

Global Station for Arctic Research
Global Institution for Collaborative Research and Education(GI-CoRE)
Hokkaido University

Final Evaluation Report



北海道大学 国際連携研究教育局
北極域研究グローバルステーション

外部評価報告書

July 2021
2021年7月

**Final Evaluation Report
(brief version in Japanese)**

外部評価報告書（日本語・概要版）

もくじ（日本語版）

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はじめに

国際連携研究教育局（GI-CoRE）は、北海道大学の強みや特色を活かした国際連携研究教育の推進と、部局が独自に進める国際連携研究教育の支援を目的とし、世界トップレベルの教員を国内外及び学内から結集した総長直轄の教員組織です。

GI-CoRE 内には研究領域ごとの活動拠点である「グローバルステーション（GS）」を置き、各 GS において、原則 5 年間の設置期間内に重点的に研究教育活動を進めています。これまでに、延べ 8 つの GS（下記※を参照）を設置し、研究活動を推進するとともに、最先端の研究成果を大学院教育などに還元してきました。

GI-CoRE では、GS の設置期間満了を迎える年度に、各 GS でのこれまでの活動を振り返るとともに、今後、より強固かつ持続可能な研究教育体制を確立していくため、国内外の有識者により構成される外部評価委員会において、評価を実施することとしています。

この外部評価報告書は、2020 年 10 月に実施した北極域研究 GS（GSA）の自己点検成果報告書及び外部評価結果を一冊に収録した、いわば GSA の研究教育活動の集大成です。

なお、北極域研究 GS は設置期間満了に伴い、北極域研究センターに定着化し、新たに「GI-CoRE 協力拠点」として認定を受けた国際連携研究ユニットとして、2021 年 4 月以降も GI-CoRE と連携しながら研究教育活動を継続しています。

本学では、外部評価結果を踏まえ、より充実した研究教育活動を実践していくことにより、世界の課題解決に貢献していきたいと考えております。

北海道大学 国際連携研究教育局長
寶 金 清 博

※これまでに設置したグローバルステーション（GS）

GS 名	設置期間 (年度)	主な学内連携部局等
量子医理工学	2014～2019	医学研究院、大学病院ほか
人獣共通感染症	2014～2019	人獣共通感染症国際共同研究所、 獣医学研究院
食水土資源	2015～2019	農学研究院ほか
ソフトマター	2016～2020	先端生命科学研究院ほか
ビッグデータ・サイバーセキュリティ	2016～2020	情報科学研究院ほか
北極域研究	2016～2020	北極域研究センターほか
バイオサーフィス創薬	2019～2023	薬学研究院ほか
先住民・文化的多様性研究	2021～2025	アイヌ・先住民研究センターほか

国際連携研究教育局(GI-CoRE)
北極域研究グローバルステーション
外部評価委員

*国立極地研究所 副所長 榎本 浩之 教授

東京大学 大学院新領域創成科学研究科 山口 一 教授

ノルウェー 海洋研究所 ハイネ ルネ・ショルダル 上級研究者

*委員長

国際連携研究教育局 (GI-CoRE)
北極域研究グローバルステーション
外部評価委員会実地調査要領

1. 調査日程

令和2 (2020) 年 10 月 20 日 (火)

令和2 (2020) 年 10 月 21 日 (水)

2. 詳細スケジュール

10 月 20 日 (火) 日本時間		
日本時間	次第	中央ヨーロッパ時間
18:00～18:05	開会挨拶 (深町教授) 外部評価について説明 (大塚 GS 長)	10:00～10:05
18:05～18:45	#1 GS 全体の活動報告 (大塚 GS 長)	10:05～10:45
18:45～19:15	#2 海洋環境ユニットから活動報告 (深町教授)	10:45～11:15

10 月 21 日 (水) 日本時間		
日本時間	次第	中央ヨーロッパ時間
18:00～18:30	#3 陸域環境ユニットから活動報告 (杉本教授)	10:00～10:30
18:30～19:00	#4 北極海航路ユニットから活動報告 (大塚 GS 長)	10:30～11:00
19:00～19:20	休憩	11:00～11:20
19:20～19:50	#5 ディスカッション・総括 (大塚 GS 長)	11:20～11:50

国際連携研究教育局 (GI-CoRE) 北極域研究グローバルステーション 外部評価調書の概要 (参考和訳)

総合評価：A

(評価コメント)

GSA は北極域に関連する独自の研究・教育プログラムを実施している。そのプログラムはうまく設計されており、集約的な研究がなされている。このことは、国際共著論文等により証明されている。

教育プログラムは、北極域固有の自然を体験し、自然と社会の状態を分析するのに非常に効果的なものである。

海洋科学、陸域科学、北極海航路は現在、重要なテーマとなっている。GSA ではこれらのテーマの理解を目指すと共に、取り得る社会的行動について考察してきた。

GSA は以下のとおり評価できる。

- 国際的にみて中規模の研究活動である。GSA に直接参画しているのは約 25 人で、その約半数は北大所属、残りの半数は外国の連携機関からである。この 5 年間 (2016 年から 2020 年) の予算額は約 1 億 8,000 万円、米ドルに換算するとおおよそ 170 万米ドルである。これには人件費及び研究費が含まれているが、運営費及び設備費は含まれていない。(GSA の) 成果は、研究活動の規模 (人員及び予算) と対比して見る必要がある。
- 海洋環境、陸域環境、北極海航路の 3 つのユニットで構成されている。各ユニットでは、GSA メンバーの研究的関心及び専門知識を反映した要素に焦点を当てた研究活動が展開されていることは疑う余地がない。これは、国際水準のすぐれた研究へと発展させ、遂行していくために、賢明、かつ必要なやり方である。
- 米国のアラスカ大学フェアバンクス校、ロシアのヤクーツクにある北東連邦大学、ノルウェーのノード大学などの優れた連携機関とのプログラムである。これは GSA メンバーによる長期に亘る協力活動に基づいている。
- 北海道及び北極域の地理的、文化的、政治的結びつきの特徴を活かした北海道大学を代表するプログラムのひとつである。北大のグローバルステーションとして、GSA は優れた業績を上げており、北極域の優れた研究・教育プログラムとして評価できる。

改善の余地がある点は以下のとおりである。

- GSA の 3 つの構成要素すなわちユニットは、「北極域の変化 (Arctic change)」の一部として広い意味でも関連しているが、より具体的な関連性もある。海氷、北極海航路、海洋生態系、陸域情報 (に関する研究) と、社会科学及び政治学などの要素とのリンクが必要かもしれない。

最後に、以下のとおり結論づけることができる。

このような困難な使命を遂行するために、GSA メンバーは多大な努力をされ、豊富な成果が生み出された。このプログラムは、多くの研究・教育の成果を達成した。

今後は、さまざまなテーマを組み合わせた研究・教育を更に発展させること、海洋研究をロシア海域へ拡大していくこと、陸域と海洋の要素を河川系を介してより深く関連付けていくこと、日本と地球に関する大気・陸地・海洋系システムを結合した気候研究（を実践していくこと）、が期待される。

**Final Evaluation Report
(original version in English)**

外部評価報告書（英語・オリジナル版）

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Foreword

Hokkaido University established the Global Institution for Collaborative Research and Education (GI-CoRE) as a faculty organization under the direct control of the President that brings together world-class researchers from around the world and within the University. It aims to promote international collaborative research and education that leverages the University's strengths and distinctive features as well as to provide support for international collaborative research and education promoted by faculties and centers, respectively.

Under the GI-CoRE system, a research and education hub known as a Global Station (GS) is implemented for each research field. GSs have a finite implementation period of five (5) years in principle to conduct intensive research and education activities. Thus far, eight (8) GSs in total (see * below) have been implemented to further develop research activities and contribute the resulting cutting-edge research outcomes to graduate school education.

In the final year of the GI-CoRE project period, a Final Evaluation is conducted by the External Evaluation Committee composed of global experts outside Hokkaido University for each GS to not only review GS activities from past years but also build a stronger and more sustainable research and education system in the future.

This Final Evaluation Report contains the Research Progress Report of GS for Arctic Research (GSA) conducted in October 2020 and the evaluation results. This report is a compilation of the research and education activities of GSA.

After the implementation period, GSA project was transitioned into Arctic Research Center and it was certified as International Collaborative Research Unit, one of the "GI-CoRE Cooperating Hubs," to continue research and education activities in cooperation with GI-CoRE after April 2021.

Hokkaido University remains committed to continuing its efforts to contribute to resolving global issues by conducting advanced research and education activities based on evaluation results.

Kiyohiro Houkin,
Director,
Global Institution for Collaborative Research and Education (GI-CoRE),
Hokkaido University
(President, Hokkaido University)

*The Global Stations (GSs) implemented thus far.

Name of the GS	Implementation Period (FY)	Main Internal Affiliation
Quantum Medical Science and Engineering	2014–2019	Faculty of Medicine, University Hospital, and others
Zoonosis Control	2014–2019	International Institute for Zoonosis Control and Faculty of Veterinary Medicine
Food, Land and Water Resources	2015–2019	Research Faculty of Agriculture and others
Soft Matter	2016–2020	Faculty of Advanced Life Science and others
Big Data and Cybersecurity	2016–2020	Faculty of Information Science and Technology and others
Arctic Research	2016–2020	Arctic Research Center and others
Biosurfaces and Drug Discovery	2019–2023	Faculty of Pharmaceutical Sciences and others
Indigenous Studies and Cultural Diversity	2021-2025	Center for Ainu and Indigenous Studies and others

Global Station for Arctic Research
Global Institution for Collaborative Research and Education (GI-CoRE)
External Evaluation Committee

* Hiroyuki Enomoto,

Vice Director-General, National Institute of Polar Research (NIPR), Professor, Arctic Environment Research Center (AERC) (Japan)

Professor Hajime Yamaguchi,

Department of Ocean Technology, Policy and Environment, Graduate School of Frontier Sciences, The University of Tokyo (Japan)

Senior Researcher Hein Rune Skjoldal,

Ecosystem Processes Department, The Institute of Marine Research (IMR), (Norway)

*Chair

令和2年3月31日

国立大学法人北海道大学 国際連携研究教育局
局長職務代理 殿

職員の任命について（回答）

令和2年3月23日付け海大国連第4-3号で依頼のありましたこのことについて、下記のとおり回答します。

記

承諾いたします。

職名・氏名	情報・システム研究機構 国立極地研究所 榎本浩之 副所長
任命期間	令和2年4月1日～令和3年3月31日

承諾いたしかねます。

令和2年 3月 31日

国立大学法人北海道大学 国際連携研究教育局
局長職務代理 殿

職員の任命について (回答)


令和2年3月23日付け海大国連第4-4号で依頼のありましたこのことについて、下記のとおり回答します。

記

承諾いたします。

職名・氏名 東京大学大学院新領域創成科学研究科・山口 一
任命期間 令和2年4月8日～令和3年3月31日

承諾いたしかねます。

山口 一 

Letter of Acceptance

31 March 2020

To Acting Director Kasahara Masanori of the Global Institution for Collaborative Research and Education (GI-CoRE), the National University Corporation Hokkaido University.

I hereby accept my appointment to serve as a member of the External Evaluation Committee for the Global Station for Arctic Research at the Global Institution for Collaborative Research and Education (GI-CoRE), Hokkaido University.

Signature



Dr. Hein Rune Skjoldal

Global Station for Arctic Research Global Institution for Collaborative Research and Education(GI-CoRE) Schedule of the External Evaluation Committee

1. Date of Implementation

Tuesday, October 20, 2020

Wednesday, October 21, 2020

2. Investigation Schedule

Tuesday, October 20, 2020		
JST	Session	CET
18:00-18:05	Opening Remarks (Prof. Fukamachi) Explanation about External Evaluation (Prof. Otsuka, GSA Director)	10:00-10:05
18:05-18:45	#1 Summary Report on the activities of GSA (Prof. Otsuka)	10:05-10:45
18:45-19:15	#2 Summary Report from the Marine Environment Unit (Prof. Fukamachi)	10:45-11:15

Wednesday, October 21, 2020		
JST	Session	CET
18:00-18:30	#3 Summary Report from the Terrestrial Environment Unit (Prof. Sugimoto)	10:00-10:30
18:30-19:00	#4 Summary Report from the Northern Sea Route Unit (Prof. Otsuka)	10:30-11:00
19:00-19:20	Break	11:00-11:20
19:20-19:50	#5 Wrap-up Discussion (Prof. Otsuka)	11:20-11:50

Results of the Evaluation Committee

**Evaluation Committee
Global Station for Arctic Research
Global Institution for Collaborative Research and Education (GI-CoRE)
Hokkaido University**

October 2020

Summary Report

Professor Hiroyuki ENOMOTO, National Institute of Polar Research (NIPR),

Arctic Environment Research Center (AERC) (Japan)

Professor Hajime YAMAGUCHI, Department of Ocean Technology, Policy and Environment, Graduate

School of Frontier Sciences, The University of Tokyo (Japan)

Dr. Heine Rune Skjoldal, Ecosystem Processes Department The Institute of Marine Research (IMR)

(Norway)

Comprehensive Evaluation: S / A / B / C / D (circle one)

The GSA has implemented a unique program of research and education related Arctic. The program was well designed, and intensive research were done. This is evidenced with the international publications.

The education programs are very effective to experience the Arctic unique nature and analyze the natural and social conditions.

The marine science, terrestrial science and Northern sea route are the important current themes. The GSA targeted understanding these themes and discussed possible social actions.

The GSA is:

- a moderate scale research activity in an international context. There are about 25 people directly involved in the GSA, about half of them from the HU and the other half from foreign partners. The budget over 5 years (2016-2020) is nearly 180 million JPY, or roughly 1.7 million USD. This includes personnel and research costs, but not operating and facility costs. The achievements need to be seen against this scale (persons and economy) of research activity in GSA.
- structured with three components: marine environment, terrestrial environment, and Northern Sea Route. Within each of the components, there are research activities focusing on elements which no doubt reflects the research interests and expertise of staff members in the GSA. This is wise and necessary in order to develop and carry out research of leading international quality.
- a program with good partner organizations, the University of Alaska Fairbanks in USA, the North-Eastern Federal University in Yakutsk in Russia and the Nord University in Norway. This is based on the GSA member's long-term cooperative activities.

- a leading program of Hokkaido University as the geographical, cultural and political characteristics of Hokkaido and connection to the Arctic. As the Global station of Hokkaido University, the GSA made good achievement and can be evaluated leading research and education program of Arctic.

There are several issues to be improved:

The three components or units of GSA are linked in a broad sense as parts of ‘Arctic change’ but there are also more specific linkages. There may be needed linkage of components: sea ice, Arctic shipping, marine ecosystems, and terrestrial information with the social and political sciences.

Finally, we can conclude

There has been done the great efforts of the members to progress such a difficult mission and have produced abundant outcomes. The program achieved many research and education outcomes. We expect farther development of research and educations combining the different subjects and also expanding marine research in to Russian seas and furthermore connecting terrestrial and marine component through river system, and climate study connecting atmosphere-land-ocean system which is relevant for Japan and Globe.

Global Station for Arctic Research Global Institution for Collaborative Research and Education (GI-CoRE) Final Evaluation

External Evaluation Committee Member Name: Hiroyuki Enomoto

Choose one of the five Evaluation Ratings options below as explained by the Evaluation Explanation for each Evaluation Item on the form.

Evaluation Ratings	Evaluation Explanation
S	Achieved outcomes surpassed the original plan (Outstanding)
A	Good progress has been maintained and expected outcomes have been achieved (Excellent)
B	Most expected outcomes have been achieved with some slight delays (Good)
C	Although certain outcomes were achieved, overall results were insufficient (Satisfactory)
D	No expected outcomes were achieved (Unsatisfactory)

I. Research	<p>1. Has construction of an international research and education center capable of attracting outstanding researchers from around the world (including from HU) been achieved?</p> <p>Evaluation Results and Reasons (Your Evaluation Results) S / <input checked="" type="radio"/> / B / C / D (circle one)</p> <p>(Reasons) The GSA has worked for research and education on the current Arctic natural and social themes and made many achievements. The international center was intensively constructed. The partner institutions of Russia, US and Norway have cooperated with GSA. The GSA and partner institute members were effectively collaborated to achieve the best performance. Even fruitful results of research and education programs, the attempts and experiences of GSA can be evaluated as the great improvement of Global station which HU aims to establish.</p> <p>Specific points (Outstanding points) Good collaboration with partner institutions</p>
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(Suggestions for improvement)

Share the success of GSA within and out of Hokkaido University program and look for the system of next step.

2. Is world-leading cutting-edge international cooperative research underway?

Evaluation Results and Reasons

(Your Evaluation Results)

S / / B / C / D (circle one)

(Reasons)

There are many international coauthored publications with US and Russia. This imply effective coordination with those researchers. Even the number of core member is not large, enormous cooperation of research were done. The marine research in Alaska was evaluated as the high level research and terrestrial research can be evaluated research and capacity building.

Specific points

(Outstanding points)

Marine research which highlighted the important research area of Arctic research

(Suggestions for improvement)

Hopefully, marine research and Russian research look for possible cooperation/synthesis and more exchange of experiences at both regions.

3. Are research outcomes from GI-CoRE being actively utilized to solve social issues?

Evaluation Results and Reasons

(Your Evaluation Results)

S / / B / C / D (circle one)

(Reasons)

Northern sea route research has directly connected to the social issues and its contribution is large.

Russian research contributes to the understanding the environmental change. This is important base of adaptation, mitigation and governance. Russian program will contribute not in the GSA period but for a long-time influence through the human resources developed by the program although the evidence will be not visible instantaneously.

Specific points

(Outstanding points)

Accumulation and establishing new knowledge on Northern sea route and politics in the Arctic.

(Suggestions for improvement)

Consider utilize the communication with partner institutes over generation as social issues will need long-term perspectives.

II. Education

Is the educational system and curriculum designed to help develop researchers who possess specialized knowledge and are capable of working internationally?

Evaluation Results and Reasons
 (Your Evaluation Results)
 Ⓢ / A / B / C / D (circle one)

(Reasons)
 I evaluated on-site education in Russia as the direct experience will have important outreach. The students, participants of program will have their unique experience and own voice. It is effective for capacity building of those person and can expand thorough the students. There is many information which are obtainable through the internet, but the on-site experience is very rear. The program called and encouraged the participants and offer the opportunity to visit different natural cultural world in the unique Arctic.

Specific points
 (Outstanding points)
 Winter school in Siberia, Russia

(Suggestions for improvement)
 Share the experience of participants and also their motivation and wishes of instructors.

III. Establishment of Framework

Are the necessary systems and frameworks being established in order to conduct international cooperative research and education?

Evaluation Results and Reasons
 (Your Evaluation Results)
 S / Ⓐ / B / C / D (circle one)

(Reasons)
 The GSA established very unique system to implement the role of Global station of Hokkaido University. This became a good example of success and contribution of university staffs. The GSA member worked for designing and implementing program. The international cooperation system was established between Hokkaido University - Far East Federal University, and Hokkaido University- University of Alaska Fairbanks.

Specific points

(Outstanding points)

Establishment of stable collaboration with Russia university.

This is available for Japanese students and researchers and also can expand opportunity for international student to access Russia through Hokkaido University system.

(Suggestions for Improvement)

Each three themes of GSA are important and can sharp their research and education specified those regions. In addition, the widely overcasting program may be available for general education of Arctic and Global program.

The GSA member includes younger members. Keeping their continuous intent and new insight of program are indispensable of improvement.

IV. Overall Evaluation

(Your Evaluation Results)

S / / B / C / D (circle one)

(Reasons)

The GSA aimed very unique program for international cooperation and succeeded. The program was well organized with oversea institutions. The research and education programs were very unique and available for both high level research and opportunity of actual Arctic issues.

The geographical, cultural and political characteristics of Hokkaido and connection to the Arctic should be recognized.

As the Global station of Hokkaido University, the GSA made good achievement and can be evaluated leading research and education program of Arctic. Although each area had great achievements, the synthesis may be useful to improve the program.

The coordination with Russian University can be evaluated. The long-term collaboration with UAF enabled the variations of program. Those advantage of Hokkaido University should be strengthened and expanded for the next steps. The leading members have been working well and carried to the next generations. I recognized the group have powerful younger members.

Although it is not clear how the partner institution got advantages from the program, the interactive advantage will be important for long-term collaborations.

Global Station for Arctic Research Global Institution for Collaborative Research and Education (GI-CoRE) Final Evaluation

External Evaluation Committee Member Name: Hajime Yamaguchi

Choose one of the five Evaluation Ratings options below as explained by the Evaluation Explanation for each Evaluation Item on the form.

Evaluation Ratings	Evaluation Explanation
S	Achieved outcomes surpassed the original plan (Outstanding)
A	Good progress has been maintained and expected outcomes have been achieved (Excellent)
B	Most expected outcomes have been achieved with some slight delays (Good)
C	Although certain outcomes were achieved, overall results were insufficient (Satisfactory)
D	No expected outcomes were achieved (Unsatisfactory)

I. Research	<p>1. Has construction of an international research and education center capable of attracting outstanding researchers from around the world (including from HU) been achieved?</p> <p>Evaluation Results and Reasons (Your Evaluation Results)</p> <p>S / A / B / C / D (circle one)</p> <p>(Reasons)</p> <p>Unfortunately, I have not heard anything about GI-CoRE, HU, from my own international network. The GI-CoRE is well organized but limited in their own network. Inter-departmental cooperation is not enough.</p> <p>Specific points (Outstanding points)</p> <p>Abundant research outcomes.</p> <p>(Suggestions for improvement)</p> <p>Research extension to the Russian side is strongly expected on the marine environment unit. The marine environment unit is isolated from the other 2 units.</p>
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2. Is world-leading cutting-edge international cooperative research underway?

Evaluation Results and Reasons

(Your Evaluation Results)

S / A / B / C / D (circle one)

(Reasons)

The terrestrial unit is well-organized and has produced outstanding outcomes. I hope this group will lead the other groups. The marine environment unit reveals a lot of natural science outcomes, but the interdisciplinary work is not enough. The northern sea route unit contains very wide areas. Although I understand the difficulty in organizing such activities and outcomes by rather small number of researchers, I don't think the organic cooperation has been fully achieved.

Specific points

(Outstanding points)

The achievement of the terrestrial unit.

(Suggestions for improvement)

The other units are expected to study the methodology of the terrestrial unit.

3. Are research outcomes from GI-CoRE being actively utilized to solve social issues?

Evaluation Results and Reasons

(Your Evaluation Results)

S / A / B / C / D (circle one)

(Reasons)

I feel the possibility, but still on the way.

Specific points

(Outstanding points)

Abundant papers.

(Suggestions for improvement)

Responses and reactions from stakeholders should be clarified.

The marine environment unit works in the Canadian side, while the other units targeting the Russian side. This makes it difficult to apply the results to social issues. I hope the marine environment unit will extend their activities to the Russian side by learning the methodology of Russian cooperation from the other units.

II. Education

Is the educational system and curriculum designed to help develop researchers who possess specialized knowledge and are capable of working internationally?

Evaluation Results and Reasons

(Your Evaluation Results)

S / A / B / C / D (circle one)

(Reasons)

The educational activities under international cooperation particularly with Russia are highly evaluated. I deeply respect the long-time efforts particularly by the terrestrial group.

Specific points

(Outstanding points)

Continuous execution of summer and winter schools.

(Suggestions for improvement)

Establishment of collaborative curriculum to make this activity be sustainable. On-line education system can be an effective tool.

III. Establishment of Framework

Are the necessary systems and frameworks being established in order to conduct international cooperative research and education?

Evaluation Results and Reasons

(Your Evaluation Results)

S / A / B / C / D (circle one)

(Reasons)

Well-organized.

Specific points

(Outstanding points)

In terms of framework, the GSA is well designed, I think. The expected results will really be produced in future since such activities need a lot of time to be approved by the society. I am afraid the university will keep continuous support to such a project-based institution. I really hope they will do that.

(Suggestions for Improvement)

Non.

IV. Overall Evaluation

Evaluation Rating and Reasons

(Your Evaluation Rating)

S / A / B / C / D (circle one)

(Reasons)

Actually between A and B.

I respect the great efforts of the members to progress such a difficult mission and have produced abundant outcomes. I think, however, the collaboration among three units is not enough. The marine environment group should soon extend their activities to the Russian side by establishing the collaboration framework with Russia, learning the methodology from the other units.

Global Station for Arctic Research Global Institution for Collaborative Research and Education (GI-CoRE) Final Evaluation

External Evaluation Committee Member Name: Hein Rune Skjoldal

Choose one of the five Evaluation Ratings options below as explained by the Evaluation Explanation for each Evaluation Item on the form.

Evaluation Ratings	Evaluation Explanation
S	Achieved outcomes surpassed the original plan (Outstanding)
A	Good progress has been maintained and expected outcomes have been achieved (Excellent)
B	Most expected outcomes have been achieved with some slight delays (Good)
C	Although certain outcomes were achieved, overall results were insufficient (Satisfactory)
D	No expected outcomes were achieved (Unsatisfactory)

I. Research	<p>1. Has construction of an international research and education center capable of attracting outstanding researchers from around the world (including from HU) been achieved?</p> <hr/> <p>Evaluation Results and Reasons (Your Evaluation Results) S / A / B / C / D (circle one) 'A'</p> <p>(Reasons) The goals of GSA are very ambitious, aiming to understand the mechanisms of environmental change in the Arctic and interactions between the Arctic environment and human society. This broad and globally important research topic has been addressed with focus on three areas, the marine environment with emphasis on oceanography and sea ice, the terrestrial environment with emphasis on permafrost, and Arctic marine shipping, notably via the Northern Sea Route. The three research foci build on expertise available in the GSA and at the HU, and they have been strengthened through cooperation with international partners in the USA, Russia and Norway. The choice of partners appears good (see Overall evaluation), and the selected experts from partner organizations both complement and supplement the overall expertise available in the GSA. The lists of publications resulting from GSA clearly demonstrate that networks of collaborating scientists have been established that are much broader than the selected members of GSA from UH and partner organizations. In this way the GSA is contributing to an increased volume of high-quality research in its selected focal areas.</p>
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The educational aspects appear to be closely linked to the research activities and reflect the expertise of the GSA core members.

Specific points

(Outstanding points)

(Suggestions for improvement)

2. Is world-leading cutting-edge international cooperative research underway?

Evaluation Results and Reasons

(Your Evaluation Results)

S / A / B / C / D (circle one) 'A'

(Reasons)

The research has generally been of high quality as reflected in the large number of publications in international journals. The publications are multi-authored by a network of cooperating scientists from the GSA, its partners, and many others. This testify to the success of carrying out a large volume of research within the focal areas for the GSA.

Specific points

(Outstanding points)

(Suggestions for improvement)

3. Are research outcomes from GI-CoRE being actively utilized to solve social issues?

Evaluation Results and Reasons

(Your Evaluation Results)

S / A / B / C / D (circle one) 'A'

(Reasons)

Experience tells us that it is notoriously difficult to integrate research across the realms of natural science and social sciences. It would appear that the GSA has been successful in this endeavor. There seems to be three topic areas for such integration:

1. Arctic shipping and use of the NSR. The research has included feasibility studies including economic and technical aspects. In this work there has been contact with local (sub-national) authorities in Japan as well as industry.

2. Petroleum activities and effects on local and state economies in Russia.
3. Political science studies related to geopolitics in the Arctic region including the work of the Arctic Council, aspects of what is called ‘para-diplomacy’, and work at local and regional scales in Russia addressing climate change effects and economic and social developments.
4. We can add a fourth element to this list, which is working with indigenous peoples in northern and eastern Russia, and in Alaska related to sea ice studies.

Specific points

(Outstanding points)

(Suggestions for improvement)

II. Education

Is the educational system and curriculum designed to help develop researchers who possess specialized knowledge and are capable of working internationally?

Evaluation Results and Reasons

(Your Evaluation Results)

S / A / B / C / D (circle one) 'A'?

(Reasons)

I am not so familiar with the Japanese university system, but I believe the GSA has been successful in developing courses for both undergraduate and graduate students. The summer and winter schools on topics of permafrost and satellite remote sensing held in Russia and in Hokkaido seem to have reached a wide audience of students and introduced them to aspects of Arctic change. This educational activity is related to a partnering with five universities in the Russian Far East.

Specific points

(Outstanding points)

(Suggestions for improvement)

III. Establishment of Framework

Are the necessary systems and frameworks being established in order to conduct international cooperative research and education?

Evaluation Results and Reasons

(Your Evaluation Results)

S / A / B / C / D (circle one) 'A'

(Reasons)

GSA has been successful in establishing a system and framework for international cooperative research and education on important aspects of the broad topic of 'Arctic change'. See more under next point (overall evaluation).

Specific points

(Outstanding points)

(Suggestions for Improvement)

IV. Overall Evaluation

The GSA is a moderate scale research activity in an international context. There are about 25 people directly involved in the GSA, about half of them from the UH and the other half from foreign partners. The budget over 5 years (2016-2020) is nearly 180 million JAY, or roughly 1.7 million USD. This includes personnel and research costs, but not operating and facility costs. The achievements need to be seen against this scale (persons and economy) of research activity in GSA.

The GSA is structured with three components: marine environment, terrestrial environment, and Northern Sea Route. Within each of the components, there are research activities focusing on elements which no doubt reflects the research interests and expertise of staff members in the GSA. This is wise and necessary in order to develop and carry out research of leading international quality.

The choice of partners I would assume is done from a practical and pragmatic, bottom-up perspective, building on personal relationships between core members of the GSA UH staff and experts at the partner institutions. The choice of partner organizations is good. The University of Alaska Fairbanks is a well-know research center in the USA with strong expertise on Arctic oceanography, sea ice, and ecology. The North-Eastern Federal University in Yakutsk in Russia has local knowledge and expertise in Arctic terrestrial environment and ecology and seems a good partner to address the linkages to social aspects of climate change. The NSR unit has partnered with the Nord University in Norway that has specialized in aspects of Arctic shipping.

The three components or units of GSA are linked in a broad sense as parts of 'Arctic change' but there are also more specific linkages. The focus on sea ice in the marine unit is clearly linked to two aspects of Arctic shipping: feasibility of operation of ships, and impacts on marine ecosystems (from the combined effects of increased shipping and climate change). Through this latter aspect, there is also a link between shipping and the biological part of the marine unit. For the terrestrial part there seems to be more limited connections to the two other units, although in the social and political sciences there are probably connections between environmental and economic development on the land side and the NSR in broad terms.

Going forward there is a potential to build on the existing collaborative framework while fostering further development of some of the linkages of the components. One aspect is the influence of the discharge from the large rivers in northeastern Russia (Lena, Indigirka, Kolyma) on the coastal and marine environments and ecosystems that form parts of the NSR. Japan and Russia are neighboring countries, and it may be of geopolitical significance to have good scientific collaboration. In terms of climate, both countries are affected by the same regional-scale coupled atmosphere-ocean-land system. The ongoing climate change is affecting not only the Arctic, but the adjacent temperate and warmer climatic zones as well. This may be one aspect of continued GSA activities (as a possible GHA) that are of special importance for northern Japan.

**Global Station for Arctic Research
Global Institution for Collaborative Research and Education
(GI-CoRE)
Hokkaido University**

**Research Progress Report
(Project Period: Academic Year 2016-2020)**

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I. Overview

■ Name of Global Station (GS)

Global Station for Arctic Research (GSA)

■ Project Period: 2016–2020 academic years (5 years) from April 2016 to March 2021

■ Location

GSA is located in the Hokkaido University Arctic Research Center (North-21, West-11 Kita-ku, Sapporo, Hokkaido, 001-0021, Japan, Fig. 1.1), where 9 of the 14 GSA Hokudai Unit research members are currently situated.



Figure 1.1. Location of GSA

■ Aims and Goals

The Arctic is warming rapidly at approximately twice the world average, an effect that is accompanied by atmospheric, climatic, terrestrial, and oceanographic changes. Today, a wide range of impacts on ecosystems are emerging in the Arctic and its surrounding regions, in addition to social, political, cultural, and economic impacts on human society. Therefore, it is important to approach these complex issues in an interdisciplinary manner.

GSA was launched as a research hub to promote interdisciplinary Arctic research via collaborations with leading researchers and institutions worldwide and via an expanded international research network. GSA seeks to use research outcomes with respect to climate and environmental change in the Arctic to foster sustainable uses of Arctic regions.

■ Necessity and Urgency

The Intergovernmental Panel on Climate Change (IPCC) AR5 Report indicated the importance of an urgent response to counter global warming. It is widely recognized that the Arctic is rapidly changing with its temperature increasing at twice the speed of the global average, a long term decrease in the amount of sea ice, acidification of the sea water, melting permafrost, increasing wildfires, and various effects on the Arctic ecosystem. Further, the cryosphere, including the Arctic, likely has great importance with respect to the mechanisms of global warming. Therefore, it is of great importance to understand the mechanisms of environmental change in the Arctic and their effects on Arctic ecosystems and the interactions and interrelations between the Arctic environment and human society, not only in the Arctic but also in non-Arctic regions; this constitutes an urgent task for the scientific community.

■ Originality and Novelty

Hokkaido University has long achieved academic results in Arctic research fields, particularly in observational research, interdisciplinary research, and practical outcomes. These research activities cover a wide range of academic fields, including natural science, engineering, humanities, and social sciences, in the Arctic.

GSA aims to leverage these achievements and its background to propel interdisciplinary Arctic research and expand international research networks based on close connections with the University of Alaska Fairbanks(UAF), North-Eastern Federal University(NEFU) in Yakutsk, the University of Oslo, and Nord University, each of which has unique and leading research achievements in Arctic research. This international network will enable GSA to foster diverse human resources to address global issues related to the warming Arctic.

II. Budget

The GSA budget is shown in Table-2.1. GSA facility and administrative costs are covered by the Arctic Research Center at Hokkaido University.

Table 2.1. GSA budget

Unit: 1,000 JPY

	Category	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020 (projected)	Total
GSA budget	Personnel costs	17,000	17,000	17,000	17,000	17,000	85,000
	Operating costs*	600	600	600	600	600	3,000*
	Research costs (approximately)	17,330	19,005	12,518	19,048	20,193	88,094
	Facility costs*	500	500	500	500	500	2,500*
Total		35,430	37,105	30,618	37,148	38,293	178,594

*Covered by the Arctic Research Center at Hokkaido University

III. Detailed Results

1. Research

1.1 Goals

The goals of GSA include determining the mechanisms of change in the Arctic Ocean, cryosphere and atmospheric environment, and terrestrial and marine ecosystems in the Arctic caused by global warming, as well as examining their impacts on and responses to humans. The primary goals of GSA are as follows:

- To examine the rapidly changing Arctic sea ice, oceanographic structure, and interactions between the ocean/sea ice/atmosphere and to understand their effects on marine ecosystems and human society;

- To examine the vulnerability of the terrestrial environment and its correlation with human society;
- To examine the feasibility, future perspectives, environmental effects, and sustainability of human use of the Arctic Ocean including shipping, resource development, tourism, and fisheries; and
- To examine the social, political, and geopolitical responses of human society to the changing Arctic environment.

1.2 Current Progress/Future Developments

(1) Base Construction

The GSA organizational diagram can be seen in Figure 3.1 and Table 3.1. The GSA base at the Hokkaido University has three research units: the Marine Environment, Terrestrial Environment, and Northern Sea Route units. There are 14 research members in total. There are also two overseas units, the University of Alaska Fairbanks (UAF) Unit in the U.S.A. and the North-Eastern Federal University (NEFU) Unit in the Sakha Republic, Russia. In addition, GSA has been working with the Center for High North Logistics (CHNL) at the Nord University Business School in Norway and Oslo University. The UAF Unit has three appointed researchers and three non-appointed researchers. The NEFU Unit has one non-appointed researcher and one researcher appointed to the Hokkaido University Unit (in March 2020).

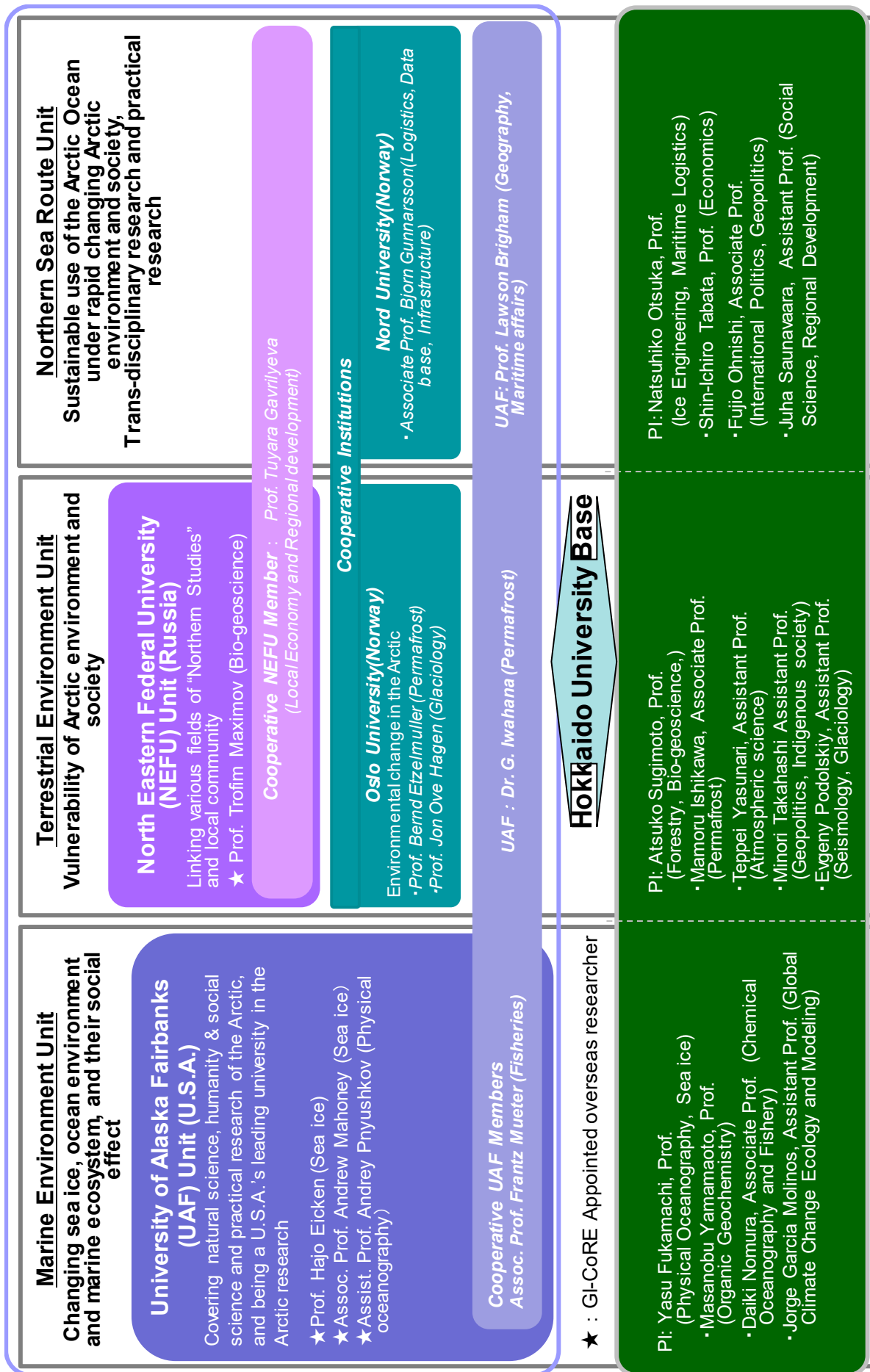




Figure 3.1. GSA Organizational Diagram

Table 3.1. GSA Research Members

Table 3.1. GSA Research Members

Affiliated institutions	Researcher name	Research field
Arctic Research Center, Hokkaido University	Marine Environment Unit: <ul style="list-style-type: none"> • Professor Yasushi FUKAMACHI • Professor Masanobu YAMAMOTO • Associate Professor Daiki NOMURA • Assistant Professor Jorge GARCIA MOLINOS 	Marine Environment Unit: Physical Oceanography, Global Climate Change Ecology and Numerical Modeling, Organic Geochemistry, Chemical Oceanography, and Fishery
	Terrestrial Environment Unit: <ul style="list-style-type: none"> • Professor Atsuko SUGIMOTO • Professor Trofim MAXIMOV (North-Eastern Federal University, Russia) • Associate Professor Mamoru ISHIKAWA • Assistant Professor Evgeny PODOLSKIY • Assistant Professor Teppei J. YASUNARI • Assistant Professor Minori TAKAHASHI 	Terrestrial Environment Unit: Forestry, Bio-geoscience, Permafrost, Seismology, Atmospheric Science, Geopolitics, and Anthropology (indigenous communities)
	Northern Sea Route Unit: <ul style="list-style-type: none"> • Professor Natsuhiko OTSUKA • Professor Shin-Ichiro TABATA • Associate Professor Fujio OHNISHI • Assistant Professor Juha M. SAUNAVAARA 	Northern Sea Route Unit: Maritime Engineering, Social Science, International Politics, Geopolitics, and the Russian Economy
University of Alaska Fairbanks Unit	Professor Hajo EICKEN Associate Professor Andrew MAHONEY Assistant Professor Andrey PNYUSHKOV	Physical Oceanography, Sea Ice Geophysics, and Arctic Social-Environmental Systems
North-Eastern Federal University Unit	Professor Tuyara GAVRILYEVA (Professor Trofim MAXIMOV)	Forestry, Bio-geoscience, Permafrost, and Economics
Joint Research Laboratory		
Hokkaido University Arctic Research Center (Sapporo, Japan) 	North-Eastern Federal University Unit (Yakutsk, Sakha Republic, Russia) 	
Other Overseas Institutions		
Oslo University (Norway)	<ul style="list-style-type: none"> • Prof. Bernd ETZELMULLER • Prof. Jon Ove HAGEN 	Permafrost and Glaciology
Center for High North Logistics (CHNL), Business School, Nord University	<ul style="list-style-type: none"> • Managing Director Kjell STOKVIK • Associate Professor and Senior Researcher Bjorn GUNNARSSON 	Maritime Engineering, Logistics, and Remote Sensing

1) Collaboration with the University of Alaska Fairbanks (UAF)

Professor Eicken and other UAF Unit members have extensive experience in physical oceanography focusing on the interaction of sea ice and the Arctic Ocean in observational and physical modeling research. The UAF Unit has accumulated field information on oceanographic and sea ice conditions in the Bering Sea, Beaufort Sea, and Chukchi Sea. Hokkaido University has a long record of performing joint observational research off the Alaskan Coast with UAF to examine sea ice and physical oceanographic characteristics. The GSA Marine Environment Unit is advancing physical oceanographic research on the Arctic Ocean by taking advantage of the accumulated field observation experience of UAF. In addition, UAF promotes a high level of research in permafrost and Arctic maritime assessment studies. The GSA Terrestrial Environment and Northern Sea Route units have been collaborating with UAF in these research fields.

2) Collaboration with the North-Eastern Federal University (NEFU)

The NEFU Unit has a long record of field observational research achievements in forestry and terrestrial environments taking advantage of its field observation base, the Spasskaya Pad Scientific Forest Station, which is located 20 km north of Yakutsk City in the Sakha Republic, Russia. In 2017, the Hokkaido University Arctic Research Center and NEFU established the Joint Research Laboratory to facilitate cooperative research and education. Using the Spasskaya Pad Scientific Forest Station, the Terrestrial Environment Unit is advancing observational research in forestry, terrestrial environments, humanities, and social sciences with the NEFU Unit.

3) Collaboration between faculty members at Hokkaido University

GSA has three research units, the Marine Environment, Terrestrial Environment, and Northern Sea Route units, in its organizational structure. Each unit is led by professors of the Arctic Research Center at Hokkaido University. Even though each research unit focuses on specialized research fields regarding the Arctic, they have a common research principle to proceed toward the common goal of GSA, as described in Section III.1. Because research issues in the Arctic tend to involve overlapping scientific fields and social disciplines, all research units work jointly to address interdisciplinary issues. The three units have been jointly offering international educational programs such as summer and winter schools and building the capacities of local Arctic communities.

(2) International Collaborative Research

1) Current progress (in meeting initial research goals)

Overseas researchers were appointed at UAF and NEFU to build a research hub to promote interdisciplinary Arctic research. Together with the overseas units, GSA has encouraged collaborative research and education in multidisciplinary academic fields covering physical oceanography, glaciology, terrestrial environment, engineering, humanities, and social sciences. Some of the research projects have expanded their activities to involve Arctic and non-Arctic stake holders, such as local communities, companies, and municipalities. International educational activities with students have been carried out

to promote an integrated understanding of the Arctic, covering the environment, industry, society, and international politics.

The Hokkaido University Arctic Research Center (ARC), which is a main body of GSA, has also opened two joint laboratories in Russia. GSA has been collaborating activities at these joint laboratories in research and education to foster international networks and cooperative research.

2) Marine Environment Unit

The following studies on the mechanisms and characteristics of sea ice and the Arctic Ocean have been carried out jointly with UAF.

- ✓ Physical oceanographic mechanisms of the Arctic Ocean, such as wind-driven oceanic routing, tidal currents, and the effect of inflow from subarctic seas, has been investigated.
- ✓ Studies on land-fast sea ice, such as stress, fracture, breakout behavior, and ice core evaluations of the surface water mass composition, have been performed.
- ✓ Studies on changes in the thickness and circulation of multiyear ice in the Beaufort Gyre have been performed.
- ✓ Studies on the role of sea ice in the global climate system as a marine mammal habitat, an engineering constraint, and a way of life for residents of Arctic communities have also been conducted. Via the integration of indigenous knowledge with unmanned aircraft technology, the mechanical behavior of ice and the mechanisms and impacts of sea ice changes in western Arctic Alaska have been investigated.

3) Terrestrial Environment Unit

- ✓ In northeastern Siberia in the Russian Arctic, long standing field observations of the forest environment have been conducted by Hokkaido University (Terrestrial Environment Unit) and NEFU. Based on these joint field observations, the characteristics of methane emission and tree death subject to precipitation, soil moisture, and extreme climate have been investigated.
- ✓ The behavior and environmental effects of atmospheric aerosols in the cryosphere, such as the snow-darkening effect from light-absorbing aerosols and wildfires, have been analyzed in collaboration with the National Aeronautics and Space Administration (NASA) National Aerosol Robotic Network (AERONET) and the National Institute for Environmental Studies (NIES) in Japan.
- ✓ Scientific expeditions in areas such as Northwest Greenland, the Nepal Himalayas, and East Antarctica co-organized by international (ETH Zurich, University of Florence, Katmandu University, and Austral University of Chile) and domestic (Hokkaido University and Nagoya University) institutions have been used to investigate the ongoing changes and dynamics of glaciers and their related environments.

4) Northern Sea Route Unit

- ✓ Studies on the Northern Sea Route have been conducted together with UAF and Nord University

focusing on navigational and commercial feasibility, future perspectives for Arctic shipping, assessments of infrastructures and river–ocean logistic networks, and related issues. Such studies cut across multiple disciplinary research fields such as ice engineering, logistics, economics, and social science and involve collaborations with the business sector with respect to port and maritime logistics.

- ✓ The impact of oil and gas development in the Arctic on the local and Russian economies is being analyzed. By examining the flow of financial and investment resources between Russian regions, it can be seen that the state budget is heavily dependent on oil- and gas-producing regions, most of which are in Arctic and subarctic areas.
- ✓ Future scenarios for Arctic societies and their effects on non-Arctic societies have been investigated from social, economic, and political viewpoints to evaluate new directions of Arctic research.

(3) Research results (FY 2016–2020)

Table 3.2 shows an overview of the GSA research results with respect to publications, presentations, awards, and external grants achieved in the fiscal years of 2016–2020.

Table 3.2. Overview of GSA Research Results (FY 2016–2020)

1. International collaborative papers (peer reviewed)	Featured in Japanese journals: 1; featured in International journals: 101
2. Other publications (peer reviewed)	Featured in Japanese journals (peer reviewed): 8; Featured in International journals (peer reviewed): 43; Books published: 6 (English), 1 (Russian), 1(Finnish), 10 (Japanese)
3. Invited oral presentations (international)	Keynote speeches: 4; invited speeches and presentations: 35; invited chairs: 10
4. Awards received	5
5. External grants	53 external grants, with GSA researchers as the principal investigator (Japan Society for the Promotion of Science (JSPS): 15; Government Ministry: 3; International: 4; Company: 1; Research institute: 24; Others: 6)

1) Academic Research Papers (peer reviewed)

From the fiscal year 2016 to 2020, 101 international collaborative papers (peer reviewed) and 43 peer-reviewed original papers were published. The research fields of these papers covered natural science, engineering, humanities, and social sciences. A breakdown of the scientific fields of these papers can be seen in Figure 3.2. International collaborative and other peer-reviewed paper lists are given in Annex-1 and Annex-2, respectively.

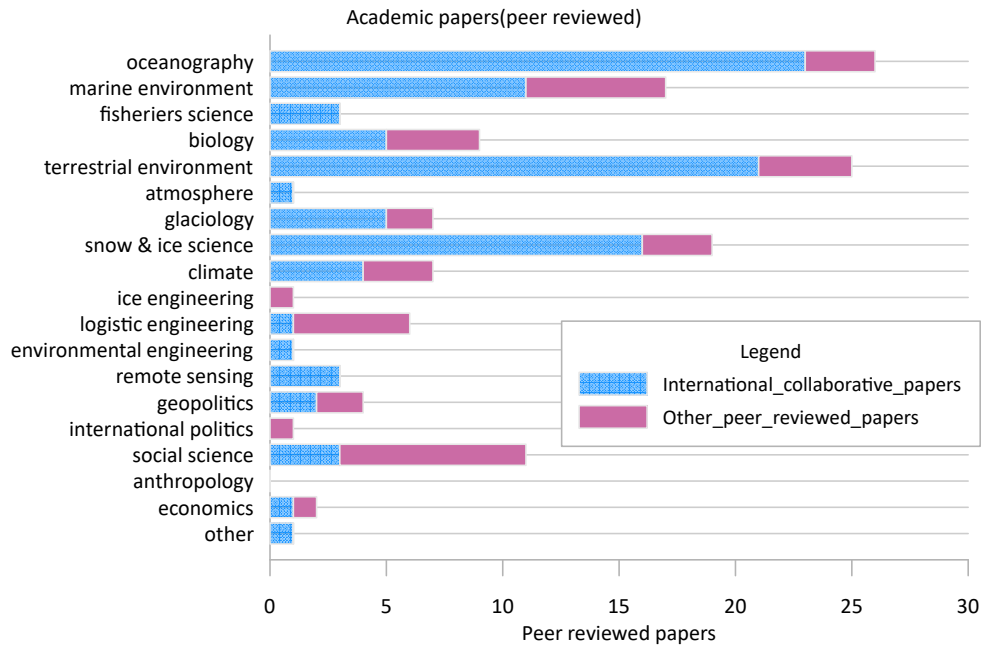


Figure 3.2. Academic fields of peer-reviewed papers

2) Published books

From the fiscal year 2016 to 2020, 21 books were published: 9 were written in English, 1 was written in Russian, 1 was written in Finnish, and 10 were written in Japanese. The themes of these books covered the academic fields of social science, geopolitics, international politics, terrestrial environment, logistic engineering, and climate (Figure 3.3). A list of the published books is given in Annex-3.

3) Oral presentations

In total, 49 invited keynotes, speeches, presentations, and chairs have been carried out internationally. These activities covered a wide range of academic fields related to the Arctic and global climate change. Figure 3.4 shows the thematic fields of each activity. A list of invited international oral presentations is given in Annex-4.

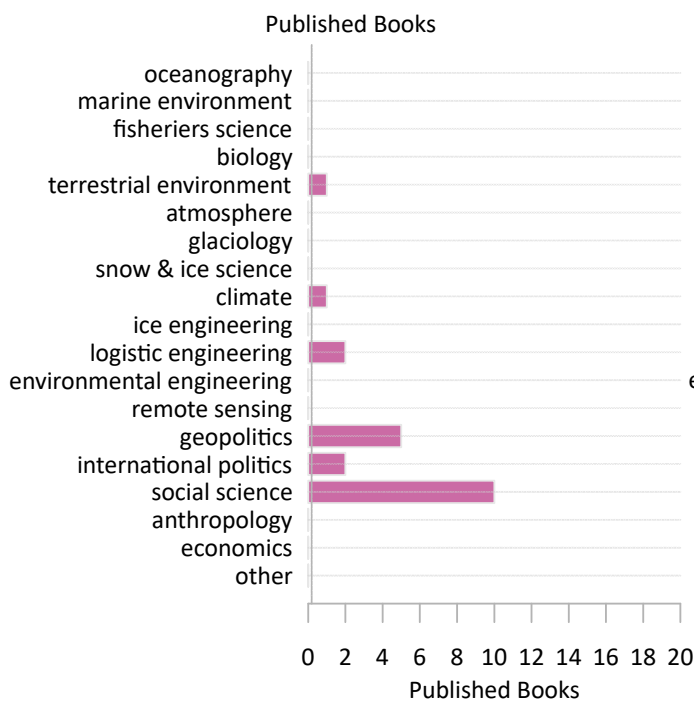


Figure 3.3. Published Books

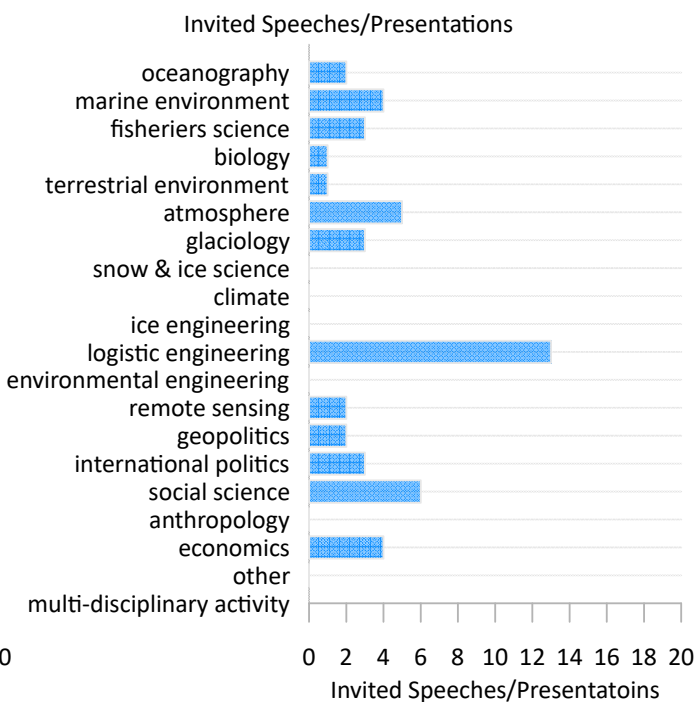


Figure 3.4. Invited Speeches and Presentations

4) Awards

From fiscal year 2016 to 2020, GSA members received the five awards listed below.

- Saitoh, S.: The 16th Wooster Award of the North Pacific Marine Science Organization (PICES). (<https://meetings.pices.int/Awards/Wooster-Award>), 2016
- Saitoh, S.: Distinguished Science Award of the PORSEC-Pan Ocean Remote Sensing Conference, (<https://porsec.nwra.com/awards/>), 2016
- Podolskiy, E.: Hirata Award of the Japanese Society of Snow and Ice, (https://www.arc.hokudai.ac.jp/seppyo_award/), September 30, 2016
- Yasunari, T.: Hokkaido University President Award for Education & Research, February 17, 2020
- Takahashi, M.: Tejima Sei-ichi Research Award, Tokyo Institute of Technology, February 27, 2020

5) External grants

All the GSA research activities and administrative operations are provided via external funding granted to each of the researchers, most of whom are concurrently serving at GSA. Table 3.3 shows a list of the external grants in which a GSA researcher is the principal investigator.

Table 3.3. List of external grants in which the GSA researcher is the principal investigator

Title	Type	Funder	Number of cases	Year
Kakenhi (Grants-in-Aid for Scientific Research), type-S (JSPS)	grant	JSPS	1	2019-2024
Kakenhi (Grants-in-Aid for Scientific Research), type-A	grant	JSPS	1	2016-2019
Kakenhi (Grants-in-Aid for Scientific Research), type-B	grant	JSPS	10	2016-2020
Collaborative Study of Long-term Variability of the Asian Monsoon (Strategic Young Researcher Overseas Visits Program for Accelerating Brain Circulation)	grant	JSPS	1	2017-2020,
Climatic and ecological changes of the past 1900 years inferred from long-chain alkenones in Kusai Lake, northern Qinghai-Tibetan Plateau	grant	MEXT	1	2018-2020
the Promotion of Joint International Research: International politics in the Arctic ~ Formulation and development of international order at regional level	grant	JSPS	1	2018-2020
Grants-in-Aid for Scientific Research, Ambient seismic noise analysis as a new proxy for glaciology	grant	JSPS	1	2018-2021
Arctic Challenge for Sustainability (ArCS), 2015~2020	National Research Project	MEXT	1	2015-2020
Resilience of river ecosystem under changing climate	grant	MLIT	1	2018-2022
RACArctic – Resilience and adaptive capacity of arctic marine systems under a changing climate	grant	Belmont Forum	1	2015-2018
COPERA – C budget of ecosystems and cities and villages on permafrost in eastern Russian Arctic	grant	Belmont Forum	1	2015-2019
Ecological resilience to climate change and extinctions in subarctic freshwaters (EC-51224R-18)	grant	National Geographic Society	1	2019
Shifting climate as a predictor for change in marine biodiversity at local, regional and global scales (NE/J024082/1)	grant	U.K. National Environmental Research Council	1	2012-2017
Social Innovation Project in the North	Joint research grant	Hitachi Ltd.	1	2016-2018
Industry-Government-Academia Collaboration Support Projects (Feasibility Study)	Joint research grant	J-ARC Net	3	2016-2018, 2017-2019, 2018-2020
Industry-Government-Academia Collaboration Support Projects (Meeting Support)	Joint research grant	J-ARC Net	3	2016, 2017, 2018, 2019, 2020
Researcher's Community Support Projects	Joint research grant	J-ARC Net	15	2016, 2017, 2018, 2019, 2020
International Ocean Discovery Program (IODP)	Contracted research	JAMSTEC	2	2015-2018, 2017-2020

continued to the next page

Low temperature operation test of Small size aerosol sensor and PM2.5 sensor	Joint research grant	Institute of Low Temperature Science (Hokkaido University)	1	2018-2019
Development of snow cover scheme of land surface model	Joint research grant	Atmosphere and Ocean Research Institute, The Tokyo University	1	2018-2019
Feasibility study on Container Transport via the Northern Sea Route	grant	Hokkaido Development Association	1	2016
Grant for Cold Region's Port Development Research (2016,2017,2018,2019,2020)	grant	Cold Region Port and Harbor Research Center	5	2016~2020

Here, JSPS indicates the Japan Society for the Promotion of Science; MEXT indicates the Ministry of Education, Culture, Sports, Science and Technology, Japan; MLIT indicates the Ministry of Land, Infrastructure and Transport, Japan; JAMSTEC indicates the Japan Agency for Marine-Earth Science and Technology; and J-ARC Net indicates the Japan Arctic Research Network Center.

6) Collaborations with institutions (universities, research institutes, local governments, and companies) other than affiliated universities

Table 3.4. Collaborations with other research institutions

Institutions	Activity
Northern Arctic Federal University (NArFU, Arkhangelsk, Russia)	GSA signed the MOU and established Joint Laboratory for cooperative research and education between ARC-HU and NArFU.
Far-Eastern Federal University (FEFU, Vladivostok, Russia)	GSA took care of the summer school and winter school lectures together with FEFU in Vladivostok.
The North Pacific Marine Science Organization (PICES)	GSA participated in the PICES working group-39 on the ICES/PICES/PAME Working Group on Integrated Ecosystem Assessment for the Central Arctic Ocean (WGICA).
Nord University (Bodø, Norway)	GSA has been conducting joint research project on Arctic shipping with Nord University.
University of Lapland (Rovaniemi, Finland)	GSA and University of Lapland have been bilaterally giving lectures, conducting social scientific research and applying international research project.
Korea Maritime Institute (Korea)	GSA has been organizing North Pacific Arctic Research Community (NPARC) together with KMI and SIIS since 2016. NPARC has been holding an annual meeting in rotation of three countries.
Shanghai Institute for International Studies (SIIS, Shanghai, People's Republic of China)	

Table 3.5. Collaborations with other institutions

Institutions	Activity
Hokkaido Committee for Economic Development (HCED, Sapporo, Japan)	GSA and HCED have been cooperating on utilizing the Northern Sea Route, and promoting Arctic sub-sea data cable/data center initiative.
Hokkaido Nutopia Data Center Study Group (Sapporo, Japan)	GSA joined to found this study group together with companies and researchers.
Arctic Economic Council (AEC)	GSA and HCED hosted the Top of the World Broad band Summit of AEC in Hokkaido University in 2018.
Arctic Council	Two members of NSR Unit are representing Japan to the Arctic Council's working groups of PAME and SDWG.
Tomakomai Port Authority (Tomakomai, Japan)	GSA and Tomakomai Port Authority have been carrying out a collaborative study on Northern Sea Route (NSR). And worked out pilot shipping of containers via the NSR in 2019.
Hokkaido Government (Sapporo, Japan)	GSA is providing an assistance to Hokkaido Government to build strategy and policy for utilizing the Northern Sea Route.

(4) Science outreach and outcome

GSA Arctic research can be characterized by its trans-disciplinary activities in the land–ocean–atmosphere spatial fields and in the natural science, engineering, humanities, and social sciences academic fields, as well as its collaborations with stakeholders such as citizens, public sectors (including government, municipality, and other related public bodies), and industry. As a result, collaborations between multidisciplinary academic fields and with stakeholders are found in various types of activities (Annex-5). Based on these activities, GSA has been encouraging members to publish international collaborative papers. Expanding international research and education networks is also an important task for GSA members.

At the same time, most of the research content at GSA is connected to the sustainability of the Arctic in terms of monitoring the rapidly changing Arctic environment and investigating mechanisms of environmental change, effects on the ecosystem, and effects on human society, economy, and international relations. All of these scientific outcomes are expected to contribute the United Nations Sustainable Development Goals.

2. Education

2.1 Goals

The educational goal of GSA is to build an educational framework to foster global human resources that are capable of working on interdisciplinary Arctic issues. To this end, GSA has joined educational activity of the Graduate School of Environmental Science and Public Policy School at Hokkaido University together with ARC.

2.2 Current Progress and Future Developments

(1) Expansion of Arctic Research in Graduate School Education

Currently, the Graduate School of Environmental Science at Hokkaido University has been planning structure reform, which includes establishment of new study course. GSA is preparing to take part in this new course under the ARC's structure.

(2) International Collaborative Education

1) Hokkaido Summer Institute

Hokkaido University has been organizing the Hokkaido Summer Institute (HSI), which covers most disciplines at the university, since 2016. HSI provides short courses to expand academic knowledge and develop skills for both undergraduate and graduate students. These courses are offered by Hokkaido University departments and leading researchers from institutions worldwide. GSA has been engaged in HSI since its start, offering scientific courses on the Arctic environment and related themes. UAF and NEFU have been taking part in HSI lectures together with GSA-Hokkaido University Unit members.

Table 3.6. Hokkaido Summer Institute

Title of course	GSA members	Target
2016		
Satellite Views of the Arctic	Saitoh, S. and Eicken, H. (UAF)	graduate
2017		
Satellite Views of the Arctic	Saitoh, S., Fukamachi, Y. and Eicken, H. (UAF),	graduate
Cryospheric Modelling	Ishikawa, M. (in collaboration with Prof. Thomas V. Schuler from University of Oslo)	graduate
2018		
Satellite Views of the Arctic	Saitoh, S., Fukamachi, Y. and Eicken, H. (UAF)	graduate
2019		
Introduction to Arctic natural and social sciences	Eicken, H. (UAF), Fukamachi, Y., Ohnishi, F., Otsuka, N., Saunavaara, J, Sugimoto, A., Takahashi, M. and Yasunari, T.	undergraduate

2) Summer and Winter schools in collaboration with NEFU

Hokkaido University provides a learning satellite educational program, which enables both undergraduate and graduate students to take short-term classes overseas and earn credits. The classes are prepared by faculty members of both Hokkaido University and overseas universities. GSA provides learning satellites together with NEFU and the Far-Eastern Federal University (FEFU, Vladivostok) in both the summer and winter terms in Russia.

As a member of the East Russia–Japan Expert Education Consortium (RJE3 Consortium) together with five Russian Far East partner universities, Hokkaido University provides two educational courses for Japanese and Russian students. GSA provides courses at the summer and winter school programs in both Yakutsk and Vladivostok.

Table 3.7. Learning satellites and other educational programs provided by GSA

Title of course	GSA affiliation	Target
2016		
Learning Satellite 1) Summer School for Permafrost Ecosystem in Yakutsk and Vladivostok 2) UArctic Thematic Network on Permafrost	Sugimoto, A. and Maximov, T.	graduate
2017		
Learning Satellite 1) Summer School for Permafrost Ecosystem in Yakutsk and Vladivostok 2) UArctic Thematic Network on Permafrost	Sugimoto, A. and Maximov, T.	graduate
RJE 3 Summer and Winter Schools	Sugimoto, A., and Maximov, T.	graduate
2018		
Learning Satellite Summer School for Permafrost Ecosystem in Yakutsk and Vladivostok	Sugimoto, A., Otsuka, N., and Maximov, T.	graduate
RJE 3 Summer School and Winter School	Sugimoto, A., Otsuka, N., and Maximov, T.	graduate
2019		
Learning Satellite Winter Course in Yakutsk and Vladivostok	Sugimoto, A., Otsuka, N., and Maximov, T.	graduate
Learning Satellite Summer School for Permafrost Ecosystem in Yakutsk and Vladivostok	Sugimoto, A. and Maximov, T.	graduate
RJE 3 Summer and Winter Schools	Sugimoto, A. and Maximov, T.	graduate
Lecture course: Introduction to Circumpolar North	Fukamachi, Y., Molinos, J.G., Ohnishi, F., Otsuka, N., Podolskiy, E., Saitoh, S., Saunavaara, J., Sugimoto, A., Takahashi, M., and Maximov, T.	graduate
Finnish-Japanese Arctic Studies Summer School	Ohnishi, F., Otsuka, N., Saunavaara, J., Sugimoto, A. and Yasunari, T.	graduate
2020		
Lecture course: Introduction to Circumpolar North	Fukamachi, Y., Molinos, J.G., Ohnishi, F., Otsuka, N., Podolskiy, E., Saunavaara, J., Sugimoto, A., and Takahashi, M.	graduate
RJE 3 Yakutsk Field Course/Winter School ONLINE	Gavrieva, T., Maximov, T., Otsuka, N. and Sugimoto, A.	graduate

3) Other practices

Professor Otsuka and Associate Professor Ohnishi have joined the UArctic Thematic Network Project, which aims to form a natural framework for the development of UArctic education and research to increase knowledge generation and sharing across the northern countries.

Table 3.8 UArctic Thematic Network

Title of activity	year	GSA affiliation	Target
Thematic Network on Collaborative Resource Management	2018~	Otsuka, N.	student, local municipality in Greenland
Thematic Network on Arctic in Asia, Asia in the Arctic	2018~	Ohnishi, F.	student

3. Framework Establishment

(1) GSA Management System

By limitation of the budget, GSA does not have an office clerk or other administrative staff. Instead, GSA management duties are performed by the GSA director, three research unit leaders, and advisor to the ARC Director.

Table 3.9. Management staff

Period	From April 2016	From April 2018	From April 2020
GSA Director	Sei-Ichi Saitoh (Prof.)	Natsuhiko Otsuka (Prof.)	
Marine Environmental Unit	Yasushi Fukamachi (Prof.)		
Terrestrial Environment Unit	Atsuko Sugimoto (Prof.)		
Northern Sea Route Unit	Shin-Ichiro Tabata (Prof.)	Natsuhiko Otsuka (Prof.)	
Advisor to ARC director	Shingo Tanaka (URA)		Masayo Ogi (URA)

URA: University Research Administrators, The Hokkaido University Research Development Section

(2) Future Plan

Following the completion of the five-year project period, GSA is planning to continue to develop international joint research activity with the current overseas units. To achieve this, the Arctic Research Center at Hokkaido University (ARC) has budgeted for project-based trans-disciplinary Arctic research and the strengthening of its organizational structure via the “Functional enhancement fund, 2020–2024.” This five-year project will enable ARC to continue to assign researchers to GSA, to propel international joint research activity, and to organize trans-disciplinary Arctic research units. ARC will form “the **GI-CoRE Cooperating Hub for Arctic Research (GHA)**(tentative name)” to inherit the international network, research activities, and educational functions of GSA. GHA(tentative) will inherit three research units, the Marine Environment Unit, Terrestrial Environment Unit, and Trans-disciplinary Unit (formerly the Northern Sea Route Unit), and develop joint research activity with the overseas GSA units. The tentative action plan of GHA(tentative) is as follows:

- Propelling interdisciplinary approaches to counter Arctic issues;
- Enabling cross appointments of young researchers to achieve further international collaboration and unique research; and
- Inheriting and further advancing the GSA international educational program.

Annex-1: International collaborative papers list (peer reviewed)

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- 2) Smith, I. J., Eicken, H., Mahoney, A.R., Van Hale, R., Gough, A. J., Fukamachi, Y., and Jones, J. (2016). : "Surface water mass composition changes captured by cores of Arctic land-fast sea ice", *Continental Shelf Research*, 118, 154-164. [International journal]
- 3) Fujiwara, A., Hirawake, T., Suzuki, K., Eisner, L., Imai, I., Nishino, S., Kikuchi, T., and Saitoh, S.-I. (2016). : "Influence of timing of sea ice retreat on phytoplankton size during marginal ice zone bloom period on the Chukchi and Bering shelves", *Biogeosciences*, 13, 115-131, doi:10.5194/bg-13-115-2016 [International journal]
- 4) García Molinos, J., Burrows, M. T., and Poloczanska, E. S. (2017). : "Ocean currents modify the coupling between climate change and biogeographical shifts", *Scientific Reports*, 7:1332, doi:10.1038/s41598-017-01309-y [International journal]
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- 9) Podolskiy, E. A., Genco, R., Sugiyama, S., Walter, F., Funk, M., Minowa, M., and Ripepe, M. (2017). : "Seismic and infrasound monitoring of Bowdoin Glacier, Greenland", *Low Temperature Science*, 75: 15-36. [International journal]
- 10) Kashiwase, H. , Ohshima, K. I., Nihashi, S., and Eicken, H. (2017). : "Evidence for ice-ocean albedo feedback in the Arctic Ocean shifting to a seasonal ice zone", *Scientific Reports*, 7:8170, doi:10.1038/s41598-017-08467-z [International journal]
- 11) Hirano, D., Fukamachi, Y., Ohshima, K.I., Watanabe, E., Mahoney, A.R., Eicken, H., Itoh, M., Simizu, D., Iwamoto, K., Jones, J., Takatsuka, T., Kikuchi, T., and Tamura, T. (2018). : "Winter Water Formation in Coastal Polynyas of the Eastern Chukchi Shelf: Pacific and Atlantic Influences ", *JOURNAL OF GEOPHYSICAL RESEARCH-OCEANS* 123(8) 5688 - 5705,

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Annex-3 : Published Books

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- 2) Saunavaara, J. (2017). : "Commercial utilization of the Northern Sea, Route and regional development policy - Hokkaido as a case study" in: Kari Alenius & Matti Enbuske (eds.), *The Barents and the Baltic Sea Region. Contacts, Influences and Social Change. Studia Historica Septentrionalia 77*. Pohjois-Suomen Historiallinen Yhdistys, Rovaniemi, ISBN-10: 9529888600
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- 5) Takahashi, M. (2019). : “The Influence of Sub-state Actors on National Security: Using Military Bases to Forge Autonomy”, Springer Polar Sciences, Berlin/Heidelberg/Dordrecht/New York: Springer, ISBN 978-3-030-01677-7 (20190125)
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- 9) Takahashi, M. (2018). : “Chap.26 Whaling ~ Utilization and Conservation” in “Context of Japan’s Diplomacy”
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Annex-4 : Invited lecture/presentation (International)

2016

- 1) Otsuka, N. : “Plenary Session ; Arctic Economic Council – The Way Forward”, Reykjavik, Iceland, Arctic Circle 2016, (20161009) [Keynote]
- 2) Tabata, S. : “Economic Development of the Arctic Regions of Russia”, St. Petersburg State University, Russia, UArctic Congress 2016, (20160914) [Keynote]

2017

- 3) Yasunari, T. : JpGU-AGU Joint Meeting 2017, Makuhari, Japan, (20170520-25), [Chair]
- 4) Yasunari, T. : The Third Workshop on Atmospheric Composition and the Asian Monsoon (ACAM), Guangzhou, China, (20170605-09), [Speech/Presentation]
- 5) Saitoh, S.-I. : ESSAS Open Science Meeting in JpGU-AGU Joint Meeting 2017, Norway, (20170611-15) [Chair]
- 6) Tabata, S. : “Second World Congress of Comparative Economics” St. Petersburg, Russia, (20170615-17), [Speech/Presentation]
- 7) Podolskiy, E.A. : Joint Workshop on Slow Earthquakes, Matsuyama, Japan, (20170919-21), [Speech/Presentation]
- 8) Tabata, S. : 49th Annual Convention of Association for Slavic, East European and Eurasian Studies (ASEEES), Chicago, U.S.A., (20171109-12) [Speech/Presentation]
- 9) Yasunari, T. : AGU Fall Meeting 2017, Guangzhou, China, (20171211-15), [Chair]
- 10) Otsuka, N. : “How sea ice science can progress safe navigation along the NSR”, Bexco (Busan, South Korea), Arctic Partnership Week 2017 ~ New Challenges and Opportunities for Arctic Cooperation, (20171213) [Speech/Presentation]

2018

- 11) Tabata, S. : Fifth International Symposium on Arctic Research (ISAR-5), Tokyo, Japan, (20180117), [Speech/Presentation]
- 12) Otsuka, N. : “Potential of Arctic Business and Resource Development”, Sasakawa Peace Foundation (Tokyo, Japan), Workshop on Arctic Governance in Tokyo 2018, (20180208-20180209) [Chair]
- 13) Yasunari, T. : Japan Society for the Promotion of Science (JSPS) US Alumni 2018 Seminar on "Growing Atmospheric Pollution and Its Impact on Climate", Orange, U.S.A. (2018.02.16), [Speech/Presentation]
- 14) Saitoh, S.-I. : The 2nd RACArctic (Resilience and adaptive capacity of arctic marine systems under a changing climate) International Workshop, Fairbanks, U.S.A., (2018.03.06-08) [Chair]
- 15) Saitoh, S.-I. : The 27th PICES WG-39 Workshop, Sapporo, Japan, (2018.03.22-23), [Chair]
- 16) Saitoh, S.-I. : Co-Chair of the "Third Meeting of the ICES/PICES/PAME Working Group on Integrated Ecosystem Assessment for the Central Arctic Ocean (WGICA), St. John's, Canada, (20180424-26), [Chair]
- 17) Saitoh, S.-I. : “Novel applications of remote sensing in Subarctic and Arctic marine ecosystems”, Fairbanks, Alaska, ESSAS Annual Science Meeting (20180601) [Speech/Presentation]
- 18) Otsuka, N. : “Investigation of Liner Shipping Operations via the NSR”, Bexco (Busan, South Korea), KoARC7 2018 Meeting, (20180915) [Speech/Presentation]

- 19) Saitoh, S.-I. : “PICES Contribution to Central Arctic Ocean (CAO) Ecosystem Assessment”, Yokohama(Japan), PICES(the North Pacific Marine Science Organization)-2018, (20181026) [Chair]
- 20) Saitoh, S.-I. : “Application of Remote Sensing and GIS to Sustainable Fisheries and Aquaculture”, Yokohama(Japan), PICES(the North Pacific Marine Science Organization)-2018, (20181101) [Speech/Presentation]
- 21) Otsuka, N. : “Challenge to the Arctic container shipping, scenario of vessel operation”, Bexco(Busan, South Korea), The 7th International Arctic Shipping Seminar 2018, (20181213) [Speech/Presentation]
- 22) García Molinos, J. : “Research on aquatic and climate change ecology at the ARC-HU 2”, Bexco (Busan, South Korea), KOPRI-HU ARC Joint Meeting, Arctic Partnership Week 2018, (201812) [Speech/Presentation]
- 23) Takahashi, M. : “How to Best Enjoy the Wealth Created by Mineral Resource Development”, Kobe University (Kobe, Japan), The Politics of Sustainability in Greenland,4th Kobe PCRC Symposium, International Law for Sustainability in Arctic Resource Development, Integration of economic, social, environmental and scientific dimensions, (20181218) [Speech/Presentation]

2019

- 24) Ohnishi, F. : “International relations in the Arctic International order at regional-level”, Research Council of Norway (RCN), Oslo, Norway, The 3rd Norway- Japan Academic Network Seminar , (20190206) “The Politics of Sustainability in Greenland”, [Keynote]
- 25) Ohnishi, F. : “Arctic Dragon: Three world views”, Kirkenes, Norway, Border Seminar 2019, Arctic in Asia, Asia in the Arctic, (20190213) [Speech/Presentation]
- 26) García Molinos, J. : “Reorganization of marine biodiversity under climate change: new challenges and opportunities”, University of Vigo, Spain Seminar series Campus do Mar, (20190226) [Speech/Presentation]
- 27) Ohnishi, F. : “International relations in the Arctic International order at regional-level”, Oslo, Norway, JSPS Norway- Japan Academic Network Seminar, (20190226) [Speech/Presentation]
- 28) Fukamachi, Y. : “Mooring measurement of sea ice and ocean in the northeastern coastal Chukchi Sea from 2009”, Fairbanks, USA, Japan-U.S. Arctic Science Collaboration “Reflections on the Past Two Decades and Future Opportunities”, (20190305) [Keynote]
- 29) Takahashi, M. : “Considering International Relations in the Arctic from the Perspective of a Triadic Political Relationship”, The Residence of the Ambassador of Japan (Oslo, Norway), International seminar, Envisioning linkages between global competition and international politics in the Arctic, (Discussant) , (20190322) [Speech/Presentation]
- 30) Podolskiy, E.A. : “Thermal fracturing on a Himalayan debris-covered glacier”, Vienna, Austria, EGU General Assembly 2019, (20190408) [Speech/Presentation]
- 31) Saunavaara, J. : “Japan’s Arctic policy”, Japan and Finland in the Changing World, Turku, Finland, (20190827) [Speech/Presentation]
- 32) Takahashi, M. : “An International Perspective on “The Future of Greenland: Political and Economic Implications for the Arctic””, 2019 North Pacific Arctic Conference Global-Arctic Interactions: The Arctic Moves from Periphery to Center, Honolulu, U.S.A., (20190815) [Speech/Presentation]

- 33) Otsuka, N. : “Japan’s Arctic Policy and observer status of the Arctic Council”, 2019 North Pacific Arctic Conference Global-Arctic Interactions: The Arctic Moves from Periphery to Center, Honolulu, U.S.A., (20190816) [Speech/Presentation]
- 34) Podolskiy, E.A. : “Continuous and discrete ice-quakes due to fracture, slow slip and fluids”, Izu, Japan, The International Statistical Seismology (StatSei) workshop, (20190821) [Speech/Presentation]
- 35) Saunavaara, J. : “Needs and problems of transport and communication infrastructure of the regions of the North”, Yakutsk, Sakha Republic, Russia, Northern Sustainable Development Forum(Cold Lands seminar), (2019/9/23) [Speech/Presentation]
- 36) Tabata, S. : ”People and community in the Arctic: possibility of sustainable development”, Northern Sustainable Development Forum, Yakutsk, Yakutsk, Sakha Republic, Russia. (2019/0925) [Speech/Presentation]
- 37) Sugimoto, A. : International symposium committee, The Xth International Symposium on "C/H2O/Energy balance and climate over the boreal and Arctic regions with special emphasis on Eastern Eurasia", and 1st Japan-Russia Joint Research Laboratory meeting on Sustainable Development of the North, Sapporo, Japan. (20191004-07)[Chair]
- 38) Otsuka, N. : “Northern Sea Route: Current Status and Future”, Dalhousie University(Halifax, Canada), CANADIAN-JAPANESE EXCHANGE ON THE LAW OF THE SEA, (20191206-20191207) [Speech/Presentation]
- 39) Fukamachi, Y. : “Mooring measurement of sea ice and ocean in the northeastern coastal Chukchi Sea” ,Chozen International Symposium on Transboundary Pollution at North-South Transect at Marginal Sea in western Pacific Ocean, Kanazawa, Japan, (2019/12/19) [Speech/Presentation]
- 40) Yasunari, T. : “Wildfire smoke transport to Hokkaido, and our portable PM2.5 sensor system for cold regions”, Kanazawa, Japan, Chozen International Symposium on Transboundary Pollution at North-South Transect at Marginal Sea in western Pacific Ocean, (2019/12/18) [Speech/Presentation]
- 41) García Molinos, J. :Convener, AGU fall meeting, San Francisco, USA.(20191211) [Chair]
- 2020**
- 42) Otsuka, N. : “Different aspects of Arctic shipping, feasibility studies concerning the NSR, port development”, University of Lapland, Rovaniemi, Finland, Finnish-Japanese Arctic Studies Seminar 2020, Infrastructure Development and Sustainable Use of the Arctic Ocean, (20200210) [Speech/Presentation]
- 43) Saunavaara, J. : “Infrastructure Development and sustainable Use of the Arctic Ocean”, University of Lapland, Rovaniemi, Finland, Finnish-Japanese Arctic Studies Seminar 2020, Finnish-Japanese Arctic Studies Seminar 2020, Infrastructure Development and Sustainable Use of the Arctic Ocean, (20200210) [Speech/Presentation]
- 44) Otsuka, N. : “Does the Northern Sea Route fit into East and West commercial shipping? A Japanese perspective”, 2020 North Pacific Arctic Conference, the East-West Center and the Korea Maritime Institute Honolulu, Hawaii (20201022) [Speech/Presentation]
- 45) Otsuka, N. : “Possibility and determinants of container shipping of the NSR”, the 9th International Arctic Shipping Seminar in Busan, (20201210) [Speech/Presentation]

- 46) Otsuka, N. : “Possibility and determinants of NSR commercial shipping”, the United States Coast Guard Academy, (20210226) [Speech/Presentation]
- 47) Otsuka, N. “Northern Sea Route and environmental risk in the Japan-Russia bordering waters”, 6th round of Russian-Japanese consultations in the field of ecosystem conservation in adjacent areas, Ministry of Natural Resources and Environment of the Russian Federation and Ministry of Foreign Affairs Japan (20201215) [Speech/Presentation]
- 48) Otsuka, N. : “Northern Sea Route ~overarching the Arctic Ocean”, China-Japan-ROK Cooperation on Polar Regions Workshop & Think Tank Union of the Yellow and East China Sea Academic Conference. (20210203) [Speech/Presentation]
- 49) Otsuka, N. : “Infrastructure in the Arctic. Asian Interests and the Path Forward in the New Arctic”, Asian Interests and the Path Forward in the New Arctic, Wilson Center, (20210209) [Speech/Presentation]

Annex-5 : Co-working with stakeholders

Activity	Stakeholders	year
Stakeholder meetings (Resilience and adaptive capacity of arctic marine systems under a changing climate, Belmont Forum)	Fishermen's association, fishing companies, fish processing companies, shipping companies	2016-2018
Stakeholder meetings (C budget of ecosystems and cities and villages on permafrost in eastern Russian Arctic, Belmont Forum)	Cities and villages on permafrost in the Republic of Sakha	2016-2018
Recommendation for policy makers on the utilization of Northern Sea Route	Hokkaido Committee for Economic Development	2016
Northern Sea Route Study Working Group	Hokkaido Government, Port authority in Hokkaido	2016~
Northern Sea Route Study Liaison Council	Ministry of Land, Infrastructure, Transport and Tourism, Japan	2016~
Arctic Council's PAME and SDWG working group	Arctic Council, Japanese Ministry of Foreign Affairs	2017~
Arctic Economic Council, Top of the World Broadband Summit in Sapporo	Arctic Economic Council, Hokkaido Committee for Economic Development, telecom companies, data center providers, Hokkaido Government, Ishikari-Bay New Port Authority	2018
International Conference on Arctic Tourism, "Sustainability is Cool in Arctic Tourism"	Ministry of Economic Affairs and Employment of Finland, Hokkaido Government, Hokkaido Committee for Economic Development, Team Finland, Business Finland, Visit Finland and Embassy of Finland in Tokyo	2018
Northern Sea Route container shipping project	Tomakomai Futo Co. Ltd., Tomakomai Port Authority, Hokkaido Committee for Economic Development	2019
The Experience - Exchange Workshop on "UArctic Thematic Network on Collaborative Resource Management"	Mombetsu City	2019
Working Meeting program on "North for work and life", World Winter Cities Association for Mayors	Sapporo City	2019
Hokkaido Nutopia Data Center Study Group	Telecom companies, data center providers, Hokkaido Government	2020~

References

Global Institution for Collaborative Research and Education (GI-CoRE) Final Evaluation for the Global Station for Arctic Research projects

1. Aims

The Global Institution for Collaborative Research and Education (GI-CoRE) shall implement an external evaluation of the research, education and organizational framework of the Global Station for Arctic Research projects which started on April 1, 2016. As the projects have welcomed the final (fifth) year of the implementation period upon the Fiscal Year 2020, the feedback of this evaluation shall be used to improve the future project.

2. Evaluation Structure

A "Hokkaido University Global Institution for Collaborative Research and Education External Evaluation Committee" shall be established in Arctic Research Global Station in accordance with the External Evaluation Implementation Guidelines for the Hokkaido University Global Institution for Collaborative Research and Education Global Station (Document 2). All evaluations and reports shall be undertaken in English.

Global Station for Arctic Research External Evaluation Committee

Candidates from Arctic Research GS: 2 Japanese members, 1 foreign member

*When the evaluation is completed, the GI-CoRE Steering Committee shall receive a report from the Committee chair.

3. Evaluation Method

The External Evaluation Committee shall check the contents of the Research Progress Report (Document 3) sent in advance from HU before implementing the investigation, and shall evaluate the evaluation items prescribed in Document 4.

A 5-level evaluation ratings (S to D) and comments shall be obtained for each "Evaluation Item".

Evaluation Ratings	Evaluation Explanation
S	Achieved outcomes surpassed the original plan (Outstanding)
A	Good progress has been maintained and expected outcomes have been achieved (Excellent)
B	Most expected outcomes have been achieved with some slight delays (Good)
C	Although certain outcomes were achieved, overall results were insufficient (Satisfactory)
D	No expected outcomes were achieved (Unsatisfactory)

4. Required Expenses

Travel expenses (only when applicable) and honoraria shall be provided to the Committee Members in accordance with HU regulations. It will be arranged and covered by Global Station for Arctic Research, Hokkaido University depending on the situation of COVID-19.

5. Publishing of Evaluation Results

Evaluation of this project shall be broadly announced, with the results both published on the relevant HU websites and published as booklets which are sent to external organizations such as the Japanese Ministry of Education, Culture, Sports, Science and Technology.

GI-CoRE Global Station External Evaluation Schedule

Year and Month	Agenda
Fiscal Year 2019 (2019-2020)	
June to November	Proposal of Evaluation Items and Evaluation Structure (Draft Fixed)
November	Selection/Arrangement of the Evaluation Committee Members *Criteria: 2 foreign and 1 Japanese members (candidates who can conduct evaluation in English) *Confirmation of affiliation, main achievements, contact details, etc.
December	GI-CoRE Steering Committee #23 *Fixing overviews of evaluation items, evaluation structure, schedule, etc. *Fixing the Evaluation Committee Members
January to March	*Starting to create the 2020 Research Progress Report (in English) *Official appointment request (letters from the GI-CoRE Director) *Fixing evaluation forms
Fiscal Year 2020 (2020-2021)	
April	Commission of Evaluation Committee Members
June to July	Completion of the Research Progress Report
August to September	Distribution of Research Progress Report to Committee Members Document screening by Committee Members Preparation of On-line Investigation
October	Online investigation via Zoom October 20th and 21st Online on-site investigation based on the document screening
November	Submission of Summary Report and Results of the Evaluation Committee Each Committee Member shall forward their evaluation results, based on the document screening and on-line meeting. The Chair shall summarize the Evaluation from each Committee and make a report.
December	GI-CoRE Steering Committee #27 *Report of the results of the Evaluation from the External Evaluation Committee Members
March	Expiration of the GSA project under the GI-CoRE System
Fiscal Year 2021 (2021-2022)	
April	Internalization of the GSA project into the affiliated faculty
July	Publication of the Final Evaluation Report

Hokkaido University

Global Institution for Collaborative Research and Education (GI-CoRE)

External Evaluation Implementation Guidelines for the Global Stations

December 15, 2015

Establishment of the Global Institution for Collaborative Research and Education Steering Committee

1. Purpose

These implementation guidelines shall provide the necessary matters for the implementation of evaluation of the Global Station by non-University affiliated persons (hereinafter the “GS External Evaluation”) of the Hokkaido University Global Institution for Collaborative Research and Education (GI-CoRE).

2. Committee

(1) The "Hokkaido University Global Institution for Collaborative Research and Education External Evaluation Committee (hereinafter the "Committee")" shall be established by GI-CoRE in order to perform the matters prescribed in each of the following items.

(i) Implementation of GS External Evaluation

(ii) Matters related to the creation and publishing of the report pertaining to the GS External Evaluation

(2) A Committee shall be established for each Global Station that is target for external evaluation.

3. Composition

(1) The Committee shall be composed of third parties other than constituent members of Hokkaido University, and designated by the Director of GI-CoRE from persons prescribed in each of the following items.

(i) Person designated by the Director of GI-CoRE who is an expert both within and outside Japan in the research field of the Global Station to be externally evaluated

(ii) Persons whom the Director of GI-CoRE deems necessary

(2) The Committee members prescribed in the preceding paragraph shall be commissioned by the Director of GI-CoRE after approval by the GI-CoRE Steering Committee.

4. Term of Office

(1) The term of office for Committee Members shall be 1 year. However, if a Committee Member vacancy occurs, the term of office of the successor shall be the remaining term of the predecessor.

(2) Committee Members may be reappointed.

5. Committee Chair

(1) A Committee Chair shall be appointed and selected through mutual election by the Committee members.

(2) The Committee Chair shall call a Committee meeting as required, and shall chair the said meeting.

6. Proceedings

- (1) A Committee meeting may not be held unless a majority of the members are present.
- (2) Committee meeting proceedings shall be decided by a majority of the attending members.
In case of a tie, the Committee Chair shall decide the issue.

7. Implementation of GS External Evaluation

- (1) The Committee shall implement the GS External Evaluation as prescribed in the following Article.
- (2) The Committee may hear the opinions of persons concerned and implement firsthand investigations related to the implementation of the GS External Evaluation.

8. Evaluation Items

The Committee shall evaluate the items prescribed by GI-CoRE in each of the following items.

- (1) Items related to research
- (2) Items related to education
- (3) Items related to the structure of the research and education center
- (4) Other items deemed necessary by the Committee

9. Creation and Publishing of the Report

The Committee shall collate the evaluation results prescribed in the preceding paragraph and publish the results in a report.

10. Response to Evaluation Results

The Director of GI-CoRE shall promptly work to implement improvements in view of the report prescribed in the previous paragraph for items in which improvements are deemed necessary.

11. General Affairs

General affairs for the Committee shall be processed by the Division of International Planning, International Affairs Department.

12. Miscellaneous Provisions

Necessary matters concerning GS External Evaluation other than those prescribed within these implementation guidelines shall be prescribed separately by the GI-CoRE Steering Committee.

Supplementary Provisions

These guidelines shall come in force on 12 December 2017.

Supplementary Provisions

These guidelines shall come into force on March 7, 2019 and shall be applied from July 1, 2018.

REGULATIONS FOR THE HOKKAIDO UNIVERSITY
GLOBAL INSTITUTION FOR COLLABORATIVE RESEARCH AND EDUCATION

HU Doc. No.151
April 1, 2014

(Purpose)

Article 1 These *Regulations* shall prescribe the organization and administration of the Hokkaido University Global Institution for Collaborative Research and Education (hereinafter referred to as "the Institution for Research and Education"), based upon the *Rules Concerning the Organization of Hokkaido University* (HU Doc. No. 31 of 2004), Article 37(4).

(Objectives)

Article 2 The objectives of the Institution for Research and Education shall be to invite teaching staff from Japan and overseas with world-class education and research results, to promote international collaborative research and international collaborative education (hereinafter referred to as "international collaborative research and education") that capitalizes upon the distinctive characteristics of Hokkaido University (hereinafter referred to as the "University"), and to provide support for international collaborative research being furthered independently by faculties or schools.

(Employees)

Article 3 A Director and other necessary teaching staff shall be placed in the Institution for Research and Education.

(The Director)

Article 4 The President shall be appointed as the Director of the Institution for Research and Education.

2. The Director shall supervise the work of the Institution for Research and Education.

(The assistant director)

Article 5 An assistant director shall be placed in the Institution for Research and Education.

2. A vice president designated by the President shall be appointed as the assistant director.

3. The assistant director shall assist the Director in his or her duties and shall take over those duties in the event of the latter being incapacitated.

(Global stations)

Article 6 The following global stations shall be placed in the Institution for Research and Education to promote international collaborative research and education that capitalizes upon the distinctive characteristics of the University.

(1) The Global Station for Soft Matter

(2) The Global Station for Big Data and Cybersecurity

(3) The Global Station for Arctic Research

(4) The Global Station for Biosurfaces and Drug Discovery

2. Full-time teaching staff from the University (including specially appointed academic staff who come under each item of Article 3 of the *Hokkaido University Specially Appointed Academic Staff Regulations* (HU Doc. No. 35 of 2006). The same applies to Article 7(2) below.) and teaching staff invited from Japan and overseas shall be placed in the Institution

for Research and Education.

3. The period for which a global station is established shall be five years. However, this period can be extended within five years if the steering committee provided for in Article 8 deems it necessary.

(Global station leaders)

Article 7 A global station leader shall be placed in each of the global stations referred to in the items of Article 6(1).

2. The global station leader shall be one of the teaching staff of the said global station who has been designated by the Director.
3. The global station leader shall supervise the work of the said global station under the orders of the Director.
4. The term of office of the global station leaders shall be three years or less, and they can be reappointed.

(Steering Committee)

Article 8 A steering committee shall be placed in the Institution for Research and Education to deliberate important matters concerning the said institution.

2. The organization and administration of the steering committee shall be prescribed separately.

(Administration)

Article 9 The administrative work of the Institution for Research and Education shall be processed in the Division of International Planning, the International Affairs Department.

(Miscellaneous provisions)

Article 10 In addition to what is prescribed in these *Regulations*, necessary matters regarding the operation of the Institution for Research and Education shall be prescribed separately by the President after approval by the steering committee.

Supplementary Provisions

These *Regulations* come into force on April 1, 2014.

Supplementary Provisions

These *Regulations* come into force on April 1, 2015.

Supplementary Provisions

These *Regulations* come into force on April 1, 2016.

Supplementary Provisions

These *Regulations* come into force on July 1, 2018.

Supplementary Provisions

These *Regulations* come into force on March 1, 2020.

Supplementary Provisions

These *Regulations* come into force on April 1, 2020.

REGULATIONS FOR THE GLOBAL INSTITUTION FOR COLLABORATIVE RESEARCH AND EDUCATION STEERING COMMITTEE

HU Doc. No. 152
April 1, 2014

(Purpose)

Article 1 These *regulations* shall provide for the necessary matters concerning the organization and administration of the Global Institution for Collaborative Research and Education Steering Committee (hereinafter referred to as "the committee"), based upon Article 8(2) of the *Regulations for the Global Institution for Collaborative Research and Education* (HU Doc. No. 151 of 2014, "*Regulations for the Institution for Education and Research*" in Article 3).

(Topics for Deliberation)

Article 2 The committee shall deliberate on the issues set forth in item (6) through item (10) of Article 2 of the *National University Corporation Hokkaido University Agenda for Hearing with Faculty Council Rules* (HU Doc. No. 42 of 2015, referred to as "*Hearing Rules*" in the following paragraph) and deliver opinions to the President.

2. In addition to the matters specified in the preceding paragraph, the committee shall deliberate the following matters pertaining to the Hokkaido University Global Institution for Collaborative Research and Education (hereinafter referred to as "the Institution for Research and Education" in (5) below).
 - (1) Matters regarding personnel affairs of the faculty (excluding matters set forth in item (6) through item (10) of Article 2 of the *Hearing Rules*).
 - (2) Matters regarding the establishment, reform or termination of global stations.
 - (3) Matters regarding the evaluation of the educational and research activities of global stations.
 - (4) Matters regarding budgets.
 - (5) Other important matters pertaining to the administration of the Institution for Research and Education.

(Structure)

Article 3 The committee shall consist of the following members:

- (1) The director of the Global Institution for Collaborative Research and Education (referred to as "the director" in Article 5)
- (2) The assistant director of the Global Institution for Collaborative Research and Education (referred to as "the assistant director" in Article 5)
- (3) One vice president designated by the President (excluding the person mentioned in the previous item)
- (4) One dean or director from each of the following categories (a-d), each of whom shall be designated by the President
 - a) The Graduate School of Law, the Faculty of Education, the Research Faculty of Media and Communication, the Faculty of Economics and Business, the Faculty of Humanities and Human Sciences, the Faculty of Public Policy

- b) The Faculty of Fisheries Sciences, the Faculty of Environmental Earth Science, the Faculty of Science, the Research Faculty of Agriculture, the Faculty of Advanced Life Science, the Faculty of Engineering, the Faculty of Veterinary Medicine, the Faculty of Information Science and Technology
 - c) The Faculty of Pharmaceutical Sciences, the Faculty of Health Sciences, the Faculty of Medicine, the Faculty of Dental Medicine, Hokkaido University Hospital
 - d) Each affiliated research institute, each research center, the Field Science Center for Northern Biosphere
- (5) Each global station leader as prescribed in Article 7 of the *Regulations* for the Institution for Education and Research
- (6) Other persons whom the President deems appropriate
2. The President shall appoint the committee members mentioned in the preceding item (6)

(Term of Office)

- Article 4** The terms of office of the committee members indicated in paragraph 1(4) and paragraph 1(6) of the previous article shall be two years. However, the term of office of substitute committee members shall be the remaining term of office of the previous committee member.
2. The committee members indicated in the preceding paragraph may be reappointed.

(Committee Chair)

- Article 5** The director shall be appointed as the committee chair.
2. The committee chair shall call committee meetings and preside over the said meetings.
3. The assistant director shall take over the director's duties in the event of the latter being incapacitated.

(Proceedings)

- Article 6** The committee cannot validly convene unless at least two-thirds of the committee members are present.
2. Committee proceedings, other than those prescribed separately, shall be decided by the majority vote of the attending committee members.

(Attendance of Persons Other Than Committee Members)

- Article 7** In cases deemed necessary by the committee, persons other than committee members may be permitted to attend committee meetings, and explanations or opinions of the said persons may be heard.

(Committees on Special Issues)

- Article 8** Committees on special issues may be established within the committee when necessary in order to deliberate specialized matters.

(General Affairs)

- Article 9** The administrative affairs of the committee shall be processed in the Division of International Planning, the International Affairs Department.

(Miscellaneous Provisions)

- Article 10** In addition to what is prescribed in these *regulations*, necessary matters regarding the operation of the committee shall be prescribed by the said committee.

Supplementary Provisions

These *regulations* come into force on April 1, 2014.

Supplementary Provisions (HU Doc. No. 196 of April 1, 2015)

These *regulations* come into force on April 1, 2015.

Supplementary Provisions (HU Doc. No. 191 of October 1, 2016)

These *regulations* come into force on October 1, 2016.

Supplementary Provisions (HU Doc. No. 163 of April 1, 2017)

1. These *regulations* come into force on April 1, 2017.
2. The dean of the Graduate School of Dental Medicine who was specified as a committee member in c) of paragraph 1(4) of Article 3 prior to the revision (hereinafter referred to as “the former committee member” in this paragraph) shall be deemed to have been appointed as a committee member under the revised *regulations* in c) of paragraph 1(4) of Article 3 on the enforcement date of these regulations. The term of office of the said member shall be the remaining term of office of the former committee member on the enforcement date, notwithstanding the revised provisions of Article 4(1).

Supplementary Provisions (HU Doc. No. 182 of June 20, 2017)

These *regulations* come into force on June 20, 2017 and apply retroactively from April 1, 2017.

Supplementary Provisions (HU Doc. No. 98 of July 1, 2018)

These *regulations* come into force on July 1, 2018.

Supplementary Provisions (HU Doc. No. 134 of April 1, 2019)

1. These *regulations* come into force on April 1, 2019.
2. The dean of the Graduate School of Letters who was specified as a committee member in c) of paragraph 1(4) of Article 3 prior to the revision (hereinafter referred to as “the former committee member” in this paragraph) shall be deemed to have been appointed as a committee member under the revised *regulations* in c) of paragraph 1(4) of Article 3 on the enforcement date of these regulations. The term of office of the said member shall be the remaining term of office of the former committee member on the enforcement date, notwithstanding the revised provisions of Article 4(1).



Final Evaluation Report

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