctic,” one of the National Science Foundation’s 10 Big Ideas. A research framework for Greenland that involves: 1) co-production by members of the U.S. and Greenland research communities, and 2) increased community engagement and student education, will place the U.S. and Greenland at the cutting edge of Arctic research. This will lead to significant advancements in understanding Earth systems and processes; cultural and social determinants of health, well-being, adaptation and survival in Greenlandic communities; and a critical examination of the ecological and economic impacts of rapid Arctic change.

Photo by Robert Gill.
Naapeqatigiinnermi anguniakkat


Siunissami periarfissat misisssornissaanni peqataasut Kalaallit Nunaanni ilisimatusarnerup aqqissuussaanaer ilikkagaqarfigaat, oqallitsisinerillu peqataatitsisut aallaavigagalugit oqallisigalunikku qanoq suleqatigiinnerit pitsaasut ineriartortinneqarsinnaasut ingerlanneqarsinnaasuullu. Ataatsimiinnerit aqqissuussat saniatigut, peqataasut Katuami innuttaasunut saqqummiipput siunissami ilisimatusarnermi suleqatigiinnissaq Kalaallit Nunaanniik USA-miillu ilisimatusartut aqutseqatigiinnynux Kalaallit Nunaallu aqqissuussak. Peqataasut isumaqatigiipput suliaq annertuneq ingerlanneqarsinnaasq inunnik atasiakkaaniik, suliffeqarfinnik, aningaasaliisartuniillu suleqatigiinnermi unammilligassat qaangerniassagaanni.

Naapeqatigiinnermi anguniagaq pingaerneq tassaavoq siunissami suleqatigiiinnissami aningaasaliisamilliul pingaarnersiuinissaq. Apeqqutit ukua isumaliuutigineqarput:

- Ilisimatusarneq aamma suleqatigiilluni ilisimatusarneq: Qanoq USA Kalaallit Nunaallu akornanni ilisimatusarnermi suliani Kalaallit Nunaanni ingerlasuni suleqatigiiinneq anertusarsinnaarvarput? Qanoq isillutik ilisimatuut USA-mi Kalaallit Nunaaliniimmi suleqatigiinnunnik nassaartsorsinnaappat? Suleqatigiinnernut aningaasaliisarnerit suut pilerorneqarsinnaappat? Aqqissuussinerit suleriaatsiillu suut suleqatigiinnerit annertunerit pitsaasullu anguniarlugit ikorfartuisinnaappat?

- Innuttaasunut saqqummiisississarnerit: Sulieraatsit pitsaasut ilisimatusartut innuttaasunut saqqummiisarnissaanunnut suuppat? Kalaallit Nunaanni suliffeqarfiit aqqissuussaaneqarlluniit sortit innuttaasunut saqqummiisarnissamuti ikorfartuisinnaappat? Qanoq USA Kalaallit Nunaallu inuiqatigiinnut attaveqaqatigiinneq pitsangorsarnisssaa sulissutigisinnnaaavat?

- Ilinniartitaaneq ilinniartuniillu sungiusaaneq: USA-mi Kalaallit Nunaanniilu ilinniartut paarlasseqatigiitternerannut ilinniartarnerannullu aqqissuussat pioereersut suuppat? Suut aqqutigalugit iliniartotoq Kalaallit Nunaanneersoq USA-mi ilisimatusarnikkut ilinniartitaasinaaava paarlattuanillu? Ilinniartitaanerit suut siunissami kinguarriitulli suleqatigiiinnissanuut piareersasinnnaappat?

Assit Cameron Planck-imik assilineqarput.
Workshop Objectives and Overview

The two-day workshop was held 27-28 August 2018 at Pinngorthtariffik, the Greenland Institute of Natural Resources, in Nuuk, Greenland. Participants were from the U.S. (19) and Greenland (29) and represented diverse backgrounds, disciplines, institutions, and government agencies. Collectively this group represents an initial U.S.-Greenland research network and is a valuable resource for points of contact (Appendix C). The group was enthusiastic about working together and optimistic that future research co-led by scientists from Greenland and the U.S. would be mutually beneficial. Participants agreed that more can be done by individuals, institutions, and funding agencies to overcome barriers for implementation of joint projects.

To explore future possibilities, participants learned about research organization and infrastructure in Greenland, participated in interactive panels and discussed how to develop and facilitate successful collaborations. In addition to structured meetings, participants interacted during an outreach event at Katuaq and during communal meals with local foods from Greenland.

The overarching goal of the workshop was to set priorities for future work and funding. The following questions were considered:

- **Research and Co-produced Research:** How can we increase U.S.-Greenland collaborations on research projects in Greenland? What are the mechanisms through which scientists find collaborators in Greenland or the U.S.? What funding can be provided in support of joint projects? What infrastructure or processes would support increased and high-quality collaborations?

- **Public Outreach:** What are the best practices for researchers to approach community outreach? What institutions or infrastructure in Greenland can help support community outreach? How can the U.S. and Greenland work to improve community relations?

- **Education and Student Training:** What are the existing frameworks in support of U.S.-Greenland student exchange and training? Through what pathways can a Greenland student receive research/scientific training in the U.S. and vice versa? What training will help prepare future generations for collaborative work?

*Photos by Cameron Planck.*
Pilersaarusiat

ATAASINNGORNEQ 27 AUGUST: NAAPEQATIGIINNERMI ULLOQ SIULLEQ

08.30 – 10.30 Ilisimatusarnermi aqqissuussaaneq attaveqarfiillu

11.00 – 12.30 Suleqatiilluni pilersitsineq: Ilisimatasat Ilisimatusarnerlulu
Paasisimasallit arfinillit Kalaallit Nunanni USA-meersullu sassartinneqarlutik suleqatigiilluni ilisimasanik ilisimatusarnermilu misilittakkatik pillugit oqallitsinneqarput. Kingorna apeqquteqarnissamut piffissaliineq aqqutigalugu naapeqatigiinnermi peqataasut suliaminnut suleriaaseq qanoq ilanngussinnaaneraat isumaliortitsivoq.

15.00 – 17.30 Katuami innuttaasunut saqqummiineq

MARLUNNGORNEQ 28 AUGUST: NAAPEQATIGIINNERMI ULLOQ AAPPAA

08.30 – 09.30 Arktis-imi Ilisimatusarfitt innuttaasut peqataatinneqarpoq usaamisartut Ilisimatusarnermilu aksussaaffii
Kalaallit Nunaanni USA-milu Ilisimatusarfermi pisortat pisussaaffitsik qanoq innuttaasut peqataatinneqarsinnaanersut tunngasut pillugit. Saqqummiinerit Ilisimatusarnermi, Ilinniartitaanermi inuiqatigiinnullu saqqummiisarnermi.

10.00 – 12.30 Peqataasut ilanngussaat: Inuiaqatigiinnut saqqummiinerit, Ilinniartitaaneq, aamma pilersitseqatiigineq.
Naapeqatigiinnermi peqataasut Kalaallit Nunaanniillu USA-meersullu suliatik naapeqatigiinnerup qulequtaannut tunngasut pillugit naatsunik saqqummiipput.

13.30 – 17.30 Ataatsimiinnerit avinneqarneri naapeqatigiinnerullu naggasernera
Ataatsimiinnerit ukua siumut eqqarsartut peqataasut nalunaarusiassamut ilanngukkusutaannik katersiipput, ilaatitut innersuusshutit siuniissamulik pingaarnersiunissamut imallit. Ullum aappaa nereqatigiinnermi Dartmouth-imik ingelanneqartumik naggaserneqarpoq. ■

Assit Robert Gill-imiik assilineqarput.
Schedule

MONDAY 27 AUGUST: DAY 1 OF WORKSHOP

08.30 – 10.30 Research Organization and Infrastructure
Participants were welcomed by Minister Vivian Motzfeldt and then learned about research organization and infrastructure in Greenland and the U.S. through a series of presentations.

11.00 – 12.30 Co-Production: Knowledge and Research
A panel of six experts from Greenland and the U.S. shared experiences with co-producing knowledge and research. A Q & A allowed time for all workshop participants to consider how they could adopt a co-production model in their own work.

15.00 – 17.30 Public Outreach Event at Katuaq
This feature event was opened with remarks by U.S. Ambassador to Denmark Carla Sands. Following her remarks, researchers from the U.S. and Greenland shared science with the local community at Katuaq, Nuuk’s Cultural Center. The format included scientific posters, hands-on displays, and presentations. This event was followed by a reception hosted by Naalakkersuisut.

TUESDAY 28 AUGUST: DAY 2 OF WORKSHOP

08.30 – 09.30 The Roles of Arctic Universities in Community Engagement and Education
University leaders from Greenland and the U.S. led a discussion about the role of institutions in facilitating engagement with communities (research, education and outreach).

10.00 – 12.30 Participant Contributions: Outreach, Education, and Co-Production
Workshop participants from Greenland and the U.S. gave brief presentations about projects related to the workshop topics.

13.30 – 17.30 Breakout Sessions and Meeting Wrap-Up
These forward-thinking sessions solicited participant input to frame the workshop report, including recommendations and priorities for future work. Day 2 concluded with a group dinner hosted by Dartmouth.

Photos by Robert Gill.
Ilisimatusarneq

Nuumi naapeqtiginnermi anguniagaq anneeq tassaavoq oqallisigissallugu qanoq USA-p Kalaallit Nunaallu akornanni suleqatiginneq pitsaasoq, ingammik pinngortitami ilisimatusarnermi suliniutini, ingerlanneqarsinnaanersoq. Peqataasut suleqatiginnerunissamut aaqqiissutissat eqqartorpaat (Takussutissiaq 1), takussusertalerlugu inuiaqatigiit pillugit ilisimatuut, annikinnerusumillu biologit, iluatsilluartumik pilersitseqatigiillutik ilisimatusarneq ingerlattarsimagaat.

Recommendations For Increased U.S.-Greenland Collaborations

Research

A primary goal of the Nuuk workshop was discussing ways to increase and maintain high quality U.S.-Greenland collaborative projects, especially in the natural sciences. The group identified solutions for increasing collaborative work (Figure 1), with recognition that social scientists, and to some extent, biologists, have successfully completed co-produced research.

Figure 1. This diagram outlines the core barriers to successful collaborations. Five solutions (S1 – S5) are provided, many of which support multiple drivers of successful collaborations.
A1. Naapeqatigiinnerit, pisussat, ilisimatuunillu paarlaaseqatigiittarnerit aqqissuuttarnissaat


Innersuussutit aalajangersimasut:

- **Naapeqatigiinnerit Kalaallit Nunaanni ingerlanneqartarnissaat** – Kalaallit Nunaanniik angalaneq aksiisullunillu piffissamik anertueqatimut atuitsarpoq, Kalaallit Nunaanniillu ilisimatuut sulininnermini piffissaliussaq nikerasrinnaassussat annikinnerusinnaalluni aamma angalanissaminnut aningaasaliissutit annikinnerusinnallutut. Tammanna aamma ilinnaartutun Kalaallit Nunaanni iluuppoq, ajornakusoorsinnaalluni nunanun allanun angalanissaq anigaaasat ilaqutariinnilu akissusaaftit pequtaallutut.


- **Naapeqatigiinnerillu allanngorartunik peqataatiaqarnissaat** – Ilisimatusarnermi naalakkersuuyoqarinnuullu ilisimatuut USA-meersut Kalaallit Nunaanneersullu, ilisimatuut aallarterlaat misiiltagartulullu, ilinniartut, peqataasullu suiaussussat oqimaqatigiittassapput. Naapeqatigiinnerit faginut arlalinnut tunngussullit aalajangiisartunik peqataatitissat suleqatiginnerit Issittumi pissuttsut paasiinnerarni ilisimatusarnermilu pingaarnersiinermi pisariaqartput. Tamanna isumallutunti illikartitsinermi nunanik assiiginningsutsuneersunik, ilisimatuut akornanni, suliffeqarfiit inuiaqatigillu akornanni (soorlu timmisartut atorlugit misissuinnermi imarmi misissuinnermut ataqatigisaarneranni) ikorfartueqtaassaaq.

- **Ilisimatuunik paarlaaseqatigiittarnisaq ineriartortinneqarnissaa** - Kalaallit Nunaanni ilisimatuununik paarlaaseqatigiinnerit sivikitsut, paarlattuanillu USA-mi, sulianik pilersaarusiornissamut, attaveqatigiinnermik pilersitsisnissamut, ilinniartunillu sulaqteqqarnissamikk piffissamik tunisissaq. Tamakkua ukioq kaajallullu pilersaarusiorqarsinaapput ukumulru atuarittisiffusuuni (Septemberimiik Majip tunganunut) pisinnaapput, aasaanerni USA-miik ilisimatuut Kalaallit Nunaanniinnermini ulapittarmik sulingiffeqarlurtallullu. Paarlaaseqatigiinnerit Kalaallit Nunaanitussanunt, periarrfissiisaaq inuiaqatigiit peqatigalugul suliuniutinin pilersaarusiorqarnissamut.
S1. Organize workshops, events, and scholar exchanges

The number one discussed solution for increasing and improving U.S.-Greenland research collaborations was to develop opportunities for face-to-face meetings. Individual connections at meetings, especially if they can be at regular intervals (e.g., annual or biennial), are effective at advancing collaborative work. Greenland workshop participants noted that they often provide letters of collaboration after an initial phone or e-mail contact but that there is often no follow-up. U.S. researchers note that they have had difficulty finding and getting responses from researchers in Greenland within their discipline. In person meetings are great for initial introductions, advancing ideas, defining project roles and funding allocations, and building relationships and trust, essential elements of successful collaborative projects (Figure 1).

Some specific recommendations:

- **Host workshops in Greenland** - It is expensive and time consuming to travel to meetings from Greenland and Greenland researchers may have less flexibility in their schedule and fewer resources for travel. This is also true for Greenland students who may have difficulty in traveling to foreign venues due to travel costs and family obligations.

- **Organize and lead sessions at international meetings that feature research in Greenland** - Researchers often travel to national and international conferences to present about their work in Greenland. These conferences offer the opportunity to lead interdisciplinary sessions/symposia that feature research from particular areas of Greenland (e.g., AGU session about research around Kangerlussuaq or the Greenland Ecosystem Monitoring program sites) or focused on particular topic areas (e.g., the Greenland Ice Sheet). These events may attract a diverse group of researchers who could also participate in side meetings in advance of or after the main conference event. Organizers of these sessions should ensure that invitations are sent to researchers from Greenland to keep them connected to the broader research community.

- **Workshops and sessions should include diverse representation** - Include academic and government researchers with representation from the diverse communities in the U.S. and Greenland, early-career to senior researchers, students, and balance participants by gender. Interdisciplinary workshops that include stakeholders are essential for developing collaborations that produce a novel understanding of the Arctic as a system and identifying research priorities. This will help to leverage resources among different countries, research groups, agencies, and communities for better science (e.g., combining large-scale aircraft surveys with land- and ocean-based ground-truthing).

- **Develop scholar exchanges** - Short-term fellowships and teaching opportunities in Greenland for U.S. researchers, and vice versa, will create time for project planning, building relationships, and working with students. These can be planned year-round and could occur during the academic year (approximately September through May) because the summer months, when U.S. researchers are in Greenland, are quite busy with field work and holiday schedules. For exchanges based in Greenland, there is also the potential for visits to and project planning with local communities.
A2. Ilisimatusarnermi attaveqaatit nittartakkatigullu paasissutissanik katersuuffiit ineriartortinneqarnissaat ingerlanneqarnissaaullu


4. The U.S. National Science Foundation-ip Issittumi paasissutissanik katersuuffia (https://arcticdata.io/): USA-mi ilisimatuut piumaffigineqartarput paasissutissaatitik tunniussallugit ukiut marluk katersuinnermiik qaangiutsinnagu imaluuniit suliniit aningaasaliinerluuniit qaangiutsinnagu.

Innersuussutit aalajangersimasut:

- **Innersuussutaavoq ilisimatuut USA-meeorsut Kalaallit Nunaanni sulimiititik Isaaffik-mi nalunaarsortassaagat** - Ilisimasat kikkut suminnersut sulerinersullu logistikkikikut, paasissutissat isumassarsiallul, suleqatigiinnermut iluqaqtaassapput, aningaasartuttit akkullineqassapput, sunniitillu annertusarugit. Tamakku aama annertuumik Kalaallit Nunaanni upalungaarsimanermut pingaaruteqarput, suliniutit Isaaffik-mi takulersinassagamikkit.

- **Listserv-imik pilersitsinissaq ingerlatsinissarlu USA-miik Kalaallit Nunaanni ilisimatuut suleqatigiinnermik soqutiqisalinntu - 2018-imii Nuummi naapeqatigiinnermi peqataasuq aallaviissapput (Ilanggutaq C) kisianni kikkulluuniit suleqatiqinnissat soqutiqinnittut Ilanggusaillaalutik. Tamanna aallartissuutaasinaavoq isumassarsianut, suliniutinut suleqatiqinnissamut, saqqammersitanut nutaat nalunaarutiginissaanut imaluuniit ikiortissarsiornermut.

- **Nittartakkakakkut naapeqatigiinnerit, aningaasaliiffigineqarnissamut periarfissat ikkullugit, paasissutissanillu, nalunaarussianik, saqqammersitanik Kalaallit Nunaanni ilisimatusarnermi suliniutinun tunngassuteqartunik avitseqatigiinnermut atorneqarsinnaaapput** - Nittartakkat tamakku periarfissiissapput ajornangitsumik suliniutinik paasissutissat anguniakkallu tigussaasunngornissaat.
S2. Develop and maintain research networks and online information portals

The use of listservs and networking-focused websites can facilitate introductions to potential collaborators from different disciplines, agencies, and institutions (Figure 1). Interested stakeholder groups and community members should be encouraged to participate in these online networks. These websites can also provide information about ongoing projects, funding, logistics, and infrastructure. This is important for increasing the transparency of research in Greenland and so that researchers are aware of the breadth of research and research locations. These should be an initial starting point for any researcher wanting to embark on a new project in Greenland. The following four websites provide information about ongoing research in Greenland:

1. Isaaffik: The Arctic Gateway (www.isaaffik.org): Anyone engaged with Arctic research, education, infrastructure, and logistics may join Isaaffik, a web platform in support of research and collaboration.

2. Interagency Arctic Research Policy Committee (IARPC) Collaborations (www.iarpccollaborations.org): This U.S.-based website brings together scientists from Federal, State, academic, NGO, industry, indigenous and international organizations to share their work and team up to solve complex Arctic issues.

3. Arctic Research Mapping Application (www.armap.org): This interactive web map, designed for funding agencies, logistics planners, research investigators, students, and others, shows information about hundreds of projects around the Arctic.

4. The U.S. National Science Foundation’s Arctic Data Center (https://arcticdata.io/): U.S. researchers are required to submit their data here within two years of collection, or by the end of the award, whichever comes first.

Some specific recommendations:

- **Make it a requirement for U.S. researchers to register their Greenland projects at Isaaffik** - Knowledge about who is where and doing what would be helpful in sharing logistics, data, and ideas, which seeds collaborations, reduces costs, and increases efficiency. This also is highly relevant to Greenland Search & Rescue, who would be able to see projects within Isaaffik.

- **Create and maintain a listserv of U.S. and Greenland researchers interested in collaborations** - The base of this group is the 2018 Nuuk workshop participants (Appendix C) but anyone interested in collaborations could join this listserv that could be a starting point for collaboration on ideas, projects, announcing new publications, and requests for assistance.

- **Use online platforms to host webinars, post funding opportunities as well as share data, reports, and publications associated with Greenland research projects** - These platforms provide potential for organizing project information and outcomes in an easily-accessible format.
A3. Aningaasaliisarnissamut suliniutit aqqissuussaanaerillu ineriartortinneqarnissaaat suleqatigiinnermik tapersersuisunik

Naapeqatigiinnermi peqataasut artlaleriarlutik aningaasaliisarnissamut aqqissuussaanaeri pingaaruteqarneri suleqatigiinneq pilersinneqassappat (Tokkussutissaq 1). Peqataasut oqallisigaat aningaasaliissutit USA-meersut Kalaallit Nunaanneersulluunniit ilisimatuunut avataaneersunut piffissaliinerannut sulinerannullu atorneqartarsinnaaneri. Peqataasut isumassarsiat uku aningaasaliisarnermut ineriartortitsinermullu saqqummiuppaat:

▶ Ataatsimoorussanik aningaasaleeriaatsit ineriartortinneqarnissaaat (nunat, aqutsisoqarfiit, suliffeqarfiillu akornanni) ilisimatuunik Kalaallit Nunaanneersunika USA-meersuniillu tamakkiisumik peqataasqortarnissanerpiut piumasaqaatitalimmik imaluunniit kmammattuissumik

▶ Kalaallit Nunaanni pisortat suliffeqarfiillull suleriaatsit ineriartortitttariaqarpat naalakkersuisoqarfinni ilisimatuut piffissaqalersinniiligut ilisimatusarnermi sultanit innuttaasunullu saqqummiinernut peqataasarnissaaannut

▶ USA-p suleqatigiinnermut tapersersuinissaata qulakkeernissaa aningaasaliinerni piffissaq isumalluutillu Kalaallit Nunaanni ilisimatusarnermi suliffeqarfinni atugassat

▶ Ilisimatusarnermut ataqtigiissaraaismik attaveqaat suliniutinut sivisuunut ikorfartuisinnaasoq aqqissuunneqarnissaa

▶ Ilisimatusarnermut hub-imik pilersitsinissaq (A4 takuuk) atortussanik USA-meersunik, Kalaallit Nunaanneersunik nunanillu allaneersunik ilisimatuunut ilisimatusarnermi suleqatigiinnissamut periarfissiisumut

A4. Kalaallit Nunaanni angallannermi attaveqaatit suliffeqarfiillu ilisimaarinneqalernissaat

Naapeqatigiinnermi USA-miik peqataasunut angusaq annertoop tassaavoq Kalaallit Nunaanni suliffeqarfiit assigiiingitsut ilisimatusarnermut ikorfartueqataasut ilisimalerner (Ilangussaq A). Tamanna aallartiffik pingaartuuvoq suleqatissanik atortissuarutinillu ujaasinermi.

S3. Design new funding programs and mechanisms to support collaborative work

Workshop participants repeatedly stressed the importance of funding mechanisms for collaborative work (Figure 1). Participants discussed how funding from the U.S. or Greenland could be used to support time and effort of foreign researchers. Participants offered the following ideas for funding and development:

- Develop pooled funding sources (across countries, agencies, institutions) that require or incentivize full participation by researchers from Greenland and the U.S.

- Government agencies and institutions in Greenland should develop a mechanism to give government researchers release time for participating in research and outreach beyond government mandates

- Ensure U.S. support for collaborative work by budgeting for sub-awards that support time and resources from local Greenland research organizations

- Organize a research coordination network that could support longer-term projects

- Develop a research hub (see S4) that includes facilities for U.S., Greenland, and international researchers to set up collaborative research spaces

S4. Become familiar with infrastructure and institutions in Greenland

One significant outcome for the U.S. workshop participants was learning about the various agencies and organizations in Greenland that support research (Appendix A). This is an essential starting point for identifying facilities and collaborators.

Briefly described at the workshop was an International Arctic Science Hub to be located in Nuuk. The Ministry of Higher Education and Science in Denmark and the Ministry of Industry, Energy, and Research of Naalakkersuisut are working to establish the hub to facilitate Arctic research on behalf of the Kingdom of Denmark. The headquarters will be placed in Nuuk with satellite hubs around the Kingdom of Denmark. The hub will serve as a main access point for researchers interested in collaborations. Ideally, each major town or settlement in Greenland will have a point of contact for researchers to connect with partners/students/researchers in Greenland.
A5. Ilisimatusarnermi suleqatiqinnissami pingaarnersiuinerit, ileqqorisassat suleriaatsillu pitsaasut pilersitseqatigiffiusumik suliarineqartarnissaat

Siunissami naapeqatiqinnerit pilersissinnaavaat USA Kalaallit Nunaalli peqatigillutik ilisimatusarnermi pingaarnersiuinerini, ileqqorineqaqusunik aamma ilisimatusarnermi suleqatiqinnermi suleriaatsit pitsaasut pillugit allagaqaatit iniernartortinneqarnissaanit (Takussutissaq 1). Allagaqaatit taakku naapeqatiqinnerillu imminerim attaveqagatiginnerinuk nukttuunik suleqatiqiiit akornanni pilersitssissapput suliniutiinillu qaffassissumik pitsaassusilinnik pilersitsillutik.


Assit Robert Gill-imik assilineqarput.
S5. Co-develop research priorities, codes of conduct, and best practices for collaborative work

Future workshops can lead to the development of joint U.S.-Greenland statements of research priorities, codes of conduct, and collaborative research best practices (Figure 1). These statements and the workshops themselves will build relationships among collaborators and lead to high-quality future projects.

- **Research Priorities** - U.S. research in Greenland is driven by a diverse academic research community whereas Greenland research is mandated by the government to be relevant to society and is often directed at natural resource management and extractive industries. These are not mutually exclusive. Participants recommended development of joint research priorities and a requirement for U.S. researchers to consider how their work is relevant to and of benefit to Greenland society. This would make it easier for Greenland researchers to participate in U.S.-funded projects.

- **Codes of Conduct and Best Practices** - Communication from start to finish is essential for equal and successful partnerships. Idea and hypothesis generation should involve researchers from the U.S. and Greenland and stakeholders/institutions in Greenland (e.g., local communities, Inuit Circumpolar Council (ICC), Ilisimatusarfik, the Hunter and Fisher Association (KNAPK)). Methods should be jointly developed. Resources should be pooled to overcome logistical issues (e.g., community members doing field sampling, institutions doing lab work). All research participants should discuss how to share results and be involved with some aspect of dissemination (outreach, reports, publications, and presentations).

Photos by Robert Gill.

Ilisimasanik pilersitseqatigiinneq ilumoortooq tassaavoq aalqafaataaniillu suluteqatigiilluni, ilisimatusarnermi aqekquttissat iluslersorneqarnermi suluteqatigigiluni qanooq akinnissat inissisornoqarnerani. Pingaarnersuineq anertood tassaavoq soqutigisat ernumanartallu assigaagta nassaarininnissat, aalsiartut, piniartut soqutigisartullu allat peqataatinneqarnerini, soorlu nunatta pisassat uppensarsanneqarnerani aqunneqarneranilu (soorlu PISUNA Ilanngussaq B-mi takuguk).


Eeqimattakkaat arlariit pisussaaffeqarput pilersitseqatigiilluni ilisimatusarnermut piginnaasanik pilersitsiarnnermut:


2. **Ilinniartitsisut (atuarfinni ilinniartitsisut, ilisimatusarfinnilu professorit Kalaallit Nunaanni USA-miilu** pikkorissarneqartaaqarput ilisimasanik pilersitseqatigiinnermut suleriaatsinik atuarfisarneqasinnamut aamaa iliinniartuniut suluminnik allartitsisarneqinneranik Kalaallit Nunaanni inuiaqatiqinninat tusaranaarisanaaneranik periarfisarneq tunisarsarlarik. Apeqput ammasoq tassaavoq qanoq Kalaallit Nunaanni ilisimatuut anertuumik piumaffigineqartaramik nunat assiigiinngitsut akornanni suluteqatigisinnaamut inuiaqatiqinnuullu sammassauriisarninnissamunolt piffissaliisamuninnut.

Co-Produced Research

The research community and the political system in Greenland are particularly concerned with the involvement of Indigenous and local knowledge in research and the development of communities in Greenland. There is a large push for research that directly benefits and involves society, and it is important for researchers to engage in issues that are of importance to Greenland society. U.S. researchers, particularly natural and physical scientists, often arrive in Greenland with project ideas that were developed without direct engagement with communities or potential colleagues in Greenland.

True co-production of knowledge means working together from the very beginning, formulating research questions together and collaboratively determining how to proceed to answer them. A priority is identifying overlapping interests and concerns, and strengthening the involvement of fishers, hunters, and other stakeholders interested in the documentation and management of natural resources (e.g., see PISUNA in Appendix B).

The preliminary work for co-production requires creating opportunities for people to develop relationships that will lead to collaboration. Researchers must build formal and informal networks and connect with local researchers and community members. The most important element of this is time. Participants suggested that it takes at least a year to year-and-a-half to build capacity, find research contacts, and develop trust and relationships that are essential for collaborations. Ideally this happens during proposal development. Participants also suggested that time and funding for developing collaborations should be built into proposals, despite the short funding cycles (3-5 years) of U.S. research projects.

Multiple groups have a role in building capacity for co-production of research:

1. *The research community in Greenland* is relatively small and could be nurtured by developing a research pipeline to inspire and train young people from Greenland to become independent researchers in Greenland. This is one goal of the Joint Science Education Project. Growing this community is important because Greenland researchers have huge demands on their time for international collaborations and community outreach.

2. *Educators (teachers, professors) in Greenland and the U.S.* must be trained to teach and embrace models of co-production of knowledge and to provide opportunities for students to meet and listen to Greenland communities before they begin their work. An open question is if and how to involve Greenland and U.S. teachers in the co-production of knowledge beyond training students. U.S. researchers, who are often professors who mentor students, should embrace co-production and emphasize its importance to research in Greenland.

3. *The general public in Greenland* may lack an understanding of what research is and what benefits it can bring them. Thus, they may not be in a good position to formulate questions in collaboration with researchers. This is an important area where Greenland researchers can build public understanding and support for long-term collaborations with U.S. and international scientists. There is also no obvious mechanism for gathering information from the public, especially given the presence of language barriers. One proposed solution is inviting people from Greenland to attend scientific meetings, where they can learn about research and give input about community interests and needs. One example is the Ilulissat Climate Days meeting that took place 2-5 June 2015 and involved both scientists and stakeholders in discussions on cryosphere changes and their effects on the Greenland environment and society. For these events to be successful, funding must be available to support the participation of Greenland community members. Even if the meeting takes place in Greenland, travel costs can be prohibitive.
Innuttaasunut saqqummiisarnerit


Tamarmik isumaqataapput innuttaasunut saqqummiisarnermi pitsaanerujussuarmik sulisqaqarnerisaaqoq. Kalaallit Nunaanniq peqataasut isumassarsiaat nalitutpput pingaartinneqarlutilli tassami paasinlikamik attaveqarnermi periuutsit assigingittuts suleriatsillu iluatsilluartut suut Kalaallit Nunaanni innuttaasunut saqqummiisarnermi atorneqarsinnaersut.

Innersuussutit siammasinnerit:

- Innuttaasunut saqqummiisarneq Kalaallit Nunaanni suliniitunut ingerlanneqartuni anguniakkatut ersarissumik allanneqartarnissaat innersuussutiligineqarpoq, aningaasiaa月qsoq sumiingaanneernersoq apeqqutaattannu.
- Isumalluutit (piffissaq aningaasallu) innuttaasunut saqqummiisinnassamut illikartinneqartassapput
- Ilisimatut ilisimatusarnerup iluquttissarner uansuutuqeninersaqqoq, kisianni Kalaallit Nunaanni inuiaqatigiinutt erseqqissartassagaataq (soorlu ilinntartarnermik pikkorissaqarnerermullu periarfissaq annertuner, atataqitigiinnermut attaveqarfiit pitsangorsarnerqarneri, nunap pissaaritaanek akinaq aqutsinertuq foranepat)
- Innuttaasunut saqqummiisarneq imak eqqarsaatinigineqartassasoq inuiaqatigiit oqaloqatigalugit, saqqummiisiffigginnarnagilt. Ilisimatut Kalaallinnik piumasaqaatit paasisutissanuttuq Iluusissaulluunniit tunngasut sapinngisamik iliuseqarfiginiartassavaat.
- Atortut angisuut atserneqarneri Kalaallit ati atorneqartassasut
- Ajornangippat, Kalaallimik ilisimatumuk nutserisumilluanunniis saqqaqepekqartiinaasak oqatsigutumunamilligissat qaangerniarlugit – peqataasoo ataaqoq oqaatigaa Kalaallit aqutsuteqarnerusartut saqqummiineriit kalaallisut ingerlanneqaraangata.
- Nuummi The International Arctic Hub inuiaqatigiinunnut saqqummiisarnaninaniq aqqissuussisinnaaqoq, ingammi sulisqararuq inuiaqatigiinunnut attaveqartarninnassamut saqqummiisarninnaxumullu aqatsisinnaasumik aqutsininnnarassamut, aammaluku nutigasanin kikuaqarssarsinnaallu.

Innersuussutit siammasinnerit:

- Nittartakkatigut inuit naapittarfii - Ilisimatut Twitter-i ilisimatusarnermikkit attaveqaqatitut saqqummiisinnikkullu atortarpaat, kisianni Kalaallit Nunaaanni Facebook (Instagram-ulu tullertut) inuiaqatigiinnut apusussitissatput pitsaanerpaallu. Kalaallit Nunaaanni Facebookkikkit pisussanik nalunaarsuinieq sileqatinillu kammalaatinilluunniin nalunaarsuineq sukkasumik ilisimatusnarnermikkit sulianek aamma inuiqatigiinnut saqqummiisinnanek pequtissasarpoq.
Public Outreach

People in Greenland are often aware of foreign researchers working in local field stations or as they transit through to more remote field camps. However, there is often little interaction among community members and researchers unless this is part of the funded work. In some instances, community members have expressed frustration at the influx of foreign researchers who have significant impacts on local resources such as housing. Participants recounted interactions with community members who questioned the need for researchers to be in Greenland as the direct benefits are not apparent.

All agree that there is room for significant improvement with regards to public outreach. Ideas offered by Greenland participants were particularly valuable and appreciated because of their understanding of the nuances of communication and best practices for outreach in Greenland communities.

General recommendations:

- Public outreach should be prioritized as an explicit goal of all projects conducted in Greenland regardless of funding source
- Resources (time and money) should be allocated to outreach
- Researchers should emphasize the benefits of research to Greenland society beyond global impacts (e.g., enhanced education and training opportunities, improved infrastructure, improved natural resource use and management)
- Think of outreach as a conversation with the public rather than a one-sided presentation. Researchers should try to respond to requests from Greenlanders for information or action on questions that the Greenlanders raise
- Use Greenlandic names to refer to major equipment installations
- If possible, partner with a Greenland scientist or translator to overcome language barriers - one participant noted that more Greenland citizens ask questions when presentations are in Greenlandic
- The International Arctic Hub in Nuuk could facilitate outreach in communities, especially if there is a dedicated person to coordinate and facilitate community outreach and assist with translations

Specific recommendations for reaching the Greenland public:

- **Radio and Local Advertising** - Seek interest from Kalaallit Nunaata Radio (KNR) and Sermitsiaq, the print media outlet (sermitsiaq.ag). Both broadcast nationally and are ubiquitous ways for the public to learn about news and events in Greenland. These venues are a significant way to advertise science outreach events, as is using local flyers in bus stops and Nuuk Ugeavis, the free newspaper in Nuuk. One exciting idea from the workshop is to connect researchers with Ilisimatusarfik journalism students, who can collaboratively work to convey information about research and results to the public through radio stories and written articles for the local free newspaper in Nuuk.

- **Social Media** - Researchers use Twitter for science communication and outreach, however, in Greenland, Facebook (and Instagram, secondarily) is the best way to reach the public. Posting events on Facebook and tagging colleagues or friends in Greenland is a fast way to spread awareness of research projects and outreach events.
Kalaallit Nunaanni innuttaasunut saqqummiisarnissanat periarfissat:

Nittartakkatigut


Nuummi Greenland Science Week ingerlanneqartartoq

Opportunities for Outreach in Greenland:

Online

Every town in Greenland has a computer with 4G internet that is available to anyone living in or near that town. A well-known website that is regularly maintained within Greenland, freely available, and that already has a lot of other information on it should have a tab created for “Outreach”. Someone clicking on that tab would be able to see science outreach film clips and science classroom activities that are crafted to be easily understood by a Greenland citizen. Isaaffik (www.isaaffik.org) is already widely known, recognized, and regularly maintained. Outreach materials could include:

- **Science videos and podcasts**: 5-7 minute brief, interesting podcasts about science results that are relevant to the citizens of Greenland. If possible, each podcast should be in multiple languages, including English and Greenlandic. The podcast should be posted on YouTube, linked on Isaaffik, and could also be linked to the official YouTube channel of Ilisimatusarfik. When the research is a partnership between scientists from other nations and Greenland community-scientists, both the local and the international scientist should be included within the footage and in the design of the video or podcast.

- **Science lessons for classrooms in Greenland**: The lessons should be pedagogically sound (e.g. follow guidance in the U.S. National Science Standards), easily understood, use materials readily available in remote communities*, and should be accompanied by a teacher’s guide to help the local teacher be prepared to use the material in his/her classroom. *Some materials, including paper-handouts and posters, may need to be sent to communities because access to printing is very limited in the smallest communities. Also, there needs to be an avenue to connect local teachers to these materials (perhaps through the Ministry of Education in Greenland and the Institute of Learning at Ilisimatusarfik).

- **Visualizations of projects and their data**: NASA has amazing visualizations, freely available at the NASA Science Visualization Studio (SVS): svs.gsfc.nasa.gov

Greenland Science Week in Nuuk

There has been a polar research day every year in Denmark that Greenland researchers attend, and, excitingly, this event is moving to Nuuk and is scheduled for 2-5 December 2019 as “Greenland Science Week”. This and future events will be a significant venue to showcase research by Greenland and international scientists. It may also be worth exploring satellite versions in smaller towns with at least one researcher from each the U.S. and Greenland in attendance. Participants suggested a good model for this event is the annual Culture Night in Nuuk, when most businesses and institutions are open to the public and host various displays, exhibitions, and activities. This has included the Greenland Institute of Natural Resources hands-on display and the Greenland National Museum and Archive exhibit and history quiz game, which are well attended in part because bus services are free during this period to encourage residents to attend. If U.S. researchers are unable to travel to partake in this important event, they could design and provide the materials for hands-on activities to partners at research institutions in Greenland. For part of the Nuuk workshop, we hosted such an event at Katuaq.
Illoqarfinni ilisimatusarnikkut suliaqarfsunusi inuiaqatigiinnut saqqummiisarnissaq

Ilisimatusartut Kalaallit Nunaannut suliaqarfimmiit tikiinginnerminni Kalaallit Nunaanneersunik ilisimatuunik piffissami pisussamiit (soorlu mittarfiimmik, innuttaasut illuaniluunniiit) pilersaarusiisurtinnik sulqaqateqarnissaat innersuussutigiqarpooq. Suleraaseq piars生姜saasooq ataseeq tassaavoq ilisimatoog ilisimatusarnermut tunngasumik naatsumik saqqummiisinniisi, piffissalliuarlunilu tusarnaartunik aqepquteqartoqarsinnaaanaq saqqummiisartut tunngasumik imaluunniiit ilisimatusarnermut tunngasumik peqetaasuniik aaliangersakkanik. Inuiaqatigiinnun saqqummiisarnemun taaqasaluninnarneq inerlanneqartartoq ataseeq tassaavoq Kangerlussuup mittarfiami ukiut tamasa Joint Science Education Project inqertennarnerani pisartoq. Inniartut takussutissanik sammiisassanillu piareersaasarput, inillartullu USA, Danmark Kalaallit Nunaanilli peqetaasaramik ilisimatusarnermi sulliuittutik aqepqutillu kalaallisut, qallunaatut tuluttullu saqqummiisinnasaraapat akillugillu.

Nunatta Katersugaasivia


Assit Lars Demant-Poort-imik assilineqarput.
Outreach in towns where field work is conducted

Scientists coming to Greenland should work with local scientists well before their arrival to organize an event at a local venue (e.g., airport, community center in Pituffik/Qaanaaq), which would then occur while the visiting scientist is in town. One possible format is having the scientist briefly talk about a research topic, allowing a lot of time to answer questions from the audience about their talk or on a range of scientific topics suggested by attendees. One currently implemented outreach event occurs at the Kangerlussuaq airport each summer during the Joint Science Education Project. Students put together displays and hands-on activities and because the teams include students from the U.S., Denmark, and Greenland, they can share their science projects and answer questions in Greenlandic, Danish, and English.

Greenland National Museum and Archives

The Greenland National Museum and Archives is tasked with protecting, preserving and disseminating information on the entirety of Greenland’s cultural history and intangible heritage. From a management standpoint, this is a daunting task as the sheer size of Greenland presents incredible logistical challenges to accessing remote parts of the country. The National Museum also holds an obligation to perform research and disseminate information on new discoveries related to Greenland’s natural history. Therefore, the National Museum has a standing interest in promoting and participating in collaborative projects that bridge the natural and social sciences and can combine cultural resource management (i.e. heritage & archaeology) with environmental/climate science. The National museum lacks funds, exhibition space and expertise in the natural history of Greenland and would like to incorporate more natural history and science into their larger public outreach efforts and in the process help scientists make their discoveries more accessible. As there is not a lot of space in the museum for full exhibitions, the Museum has offered to post videos and develop new virtual platforms on the museum’s website and Facebook page and possibly KNR that help promote scientific literacy and general interest in local scientific research. Again, the target audience would be both local and international, with translations provided in Greenlandic, Danish and English.

Photos by Lars Demant-Poort.
As part of the workshop, researchers from the U.S. and Greenland set up hands-on exhibits and shared science with the community at a two-hour event at Katuaq, Nuuk’s Cultural Center. This feature event was opened with remarks by U.S. Ambassador to Denmark Carla Sands. Following her remarks, researchers from the U.S. and Greenland used various formats for communication. Some participants elected to prepare a five-minute presentation describing their project and research for the general public. The talks included a personal dimension, i.e., ensuring to introduce yourself, your background, and tell a little bit about your story of being a researcher in Greenland. We displayed over ten posters that described various projects in Greenland led by U.S. and/or Greenland researchers and we had a collection of hands-on exhibits featuring photographs, videos, scientific equipment, and field samples.

Photos by Kisser Thorsøe, Bo Gregersen, Lauren Culler.
Exploring Science in Greenland

*U.S. and Greenland partnerships*

Presentations and Exhibits by Scientists from Greenland and the U.S.

**MONDAY 27. AUGUST 2018**

15.00 - 17.00 at KATUAQ

FREE ENTRY

Activities for Children
Ilinniartitaaneq

Peqataasut oqallisigaat ilisimatusartut kinguaariit tullii qanoq ilinniartitaasinnanersut sungiusarneqarlutilini. Kalaallit Nunaanni ilisimatusartut paasinarsitippaat ilinniartut sulifimmillu misiliisut toqqammaviusumik ilisimatusarnermut ilinniagallit taavalu teknikkikkut ilinniagaqarnissiut soorlu ungassisumiik uuttuisinnaa niissaq aamma GIS (geographic information systems) pisariaqartut. USA-mi Kalaallit Nunaannilu ilinniartut suleqatigilinnissamut piareersimanerusinnaapput tamakkua ilinniartitaanermimmuni sammineqartarpata.

Innersuussutit aalajangersimasut ilagaat:

Kalaallit Nunaanni STEM-ip iluani atuartitsissutit pikkorissaranerilli periarfissat ineriartortinnegassapput -

- Kalaallit Nunaanni atuarfiit ilisimatusarnermut atuartitsissutit (iliinniartitsinermut immikkoortukkaat, atuartitsinermut pilersaarutit, atuakkat il.l.) kalaallisoortut piumavaat, pingaartumik apeqqutit aallaavigalugit ilinniusit. Ilisimatusartut taavalu Ambassador-mik stipendiatit Nuummi ilinniusiorfik, ilin niartitsisut, Ilinniarfissuaq Ilinniartaanermultu Naalakkersuisoqarfik suleqatigisinnaavaat kalaallisut ilisimatusarnermut ilinniusiutit ineriartortinnissaannu t.

- Peqataasut sulissutigerusuppaat ilisimatusarfimmi ilisimatusarnermut pikkorissaanerit ilin niartitsinermiilu ingerlanneqartalernissaannut taavalu ilinniarneq ineriartortinnegarnissaa. USA-miik ilin niartitsisut tikeraat amerlanerit pikkorissaanerit naatsunik ingerlatsi tsisut ikorfartorsinnaavaat pensum-i siammasinnerusuoq ineriartortinnegaraneranat taavalu tuluttut pikkorissaanerit tapertaralugit.


- Aasaanerani ilin niartitaanermut suliniutit Kalaallinik ilinin iar unik peqataatitaqartartut ataaavartumik ingerlanneqartarnissaaat. Suliniut ingerlalluartoq tassaavoq USA-miik taavalu Naalakkersuisunik aningaasalersorneqartoq Joint Science Education Project (ataaniittoq ilangussaq takuguk) kisian ni suliniutit pikkorissaanerillu allat aamma ineriartortinnegarsinnaapput (soorlu pikkorissarneq ataat simut isiginnilluni pinngortitap pissartitaanut avatingiisini allanngorartuni aqutsinermut) ilinniartunut ukiunut tamanut naleqqussakkat.

- Nittartakkakut pikkorissaanerit nittartakkallu ilinniakkat, soorlu University of Alaska-Fairbanks-imit ingerlanneqartartut periarfissaasinnannaapput Kalaallit Nunaanni ilin niartut pikkorissarnernik peqataaffigisinnaa saannik. Tamanna iliniarnernik tamakkiusunq naammassisititsinngikkaluarluni, ilin niartut Ilisimatusarfimmi ilin niarnerninnput point-itik nuutsissaassavaat.

USA-mi Kalaallit Nunaannilu ilimutuqunngorniit nunap inoqqaavinik siuallit attaveqalernissaat - Tamanna Kalaallit Nunaanni iliimatusarnermi annermik iminnut takusinnaalernissaanutt iluaqutaassaaq USA-meersullu nunap inoqqaavinik siuallit iliimatusarfinnun Kalaallit Nunaanni iliimatusarnermi suloqtagiinermi assigiinnitsunuti ilisimaurinnitsilerluitik. Tamanna ilinniartunut nunap inoqqaavinik siuaulinunitt Issittumi pinngortitami uniaqtagiilerninermi iliimatusarnermi soqutiginninneq periarfissiilerlu annertuneq pilersissavaa.

Education

Participants discussed how to educate and train the next generation of Greenland and U.S. researchers. Greenland researchers indicated a need for students and interns with basic scientific training as well as with technical skills such as remote sensing and GIS (geographic information systems). U.S. and Greenland students can be prepared for collaborative work if it’s emphasized in their training.

Specific recommendations include:

**Develop greater access to STEM resources and courses in Greenland -**

- Greenland schools want more science materials (education modules, lesson plans, textbooks etc.) in Kalaallisut (Greenlandic), especially inquiry-driven materials. Researchers and Embassy Science Fellows could work with the publishing house in Nuuk, with teachers, the teachers’ college, and the Ministry of Education to develop science materials in Kalaallisut.

- Participants were excited about the idea of developing and leading research-based science courses and a possible science degree at Ilisimatusarfik. More visiting lecturers from the U.S. offering lectures or short courses at Ilisimatusarfik would be helpful in broadening the curriculum and adding English coursework.

- Ph.D. courses combined with a workshop in Greenland is another way to train and engage the next generation in research and build networks. For example, from 2-9 October 2019, Ilisimatusarfik will host the Ph.D. course “Community based health research – methods and strategies.” As part of that course, students will develop presentations to give at NUNAMED 2019, a conference on Greenlandic health and medicine (5-7 October 2019, www.nunamed.org).

- Continue to implement summer school programs that include Greenland students. A successful model is the U.S. NSF- and Naalakkersuisut-funded Joint Science Education Project (see Insert below) but other courses should be developed (e.g., a course focused on holistic management of natural resources in rapidly changing environments) including for students of all age groups.

- Online Courses and online certificate programs, such as those offered by the University of Alaska-Fairbanks might be another avenue for Greenland students to access coursework. While this would not lead to completed degrees, the students could transfer some of these credits into Ilisimatusarfik degree programs.
Develop and encourage student exchanges or mechanism for Greenland students to study in the United States and vice versa - The education of Greenland researchers in Denmark has built a strong base of collaboration. An equivalent pathway in the U.S. would facilitate U.S.-Greenland collaborations. There is also desire for greater access for Greenland students to study in the U.S., with U.S. government support in acknowledgement of Greenland’s engagement with the U.S. for research and security missions. U.S. hosts could have students participate in labs as visiting researchers without having to enroll and pay tuition. U.S. universities with a large funding effort in Greenland should pursue self-funding their student and faculty exchange programs. Even at very modest scale, these efforts will be impactful in building reciprocal relationship. For example, each year since 2009 the Institute of Arctic Studies has funded a student from Ilisimatusarfik to spend a term at Dartmouth and this relationship has grown where recently Dartmouth students can now spend a term at Ilisimatusarfik.

Connect Indigenous U.S. and Greenland undergraduates - This would aid Greenland students in identifying with science to a greater degree and introduce U.S. Indigenous students to the research collaborations operating in Greenland. This would produce greater interest and access to Arctic physical and social sciences among Indigenous students.

Provide training for teachers - The U.S. Embassy in Copenhagen, Naalakkersuisut, and Ilisimatusarfik are recruiting an Embassy Science Fellow to work with the teachers’ college in Greenland to identify their interests and needs, some of which include creating hands-on materials and inquiry-based field teaching, and how to teach science to different age groups. An example from the U.S. is the NSF-funded School of Ice Project that trains educators about teaching polar science. Other programs that focused on hydrology, geology, biology, etc. would also be appreciated. This would also provide more English instruction, which could help Greenland students connect with the broader scientific community. ■
The Joint Science Education Project (JSEP)


Assit Lars Demant-Poort-imik assilineqarput.
The Joint Science Education Project (JSEP)

JSEP is a U.S.-Greenland collaboration funded by the U.S. National Science Foundation and Naalakkersuisut. Each summer since 2009, high school students from Greenland, Denmark, and the U.S. travel to Greenland to study rapid environmental change. The program is based in tundra ecosystems around Kangerlussuaq and on the Greenland Ice Sheet at research sites such as the U.S. Summit Camp or the Danish East Greenland Ice Core Project (EGRIP). Throughout the program, students work in the field alongside scientists and graduate students to get hands-on experience in interdisciplinary field research and the process of science beyond what most classrooms can offer. Students complete inquiry-driven projects that they then present at an outreach event the airport in Kangerlussuaq where they reach hundreds of people traveling to, from, and around Greenland. Giving the students a voice to share their discoveries is an important step for preparing them as future leaders. Built into the program is intentional cultural sharing- the educators & students host a U.S. night, Denmark night, & Greenland night. This fosters open and creative multicultural research teams that represent the future of U.S.-Greenland research. Importantly, JSEP also gets Greenland students engaged in research and onto the Greenland Ice Sheet, a massive part of the Greenland landscape that is largely inaccessible to Greenland students and the public.

*Photos by Lars Demant-Poort.*
Nalunaarummik Allagaqartunik
Naggassiummik Oqaaseqaatit


Ukua naapeqatigiinnermut toqqaannartumik tapersersuisut qujaaffigerusuppagut: Naalakkersuisut, U.S. National Science Foundation (aningaasaliissut #1837806 L.E. Culler aamma R.A. Virginia tunniunneqarnikoq); Pinniportitaleriffik ataatsimiinnernut inissanut peqataanerannullu; Kalaallit Nunaanni ilisimatusarnermut Snuumersiusoqatigiit; the National Aeronautics and Space Administration (NASA); the Smithsonian Astrophysical Observatory (SAO), aamma CH2MIIHill Polar Services. Peqataasut tamarmik qujaaffigerusuppagut Nuummi naapeqatigiinnermut pingaarutilimmut piffissaq tunniussaannut. Mitdlarak Lennert qujaaffigaarput nalunaarusiaq tuluttuumiik kalaallisuumut nutserneranut.

Ilisimatusarneq tassaavoq ilisimasat paasinninnerlu, inuit peqataatinnagat anguneqarsinnaangitsut. Naatsorsuutigaarput naapeqatigiinnerput suleqatigiinnererit Kalaallit Nunaat USA-lu ilisimatuut akornanni nutaat nukittuullu pilersissimagaat, attaveqatigiinnerit pingaaruteqarlunnartut ilisimatusarnermi sammisat Issittumi allanngoriartorneq sukaqajisumut tunngasut Kalaallit Nunaanunut nunaarsuarmullu sunniutit iliuuseqarfliginnisaannut.

**Sten Lund**
Research Coordinator
at the Government of Greenland

siu@ufm.dk

**Josephine Nymand**
Head of Dept.
at Greenland Institute of Natural Resources

jony@natur.gl
Concluding Remarks by Authors

We are overwhelmingly appreciative of the efforts of our esteemed colleagues at this workshop for openly and enthusiastically discussing opportunities and actions to enhance U.S.-Greenland research collaborations. Naalakkersuisut (the Government of Greenland) and our many partners in Nuuk offered an excellent environment and venue for our dialogue and network building. It was apparent to all that this workshop was a watershed event in identifying pathways for joint long-term productive relationships and programs. We have done our best to capture the dialogue and recommendations made by the participants and take responsibility for any omissions.

We hope that this report and the specific recommendations are helpful to the broader research communities and to stakeholders in Greenland. We hope the report will also help U.S. funding agencies understand the opportunities and challenges facing interdisciplinary and international collaborative research in Greenland. From this workshop we have an emerging network of institutions, centers, and researchers who can share their perspectives and knowledge of how to better conduct and share research with Greenland and the public.

We wish to thank the following for their direct support of this workshop: Naalakkersuisut (the Government of Greenland), the U.S. National Science Foundation (award #1837806 to L.E. Culler and R.A. Virginia); Pinngortitalleriffik (the Greenland Institute of Natural Resources) for meeting space and their active participation; Kalaallit Nunaanni Ilisimatusarnermut Siunnersuisogatigiit (the Greenland Research Council); the National Aeronautics and Space Administration (NASA); the Smithsonian Astrophysical Observatory (SAO), and CH2MHill Polar Services. We thank all participants for their willingness to be in Nuuk and dedicate their time to this important workshop. We thank Mitdlarak Lennert for translating the report from English to Greenlandic.

Research is about science, knowledge, and understanding, all of which are impossible without people. We are confident that our workshop has brought about new and stronger partnerships among the Greenland and U.S. research communities, connections that are critical for addressing urgent scientific issues related to rapid rates of Arctic change and its impacts on Greenland and global society.
Ilanngussat // Appendices

**Ilanngussaq A – Kalaallit Nunaanni USA-milu Ilisimatusarneq**
Kalaallit Nunaanni ilisimatusarnermut tunngutillugu suliat USA-miik Kalaallit Nunaanniillu aningaasalersorneqartut nalunaarsorneqarnerti.

**Kalaallit Nunaat**


**USA**

USA-p Kalaallit Nunaanni Ilisimatusarnera aningaasalersorneqartartoq aqutsisoqarfinkin soorlu National Science Foundation, the National Aeronautics and Space Administration (NASA), the National Institutes of Health (NIH), the National Oceanic and Atmospheric Administration (NOAA), aama the Smithsonian Astrophysical Observatory (SAO). Aqutsisoqarfiit taakkua suliniutit ilisimatuunik Ilisimatusarfinneersunik NGO-nilu (tamaani nalunaarsornissaannut amerlavaalaraqput) aqutsisulinnik. Ilisimatusarneq faginik amerlasuunik aallaaveqartortput Kalaallit Nunaanni Ilisimatusarneq faginik meralletthunulugatit (Takussutissaq A2). NSF RSL-nilu U.S. Air Force amma the U.S. Air National Guard toqgammavigisarpqoaq Kalaallit Nunaanni Ilisimatusarneq Kalaallit Nunaat nuqrahlu iluani ilisimatusarfiusunut angallassinerminnini. Logistikkkikut suliaqartartoq, maana CH2MHill Polar Services, ikiuutaasarpqoq suliniutit assigiinngitsut logistikkkikut pisariaqartitaat naammassiniarlunikkit. ■
Appendix A - Greenland and U.S. Research
An overview of the extent of research in Greenland funded by the U.S. and Greenland.

Greenland
The Greenland Research Council, a national and independent organization, promotes and strengthens research that is rooted in and benefits Greenland. In Greenland, over 100 projects since 2016 have been conducted by Greenland institutions such as Asiaq, Pinngortitaleriffik, and Ilisimatusarfik (Table A1). Most of these projects are location along the coastal areas (Figure A1). Danish agencies and institutions have supported a similar amount of research projects in Greenland.

Pinngortitaleriffik, Greenland’s Institute of Natural Resources, has office and laboratory facilities in Nuuk that are home to the Department of Fish and Shellfish, the Department of Birds and Mammals, and the Department of Environment and Mineral Resources. The Greenland Climate Research Centre is embedded in Pinngortitaleriffik and conducts research about the effects of climate change on the Arctic environment and Greenlandic society. Pinngortitaleriffik also has an established field station in Niaqornat. Greenland also maintains the Kobbefjord Research Station outside of Nuuk and the Zackenberg Research Station, which is owned by the Government of Greenland but run by Aarhus University (Denmark). The Arctic Station in Qeqertarsuuaq is maintained by the University of Copenhagen. The Government of Greenland maintains and runs the Kangerlussuaq International Science Support (KISS) building in Kangerlussuaq, which provides accommodations and laboratory space for international scientists.

United States
In any given year, 250-300 U.S. researchers travel to Greenland as part of approximately 50 different projects. There are about 100 project locations (Figure A2), however, many are semi-autonomous instruments. The U.S. National Science Foundation’s Research Support and Logistics (RSL) program coordinates support of NSF-funded research as well as research funded by other government agencies. RSL, whenever possible, relies on local Greenland infrastructure and resources (e.g., Air Greenland, Royal Arctic Shipping, Mittarfeqarfiit, KISS). The U.S. built and maintains Summit Station, the only high altitude, high latitude, inland, year-round observing station in the Arctic.

U.S. research in Greenland is funded by government agencies such as the National Science Foundation, the National Aeronautics and Space Administration (NASA), the National Institutes of Health (NIH), the National Oceanic and Atmospheric Administration (NOAA), and the Smithsonian Astrophysical Observatory (SAO). These entities fund projects that are led by principal investigators at public and private universities and non-governmental organizations (far too many to list here). The research spans many disciplines and covers many remote parts of Greenland (Figure A2). The NSF RSL works work the U.S. Air Force and the U.S. Air National Guard to provide transportation to/from and around Greenland research sites. A logistics contractor, currently CH2MHiIl Polar Services, helps cover the unique logistics needs for each project.
### Table A1

A list of the major organizations and institutions in Greenland that support and conduct research.

- Asiaq Greenland Survey
- Center for Arktisk Teknologi (ARTEK)
- Dronning Ingrids Hospital i Nuuk (SANA)
- Geological Survey of Denmark and Greenland – GEUS, Nuuk Office
- Greenland National Museum & Archives
- Greenland Representation in D.C.
- Greenland Research Council
- Ilisimatusarfik – University of Greenland
  - Greenland Centre for Health Resources
  - Greenland Perspective
- Inerisaavik (Pædagogisk Center)
- Ministry of Industry, Energy and Research
- Ministry of Fisheries, Hunting & Agriculture
- Ministry of Mineral Resources and Labour
- Mineral License and Safety Authority
- Pinngortitaleriffik – Greenland Institute of Natural Resources
  - Greenland Climate Research Centre
- Statistics Greenland

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Assit Lars Demant-Poort-imik assilineqarput.

Photos by Lars Demant-Poort.
Figure A1.
The locations and numbers of Greenland-funded projects since 2017. Green nodes indicate there is one project at site location. Map generated on 05/13/2020, for updates, visit: www.isaafik.org.

Figure A2.
The locations of U.S.-supported field-based research in Greenland since 2017. Map generated on 05/13/2020, for updates, visit: ARMAP.org.
Ilanngussaq B - Suleqatigiilluni ilisimatusarnermi asserssuutit
USA Kalaallit Nunaallu suleqatigiinnerannik asserssuutit pingasut.

Assersuut 1: Piniakkanik sumiiffinni nalunaarsuin eq (PISUNA)


Assit Denis Defibaugh-imik assilineqarput.

Assersuut 2: The Rockwell Kent aamma Early Twentieth Century Greenland pillugit suliniut

Appendix B - Examples of Co-Produced Research

Three examples of U.S.-Greenland collaborative projects.

Example 1: Piniakkanik sumiiffinni nalunaarsuineq (PISUNA)

PISUNA (http://www.pisuna.org) is a project that involves local people in the documentation and management of the environment and living resources in Greenland. The Nordic Council Environment Prize in 2018 was awarded to the Natural Resource Council of Attu, West Greenland, who is tasked with collecting information and observations from fishers and hunters in the community. The award recognized the value of the local council in documenting the marine environment and proposing new ways of managing it. The PISUNA project has worked with the NSF-supported Exchange for Local Observations and Knowledge of the Arctic (ELOKA, https://eloka-arctic.org/pisuna-net/en) and the University of Alaska Fairbanks’ Alaska Arctic Observatory and Knowledge Hub (A-OK, https://arctic-aok.org/) to jointly develop a database and interface for sharing community-based observations that can help inform management of marine living resources (https://eloka-arctic.org/pisuna-net/en). The exchange of information and best practices between the project in Alaska and that in Greenland, along with involvement from the ground up of the ELOKA data management experts resulted in a co-produced tool that further empowers local Greenland fishers and hunters to share observations amongst themselves for better resource management.

Example 2: The Rockwell Kent and Early Twentieth Century Greenland Project

This collaborative study combines visual, historical and anthropological methodologies to approach how social, cultural and environmental changes and continuities are constructed and experienced in Greenland. The project started with the work of Rockwell Kent, an American artist and writer, who resided in Greenland in the early 1930s and produced an extensive collection of photographs, art, and literature about his time in the country. Prior to the start of research, the PI and Co-PIs (2 from U.S. institutions and 2 from Ilisimatusarfik) visited the study communities of Illorsuit, Sisimiut, Nuuk, and Uummannaq, discussed the project, displayed Kent’s art and photographic works and gathered community feedback which was incorporated into the research design. In the later research stage, Kent’s work served as a starting point to engage communities and discuss how social, cultural and environmental changes as well as continuities with the past are understood and defined. Interviews were conducted with community members focusing on the transitions they have experienced in their own lives and in the life of their town/city. Community members were also asked about their knowledge of Kent and his work related to Greenland. In an effort to engage youth in this research and incorporate their perspectives into the project, photographic workshops were carried out with the aid of local schools in 2017/2018 in each of the study communities. During the 1-2 week workshops, the
Assersut 3: Kalaallit Nunaanni Inuttussutit Allangngornerarter: Arlalinnik aallaaveqarluini misissueriaaseq atorlugi naartusarnermut allanguutit pillugit Kalaallit Nunaanni misissuineq (PDG)


PDG examined how decisions regarding conception, pregnancy and parenthood are shaped by multiple interacting constraints and influences in Kullorsuaq, an indigenous, predominantly youthful, northern community in Greenland undergoing economic and environmental changes. PDG was a community based participatory research study (CBPR). The study’s theoretical framework combined ecological systems theory with traditional knowledge to investigate the complexity of factors that create the context in which people in Kullorsuaq make reproductive decisions. Data collection strategies included semi structured in-depth interviews and ethnographic methods. There were three overarching PDG findings. First, CBPR is an effective method to engage community members in the Arctic. Second, the positionality of the research team within the community creates a psycho-social-emotional relationship between research team members and community members. Third, reproductive health in Kullorsuaq is influenced by an interplay of cultural, social, economic, and environmental factors in the community as well as within the large context of Greenland’s political, social service, and health care system. Improving reproductive health outcomes in Kullorsuaq requires a multi-faceted approach. At an individual level culturally relevant sexual and reproductive health education and skill building that addresses communicating about sex, birth control and pregnancy with sex partners and within families and strategies for developing and maintaining healthy intimate relationships is need. At the family level interventions are required that support clear boundaries and expectations within families related to having and raising children. At the community level social norms grounded in pro-cultural beliefs and practices that promote respectful relationships between individuals, couples, and families are warranted. At a political systems level development in the infrastructure that establish culturally relevant educational, social and health care services that are based on the needs of people in Kullorsuaq and Greenlanders are necessary. ■

researchers with the aid of local teachers met with students and presented a brief history of photography, lessons in basic photographic techniques and provided students with cameras. Students were asked to take photos of their families, communities, hopes and dreams and keep a photo journal. Participants produced over 1000 photographs during the workshops. After initial analysis, part of the research team returned to each of the study communities in late 2018 and met with workshop participants again to examine their photos and write captions which will be used in a book of the student photos. The researchers have efforted to incorporate students into the various stages of research, thus the ability to return to study communities and meet with workshop participants has been essential. All participants will receive their photos on a USB drive and a copy of the photobook and the proceeds from any sales of the book will be donated to a children’s charity in Greenland. The incorporation of youth with the aid of local schools and teachers was an indispensible component of this research allowing for a glimpse into how young people in Greenland see their own time, their social lives and their hopes and dreams for the future. The visual is crucial, not only for how we culturally construct our world, but for what we see, how we see, what it means to us, and how it affects us.
Appendix C - Participant List

**Greenland**
- Mikkel Høegh Bojesen
- Lars Demant-Poort
- Klaus Georg Hansen
- Hans Husyan Harmsen
- Julie Hollis
- Lene Kielsen Holm
- Thomas Juul-Pedersen
- Kirsty Langley
- Mîtdlârak Lennert
- Nette Levermann
- Sten Lund
- Arnajaaq Lynge
- Christian Koch Madsen
- Eva Mätzler
- Kirstine Eiby Møller
- Vivian Motzfeldt
- Gert Mulvad
- Klaus Nygaard
- Josephine Nymand
- Allan Olsen
- Hans Kristian Olsen
- Martin Olsen
- Qupanuk Olsen
- Najaaraq Paniula
- Gitte Adler Reimer
- Jette Rygaard
- Simon Thaarup
- Kissær Thorsøre

**United States**
- Alden Adolph
- Mary R. Albert
- Kelly Brunt
- Zoe Courville
- Lauren E. Culler
- Denis Defibaugh
- Hajo Eicken
- Bo Gregersen
- Lenore A. Grenoble
- Jay T. Johnson
- Ellen Martin
- Jon Martin
- Jennifer Mercer
- Nimesh Patel
- Elizabeth Rink
- Cynthia Suchman
- Kirsty Tinto
- Susan Vanek
- Ross A. Virginia
- Jeff Welker