Statement of Principles and Practices for Arctic Data Management
April 16, 2013

All IASC-endorsed scientific results shall be verifiable and reproducible through ethically open access to all data necessary to produce those results. Data shall be preserved, accessible, and used in accordance with scientific norms of fair attribution and use.

To this end, IASC Council approves the following actions:

1. Endorsement of the Statement of Principles and Practices for Arctic Data Management;

2. Establishment of an IASC Data Standing Committee;

3. To undertake measures towards adoption of national data policies consistent with the principles and practices described below.

Introduction

IASC seeks to "encourage and facilitate cooperation in all aspects of Arctic research, in all countries engaged in Arctic research, and in all areas of the Arctic region."[i] This mission is increasingly important in a time of very rapid Arctic change and to sustain the increase in Arctic cooperation resulting from the International Polar Year 2007-8 (IPY). Data exchange is a central to scientific collaboration, especially interdisciplinary collaboration. IASC has strongly supported the IPY Data Policy with its emphasis on ensuring security, accessibility, and free exchange of relevant data that both support current research and leave lasting legacy, but to date IASC has lacked its own data policy and strategy. IASC, therefore, developed this statement of principle to sustain and continue IASC's mission.

IASC data are multidisciplinary and disparate. This document aims to provide a framework for these data to be handled in a consistent manner, and to strike a balance between the rights of investigators, the rights of indigenous peoples, and the public, thus the need for widespread access through the free and unrestricted sharing and exchange of both data and documentation. The document is compatible with existing policies from the International Council of Science (ICSU) and other IASC organizational collaborators, and it builds on recommendations from the IPY Data Committee[ii], the SCAR/IASC Bipolar Action Group[iii], and international, strategic, polar-data workshops.[iv]

The central purpose of this document is to support the IASC mission and especially the following specific objectives.

- Provide mechanisms and instruments to support science development;
- Seek to ensure that scientific data and information from the Arctic are safeguarded, freely exchangeable and accessible;
- Promote international access to all geographic areas and the sharing of knowledge, logistics and other resources;
- Provide for the freedom and ethical conduct of science;
- Promote and involves the next generation of scientists working in the Arctic

And the following IASC Working Group objectives:

- 3.3 Encourage the exchange and dissemination of information;
- 3.4 Encourage means of initiating and maintaining observational systems and the data they produce, and coordinating with other long-term observational programs in the Arctic and globally.

Realizing these objectives requires a focus on basic norms and principles of science, namely that scientific results must be verifiable, reproducible, and recognized. Therefore, data must be preserved and openly accessible. These principles are the heart of this document and IASC will act as a strong advocate for both the principles and clear and forceful implementation.

Data Definition

IASC data are everything necessary to reproduce and verify a scientific result from an IASC endorsed activity.

This is both a broad definition, in that it can include everything from observations and model outputs to software and algorithms, and a restrictive definition, in that it is limited to IASC endorsed results. IASC is neither a research program nor a funding agency. It does not create data per se; rather it acts as a coordinator that facilitates international collaboration. IASC acts as a moral and scientific authority that works to ensure that its endorsed results are truly verifiable, while also actively promoting the principles of verity, openness, and ethics.

Note this definition can also apply to physical samples, biological specimens, cultural artifacts, and other non-digital material. This document focuses on access and preservation to digital materials. Access to physical materials is necessarily more constrained, but materials should still be reasonably open to scientific sharing and investigation in accordance with the International Council on Archives's Standards and Guidelines,[v] the Society of American Archivists's Core Values Statement and Code of Ethics,[vi] and other community guidance. Basic principles of preservation, documentation, and ethical use also apply.

Ethically Open Access

In accordance with
- the Twelfth WMO Congress, Resolution 40 (Cg-XII, 1995)
- the Thirteenth WMO Congress, Resolution 25 (Cg XIII, 1999)
- the ICSU 1996 General Assembly Resolution
- the ICSU World Data System Data Policy[vii]
- the ICSU Assessment on Scientific Data and Information (ICSU 2004b)

and in order to maximize the benefit of data gathered under the auspices of the IASC, the IASC Council requires that IASC data are made available fully, freely, and openly with minimal delay.

The only exceptions to this requirement of full, free, and open access are:
- where human subjects are involved, confidentiality shall be protected as appropriate and guided by the principles of informed consent;
- where local and traditional knowledge is concerned, rights of the knowledge holders shall not be compromised;
- where data release may cause harm, specific aspects of the data may need to be kept protected (for example, locations of nests of endangered birds or locations of sacred sites).

These ethically allowable restrictions are in accordance with International Arctic Social Science Association's Guiding Principles on the Conduct of Research[viii] and Article 8 of the Convention on Biodiversity.[ix] In addition, local, national and agency guidelines and policies regarding ethical conduct of research must be followed.

Ethically open access includes recognition of the concerns, rights, and management practices of Indigenous knowledge holders and stewards. In the context of research involving Indigenous knowledge, data management principles based on the concepts of respect, reciprocity, and responsibility should be observed. This includes appropriate engagement of Indigenous people, communities or organizations throughout the entire data life cycle, formal attribution of contributed knowledge, establishment of informed consent for use of knowledge and derived products, and the maintenance of contributor control of data and information resources. Required institutional ethics review processes (e.g. Institutional Review Boards, Research Ethics Boards etc.) will guide data management, however Indigenous communities or organizations may have specific, practices or requirements in place. It is the responsibility of researchers to familiarize themselves with and adhere to these practices and requirements.

Any data access restrictions must be described and justified in a data management plan based on these ethical, rather than proprietary, principles of data sharing. In general, data providers and users should adhere to the Polar Information Commons Ethics and Norms of Data Sharing,[x] especially with regards to fair attribution of and collaboration with data providers.

ICSU (2004b) defines "Full and open access" as equitable, non-discriminatory access to all data preferably free of cost, but some reasonable cost-recovery is acceptable. WMO Resolution 40 uses the terms "Free and unrestricted" and defines them as non-discriminatory and without charge. "Without charge", in the context of this resolution means at no more than the cost of reproduction and delivery without charge for the data and products themselves.

IASC seeks for open data to be an ethical norm of science. In this time of rapid Arctic change, it is more important than ever that data be available with minimal delay. This is meant to accommodate reasonable periods for quality control and verification of the data but does not generally allow for periods of embargo or exclusive use. IASC does not generally support exclusive use periods, and any such periods must be carefully justified in the data management plan.

Data also require documentation (or metadata). Documentation is essential to the discovery, access, and effective use of data. All IASC data must be fully documented and described. In accordance with the ISO standard Reference Model for an Open Archival Information System (OAIS)[xi], complete documentation may be defined as all the information necessary for data to be independently understood by users and to ensure proper stewardship of the data. Regardless of any data access restrictions or delays in delivery of the data itself, all IASC

projects must make both digital and analog data discoverable by sharing basic descriptive information of collected data through the Polar Information Commons[xii] or in an internationally recognized, standard format to an appropriate catalog or registry (see Appendix B).

Preservation and Stewardship

Recognizing that the true value of scientific data is often realized long after these data have been collected, and to ensure the lasting legacy of IASC supported activities, it is essential to facilitate long-term preservation and sustained access to IASC data. All IASC data should be archived in their simplest, useful form and be accompanied by a complete metadata description in accordance with the OAIS Reference Model. Projects should identify appropriate long-term archives and data centers and describe preservation processes in their data management plans. Projects are urged to use certified archives such as those within ICSU's World Data System (WDS)[xiii]. If certified archives are not available, the data management plan should describe a path toward the development and certification of an appropriate archive. It must be recognized that data preservation and access should not be an afterthought and needs to be considered when data collection plans are first developed. IASC must be a strong advocate for preservation and work with the relevant national institutions, the WDS, and other organizations to ensure the preservation of IASC data.

A closely related issue is that the intellectual work going in creating a good data set should be recognized and ideally cited in formal publications. Citation also aids reproducibility, which means that the citation must have a persistent locator or identifier to the data such as digital object identifier. This in turn means the data need to be professionally stewarded over time.

Fair attribution is also fundamental to an ethically open data environment. Data creators and associated institutions deserve formally recognizable credit for their scientific contributions. IASC encourages this recognition through citation, appropriate co-authorship, and other means, and encourages IASC members to require appropriate credit and reference when serving as editors and reviewers.

Policy Implementation and Data Management Plans

All IASC-endorsed projects must include a data management plan that describes how the data will be ethically shared and preserved over time. Appendix A provides draft guidelines for data management plans. The IASC Executive Committee will establish an IASC Data Standing Committee with representatives from the Council and each of the Working Groups to review proposed data management plans for cross-cutting IASC projects. Individual Working Groups may develop their own processes within the scope of these principles for reviewing data management plans for projects within their groups. The Data Standing Committee will continually solicit feedback from the community and review and update this document every two years. Additions to the appendices can be proposed at any time.

IASC should not endorse future projects that do not adhere to the principles outlined in this document. IASC should actively encourage adherence to the principles and may withdraw project endorsement if necessary.

[i] http://www.iasc.info/home/iasc

[ii] Parsons, MA, T de Bruin, S Tomlinson, H Campbell, Ø Godøy, J LeClert, and IPY Data Policy and Management SubCommittee. 2011. The state of polar data—the IPY experience. In I Krupnik, I Allison, R Bell, P Cutler, D Hik, J López-Martínez, V Rachold, E Sarukhanian, and Summerhayes (ed.). *Understanding Earth's Polar Challenges: International Polar Year 2007-2008* Edmonton, Canada: CCI Press. pp. 457-476. Available at http://www.icsu.org/news-centre/publications/reports-and-reviews/ipy-summary

[iii] http://www.iasc.info/files/BiPAG/BipAG%20II%20final%20report%20May%20meeting%202011.pdf

[iv] http://www.arcticobserving.org/background/data-management-workshop and http://www.arcticobserving.org/tasks/118

[v] http://www.icacds.org.uk/eng/standards.htm

[vi] http://www2.archivists.org/statements/saa-core-values-statement-and-code-of-ethics

[vii] http://www.iassa.org/index.php?option=com_content&view=article&id=13&Itemid=23

[viii] http://www.icsu-wds.org/organization/data-policy

[ix] http://www.cbd.int/convention/articles/?a=cbd-08

[x] http://polarcommons.org/ethics-and-norms-of-data-sharing.php

[xi] http://www.iso.org/iso/home/store/catalogue_ics/catalogue_detail_ics.htm?csnumber=57284

[xii] http://polarcommons.org

[xiii] http://www.icsu-wds.org/our-members/membership-categories

Appendix A: Data Management Plan Guidelines

To be further developed by the IASC Data Standing Committee.

Requirements:

- Abstract of research project
    - Research question(s)
    - Overview of research domain and methods applied
    - Summary of expected or achieved results
    - Description of research team
    - Expected or achieved broader impacts
- Description of data to be collected and managed
    - Proposed method(s) for describing data
    - Metadata standards/specifications
    - Descriptive vocabularies (e.g. domain specific keywords)
    - Catalogue or other discovery mechanisms
- Description of mechanisms for data access and sharing
    - Description of data formats
    - Data structure and semantics (e.g. structure of relational database; definition of measurement scales used, data related vocabularies)
    - Data access and sharing methods and tools (e.g. Web mapping tools, file downloads, Web services)
- Preservation plan in an appropriately recognized archive including documentation and advertisement through appropriate portals.
- Documentation of applicable local ethical and data management protocols, and justification for requested exception(s) to open data policy
- Data release schedule

Appendix B: Recommended Data Centers

To be developed by the IASC Data Standing Committee following consultation with Working Groups. For now use WDS list.