A report from JCAR to inform the ICARP IV Process

Topic Area 6: C Preparing present and future generations through Education, Outreach, Communication, Capacity Building, and Networking

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Prepared by Hiroyuki Enomoto
Arctic Environment Research Center, National Institute of Polar Research, Tokyo, Japan
Contact: enomoto.hiroyuki@nipr.ac.jp

Japan Consortium for Arctic Environmental Research (JCAR) published "Long-term Plan for Arctic Environmental Research (JCAR, 2024)" with its Executive Summary (JCAR, 2023) that includes research priorities from viewpoints of Japanese Arctic research communities. Here, from the Executive Summary (JCAR, 2023), we have extracted, edited, and added key elements related to "Topic Area 6: Preparing present and future generations through Education, Outreach, Communication, Capacity Building, and Networking" of ICARP IV.

Strengthen society by clarifying the role of community activities.

There were arguments that international engagement of and the role played by the subnational governments, private enterprises, indigenous organizations, academia and epistemic communities, and NGOs in the Arctic governance are not properly covered in research literature. While this argument is partly based on an incomplete analysis of the existing research, there certainly is a need and room for further studies also reflecting the changes caused by the geopolitical conflicts.

Current research is characterized by an uneven but constantly widening geographical coverage; interest in non-state actors' role in the Arctic Council; interest in relationship between national and subnational authorities in Arctic matters; studies on international scientific cooperation that is not emphasizing science diplomacy or Arctic governance; studies on Arctic economy and business which only rarely focuses on Arctic governance or the interaction between private sector and policy-makers. Following research may strengthen community activities:

- Empirical research to reveal the extent of the "actual presence" of indigenous peoples forgotten in the dynamics of national history.
- Research to extract descriptive inferences, that is, established facts accumulated by reading extensively, responding to, and writing about primary sources.
- Research identifying missing variable bias through the critical reading of history and documents, contrasting what was written in history and documents with what was not (as cases of deviation, etc.), while taking into account the history of knowledge and power.

- Research analyzing the impacts of geopolitical conflict into the structures and functions of the organizations and forums supporting interregional collaboration in the circumpolar north.
- Research analyzing the issue areas that will gain greater importance or lose their significance in collaboration between the Arctic and northern regions and other non-state actors.
- Research that focuses on the relationships and interaction between companies and different levels of government to elaborate the drivers and practices of Arctic governance.
- Research analyzing the possibilities, challenges, and achievements in the rebuilding of the international epistemic communities and scientific collaboration shaken by the geopolitical conflict.

Strengthen interdisciplinary collaboration to address urgent issues.

-Regarding Natural Resource Development and Adaptation to Disasters

Human activities adapt to the various constraints of the cold environment, from subsistence use of the natural environment to the development of mining resources in the Arctic. However, the foundation of these activities is being shaken from the ground up by catastrophic events associated with climatic and environmental changes progressing throughout the Arctic region. Adaptation of resource development and livelihoods to environmental changes is in the phase of shifting awareness and activity patterns that will lead to social implementation, requiring further accumulation of integrated knowledge through interdisciplinary collaboration based on clarification of actual conditions and future projections.

Developing infrastructure to support networking.

-Regarding Information engineering

Information engineering in the Arctic is an issue that should be considered on a global scale, not just in the Arctic, and there are two major perspectives. One is that it is an information service for people and places who live and conduct research in the Arctic region, and the other is that people and companies outside the Arctic region can use the geographical and climatic conditions of the Arctic region.

Many areas in the Arctic region have low population density, low economic activity, and undeveloped remote access environments. As a result, compared to mid and low latitudes, the region is behind in terms of information services for the people living in this region. These factors cause problems such as lack of real-time observation data and transmission/reception of large-volume data, which are necessary for weather and climate forecasting research at high latitudes, including the Arctic region, and contribute to the inability to improve the accuracy of global forecasts.

On the other hand, the Arctic Ocean is the shortest route connecting the economic zones of Asia, North America, and Europe due to its geographical conditions, and the Arctic Sea route is the focus of attention and has been used as an air route for a long time. However, recent global warming has led to

the discovery of new applications for the Arctic Ocean in the field of information engineering, and the possibility of laying submarine fiber optic cables connecting the west coast of North America, Europe, and Asia via the Arctic Ocean has emerged.

There is also growing focus on locating data centers with high power consumption in regions with cold climatic conditions, where submarine cables are landed. It is well known that most of the power consumed by data centers is by the air conditioning systems that cool the ICT equipment. The cold climate conditions of the Arctic region mean that data centers can reduce their power consumption. Furthermore, it is essential to enhance the network environment through the development of low earth orbit satellite systems. Its network will also be connected to the optic fiber cable backhaul infrastructure, which will lead to improved information services in the less densely populated Arctic region. The innovation and infrastructure will also be essential for commercial and research activities by ships and other vessels in the Arctic Ocean.

Human Resource Development

Medium- to long-term activities are needed to foster young researchers who will be responsible for Arctic research and have an international perspective. To this end, outreach to high school and undergraduate students who have not decided the future research field, and the development and clarification of career paths after obtaining degrees are required, while keeping in mind the need to resolve the current serious gender imbalance. In addition, the program is expected to contribute to the development of young indigenous researchers internationally.

Toward strengthening human resource development

Nurturing the next generation of human resources is the most important issue for the progress and development of research regardless of academic field. There are several serious problems in the training of researchers and experts, including unclear career paths, instability in research jobs, and gender imbalance, which is particularly noticeable in science and engineering fields. But the influence is great.

The field of Arctic research: The promotion of research activities and their results have a direct impact on local and international society, so it can be said that a wide range of human resources, not just researchers, are needed and there are opportunities for success.

Characteristics and future challenges of Arctic research from the perspective of human resource development

A wide range of academic fields are needed in the Arctic region, which faces rapid environmental changes. Research is required not only in fields directly connected to traditional environmental science, but also in engineering, humanities, social sciences, and academic fields that integrate these, and at

the same time, practical application in society.

As described above, since Arctic research is an interdisciplinary and comprehensive discipline that is closely related to society, there are a wide variety of skills and backgrounds required of people involved in Arctic research.

1. Acquisition of specialized knowledge and skills: To contribute to Arctic research and solving issues in the Arctic region, in addition to research ability or specialization such as a certain level of technology and knowledge, an understanding of the unique background of the Arctic is required.
2. Opportunities for fieldwork: In order to study the polar natural and social environment, which is a characteristic of the Arctic region, from a non-Arctic country, it is necessary to conduct research such as on-site observations, sampling, and interviews. It is desirable to have opportunities to conduct field surveys at an early stage to acquire fieldwork techniques that will allow you to carry out surveys safely, and to learn about the environment and circumstances unique to the Arctic region.
3. Communication skills: Since the themes of Arctic research are often interdisciplinary, it is necessary to carry out research while having discussions with researchers from various backgrounds. Furthermore, as surveys are often carried out in people's living areas, and problems are often problem-solving, cooperation and collaboration with residents in the Arctic is essential. In either case, high communication skills, including language skills, are required.
4. International sense and cooperation: In Arctic research where the research target area is the territory or territorial waters of another country, research activities are often carried out as international joint research, so it is important to have an international perspective and build cooperative relationships with Arctic countries. It is necessary to do so.

They often participate in and contribute to international research networks to promote difficult observations and research in the Arctic region and are required to have an international sense and the ability to cooperate in order to take appropriate responses in a variety of situations.

Simply bringing together ``narrow and deep" researchers with different specialties will not result in cross-disciplinary research. Previous research projects have clearly shown that organic discussion is possible only when individual researchers acquire interdisciplinarity. One of the challenges is how to help each player acquire the added benefits of expanding their field of defense in a way that does not put them at a disadvantage in their careers.

Gender imbalance

Eliminating gender imbalance is also an international issue and requires an academic field to address it. Gender equality is one of the goals of the Sustainable Development Goals (SDGs) adopted at the United Nations Summit in September 2015, and one of the specific goals is "Gender equality The goal is to ensure women's full and effective participation and leadership opportunities in decision-making.

During its 2019-2021 Arctic Council (AC) presidency, Iceland made gender equality a priority goal. Gender equality has been an issue in the AC since the early 2000s, and the Sustainable Development Working Group (SDWG) project ``Gender Equality in the Arctic'' has been implemented since 2013 under the leadership of Iceland. The project's report calls for gender mainstreaming - ensuring that all actions and policies at all levels of society benefit men and women equally and preventing gender inequality - and (Pan-Arctic Report, Gender Equality in the Arctic, Phase 3, 2021).

One immediate measure in the field of Arctic research is to strengthen humanities and social science fields, where the proportion of women is relatively high. This is consistent with the international trend towards further interdisciplinarity and cross-disciplinary activities, so there is plenty of room for consideration in future Arctic research projects.

Steady but long-term efforts are essential, such as making Arctic research a more welcoming workplace for women and continuing efforts at outreach events for the general public and students.

Related efforts and future challenges

The international activities that have great effects on human resource development.

1. The Association of Polar Early Career Scientists (APECS) is an organization run by students and young researchers who conduct research in both poles. Participating in APECS and participating in its activities is considered to be effective for career development for young people aiming to become researchers in polar science. The community of Arctic researchers is expected to continue to contribute to the development of young researchers through support for APECS and its domestic organizations.
2. UNIS is the world's northernmost university, established in 1993 by the Norwegian Universities Union. There are nearly 20 full-time faculty members, and a comprehensive course on Arctic science, including Arctic field research techniques, is offered. Approximately 300 students from all over the world choose this course each year.
3. Fellowship system of IASC and the allocation of travel support to young researchers in five field-specific working groups and recruit researchers in the early stages of their careers for Fellowship system. This is an extremely effective mechanism for learning about the international aspects of Arctic research and forming a network of researchers.

Research promotion system.

Arctic research requires the sharpening of specialized fields and interdisciplinary collaboration. In addition, there is a need not only to explore scientific truths but also to connect with society, such as social fields such as industry and resource development, and government agencies and local governments that carry out policy activities. International movements in Arctic research are diverse and change rapidly, and international cooperation is frequently called for. To respond quickly and

appropriately to these global trends, researchers should strengthen their activities, build cooperative systems, obtain information on international trends, and participate in domestic and international decision-making.

Submitted together with:
JCAR (2023): Executive Summary of Long-term Plan for Arctic Environmental Research.
https://www.jcar.org/longterm/executive_summary20240109.pdf

References:

Japan Consortium for Arctic Environmental Research (2023). Executive Summary of Long-term Plan for Arctic Environmental Research.

Japan Consortium for Arctic Environmental Research (2024). Long-term Plan for Arctic Environmental Research. [in Japanese]