

After Breaking the Deadlock:

Extending Cooperation with Democratic People’s Republic of Korea through Natural Disaster Management*

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I. Introduction
II. The Current Situation
III. Data Collection and Categorization of DPRK Natural Disasters
IV. DPRK Natural Disaster Policy and Management System
V. How to Improve Cooperation with DPRK for Natural Disaster Management
VI. Conclusion
Keywords: Peacebuilding, Natural Disasters, Human Security, Environmental Management, Cooperation

| ABSTRACT |

This article aims to review the current situation of DPRK natural disaster management and suggest the possible ways of cooperation to invite DPRK into the global society. We focus on three objectives. First, we review and categorize the natural disasters that occurred in DPRK between 2001 and 2015. We trace the damages caused by them and frequency of occurrence. Second, we examine DPRK disaster management policies and legal systems. Third, based on the results of the previous two analyses, we suggest approaches to promote cooperation and possible projects to prevent and manage natural disasters in DPRK. To propel persistently the cooperation with DPRK, active cooperation with IGOs and INGOs might be a good approach, which encompasses information and personnel exchanges. The aid to DPRK should start from small-scale pilot project cases. We should also pursue to build network with DPRK experts and government officials as overriding concern.

✦ 『국제관계연구』 (*Journal of International Politics*), Vol. 24, No. 1 (Summer 2019).
<http://dx.doi.org/10.18031/jip.2019.06.24.1.133>

* This study was supported by the “Data Collection for Natural Disaster Management in the Democratic People’s Republic of Korea and Cooperation between two Koreas (I)” project of the Korea Environment Institute, ROK. The authors thank to Ms. Sohyun Ham for her valuable technical support on this project.

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I. Introduction

Owing to the harmonic atmosphere of 2018 PyeongChang Winter Olympic Games and efforts of the government of Republic of Korea (ROK), the Democratic People's Republic of Korea (DPRK) has shown its will of returning to the global stage as a normal state. The world has watched dramatic changes including the inter-Korean summit and the meeting of the US president with DPRK leader Kim Jong Un. The ROK wants to change the strategic circumstances surrounding the Korean Peninsula as a way of improving the possibility of peaceful reunification and solving the nuclear issue that has threatened the security of the Peninsula for several decades. However, the sanctions posed on DPRK have not been lifted yet and we have to wait and see how the situation will go on as there are too many variables to predict the fixed results. One thing clear is that it would not be easy to evade the security dilemma nor to secure DPRK denuclearization.

While the global society is obsessed with DPRK nuclear program and negotiating with its political leaders, the common people of DPRK, who suffered not only from economic sanctions but also from natural disasters, have been neglected. Human security has not been there for a long time. Despite limited contacts, some international NGOs have helped them in various ways, but it was not enough. It is widely known that DPRK has suffered extensively from frequent natural disasters including drought, flood and landslide. This has exacerbated the shortage of food and instigated population migration, which might impede the security of the neighboring countries as well.

Assisting DPRK to overcome its natural disasters and helping its people might be a good way of improving the relationship between DPRK and the international society. Coping with natural disasters together will go beyond the security dilemma and by doing so, the international society might invite DPRK into the realm of peaceful cooperation again.

This article aims to review the current situation of DPRK natural

disaster management and suggests the possible ways of cooperation. To fulfill this, we will focus on three objectives. First, we will review and categorize the natural disasters that occurred in DPRK between 2001 and 2015. We will trace the damages caused by them and frequency of occurrence. Second, we will examine DPRK disaster management policies and legal systems. Third, based on the results of the previous two analyses, we will suggest approaches to promote cooperation and possible projects between DPRK and international society to prevent and manage natural disasters.

II. The Current Situation

DPRK has suffered extensively from frequent natural disasters. Various statistics substantiates the harsh conditions in DPRK. However, we doubt the accuracy of statistics open to the public, as DPRK government does not periodically announce the data of natural disasters. As it is not easy to find out and exactly assess the current situation of DPRK natural disasters, guessing through various readings is the usual way used by researchers. A few research centers and international organizations have presented the DPRK natural disaster statistics.

In 2015, seven out of ten North Koreans were affected by natural disasters. Analysis from the Center for Research on the Epidemiology of Disasters (CRED) at the Université Catholique de Louvain in Belgium indicated that approximately 18 million North Koreans were disaster-stricken to varying degrees, the highest in the world. “DPRK ranked first in countries most affected by disasters, followed by India with 16.6 million, Ethiopia with 10.2 million, and Nepal with 5.6 million. DPRK also placed first for rates measured per 100,000 population.”¹⁾

1) UPI, “North Koreans hardest hit by natural disasters, study shows,” <https://www.upi.com/>

Germanwatch presents its briefing paper ‘global climate risk index’ every year and it reported that DPRK is ranked seventh in the world on the Global Climate Risk Index.²⁾ According to the 2015 World Disasters Report compiled by the International Federation of Red Cross and Red Crescent Societies (IFRC), between 1995 and 2014, 2,126,856 people died across the world from natural disasters. DPRK comprised 28.78% (612,141) of the total, which is equivalent to the sum of casualties in Africa, the Americas, and Europe.³⁾

DPRK’s disaster management capability is severely low owing to the lack of infrastructure, mainly caused by its economic difficulties. In turn, DPRK’s vulnerable disaster management system worsens its food insecurity as well as people’s nutrition and hygiene. Vicious circle goes on. The 2012 National Nutrition Survey found that 85% of children under the age of 2 and 50% of pregnant and lactating women had insufficient dietary diversity.⁴⁾

Despite the severe conditions they face, the world has neglected the people of DPRK in terms of humanitarian aid, owing to its provocative international policies, especially the nuclear armament project. The world is just watching its political leaders, not the common people. Human security has not been there for several decades.

DPRK government, while addicted to nuclear development and indifferent to the sufferings of its own people, has shown its will to manage natural disasters. It has indicated that it would cooperate with the international community to prevent climate change and natural disasters. At the 21st Conference of the Parties (COP 21) session for

Top_News/World-News/2016/04/06/North-Koreans-hardest-hit-by-natural-disasters-study-shows/7401459955485/ (Accessed August 16, 2018).

2) Harmeling, S., D. Eckstein, *Global Climate Risk Index 2013* (Berlin: Germanwatch, 2012).

3) IFRC, *World Disasters Report 2015: Focus on Local Actors, the Key to Humanitarian Effectiveness* (Geneva: IFRC, 2015).

4) WFP (World Food Programme), “Protracted Relief and Recovery Operation: Democratic People’s Republic of Korea 200907,” <https://docs.wfp.org/api/documents/4491de50d6bd40fab3d178e2821d718/download/> (Accessed August 16, 2018).

the 2015 United Nations Climate Change Conference in Paris, DPRK Minister for Foreign Affairs Ri Su-yong said that it had launched a war on deforestation to engage in global environment efforts actively. He said that DPRK aimed to reduce the country's total greenhouse gas emissions by 37.4% compared with the levels of the 1990s.⁵⁾

DPRK remains fragile in terms of humanitarian conditions and the causes of vulnerability persist. After the closure of the Kaesong Industrial Complex in 2016, the situation has worsened. It was esteemed that the deadlocked relationship between two Koreas would not end without a certain political decision either by those involved. Fortunately, the deadlock ended with DPRK's dramatic participation in 2018 PyeongChang Winter Olympic Games after ROK President Moon Jae-in's active invitation. This led to the accomplishment of inter-Korean summits and the US-DPRK summits. We watched them with positive expectations for the future.

The current situation strongly calls for increasing cooperation with DPRK not only for the improvement of relations but also for providing humanitarian aid to the people of DPRK. Preventing natural disasters together can be an excellent method to expand the current friendly atmosphere. Existing various studies have suggested it. Among them, Wirth and Cui mention the cooperation between two Koreas as a possible way of improving the relationship.⁶⁾ They argue that cooperation with DPRK in non-traditional security issues such as environmental protection and natural disaster might be politically easier to realize because it poses less threat to security. As the mutual conflict and distrust between the two Koreas have persisted, cooperation in non-traditional security areas

5) The Guardian, "North Korea launches war on deforestation," <https://www.theguardian.com/world/2015/dec/08/north-korea-war-climate-paris-deforestation> (Accessed August 16, 2018).

6) Wirth C., "The Nexus between Traditional and Non-Traditional Security Cooperation in Japan-China Relations: Environmental Security and the Construction of a Northeast Asian Region," *Asian Regional Integration Review*, Vol. 2 (2010); Cui S., "Beyond History: non-traditional security cooperation and the construction of Northeast Asian international society," *Journal of Contemporary China*, Vol. 22, Issue 83 (2013).

has a tendency to depend on the development of inter-Korean relations. However, if inter-Korean exchanges could begin on the foundation of mutual trust, assuming that the relations between North and South will improve in the future, and then environmental cooperation between the two Koreas would become a cornerstone of inter-Korean exchanges and could lead to additional cooperation in other areas. In this regard, environmental cooperation could play an important role by becoming a catalyst for a movement toward a peaceful co-existence of the two Koreas.

Few works on the subject have analyzed on DPRK natural disasters. Lee explores the possible cooperation between both Koreas in cases of natural disasters and examines DPRK disaster management policies and systems.⁷⁾ Shin and Beak briefly introduce a DPRK disaster management system.⁸⁾ These studies are helpful in understanding DPRK's natural disaster management system. Myeong *et al.* adopts an estimation methodology utilizing Geographic Information Systems (GIS) to predict vulnerable disaster locations.⁹⁾ Yang *et al.* attempts to build basic techniques and strategies for disaster management.¹⁰⁾ Choi and Seliger focus on European Union Project for international cooperation to solve environmental problems in DPRK.¹¹⁾ However, none of the existing studies have systematically reviewed and categorized the natural disasters in

7) K. S. Lee, *Collaboration Strategies for Disaster Management between South Korea and North Korea* (Seoul: Korea Institute for National Unification, 2001) (written in Korean).

8) H. J. Shin, M. H. Beak, "A Preliminary Study on the Responses of South Korea according to the Occurrence of Disasters in North Korea," *Journal of Korean Society of Hazard Mitigation*, Vol. 14, No. 5 (2014) (written in Korean).

9) S. J. Myeong, H. J. Hong, H. I. Choi and J. C. Jung, *Estimation of Flood Vulnerable Areas in North Korea and Collaboration Strategies between South Korea and North Korea* (Seoul: Korea Environment Institute, 2008) (written in Korean).

10) D. M. Yang, B. G. Kang, G. H. Jang and J. Y. Yeom, *Construction of Fundamental Technology for Disaster Risk Assessment and Response (1)—Disaster Risk Assessment System for Korea* (Seoul: The National Disaster Management Research Institute, 2014) (written in Korean).

11) H. Choi and B. Seliger, "International cooperation to solve environmental problems in DPRK—Focus on European Union project," *Korean Unification Studies*, Vol. 21, No. 1 (2017) (written in Korean).

DPRK. Above all, the failure to accumulate data is what hinders further studies. Thus, we try to solve the problems by reviewing the data set that we can get and categorize the DPRK natural disasters.

III. Data Collection and Categorization of DPRK Natural Disasters

1. Data Collection

It was challenging to collect data on DPRK natural disasters chiefly due to the minimal information offered by the DPRK government. The authors collected data in three ways. First, we surveyed all the DPRK natural disasters reported by the official media including the Rodong Shinmun, Korean Central News Agency (KCNA), and Korean Central Broadcasting Committee (KCBC) between January 1, 2001 and December 31, 2015. Second, we verified the results of the previous research with reports from ROK media that mainly dealt with DPRK news. Third, we also examined the reports of international organizations that cooperated with the DPRK government in offering humanitarian aid to people affected by natural disasters. Through this verification, we attempted to minimize any possible omissions and errors.

While categorizing the natural disasters, we used the 14 types that have already been established by ROK's Framework Act on the Management of Disasters and Safety and added three types—cold wave, heat wave, and landslide/falling rock—as well. Altogether, this article studies 17 types of disasters.

Table 1. displays the total number of natural disasters in the last 15 years while Table 2. displays the number of disasters and the places they affected.

〈Table 1〉 Natural Disasters from 2001~2015

Type Year	Ty- phoon	Flood	Heavy rainfall	Strong wind	Wind wave	Tsu- nami	Heavy snow	Thun- der- stroke	Drought	Earth- quake	Yellow dust	Tidal wave	Ebb and flow	Vol- canic activity	Cold wave	Heat wave	Land- slide / Falling rock	Total (co- occurrence)
2001	0	1	2	1	0	1	2	0	2	1	1	0	0	0	1	1	2	15(5)
2002	3	1	3	2	0	1	0	0	0	8	3	0	0	0	0	0	1	22(7)
2003	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2(1)
2004	1	2	5	0	0	0	0	0	0	6	8	0	0	0	1	0	1	24(4)
2005	1	1	4	1	0	2	0	0	0	5	8	0	0	0	0	0	1	23(6)
2006	0	2	3	1	0	1	0	0	0	4	1	0	0	0	0	0	2	14(6)
2007	1	1	2	1	0	0	0	0	0	8	4	0	0	0	0	0	0	17(3)
2008	1	1	1	1	0	0	0	0	0	12	1	0	0	0	0	0	0	17(3)
2009	0	0	1	0	0	0	0	0	0	14	0	0	0	0	1	0	1	17(1)
2010	1	4	4	2	0	0	0	0	0	10	0	0	0	0	2	0	0	23(7)
2011	2	2	5	2	0	1	2	0	1	10	11	0	0	0	1	0	1	38(8)
2012	2	5	5	1	0	0	0	0	1	7	0	0	0	0	2	0	2	25(10)
2013	0	1	1	0	0	0	0	0	0	7	0	0	0	0	1	0	1	11(2)
2014	0	0	0	0	0	0	0	0	1	9	1	0	0	0	0	0	0	11(0)
2015	1	2	2	0	0	1	0	0	1	3	0	0	0	0	0	0	0	10(4)
Total	13	23	39	12	0	7	4	0	6	104	38	0	0	0	9	1	13	269(67)

* In case the natural disasters occurred over a month, it was calculated as one time
Source: author

〈Table 2〉 Natural Disasters from 2001~2015 in Cities and Provinces

Type Province	Ty- phoon	Flood	Heavy rainfall	Strong wind	Wind wave	Tsu- nami	Heavy snow	Thun- der- stroke	Drought	Earth- quake	Yellow dust	Tidal wave	Ebb and flow	Vol- canic activity	Cold wave	Heat wave	Land- slide/ Falling rock	Total (co- occurrence)
Pyongyang	4	5	12	4	0	0	3	0	1	3	5	0	0	0	0	0	5	42(18)
Rason	2	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	1	8(6)
Nampo	1	3	3	2	0	0	0	0	1	2	2	0	0	0	0	1	2	17(7)
S. Pyongan	5	13	21	5	0	3	0	0	2	11	5	0	0	0	0	0	10	75(36)
N. Pyongan	3	8	11	3	0	0	0	0	2	1	4	0	0	0	0	0	3	35(17)
S. Hamgyong	3	13	16	4	0	0	0	0	1	10	2	0	0	0	0	0	9	58(29)
N. Hamgyong	2	2	4	2	0	0	0	0	0	0	1	0	0	0	0	0	1	12(7)
S. Hwanghae	9	10	20	7	0	3	2	0	3	16	5	0	0	0	0	1	6	82(35)
N. Hwanghae	9	13	22	8	0	0	0	0	3	48	4	0	0	0	0	1	10	118(40)
Kangwon	8	13	22	8	0	2	3	0	2	8	1	0	0	0	0	0	9	76(41)
Chagang	0	1	1	1	0	0	0	0	0	1	4	0	0	0	0	0	0	8(2)
Ryganggang	1	2	3	1	0	0	0	0	0	0	3	0	0	0	0	1	2	13(6)
Overall	0	0	0	0	0	0	0	0	3	0	29	0	0	0	6	0	0	38
Others*	0	1	1	0	0	0	0	0	0	4	1	0	0	0	0	0	0	7(1)
Total	47	86	138	46	0	8	8	0	18	104	66	0	0	0	6	4	58	589(245)

* Others include Baengnyeong-do in the West Sea, East Sea Coast, and West Sea Coast
 ** In case the natural disasters occurred over a month, it was calculated as one time
 Source: author

2. Analyzing the Data

Between 2001 and 2015, we recorded 269 cases of natural disasters in DPRK. Among them, 67 could be categorized as co-occurrences, which refer to a natural disaster that occurs simultaneously with another.

Reviewing the data, we found that earthquakes took place the most in DPRK despite its light damage. They occurred 104 times during this period. This was followed by heavy rainfall and yellow dust, which occurred 39 and 38 times respectively. North Hwanghae was the province with the most number of natural disasters, having experienced 118 in the last 15 years among which, earthquakes occurred 48 times and heavy rainfall 22 times. Although earthquakes constituted 41% of the natural disasters in this province, the damage was minimal since their magnitude on the Richter Scale remained between 2.1 to 3.8. We do not know the exact scale of damage, as the information was not accurately reported nor is it available to the public. As a result, all we could do was formulate suppositions based on media reports.

Our study revealed that the most frequently occurring disasters varied based on geographical location. In North Hwanghae, wind and water related disasters comprised 44% of the total, while in South Hwanghae, wind and water related disasters comprised 56.1% of the total. In Kangwon, wind and water related disasters comprised 67.1% of the total. South Pyongan and North Hwanghae have been relatively further affected by landslide/falling rock. In South Pyongan, wind and water related disasters comprised 59% of the total. This illustrates that wind and water related disasters affected DPRK more frequently, which indicates that building infrastructure to prevent wind and water related disasters is urgently required.

Regarding the scale of damage, South Pyongan had the largest number of casualties. The number of deceased (or missing) was 724 with 792 being wounded. Kangwon followed, with 415 deceased (or missing) and 570 wounded. South Pyongan had the largest number of victims

as well, with 130,000 being affected by floods while 100,000 were affected in North Pyongan.

This indicates that DPRK needs to build infrastructure to prevent water and wind related disasters. However, as it is widely known, the infrastructure in DPRK is inadequate and ineffectual owing to its economic difficulties. To the international community, DPRK requested aid for the infrastructure, but it has received a lukewarm response due to its hostile foreign policies, especially regarding nuclear armament.

IV. DPRK Natural Disaster Policy and Management System

DPRK promulgated the Law on Disaster Prevention, Rescue, and Rehabilitation on June 27, 2014, by Decree No. 76 of the Permanent Committee of the Supreme People's Assembly, which provides guidelines for protecting people's lives and state property. It consists of 63 articles and 6 chapters including different administrative and technical components of Disaster Risk Management (DRM).¹²⁾ DPRK also established the State Committee for Emergency and Disaster Management (SCEDM) and the specialized Disaster Management Department in key line ministries.

Other relevant laws are Law on Weather, Law on Prevention of Earthquake and Volcanic Eruption and the Relief, and Law on Fire Services. For the prevention of floods, DPRK legislated Law on River, Law on Water Resource, Law on Environment Protection, Law on Forest, Law on Floodgate, Law on Waterway, and Law on Garden. Other related

12) Chapter 1: Fundamentals of the Law; Chapter 2: Planning for Disaster Risk Reduction; Chapter 3: Observation of Disaster-Causing Natural Phenomena and Early-Warning; Chapter 4: Preparation and Supply of Resources for Disaster Management; Chapter 5: Response to and recovery from Disasters; Chapter 6: Guidance and Control of Disaster Management

laws are Law on Agriculture, Law on State Farm, and Law on Land. Names of the DPRK laws used here are quoted from UNEP and DPRK.¹³⁾

1. The Overall Institutional Structure for Disaster Risk Management in DPRK

Not much is known about DPRK risk management systems. However, from the reports of the DPRK media and international organizations we do know that DPRK has attempted to establish a disaster management system. Above all, the establishment of the SCEDM should be noted as it manages all natural disasters at the national level. Before the launch of the SCEDM, several organizations existed in DPRK, including the Bureau for Disaster Management later integrated into the SCEDM, the National Disaster Coordinating Commission (NDCC),¹⁴⁾ and the National Disaster Prevention Committee (NDPC).¹⁵⁾ It is mentioned that the DPRK Red Cross is a member of the National Disaster Management Committee (NDMC).¹⁶⁾ When it comes to NDPC and NDMC, we assumed that the same committee was given a different name during the translation process. The concrete data and records regarding its activities were difficult to obtain as well.

Today, the most important organization in disaster risk management in DPRK is the SCEDM.¹⁷⁾ Its primary mandate is to guide, coordinate, and control disaster management across all sectors and line ministries.

13) UNEP and DPRK, *Democratic People's Republic of Korea Environment and Climate Change Outlook* (Pyongyang: Ministry of Land and Environment Protection, 2012).

14) IFRC, *Building Capacity in Disaster Risk Management: Red Cross Red Crescent Lessons Learned in the Democratic People's Republic of Korea* (Geneva: IFRC, 2010).

15) IFRC, *Democratic People's Republic of Korea: Annual Report 2012* (Geneva: IFRC, 2013a).

16) IFRC, *Disaster Relief Emergency Fund (DREF), Democratic People's Republic of Korea: Flood* (Geneva: IFRC, 2013b).

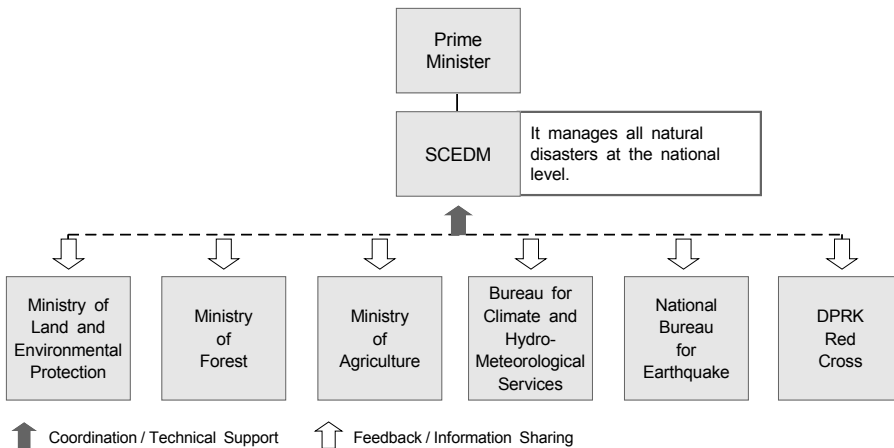
17) FAO, *Enhancing Institutional Capacities in Disaster Risk Management for Food Security in the D.P.R. Korea: A Roadmap* (2016), pp. 11-12.

The SCEDM covers Disaster Risk Reduction (DRR), disaster risk preparedness, primary recovery, and consolidation of scientific and technological basis for disaster management by consolidating and analyzing disaster related data. The SCEDM comprises eight departments including the departments of survey and assessment, administration, planning, risk management, finance, contingency control, storage and supplies, external cooperation, and inspection.

Sectoral and regional administrative organs for disaster management have been established under the SCEDM. At the national level, disaster management related line ministries include the Ministry of Land and Environmental Protection (MoLEP), Ministry of Forest (MoFR), Ministry of Agriculture (MoA), Bureau for Climate and Hydro-meteorological Services (BCHS), Bureau for Earthquake, and the DPRK Red Cross. The organizational chart is illustrated in Figure 1.

The Ministries have their own Department of Disaster Managements, whose directors and the SCEDM meet every six months to align sectoral plans and exchange information. We presume that the relationship among them is not hierarchical; rather they cooperate and coordinate by aligning

〈Figure 1〉 DPRK Disaster Management Organizational Chart



Source: Figure 1 was constructed based on the authors' inferences of the contents provided by the FAO (2016)

policies and sharing information.

V. How to Improve Cooperation with DPRK for Natural Disaster Management

Regardless of a well-appointed natural disaster management system, DPRK's preparedness for natural disaster is ineffectual. The evidence of the fragile system is the number of casualties and the extent of damage caused by natural disasters. Above all, we have no accurate method of accessing the reality in DPRK. The data used here is just an estimate and we have no concrete data on the extent of damage. International organizations publish reports, some of which have the approval of DPRK. We can use them for estimation. Nevertheless, they are not exact. Hence, most reports dealing with natural disasters across the world do not contain statistics on DPRK.

The most affected by natural disasters are the people of DPRK. If this continues, the security to human life will be further threatened and make them try to find better ways and places to live which might threaten DPRK stability. This will give troubles not only to DPRK government but also to its neighboring countries, especially ROK. If ROK assumes that someday unification will be realized, the fragility of DPRK will be the fragility of ROK and a Unified Korea. Unification aside, the current situation of DPRK people is a real threat and agony to ROK and its neighboring countries. Thus, the DPRK natural disaster management system should be amended and modified to expand possible cooperation with ROK and global society. On the other hand, to prepare for the unification and minimize its costs, ROK government needs to consider possible ways of cooperating with DPRK in managing natural disasters. The following section explores possible means of cooperation with DPRK and suggests some projects we can pursue together.

1. Difficulties and Problems for Managing Natural Disasters

Several difficulties exist in promoting cooperation with DPRK.

First, we should note the lack of accurate data. DPRK does not provide access to the data on its natural disasters. The ROK government manages a portal that deals with DPRK issues, but we can obtain the data on heavy rainfall only from the portal. We do not even know the exact contents of the DPRK laws on disaster management promulgated in 2014.

Second, the enforced sanctions on DPRK have strained relations with DPRK. The fifth nuclear test in DPRK in 2016 reopened the intensified sanctions from the global community as well as the independent sanctions posed by the ROK government. Even the ongoing dramatic changes, the international society has not lifted the sanctions on DPRK yet. We expect that the sanctions will be lifted only after DPRK decides to change its hostile foreign policies, especially the abandonment of nuclear armament.

Third, owing to the strained relations, the existing channel of co-operation with DPRK has received a lot of damages. We do not possess any standing consultation body for natural disaster management with DPRK, which in turn hinders the accumulation of data. It is not easy to recover the severed communication channel. We should try to rebuild the communication channel with DPRK.

Fourth, there is much to be desired in terms of DPRK laws and infrastructure for disaster management. In addition, DPRK is overly dependent on international organizations in providing aid to its people. This weak DPRK natural disaster management capability is located at the core of the problem. Against this backdrop, the cooperation from the global society is strongly needed.

2. The Directions and Programs of Cooperation with DPRK for Disaster Management

1) Directions

The cooperation with DPRK should be based on mutual interests. Reciprocity is one of the basic principles of prolonged and stable co-operation. But for some time, unilateral concession is needed to solidify the possible cooperation with DPRK. When we look back the past experiences, only after unilateral concession, reciprocal cooperation might work in relations with DPRK.

Through disaster management cooperation, DPRK can obtain practical benefits regarding improvement of living conditions of its people through disaster relief and rehabilitation. We can launch a project for preventing disasters, which can lead to the improvement of an autonomous response system and infrastructure. The project should be designed following the needs of DPRK.

The cooperation should be amalgamative by connecting with other fields. Information technology is an excellent basis for cooperation, which is related to predicting and preventing natural disasters. Joint investigations or joint research using information technology might also be taken into consideration.

Stabilizing the livelihoods of the public should be another principle for cooperation. We need to expand and develop opportunities to meet the people of DPRK directly. In addition, we should pursue the improvement of the DPRK ability of autonomous solution by cultivating a response capability for disaster management.

Inviting the global community can improve the situation. NGOs currently residing in DPRK have contributed extensively to coping with natural disasters. In restoring the damage caused by natural disasters, these NGOs have cooperated with the local governments in DPRK. Thus, they can provide practical assistance by using the networks they have already established through their cooperation experiences.

All these aspects should be approached comprehensively in line with the consideration of future cooperation with DPRK, including the possible unification of the Korean Peninsula. By synthesizing preventive and relief measures for natural disasters, the two Koreas might prepare solutions to natural disasters as well as investigate the fundamental problems. This, in turn, will lead to cooperation between them, which might contribute to establishing peace on the Korean Peninsula and in building the South-North unity.

2) Possible Projects

Those projects include information exchange and joint research, building an integrated data collection system for natural disasters, modifying and enacting various laws and regulations for natural disaster management cooperation, and developing mid and long-term roadmaps.

Primarily, we should exchange information on meteorological disasters. In December 2007, the two Koreas agreed on the need for cooperation in the field of meteorology. However, as they could not convene again, the agreement failed. Some reports said that DPRK displayed interest in raising the accuracy of weather forecast by introducing advanced forecasting methods as well as accumulating data.¹⁸⁾ Though some are pessimistic as they worry about the possibility of weather data being used for military purposes, the information exchange is worth pursuing to promote long-term cooperation with DPRK.

The United Nations has often pointed out the need for further systematic monitoring and support to build local capacities and increase preparedness in DPRK.¹⁹⁾ By organizing joint seminars, consultations, and joint researches, we can induce DPRK to improve its capacity for

18) Y. S. An, "DPRK, Bureau for Climate and Hydro-Meteorological Services will improve the accuracy of the weather forecast," *CBS No Cut News* (February 1, 2015), <http://www.nocutnews.co.kr/news/4362587> (last accessed on 30 June 2018) (written in Korean).

19) U.N. (United Nations), "D.P.R. Korea 2015: Needs and Priorities Democratic People's Republic of Korea," https://reliefweb.int/sites/reliefweb.int/files/resources/20150401%20DPR_Korea_NP_FINAL.pdf (Accessed on 16 August 2018).

disaster management. A study on the eruption of Mt. Baekdu might be undertaken as a possible joint project as it is an issue that interests DPRK.²⁰⁾

Conducting a joint study or research with international organizations in Pyongyang and neighboring countries is another method to promote cooperation. Since they are already cooperating with the central and local governments in DPRK, by connecting with them, we might discover means to utilize the networks of those organizations. Thus, organizing a meeting or seminar in a third country, where both Koreans and International Organization (IO) members can meet each other, is an excellent way to promote the disaster management cooperation system as well as expanding human networks.

Establishing an integrated data collection system for natural disasters is another essential aspect that needs to be realized. Collecting DPRK natural disaster data and storing it into a database is urgently required. This can be prepared by collecting information from within and outside the country and categorizing them. In addition, the DPRK legal and institutional system should be categorized and analyzed. This requires the cooperation of the IOs in DPRK. We might consider the financial support to IFRC and World Food Program as they have continuously cooperated with the DPRK government in the field of famine and hygiene caused by natural disasters.

For ROK, legislation is also required to establish a system of cooperation with DPRK in the sphere of natural disasters; certain problems can be resolved in advance by enacting laws for launching an exclusive organization that will ensure cooperation and manage funds. This organization can supervise possible outbreaks of natural disasters, including the eruption of Mt. Baekdu,²¹⁾ the flooding of Imjin River that crosses

20) Several studies argued that the eruption of Mt. Baekdu is an eminent threat. They expect Mt. Baekdu would be erupted within 20 years with a high possibility. Regarding this, please refer to articles in the Special Edition of the *Journal of International Area Studies*, Vol. 18, No. 3 (2014) (in Korean).

the Korean Demilitarized Zone (DMZ), and other possible disasters. If Mt. Baekdu erupts, it might cause an unexpected regional security breach, which makes the establishment of such an organization an urgent necessity.

Finally, preparing mid and long-term roadmaps is recommended. To prepare for the regular and full-scale cooperation with DPRK, we should establish mid and long-term plans for cooperation and create agendas that can be realized preferentially based on mutual interests. International organizations can be invited to establish practical businesses, which might assist the people of DPRK.

3. A Preliminary Review for Selecting Model Area for Cooperation

Based on the collected data, we attempted to identify a model area for cooperation with DPRK. When selecting a model area, we should take the needs of the recipient into consideration. However, currently it is difficult to identify the needs of DPRK. Thus, the present selection can only be a preliminary review. In addition, as DPRK has never released data on its administrative divisions in the provinces, we should note that the data is limited.

1) Preliminary Selection of Model Area through Donor Viewpoint

In selecting a model area for possible cooperation with DPRK, we should consider both donor and recipient viewpoints. Under donor, we identified three evaluation categories: demand, accessibility, and effectiveness. Table 3. displays them.

21) G. W. Jung, "A Brief Study on the Possibility of the Eruption of Baekdu Mountain and the Sudden Change of North Korea: Focusing on the relationship between South Korea and Neighbouring Countries," *Journal of International Area Studies*, Vol. 18, No. 4 (2014). pp. 233-253 (written in Korean).

〈Table 3〉 Evaluation Category, Index, and Standard

Viewpoint	Evaluation Category	Evaluation Index	Evaluation Standard
Donor	Demand	The number of disasters	In ascending score
		The number of victims among 1,000	In ascending score
	Accessibility	Infrastructure	Sum up the infrastructure
		RCS branch	0 or 1
	Effectiveness	Population density (km ² /person)	In ascending score
		Damage density of agricultural land (ha/km ²)	In ascending score
Recipient	Politico-security consideration	Is it menacing to remain under the current political regime?	Distance from Pyongyang

Source: author

〈Table 4〉 Demand Calculation Based on Donor Viewpoint

Area	Type	Number of disasters	Ascending score (A)	Victims among 1,000	Ascending score (B)	Total (A+B)
Pyongyang		42	7	0.87	3	10
Rasun		8	1	0.03	2	3
Nampo		17	5	0.02	1	6
S. Pyongan		75	9	34.07	10	19
N. Pyongan		35	6	36.61	11	17
S. Hamgyong		58	8	15.74	8	16
N. Hamgyong		12	3	7.16	5	8
S. Hwanghae		82	11	14.53	6	17
N. Hwanghae		118	12	15.08	7	19
Kangwon		76	10	53.85	12	22
Chagang		8	1	4.65	4	5
Ryanggang		13	4	30.59	9	13

Source: author

First, we need to understand the demands of the people of DPRK. However, it was not possible to comprehend them, as we did not have access to them. As an alternative, we used the number of disasters and the number of victims among 1,000 as the evaluation index. We calculated the amount of damage caused by natural disasters by the number of casualties, the number of wounded, the number of destroyed buildings, and so on. In this study, we primarily used the number of victims when calculating the needs of DPRK, which are summarized in Table 4.

Second, we considered accessibility. We evaluated the degree of ease in travelling for restoration to a certain place that was damaged by natural disasters. The existence of airports and harbors was mainly

〈Table 5〉 Accessibility Based on Donor Viewpoint

Area	Type	Infrastructure*		RCS Branch (D)	Total (C+D)
		Airport/Airfield	Harbor Points (C)		
Pyongyang	Pyongyang Soonan Hub airport, Airfield (2)	—	3	—	6
Rasun	—	4	4	—	4
Nampo	Airfield (1)	1	2	—	2
S. Pyongan	Airfield (3)	—	3	1	4
N. Pyongan	Sinuiju Airport, Airfield (5)	8	14	1	15
S. Hamgyong	Airfield (4)	8	12	1	13
N. Hamgyong	Soongam-ri Airport, Kyongsungcheol Airport, Airfield (1), Airstrip (1)	6	10	1	11
S. Hwanghae	Haeju Airport, Airfield (2)	7	10	1	12
N. Hwanghae	Airfield (4)	2	6	—	6
Kangwon	Airfield (5)	5	10	1	11
Chagang	Airfield (1)	—	1	—	1
Ryganggang	Samjiyeon Airport, Airfield (2)	—	3	—	3

* The result is based on the website of North Korea Information Portal, <http://nkinfo.unikorea.go.kr/NKMap/main/viewMain.do> (Accessed on 16 August 2018)

Source: author

used as evaluation indexes. Extra ratings were given to hub airports depending on their significance. This is displayed in Table 5.

Due to lack of information regarding express highways and railroads in DPRK, we were unable to study them. If this information can be obtained, however, they should be considered an important evaluation index, as they are a much easier way to travel within DPRK.

The existence of the Red Cross Society (RCS) branch might also help improve cooperation to manage natural disasters. The DPRK Red Cross has six Provincial Disaster Response Teams in South Hamgyong, North Hamgyong, Kangwon, South Hwanghae, South Pyongan, and North Pyongan.²²⁾ Therefore, one point was given to the provinces where RCS existed while others received none.

Third, effectiveness was the final evaluation category. We presumed that high population density might imply a high reception rate, which means that more people can benefit from the rehabilitation activities. Damage density was also used to evaluate the effectiveness. Population density was calculated by dividing the area by the number of people, while damage density was calculated by dividing the area by the damaged agricultural land. Each area received points in ascending order, which are displayed in Table 6.

22) IFRC, *Democratic People's Republic of Korea: Annual Report 2011* (Geneva: IFRC, 2012).

〈Table 6〉 Effectiveness Based on Donor Viewpoint

Type Area	Population (×1000)	Area (km ²)	Damage of agricultural land (ha)	Population density (km ² / person)	Population density in ascending score (E)	Damage density (ha / km ²)	Damage density in ascending score (F)	Total (E+F)
Pyongyang	3,061	1,747	4,20	175.2	12	0.24	2	14
Rasun	201	945	1,363.97	21.3	6	1.44	6	12
Nampo	374	1,142	1,238	32.7	11	1.08	5	16
S. Pyongan	3,760	11,578	39,744.86	32.5	10	3.43	9	19
N. Pyongan	2,785	12,680	34,900.92	22.0	7	2.75	8	15
S. Hamgyong	3,129	18,535	29,213.72	16.9	5	1.58	7	12
N. Hamgyong	2,174	15,980	4,562.60	13.6	3	0.29	4	7
S. Hwanghae	2,358	8,450	165,902.09	27.9	9	19.63	12	21
N. Hwanghae	2,418	10,345	45,069.62	23.4	8	4.36	10	18
Kangwon	1,508	11,091	76,601.23	13.6	3	6.91	11	14
Chagang	1,326	16,765	—	7.9	2	0.00	1	3
Ryanggang	734	13,880	3,412.32	5.3	1	0.25	3	4

Source: author

2) Preliminary Selection of Model Area through Recipient Viewpoint

Alternatively, the recipient viewpoint needed to be considered as well. Recipient viewpoint was primarily based on DPRK’s politico-security considerations focusing on the distance from Pyongyang, the capital city. The closer to Pyongyang a model area of cooperation was the more DPRK might feel threatened in terms of natural disaster management cooperation. Since DPRK does not want its people to be affected by cooperation with global society, it might be much safer to permit aid from outside when the area is distant from Pyongyang. When both Koreaes were choosing possible sites for economic cooperation in the early of 2000s, DPRK suggested Sinuiju in North Pyongan, although the final selection was Kaesong. ROK presumed that the primary reason

〈Table 7〉 Model Area Evaluation

Area	Type	Donor Viewpoint				Recipient Viewpoint	Result
		Demand A+B=(a)	Accessibility C+D=(b)	Effectiveness E+F=(c)	Total (a+b+c)	Rank	
Pyongyang		10	6	14	30	7	
Rasun		3	4	12	19	11	
Nampo		6	2	16	24	9	
S. Pyongan		19	4	19	42	5	
N. Pyongan		17	15	15	47	2	*
S. Hamgyong		16	13	12	41	6	
N. Hamgyong		8	11	7	26	8	
S. Hwanghae		17	12	21	50	1	*
N. Hwanghae		19	6	18	43	4	
Kangwon		22	11	14	47	2	*
Chagang		5	1	3	9	12	
Ryanggang		13	3	4	20	10	

Source: author

for recommending Sinuiju was for military-security reasons. Similarly, the opposite choice might be considered rational depending on the circumstances.²³⁾ Given this reasoning, South Hwanghae, Kangwon, and North Pyongan might be provinces where the cooperation can be realized. South Pyongan and North Hwanghae would be excluded as they are closer to Pyongyang. Table 7. displays the results of this evaluation.

As reviewed previously, natural disasters in DPRK comprised typhoons, floods, heavy rainfall, and strong winds, all of which might lead to damage caused by water. Taking this into consideration, the possible future cooperation with DPRK should focus on the prevention of water damage.

Coping with water damage should focus not only on management but also on prevention, which might lead to the argument that we need to build an accurate forecast system. It is known that DPRK has experienced difficulties obtaining even weather data owing to inadequate communication networks. This ought to be the first aspect where cooperation should be pursued in terms of establishing mutual communication networks on weather data and early warning systems.

Management is as important as prevention. While preventing water related damage, a manual for assisting the victims should be prepared in advance especially with regard to building shelters, preparing adequate provision for food, hygiene and so on. Follow-up management should be organized as well. Overall, the DPRK disaster management system needs to be rebuilt. It was reported that the IFRC had prepared a manual autonomously and cooperated with the DPRK government in managing natural disasters, though it was not satisfactory.

At the Peninsular level, cooperation for preventing yellow dust, cold wave, and the flooding of Imjin River can be considered possible model joint projects. Air pollution is another critical problem since DPRK is

23) KICFYPC (Kaesong Industrial Complex Five Years Publication Commission), ed., *Kaesong Industrial Complex Five Years: Going Kaesong Can See Peace* (Seoul: Ministry of Unification Kaesong Industrial Complex Support Group, 2007) (written in Korean).

geographically located in the center of the movement of polluted air that advances around North East Asia. In addition, its industries using low-grade energy contribute to relatively high carbon dioxide emissions. As this might influence its neighboring countries, especially ROK, cooperation between both Koreas is urgently required, at least for damage reduction.

VI. Conclusion

The ongoing dialogues among both Koreas and its surrounding powers make us dream of a new peaceful era. The relationship between both Koreas had reached a stalemate and chaotic, but two Koreas are now trying to find a new era of peaceful coexistence. This gives us the chance of helping the security of precious human lives in DPRK. Preventing and managing natural disasters in DPRK would be helpful for further cooperation. That is not only a necessity but a must for both two Koreas and the world.

We attempted to collect and analyze the data of natural disasters in DPRK between 2001 and 2015 and identify the possible methods of cooperation, which might be helpful for pursuing the co-prosperity. We also suggest some possible joint projects and model areas for co-operation, based on the analyzed data.

Realizing the cooperation with DPRK seems to go through difficulties. Above all, worries about the possibility of DPRK's diverting the aid from the world for other purposes should be resolved. Looking back to past cooperation experiences strengthens the previous suspicion as DPRK has betrayed the hope of global society by violating the joint agreement, strengthening armaments and developing nuclear weapons. However, as we already pointed out, despite difficulties, the unilateral concession is needed for some time for future cooperation.

Will DPRK be cooperative this time? No one can be sure to answer the question. In addition, the world is under a great politico-economic upheaval, which makes the situation more complicated.

Lastly, we have to acknowledge that the study had some limitations in certain aspects. The original research design was to analyze all the data of DPRK natural disasters between 1953 and 2015. However, lack of information compelled us to shorten the target period, which might be inadequate to identify regularities and patterns of DPRK natural disasters. Even the acquired data was not satisfactory, as we could not access the whole. This can be resolved by accumulating data going forward and continuing to collect the past data as well. Limited access to DPRK information has been frequently highlighted as an obstacle to related researches. We also had difficulties reviewing the DPRK legal system and laws on disaster management. This might be solved by expanding direct contacts with DPRK government and people. DPRK refugees might be helpful in getting related information. Attempting to discover solutions through collective intelligence by using IT techniques need to be taken into consideration as well.

To persistently propel the cooperation with DPRK, active cooperation with IGOs(Intergovernmental Organization) and INGOs(International non-governmental Organization) is strongly needed, which encompasses information and personnel exchanges. The aid to DPRK should start from small scale pilot project cases. Building network with DPRK experts and government officials should be pursued as overriding concern. The needs of possible projects that DPRK wants to pursue should be analyzed first.

Despite the unsatisfactory results, we hope that this can be used as the starting point of environmental cooperation with DPRK.

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[초 록]

교착을 넘어: 자연재해 관리를 통한 북한과의 협력 확대

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본 논문은 북한의 자연재해 관리 현황을 검토하고 북한을 국제사회로 초대하기 위한 가능한 협력의 방법들을 제시하는 데 목적이 있다. 이를 위해 본 논문은 세 가지에 집중하고 있다. 첫째, 2001년부터 2015년 사이에 북한에서 발생한 자연재해를 고찰하여 그 피해 정도와 발생의 빈도를 추적함으로써 범주화하였다. 둘째, 북한의 재해 관리 정책과 법체계를 분석하였다. 셋째, 앞의 두 가지 분석 결과를 바탕으로 북한과의 협력을 촉진하고 북한의 자연재해를 예방하고 관리할 수 있는 가능한 사업방안을 제안하고 있다. 북한과의 협력을 지속적으로 추진하기 위해서는, 정보 및 인적 교류를 포괄하는 IGO 및 NGO와의 적극적인 협력이 좋은 접근법이 될 수 있다. 북한에 대한 지원은 소규모 시범 사업에서 시작될 필요가 있다. 또한 북한의 관련 전문가 및 정부 관리들과의 네트워크 구축이 무엇보다도 우선되어야 한다.

주제어: 평화구축, 자연재해, 인간안보, 환경관리, 협력

투고일: 2019년 4월 14일, 심사일: 2019년 5월 8일, 게재확정일: 2019년 5월 23일