ESTABLISHING KOREAN POLAR DATA MANAGEMENT POLICY AND ITS FUTURE DIRECTIONS

D Jin[1]* and M C Lee[1]

[1]Dept of Knowledge and Information, Korea Polar Research Institute, 26, Songdomirae-ro, Yeonsu-gu, Incheon 406-840, South Korea
**[1]Email:* dmjin@kopri.re.kr

ABSTRACT

Korea implemented its Antarctic research program in 1987 and diversified to the Arctic in 2002. Since the development of the Joint Committee on Antarctic Data Management, Korea has acknowledged the importance of data management. The launch of the Korea Polar Research Institute in 2004 also saw establishment of the Korea Polar Data Center (KPDC), which outlines and executes a Polar Data Management Policy. KPDC has set up an Information Technology infrastructure and has developed a metadata management system. However, there is still a long way to go, especially in terms of raising researcher recognition for improving data registration and sharing.

Keywords: Antarctic data, Arctic data, Polar data, Data management policy, Data management plan

1 INTRODUCTION

The Korea Polar Research Institute (KOPRI) is the national operator of the Korean Polar Program, and it established the Korea Polar Data Center (KPDC) in 2010. KPDC's role is to efficiently manage and collaboratively share polar data produced by the Korean Polar Program. Korea implemented its Antarctic research program in 1987 and diversified into the Arctic in 2002.

The Scientific Committee on Antarctic Research (SCAR) and the Council of Managers of National Antarctic Program initiated the Joint Committee on Antarctic Data Management in 1997 to seek out the best way forward for Antarctic data management. However, this was before KOPRI was set up as an autonomous and affiliated research body in the Korean Ocean Research and Development Institute (KIOST; previously KORDI), and active discussions, and subsequent concrete preparations, for founding KPDC began in 2010. The establishment of KPDC then led to the adoption of a Polar Data Management Policy within KOPRI, along with regulations and guidelines prescribing definitions and procedures for handling polar data (KPDC, 2011a–c).

Several points of the adopted data policy are of particular interest. Firstly, not only Antarctic but also Arctic data are included, due to Korea's bi-polar activities. Secondly, the policy mandates that researchers include a data management plan (DMP) when submitting a project proposal; this plan is evaluated as a part of the proposal. Thirdly, to maintain data quality and minimize any losses, researchers should upload all data to KPDC within three months of acquisition. Lastly, to enhance cooperative use of data, metadata are made open after registration, and raw data are made open after a three-year exclusivity period.

The data policy is implemented as a research institute regulation without any underpinning from a national legal basis, however, which results in some limitations on its execution. Certain domestic laws such as the Marine Scientific Research Act might be applicable to the management of polar data, but these can involve controversies. Moreover, with a Consultative Meeting of the Antarctic Treaty underlining the importance of data sharing, and with the International Arctic Science Committee (IASC) emphasizing the open use of data, KPDC is now being asked to respond in a timely and appropriate manner to such international trends and fill the domestic gap by evolving its data policy appropriately.

2 KPDC ESTABLISHMENT AND OUTLINE OF ITS POLAR DATA MANAGEMENT POLICY

Endeavors to establish KPDC began immediately after the launch of KOPRI as an autonomous institute within KIOST in 2004. Lack of manpower and budget initially delayed progress, but as Korean investment in polar research activities increased, KOPRI secured sufficient finances to found KPDC in 2010. The setting up of KPDC was carried out in two directions: (1) development of a data policy and (2) development of infrastructure, including software. KPDC outlined its Korean Polar Data Management Policy reflecting international requirements, and in doing so increased researcher awareness of the importance of polar data. Moreover, KPDC installed a system having storage provision and metadata management tools.

2.1 Considerations when developing the Korean Polar Data Policy

The Korean Polar Data Management Policy was drafted in April 2011, and open discussions were held several times on that draft. KOPRI finally adopted the revised policy in September 2011 (KPDC, 2011a).

2.1.1 Scope of Korean polar data

Korean research activities are not limited to Antarctica but extend into the Arctic. Considering this fact, KPDC included bi-polar data when formulating its policy. At that time, the Antarctic Treaty, which states that scientific observations and results from Antarctica shall be freely available and exchanged, meant all Antarctic data should be (in theory) managed. In contrast, international agreements for Arctic data did not exist; IASC's Arctic data policy was ratified in April 2013 (IASC, 2013).

2.1.2 Korean researcher awareness of polar data

A mechanism for integrated data management has not been settled on in Korea. Although domestic laws such as the Marine Scientific Research Act necessitate researchers to submit data acquired in the process of their research activities, full compliance with such laws has not been forthcoming.

2.1.3 International trends

International scientific communities have underlined the importance of polar data in understanding the effects of global climate change (IASC, 2013; SCAR, 2011). As a result, efficient use and prompt sharing of polar data are international trends.

2.1.4 Korean international contributions

Korea commenced operation of the RV Araon icebreaker in both polar regions in 2010, and its second Antarctic research station, Jang Bogo (Terra Nova Bay, Ross Sea), will be completed during the austral summer season of 2014. The Korean Polar Program is hence expected to produce many more data than it did previously.

2.2 Key content of Korean Polar Data Management Policy

2.2.1 Scope of data

Korea operates its Arctic Dasan Station in NyAlesund, Svalbard and its Antarctic King Sejong Station in King George Island, Antarctic Peninsula. RV Araon has been conducting research cruises in both polar seas since 2010. KPDC data thus covers not only Antarctic but also Arctic data (KPDC, 2011a–c).

2.2.2 Korean researcher awareness of polar data

Enforcing timely data registration by researchers is an extremely challenging task. To facilitate researchers' registration of data in the system, the developed data policy clearly states the timeframe in which researchers must register their data and when those data will become openly accessible (Table 1).

Table 1. Data registration and open access periods

Data Type	Registration	Open Access
Metadata	Immediately after acquisition	As soon as confirmed by administrator
Raw data	Within three months of acquisition	Three years after date of acquisition

If data registration is delayed, alteration or damage to the raw data can occur; that is, delay of data registration may cause decline in data quality. Considering this point, KPDC clearly defines the time periods for data registration and open access as in Table 1 in order to minimize data loss and contribute toward quality control. A three-year exclusive usage period is given to data providers to prevent abuse of the registered data and to protect the providers' rights.

2.2.3 DMP submission mandate

A DMP must be included as a part of all submitted data proposals. KPDC then mandates that researchers register and archive relevant data according to the submitted DMP (KPDC, 2011a–c).

Table 2. Number of annual registrations

Year	2010	2011	2012	Total
Counts	17	201	105	323

Table 2 shows the number of datasets annually registered to the data center. In 2010, only 17 datasets from both polar regions were registered. However, this number increased considerably from 2011 onwards. It is understood that the establishment of the Korean Polar Data Management Policy triggered this increase. Before implementation of the policy, there was no basis on which to request researchers to register their data. Furthermore, researchers had no obligation to register or manage their data. Once the policy was instigated, researchers were then compelled to submit a DMP, and they began to acknowledge the importance of data management.

3 LIMITATIONS

Establishment of KPDC and implementation of its Polar Data Management Policy contributed toward setting up a foundation for data management in KOPRI as well as generally raising awareness of its importance. However, this was merely a starting point, and there were (and still are) many obstacles to overcome.

3.1 Researcher awareness

Datasets acquired during scientific research activities in Korea have been historically treated as personal property, and many researchers are still reluctant to submit data. The cause of this phenomenon can be explained as follows.

First, the Korean government annually provides significant funding to support the research activities of universities and national research institutes. There is not a transparent system for managing the datasets acquired during the research activities process, however, and a natural consequence is that research institutes and universities participating in research and development do not acknowledge data management as being a valuable exercise.

Second, unlike in the United States, the United Kingdom, and Australia, Korean universities do not provide an educational program on data management during undergraduate and graduate scientific courses. Accordingly, researchers do not study systematic data management, and again acknowledgement of the importance of data management is insufficient.

Finally, ineffective national law can be pointed to. Korea has already enacted the Marine Scientific Research Act and the Act on the Development, Management, and Utilization of Biological Resources, which both enforce the registration and opening of acquired data (Korea Ministry of Government Legislation, 2008; 2009). Nevertheless, the majority of researchers are unaware of those acts, and when the acts are not observed, ineffectual application of actual disadvantage or punishment leads to negligent data management. Consequently, researchers still have a tendency to be reluctant to embrace data management. It is expected that current international trends and the diffusion of research ethics may help to improve this situation.

3.2 Lack of legal obligation

The implemented data policy has been built on KOPRI's internal regulations, which have limited applicability and may conflict with domestic laws for handling polar data. Moreover, (as already stated) even though the Korean government allocates considerable funds to the national research and development program by supporting research institutes and universities, Korea, in contrast to the US, UK, and Australia, lacks an integrated and systematic data management law (National Science Foundation, 2010; Natural Environment Research Council, 2011; Australian Antarctic Data Centre, 2013). The Marine Scientific Research Act and Act on the Development, Management, and Utilization of Biological Resources may force researchers to register and make available data acquired during research activities, but data management is still in its infancy, and delay in the uptake of effective management procedures lessens the impact of both acts.

The abovementioned two acts also deal with only a proportion of data collected from the polar regions; they cannot be applied to the entirety of polar research activities. In this sense, it is necessary to articulate and execute polar data management law under the framework of national legislation.

3.3 Continuation of system and expert development

Polar data management is not a short-term consideration. Continual system development and training of experts are required.

As mentioned in Section 2.1, as Korea expands its polar activities through operation of research icebreaker Araon and construction of the second Antarctic station, Jang Bogo, it is anticipated that the quantity of polar data produced by the Korean Polar Program will increase very rapidly. This means that Korea will need a more effective system for polar data management and an increased number of well-trained experts in this area.

Experts are requested to have training such that they are knowledgeable in both Information Technology systems and the Polar Sciences in order to set up an effective system and manage it. Considering the dearth of experience in polar data management, international cooperation and joint training will be a definite necessity, and lobbying of the government and relevant institutes to allocate budget toward this long-term perspective should be continued.

4 CONCLUSION

The first task of KPDC was to formulate and instigate a Polar Data Management Policy as well as set up an initial data management system. This awoke researchers to the importance of expensively obtained polar data, and KPDC attained a rapid increase in data registration and opening in a short period. The implementation of a data policy has thus been shown to be an essential prerequisite of effective data management. However, KPDC’s data policy is not seen as perfect, and we will explore the following in the future.

1. KPDC will strengthen its outreach program to enlighten researchers on the importance of polar data. Such a program might include lectures, publications, and dissemination of guidelines.
2. KPDC will prepare to legislate a polar data management law in the national legal system and will provide relevant information and material to the government to achieve this.
3. KPDC will continue to proactively improve and develop its data management system to increase management efficiency.

KPDC will do its best to persuade the government and institutes to secure a budget stream and experts as a long-term perspective.

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6 REFERENCES

Australian Antarctic Data Centre (2013) The Australian Antarctic program Data Policy. Retrieved March 3, 2014 from the World Wide Web: https://data.aad.gov.au/aadc/about/data_policy.cfm

IASC (2013) Statement of Principles and Practices for Arctic Data Management. Retrieved March 3, 2014 from the World Wide Web: http://www.iasc.info/home/iasc/data/

Korea Ministry of Government Legislation (2008) The Marine Scientific Research Act. Retrieved March 3, 2014 from the World Wide Web: http://www.law.go.kr

Korea Ministry of Government Legislation (2009) Act on the Development, Management, and Utilization of Biological Resources. Retrieved March 3, 2014 from the World Wide Web: http://www.law.go.kr

KPDC (2011a) *Polar Data Management Policy,* Incheon, Korea: Korea Polar Research Institute.

KPDC (2011b) *Polar Data Management Regulations,* Incheon, Korea: Korea Polar Research Institute.

KPDC (2011c) *Polar Data Management Guidelines,* Incheon, Korea: Korea Polar Research Institute.

National Science Foundation (2010) Dissemination and Sharing of Research Results. Retrieved March 3, 2014 from the World Wide Web: https://www.nsf.gov/bfa/dias/policy/dmp.jsp

Natural Environment Research Council (2011) NERC Data Policy. Retrieved March 3, 2014 from the World Wide Web: http://www.nerc.ac.uk/research/sites/data/policy/data-policy.pdf

SCAR (2011) Data and Information Management, Antarctic Science and Policy Advice in a Changing World: The SCAR Strategic Plan 2011–2016. Retrieved September 10, 2014 from the World Wide Web: http://www.scar.org/scar_media/documents/publications/SCAR_Strat_Plan_2011-16.pdf

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