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사업명	한반도 생물다양성 보전을 위한 남북 협력 방안 연구 Inter-Korean Cooperation for the Biodiversity Conservation on the Korean Peninsula		
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Inter-Korean Cooperation for the Biodiversity Conservation on the Korean Peninsula

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1 Introduction

North Korea possesses outstanding biodiversity in Northeast Asia, comprising 10,012 plant species and 9,759 animal species as of 2006 (McCarthy et al., 2021). The designation of 326 protected areas in 2007, covering 7.2% of the total land area, reflects North Korea's commitment to environmental conservation (Heo & Yoo, 2021). Despite these efforts, habitat destruction has led to species loss, with 21% of vertebrates, including the Asiatic black bear (*Ursus arctos*) and Eurasian otter (*Lutra lutra*), facing threats (McCarthy et al., 2021). To reverse the biodiversity loss, North Korea has engaged in international environmental projects and held domestic workshops for wetland conservation, indicating a proactive stance.

Globally, over 21,000 protected areas, constituting 14.7% of the world's land, highlight the urgency of addressing biodiversity loss and habitat fragmentation due to ecological degradation (McCarthy et al., 2021; WWF, 2022). Developed countries, including Germany actively pursue biodiversity conservation projects in developing countries, exemplified by Germany's projects in Ecuador, Ethiopia, and Vietnam (GIZ, 2023). Bordering countries designate shared natural resources as transboundary biosphere reserves, such as the Ecuador-Peru "Bosques de Paz" (Forests of Peace) (Iniguez-Gallardo et al., 2021).

For the effective conservation of biodiversity in the Korean Peninsula, collaboration between North and South Korea becomes imperative. This research aims to grasp North Korea's biodiversity status, analyze patterns in biodiversity-related Official Development Assistance (ODA), and propose cooperation strategies and principles for biodiversity conservation on the Korean Peninsula.

Building on the findings of the 2022 Institute for Peace and Unification Studies project on "Natural Resource Management Model in the Transboundary Areas between South and North Korea," international case studies on transboundary biosphere reserves will inform the development of North-South cooperation strategies. The study explores the comprehensive status of biodiversity in North Korea and analyzes biodiversity issues and

policies in North Korea, Inter-Korean forest cooperation experiences, global transboundary biodiversity conservation cases, and biodiversity targeting ODA in North Korea to strategically formulate transboundary cooperation principles and agendas.

2 Literature review

2.1 Transboundary Environmental Governance

Transboundary environmental governance involved a full range of actors and institutions in shaping and implementing decisions about the environment across jurisdictions and property boundaries within, as well as between, nation-states (Miller et al., 2020). It also refers to the cooperative management and regulation of environmental issues that transcend national borders that involves the collaboration of multiple countries to address shared environmental challenges, such as air and water pollution, biodiversity conservation, climate change, and the management of transboundary natural resources (Milman et al., 2020). This form of governance recognizes that environmental issues often do not respect political boundaries and require coordinated efforts to achieve effective solutions.

Effective transboundary biodiversity governance can be evaluated using the twelve criteria for transboundary conservation of terrestrial biodiversity (Lim, 2016). The following are the threshold issues of net benefits of ‘going transboundary’ to be considered.

1. Engages each level of political organization: It emphasizes the importance of transboundary cooperation in biodiversity conservation, emphasizing the need for engagement across multiple political levels and advocating for well-coordinated plans that address risks at various scales. It highlights the drawbacks of a top-down conservation approach and emphasizes the essential involvement of local communities for motivation and participation.
2. Has political buy-in: The success of transboundary biodiversity initiatives hinges on garnering commitment across political levels, addressing challenges posed by diverse stakeholders and competing interests. Establishing a sense of ownership, highlighting the varied values of biodiversity, and involving all relevant actors from the start are critical for long-term success, yet political mistrust and

sovereignty issues complicate regulatory efforts. National support is paramount, as the translation of treaty aspirations into tangible environmental outcomes relies on their integration into national policies and decision-making.

3. Costs and benefits of transboundary conservation are equitably distributed: For transboundary conservation, equitable distribution of costs and benefits is hindered thus, emphasizing the need to address such issues for effective collaboration.
4. An integrated ecosystem approach which incorporates available science is applied
Implementing an ecosystem approach across borders necessitates considering broader landscapes, integrating biodiversity implications into various sectors' policies, and overcoming challenges in translating scientific findings into effective policy and practice to address challenges as global biodiversity conservation, particularly within protected areas.
5. The objective of conservation is explicit: The objective of conservation must not be overlooked in the incorporation of multiple values and sectors since there is an increasing recognition of the interconnectedness between biodiversity and livelihoods. It is also important to integrate human well-being and biodiversity conservation.
6. Good governance is practiced: Effective transboundary governance is essential to overcome impediments and ensure equitable outcomes, particularly in addressing governance challenges crucial for implementing the ecosystem approach successfully. Good governance is paramount in transboundary management, as corruption and lack of transparency can impede resource mobilization and divert efforts from poverty reduction and sustainable development.
7. Clear success indicators for ongoing monitoring and evaluation exist and adaptive management is practiced: Establishing value-based standards is essential for the good governance of natural resources, and effective monitoring and evaluation using specific indicators are crucial tools for showcasing progress and gaining stakeholder support. Adaptive management in transboundary biodiversity conservation necessitates strong monitoring and evaluation processes, while

involving stakeholders at various political levels in indicator development enhances legitimacy and empowers local communities.

8. Existence of rules and legal instruments that enable the process: Legal instruments are crucial for defining stakeholder interactions, establishing regulatory measures, and conveying the importance of biodiversity conservation. The careful development of precise legal instruments at each transboundary level is essential, helping reduce corruption and ensuring the effectiveness of agreements by addressing conflicts and inconsistencies in existing legislation.
9. Designated institutions are identified at each level of organization and vertical and horizontal linkages are established across all levels: The effectiveness of transboundary biodiversity initiatives relies on aligning management processes and institutions with the scales of the ecosystems being managed. While a single institutional body for an entire transboundary area is ideal, political acceptability and existing capacities often lead to cooperation within established agencies. Whether working with existing institutions or creating new ones, success hinges on horizontal and vertical linkage, impartial decision-making, and enduring support.
10. Operates in consideration of capacity: The criterion underscores the need to assess existing capacities before designing transboundary initiatives, legal instruments, and institutions. It emphasizes adapting implementation strategies to match available resources at each level of authority, addressing capacity gaps within administrative systems, and recognizing the importance of long-term capacity-building for enduring impact.
11. Complexity is recognized and appropriate funding is secured: Sustainable and flexible funding is essential for transboundary conservation initiatives tackling complex resources, given the usual limitations of short project time frames. To ensure success, it is crucial to diversify funding sources, establish clear benefit-cost links at the local level, and promote equitable benefit-sharing. Incorporating "transboundary thinking" into routine operations is advocated as a strategy to enhance funding sustainability.

12. Dispute resolution mechanisms exist: Effective dispute resolution is crucial across all political levels, requiring dedicated mechanisms supported by political commitment and financial backing for successful implementation.

2.2 Transboundary Biosphere Reserves

The United Nations Educational, Scientific, and Cultural Organization (UNESCO) was established in 1945 as one of the specialized agencies of the United Nations to promote international cooperation among its Member States in the fields of education, science, culture, and communication. UNESCO established biosphere reserves under its Man and the Biosphere Program (MAB) as a model for addressing biodiversity conservation to promote a sustainable connection between people and nature and supports interdisciplinary research, demonstration, and education in natural resource management (Taggart-Hodge et al., 2016; So, 2005).

The concept of Transboundary Biosphere Reserves (TBR), officially endorsed by the International Coordinating Council of the MAB program in 1992-1993, signifies a collaborative effort across borders. The Tatra Mountains (Poland and Slovakia) and the Krkonose / Karkonosze Mountains (Czechoslovakia and Poland) were the first two areas designated as TBR, demonstrating an early implementation of this approach (UNESCO Technical Notes, 2003). The TBR mechanism was developed to facilitate official recognition of a political will to cooperate on important conservation and sustainable use issues through coordinated management of a shared ecosystem, linked across international boundaries with more than two countries, and addresses the management of socio-ecological system across borders and must meet certain requirements to be recognized by UNESCO (Technical Report, 2013 & 2015).

The designation of TBR yielded several valuable lessons. Firstly, successful establishment required close collaboration and coordination among multiple countries, fostering strong partnerships, shared vision, effective communication, and a peace project effect (Kock et al., 2022). Secondly, inclusive stakeholder engagement involving governments, local

communities, NGOs, and scientific institutions played a vital role in shaping the reserve's design and management (Mohl et al., 2020). Lastly, the ecosystem approach of the TBR provides a holistic and integrated strategy for conservation, recognizing the interconnectedness of ecosystems and services.

Similarly, TBR offers significant added value for cooperation, particularly in European TBRs. Wulff (2007) emphasizes its role as a cross-border cooperation framework, creating attractive tourist destinations and a common management system. It serves as a new dimension in the world network, addressing problems and conflicts through collaboration rather than solely at the national level. It enhances international exposure, attracting interest from donors, and serves as an open forum for communication among stakeholders, and mitigating structural difficulties. The TBR harmonizes different systems by protecting shared natural heritage through sustainable development and active cooperation across boundaries and cultures (Wulff, 2007). The peace-keeping effect of TBR is evident in examples like the Bosques de Paz TBR, resolving long standing disputes and contributing to economic and social development (Kock et al., 2022). Shared concerns for the environment and sustainable development strengthen trust between countries, preventing future conflicts. Additionally, TBR plays a crucial role in shaping the socioeconomic development of borderlands, fostering good working relations, and building human capacity through international exposure and collaboration (Fall et al., 2023).

The establishment and management of TBR present several challenges related to governance, decision-making, funding, resource constraints, and stakeholder engagement (Jakubowski et al., 2022; Fall et al., 2003). In terms of governance, the TBR nomination application process involves negotiating agreements and collaborations between multiple countries, each with its political and administrative processes, requiring extensive communication and agreement on common goals (Fall et al., 2003). Harmonizing regulations and decision-making levels can be challenging due to differences in legal traditions. Additionally, varying levels of understanding of the biosphere reserve program and financial disparities among member countries pose limitations. Funding and resource constraints hinder the effective coordination of

multiple countries' contributions, and the limited allocation of financial resources may restrict project impact. Stakeholder engagement poses another set of challenges. The engagement of all stakeholders for a long-term commitment requires sustained efforts and may face resistance due to conflicting interests and priorities. Building a common shared vision and implementation programs can be limited by cultural differences and relative weakness of local stakeholders. Furthermore, involving additional countries in a TBR lengthens negotiations and necessitates significant efforts in stakeholder involvement, as demonstrated by the extended negotiation for the Mura-Drava-Danube TBR due to boundary issues between Serbia and another country, requiring resubmission (Kock et al., 2022).

For better understanding of the TBR mechanism, the following are the successful cases that can be used for biodiversity conservation in the Korean Peninsula. For wetland and river management, the Danube Delta and Mura-Drava-Danube TBR present a comprehensive approach to preserving these crucial ecosystems. In the Danube Delta, recognized as one of Europe's vital wetland areas, transboundary cooperation between Romania and Ukraine is emphasized to effectively manage shared resources. Biodiversity conservation is a central focus, encompassing various species of birds, fish, and plant life. The TBR initiative also highlights wetland restoration, with a particular emphasis on re-establishing natural floodplain dynamics, and promotes sustainable tourism practices to balance economic benefits with environmental protection. Moreover, the Mura Drava Danube region, transboundary conservation across Austria, Croatia, Hungary, and Slovenia is paramount for safeguarding shared ecosystems at the intersection of three major rivers. The TBR prioritizes floodplain management to restore and maintain natural dynamics, protecting ecosystems and preventing downstream flooding (Mohl et.al 2020). Recognized as a biodiversity hotspot, efforts concentrate on the protection and restoration of habitats for rare and endangered species. River connectivity is enhanced through the removal of barriers, such as dams and weirs, to support crucial fish migration. Additionally, sustainable agriculture practices are promoted to reduce pollution and mitigate habitat degradation in this ecologically significant region.

In terms of wildlife conservation, the Mono TBR, situated in West Africa, plays a vital role as a haven for winter and migratory birds. Encompassing diverse ecosystems such as coastal wetlands, lagoons, and savannas, the reserve attracts a wide array of migratory bird species, including waterfowl, shorebirds, and songbirds, during their wintering and migratory periods (Baboianu, 2016). Within the reserve, focused conservation efforts prioritize the protection of critical habitats crucial for the well-being of these birds, spanning wetlands, mangroves, and coastal areas. Sustainable ecotourism initiatives are actively promoted to generate revenue for conservation endeavors and raise awareness about the reserve's significance. Given the transboundary nature of the Mono TBR, spanning Benin and Togo, international cooperation stands as a cornerstone for the effective conservation and management of these essential winter and migratory bird habitats.

In forest management, a comprehensive strategy addresses the inherent risk of wildfires in diverse ecosystems of Geres/Xures and Meseta Iberica TBR. The rugged terrain and dense forests in the northern TBR, characterized by fire-prone features, prompt preventive measures such as firebreaks, controlled burns, and community involvement to reduce wildfire risk. Transboundary collaboration and cross-border networks of governance between Portugal and Spain is pivotal for managing wildfires that may traverse the international border, involve local communities and social participation in adaptive fire management practices and ensure a coordinated and effective response to manage wildfires across the TBR, emphasizing both prevention and resilience-building strategies (Romano et al., 2020).

For peace and order cases, a peace treaty between Ecuador and Peru was signed in 1998 amidst their territorial conflict since 1981. The Tumbesian Region, located in southwestern Ecuador and western Peru, stands out as a global hotspot, particularly in the northwest. This region boasts exceptionally high rates of endemism, resulting in the establishment of four of the world's most crucial avian endemic zones, hosting 59 out of 80 endemic species. Unfortunately, fifteen bird species in the area are classified as endangered, and a mere 5% of their original habitat remains. The references and

interpretations of the region are in the context of a dry forest. Recognizing the significance of conservation, Ecuador and Peru designated this area as a Biosphere Reserve in 2014 and 1977, respectively. Subsequently, in 2017, the two countries collaboratively registered the region as a biological reserve named Bosques de Paz. The shared Catamayo-Chira and Puyango Tumbes rivers play a vital role in supporting local farming and pastoralism. The climate and geographical features dictate the practices of crop cultivation and cattle breeding in the area. The primary economic activities in the region include fishing, pastoralism, tourism, agriculture, and the cultivation of medicinal plants. However, the Tumbesian region, straddling both countries, is currently facing challenges such as human-wildlife conflicts (Iñiguez-Gallardo et al., 2021), as well as issues related to the tourism industry and mining (Barriga, 2017).

3 Contextual Background

The Han River estuary, situated at the boundary between South and North Korea, serves as an outlet where the Han and Imjin Rivers discharge into the West Sea (Figure 1). Owing to the military tensions following the Korean War, the region has been inaccessible for normal use and development for the past six decades. The Han River estuary holds significant potential for mutually beneficial outcomes for both South and North Korea, encompassing advantages in transportation, tourism, and the preservation of the ecosystem. Additionally, collaborative efforts between the two Koreas in restoring and utilizing the estuary could play a crucial role in flood control and prevention within the water system (Kim, 2019).

Figure . North-South shared river and dams



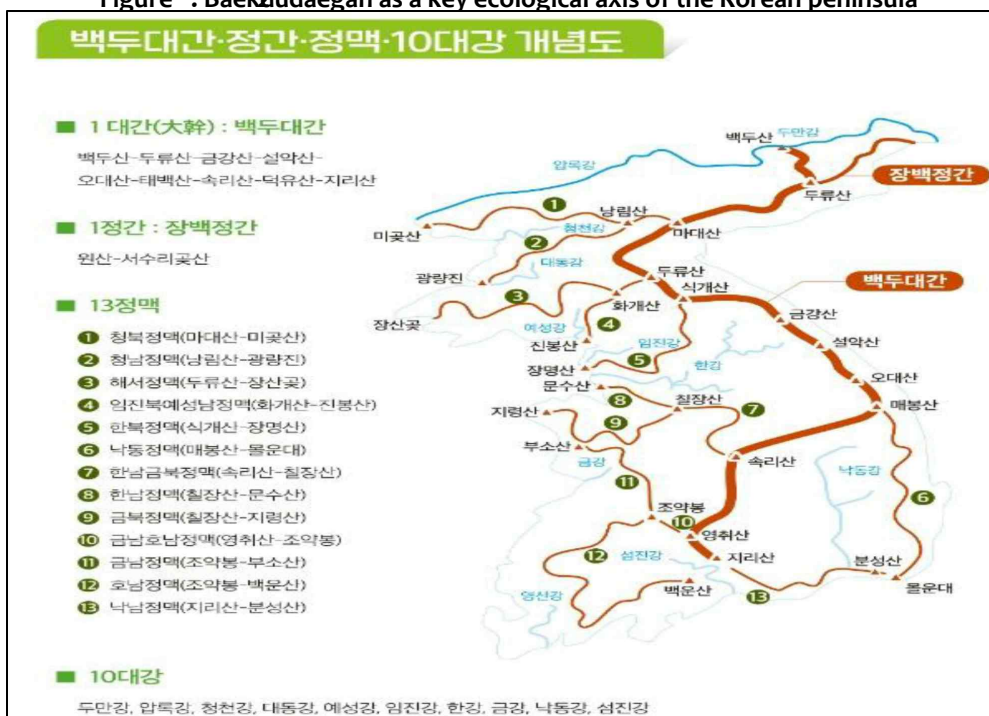
Source: Kim (2019)

The Han River basin encompasses seven shared rivers, with the Imjin River and the Bukhan River playing pivotal roles in water management. The Imjin River spans a total length of 254 km, covering an area of approximately 8,110 km². South Korea and North Korea contribute around 3,000 km² and 5,110 km², respectively, to the basin. North Korea has constructed seven dams upstream of the Imjin River, including April 5th Dams 1 to 4, Hwanggang Dam, Naepyeong Dam, and Guryong Dam. However, the lack of negotiations

with North Korea has resulted in a dearth of essential dam data, making it challenging to implement management plans effectively (Lee, 2022).

The Baekdudaegan Mountains, serving as the core mountain range on the Korean Peninsula, extend from Mt. Baekdu to Mt. Geumgang, encompassing Mt. Seorak, Mt. Taebaek, and Mt. Cooperation. Preserving and managing the Baekdudaegan are crucial for sustainable forest management and the conservation of rare flora, fauna, and forest resources. Unfortunately, access to the Demilitarized Zone (DMZ) is restricted, hindering collaborative efforts. Therefore, safeguarding the Baekdudaegan, as a vital ecological axis (Figure 2), is essential for sustainable forest management across the Korean Peninsula.

Figure . Baekdudaegan as a key ecological axis of the Korean peninsula



Source: Lim (2020)

4 Research Design and Method

The research aims to develop transboundary cooperation principles focused on biodiversity management in the Korean Peninsula's borderlands, employing a literature review methodology. This approach involves four distinct research steps (Figure 3).

Figure 3. Research process



In the first step, an analysis of biodiversity issues and policies in North Korea will be conducted through an extensive review of academic articles, reports, and publications. This will provide a comprehensive overview of the current state of biodiversity, existing policies, and challenges in the region. Identification of literature gaps will guide further exploration.

The second step involves an examination of Inter-Korean forest cooperation experiences. By reviewing academic literature, official documents, and reports on past and ongoing initiatives, the research will analyze successes, challenges, and lessons learned, particularly in the context of biodiversity conservation. Principles and strategies effective in fostering transboundary cooperation in forest management will be extracted.

In the third step, the research will include an analysis of biodiversity Official Development Assistance (ODA). Through OECD Creditor Reporting System (CRS) and relevant project reports and studies, the study will assess ODA projects focused on biodiversity in North Korea. This analysis will contribute insights into international efforts and support for biodiversity conservation in the region.

The final step involves synthesizing insights obtained from the analyses of biodiversity issues, Inter-Korean forest cooperation experiences, global transboundary biodiversity

conservation cases, and biodiversity ODA. This synthesis will inform the formulation of transboundary cooperation principles tailored to the specific challenges and opportunities present in the Korean Peninsula. This literature review methodology aims to contribute to designing effective principles for transboundary biodiversity cooperation in the borderlands of the Korean Peninsula.

5 Biodiversity issues and policies in North Korea

5.1 Biodiversity status in Korean Peninsula

The vegetation in the Korean Peninsula is characterized by a high diversity of plant species, with a significant proportion being endemic species, which indicates that the region possesses a varied natural environment. To be specific, the Korean Peninsula is situated at the eastern end of the Eurasian continent, extending longitudinally from approximately 42° 2'N to 33° 4'N. Its geographical location provides diverse conditions that can accommodate a variety of organisms (NGII, 2020). The main mountain ranges run from north to south, connecting various branches and forming a diverse topography, including expansive plains in the southwest and approximately 4,000 large and small islands distributed along the western and southern coasts, along with wetland environments (NGII, 2020).

In South Korea, there are a total of 30,675 animal species, including 2,009 vertebrates, 128 mollusks, and 28,538 invertebrates. As for plants, there are 5,517 species, indicating a relatively rich diversity of species and a high endemism rate compared to temperate regions (NGII, 2020).

Meanwhile, according to North Korea's Fifth National Report on Biodiversity (DPRK 2016), the biodiversity status of North Korea includes 10,012 plant species and 10,146 animal species. Among animals, there are 1,436 vertebrate species, 8,652 invertebrate species, 107 mammal species, 866 fish species (190 freshwater and 676 marine), 17 amphibian species, 26 reptile species, and 420 bird species. The report also notes the richness of genetic diversity at both the ecosystem and species levels in North Korea (Table 1).

Table . Biodiversity status of Korean Peninsula

	North Korea	South Korea
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Characteristics	Topographical diversity (Mountains, rivers, islands, wetlands, coastline)	
Mountainous area	74.7%	77.4%
Plant species	10,012	5,517
Animal species	10,088 animal species - 1,436 vertebrates - 5,652 invertebrates	30,675 animal species - 2,009 vertebrates - 28,538 invertebrates

Source: NGII (2020), DPRK (2016)

5.2 Biodiversity status in DMZ

The area known as the Demilitarized Zone (DMZ) on the South Korean side encompasses the DMZ itself and the Northern Limit Line, including civilian control zones in the northern region. The DMZ was established in accordance with the "Korean War Armistice Agreement" signed on July 27, 1953. Stretching across the peninsula at a distance of 2 km on each side of the Military Demarcation Line (MDL), it has remained in a state of controlled access for humans in the natural conservation status since the armistice. The Northern Limit Line, within 10 km south of the MDL, is designated as the Civilian Control Line (CCL) under the "Act on the Protection of Military Bases and Military Facilities." The area from the CCL to the southern boundary line is designated as a civilian control zone (NGII, 2020).

The DMZ serves as an ecological belt across the Korean Peninsula. The eastern mountainous region meets the Baekdu-Daegan, while the western end reaches the sea, creating diverse ecosystems such as forest and marine ecosystems, as well as rivers, wetlands, and valleys. It is home to numerous natural monuments, endangered species, and protected wildlife. The area is internationally significant as a habitat and migration route for important waterbirds and crane species, contributing to the maintenance of biodiversity on a global scale (NGII, 2020).

A total of 5,929 species of wildlife, including 101 endangered species, have been

identified in the DMZ. It means that 23% of the nation's species live in an area that accounts for only 1.6% of South Korea's area. The 101 endangered species represent about 38% of the total 267 endangered species, indicating the exceptional ecological value of the DMZ for endangered wildlife. The DMZ is confirmed to be a habitat for wildlife in eight categories: insects (2,954 species), plants (1,926 species), benthic macroinvertebrates (417 species), birds (277 species), spiders (138 species), freshwater fish (136 species), mammals (47 species), and amphibians and reptiles (34 species). Among the critically endangered wildlife (Class I), 18 species have been identified, including 6 mammal species such as musk deer and otters, 10 bird species including the cinereous vulture and yellow-billed crane, and 2 species each of amphibians (Suwon tree frog) and freshwater fish (white sturgeon) (NGII, 2020).

5.3 Biodiversity policies in North Korea

National Biodiversity Strategy and Action Plan (NBSAP)

In pursuance of the Convention on Biological Diversity (CBD), North Korea developed the National Biodiversity Strategy and Action Plan (NBSAP) in 1998 with support from GEF and UNEP. It updated NBSAP in 2007 and submitted the Fifth National Report on Biodiversity in 2016 focusing on the progress in implementing the second NBSAP to CBD. While it is not easy to find information about the biodiversity status and policies of North Korea, they are well organized in these reports.

Myeong (2020) compared the characteristics of the biodiversity conservation strategy of North Korea and South Korea, based on the second NBSAP of North Korea (DPRK, 2007) and the fourth NBSAP of South Korea (Jointly prepared by relevant ministries, 2018). First South Korea focused on creating a culture of nature conservation by raising public awareness, beyond simple biodiversity conservation, while North Korea focused on strengthening conservation capabilities and establishing management systems. Second, South Korea sought to establish and evaluate the performance of policies and projects quantitatively and qualitatively, and North Korea constructed its strategy mainly based on qualitative indicators and there is a quantitative indicator that 8% of the territory will

be designated as a protected area by 2010. Third, North Korea set goals to promote strategies and priority projects related to agriculture and forest restoration, probably due to the large rural population and lack of food and energy. South Korea's goals related to agriculture and forestry were to achieve a sustainable agricultural product ratio of 5% by 2023 and increase the production area by 20km² per year. Fourth, in North Korea, a lot of effort was being put into restoring wetland ecosystems, preserving spoonbills and cranes, and monitoring coastal biodiversity.

The Fifth National Report on Biodiversity (DPRK, 2016) specified five main threats to biodiversity of North Korea: Overuse of natural resources, impacts of soil and water loss by deforestation, habitat loss of wild species, invasive alien species and environmental deterioration, and climate change. The major impacts of biodiversity loss are deterioration of the ecosystem service function and reduced agricultural production and the pharmaceutical industry of Koryo Medicine (traditional medicine used in North Korea).

In the fifth report, the four important tasks to achieve the goals for biodiversity conservation and sustainable use are identified as below:

- Accelerating the national afforestation and gardening
- Restoring degraded forests within 10 years
- Increasing natural reserve areas gradually
- Establishing the national reserve network system
- Improving and strengthening the reserve management and conservation of ecosystem, species and genetic diversity.

Legislation

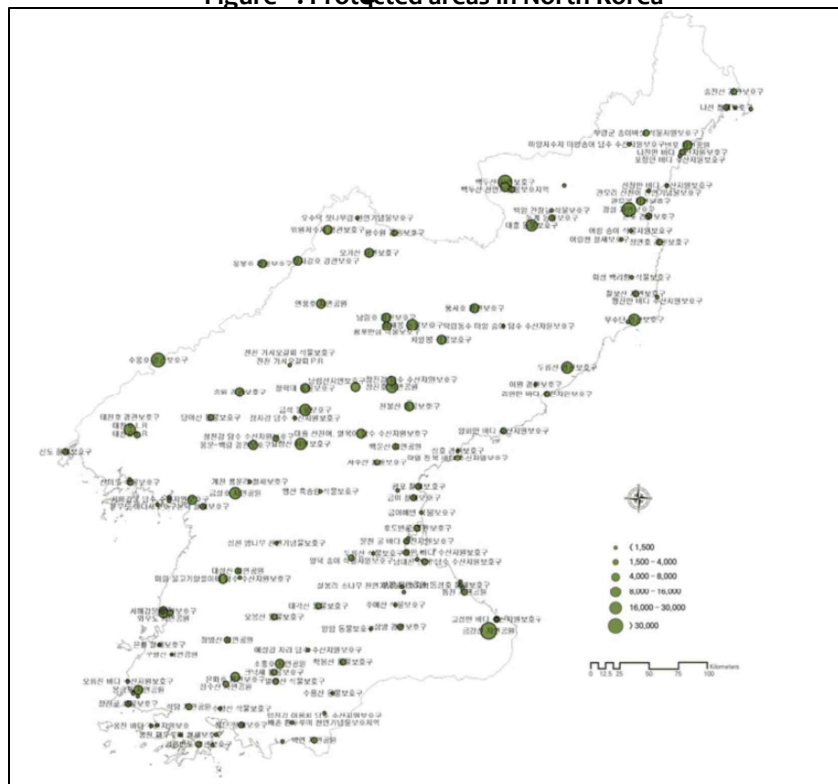
After the legislation of the Law on Environment Protection (1986), North Korea's national laws related to the habitat conservation developed as its subordinate laws, which include: "Law on Forest" (1992); "Law on Protection of Scenic Spots and Living Monuments" (1995); "Law on Soil" (1997); "Law on Water Resources" (1997); "Law on Prevention of Marine Pollution" (1997); "Control Law on Environment Protection" (1998) "Law on Agriculture" (1998); "Law on Conservation of Useful Animals" (1998); "Law on

Medicinal Plants” (2004); “Law on Land Planning” (2006); “Law on Environmental Impact Assessment” (2006) (DPRK, 2016).

Protected areas

North Korea manages 3 kinds of protected areas. First, there are 326 protected areas, which account for 8,793km² (7.2% of the total land area) (Figure 4). Second, 5 UNESCO MAB Biosphere Reserves are designated: Mount Paekdu (1989), Mount Kuwol (2004), Mount Myohyang (2009), Mount Chilbo (2014), Mount Kumgang (2018). Third, 2 Ramsar wetland sites are designated: Mundok Migratory Bird Reserve, Rason Migratory Bird Reserve (Figure 5).

Figure . Protected areas in North Korea



Source: Myeong (2020)

Figure . Ramsar wetlands in North Korea



Source: <https://m.khan.co.kr/environment/environment-general/article/201803160600145#c2b>

5.4 Environmental conventions/protocols signed by North Korea

North Korea has signed a number of international conventions and protocols related to biodiversity conservation and environment protection. They are organized in the table 2 and the key items are highlighted in bold.

Table . Environmental conventions/protocols signed by North Korea

Conventions/Protocols	Date
UNESCO Man and the Biosphere Programme	1979
United Nations Convention on Biodiversity	26 Oct 1994
United Nations Framework Convention on Climate Change	05 Dec 1994
Vienna Convention on the Protection of Ozone Layer	05 May 1995

Montreal Protocol on Substances that Deplete the Ozone Layer	06 May 1995
Stockholm Convention on Persistent Organic Pollutants	19 Aug 2002
Cartagena Protocol on Biosafety	29 July 2003
United Nations Convention on Combating Desertification	28 Mar 2004
Kyoto Protocol to the United Nations Framework Convention on Climate Change	27 Apr 2005
Basel Convention on Trans-boundary Movements of Hazardous Wastes and their Disposal	10 July 2008
Nagoya Protocol on access to genetic resources and the fair and equitable sharing of benefits arising from their utilization	2012
The International Union for Conservation of Nature	2017
the Convention on Wetlands of International Importance Especially as Waterfowl Habitat (Ramsar Convention)	16 May 2018
East Asian-Australasian Flyway Partnership	2018

Source: Myeong (2020), DPRK (2016)

5.5 Projects and activities for biodiversity conservation

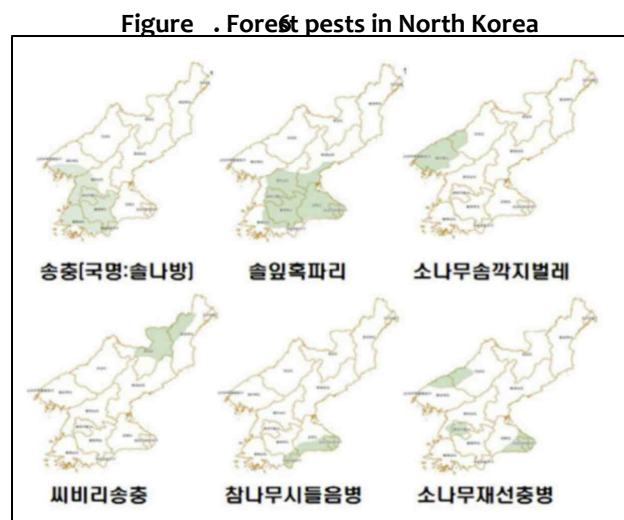
Case 1. “Slope Land Management in Suan County” project (2012-2014)

“Slope Land Management in Suan County” project was implemented with support of SDC (Swiss Agency for Development and Cooperation) and demonstrated agroforestry management on slope land. He and Xu (2017) analyzed the outcomes of this project as partial decentralization, food security and livelihood development, improved community capacity (User group participation), and impact on North Korea land-use policy such as North Korean National Agroforestry Congresses, a Central Agroforestry Committee, and National Agroforestry Strategy.

Case 2. Third 5-Year Plan for Development of Science and Technology (2008-2012)

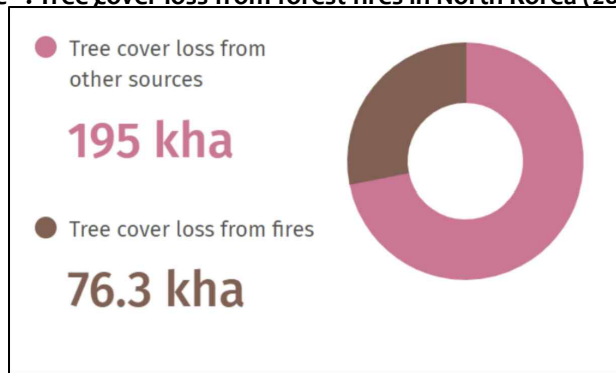
Through the Third 5-Year Plan for Development of Science and Technology, several national researches related to biodiversity conservation and its sustainable use were carried out and their results were applied into practice. Major projects include protection of ecosystem in the main reserves, study on assessment, protection and sustainable use of biodiversity in major wetlands in North Korea, study on effects of forest environment conditions on development of major forest pests, and prediction and forecasting methods, study on assessment system for forest fire risk by 3S (Remote sensing, GIS, GPS (DPRK, 2016).

Forest pests and forest fire risk are the main concerns of North Korea forest management. Pests such as eggar (송충), pine leaf gall midge (솔잎혹파리) occur in many places in North Korea, damaging forests severely (Kang, 2022) (Figure 6). In addition, fires were responsible for 28% of tree cover loss in North Korea between 2001 and 2022 (Global Forest Watch, 2023) (Figure 7).



Source: Gang (2022)

Figure . Tree cover loss from forest fires in North Korea (2001-2022)



Source: Global Forest Watch (2023)

6 Inter-Korean Forest Cooperation Experiences

6.1 Successful Inter-Korean Forest management experience

Forest disease control by Gangwon Province

South and North Korea have experiences of cooperating forest resource management. Gangwon province has collaboratively controlled forest diseases and insect pests (Park, 2015). Based on agreements for South-North Gangwon Province's cooperation, Southern Gangwon Province provided chemicals and equipment and Northern Gangwon Province provided trained forest technicians for the control of pine needle gall midge (*Thecodiplosis japonensis*) and black-tipped sawfly (*Acantholyda posticalis posticalis*) (Table 3). Since June 2001, control activities of pine needle gall midge were conducted in 11,100 ha of the region of Kumkang Mountain. Over 92 percent of the controlled areas were co-monitored by South-North Gangwon Province. Responding to the request by North Gangwon Province, South Gangwon Province controlled black-tipped sawfly in 8500 ha of North Gangwon Province, including in the cities of Wonsan, Tongcheon, and Anbyeol until 2008.

Table 3. Collaborative control of diseases and insect pests

Date	Controlled Area (ha)		Number of Participants	
	<i>Thecodiplosis japonensis</i>	<i>Acantholyda posticalis posticalis</i>	South	North
June 8, 2001	1000	0	8	20
June 4, 2002	2000	0	13	14
July 29, 2003	0	1,000	11	12
June 3, 2004	1,000	1,000	15	11
July 17, 2005	1,500	1,000	14	10

July 20, 2006	1,500	1,000	10	12
July 18, 2007	1,500	1,000	6	9
July 3, 2008	1,600	1,100	-	-

Green One Korea (겨레의 숲) (2007 ~ 2010)

‘Green One Korea’ is a consultative body between social organizations established to restore a healthy and abundant natural ecosystem and agricultural productivity in North Korea by restoring North Korea's devastated forests, contributing to overcoming the food, drinking water, and energy shortages and creating a new exemplary case for development and recovery cooperation between North and South Korea (Ahn, 2011). About 20 civic groups, forest environment groups, and religious groups from the South who are interested in North Korean forest greening gathered together to establish ‘Green One Korea’ in April 2007 and continued its activities until 2010 (Figure 8, 9). The projects carried out by ‘Green One Korea’ are as follows:

- Reforestation
 - Support for tree nursery creation and restoration (8 locations)
- Cultivation of saplings
 - Provision of seedlings for restoration of devastated land (approximately 3.2 million plants)
- Control of insect pests
 - Forest pest control support (6,400ha)
- Citizen participation projects
 - Joint tree planting event between North and South Korea
 - Approximately 3,500 participants - Mt. Geumgang, Kaesong, Pyongyang

Figure 10. Cultivation of saplings



Source: Ahn (2011)

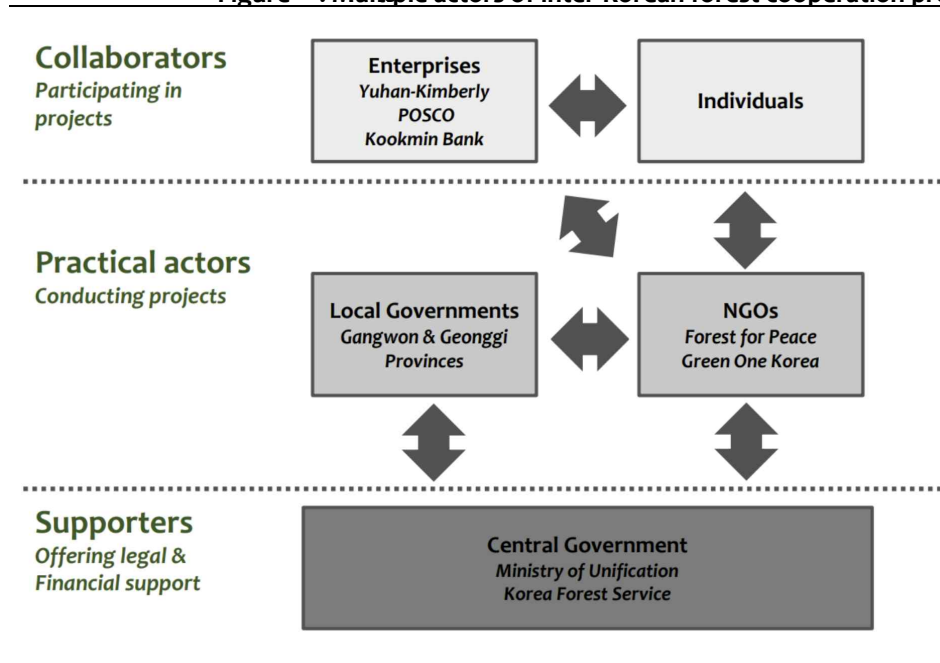
Figure 11. Control of insect pests



Source : Ahn (2011)

Park (2015) revealed that both public actors (central and local governments) and private actors (NGOs, enterprises and individuals) participated in establishing and implementing policies of Inter-Korean Forest Cooperation. Multiple actors played different roles as supporters, practical actors, and collaborators in building Inter-Korean Forest Cooperation (Figure 10).

Figure . Multiple actors of inter-Korean forest cooperation projects



Source: Park (2015)

6.2 Unsuccessful Inter-Korean Forest management experience

DMZ Eco-Peace park

One of the unsuccessful cases for Inter-Korean Forest Cooperation is the failure of establishing DMZ Eco-peace park. There have been continuous attempts to establish DMZ Eco-peace park, but finally they ended at a declarative level amid strained inter-Korean relations. As armed conflict continued, military tensions in the DMZ and border areas increased, making it difficult to proceed with peace projects. (EHI, 2021)

Timeline

- 2008: Adoption of 'creating a DMZ eco-peace park' as a national task (Lee Myung Bak)
- 2008-2009: Deteriorating inter-Korean relations (Suspension of Geumgangsan tours, North Korea's second nuclear test)
- 2010: Peace Park and Ecological Peace Belt Project in the DMZ Adjacent Area

- 2013: Declaration of 'Plan for the DMZ World Eco Peace Park' (Park Geun Hye)
- 2019: Proposal of 'Turning DMZ into Int'l Peace Zone' (Moon Jae In)

(The timeline was organized with reference to EHI (2021))

DMZ TBR

Another unsuccessful case is the failure to designate DMZ TBR. Biosphere Reserve (BR) began to be reviewed in the late 1990s as a way to arouse international interest in the conservation of the ecosystem in the DMZ area. In 1997, the Korean National Commission for UNESCO promoted 'Research to simultaneously preserve the ecosystem and revitalize the local community in the Civilian Control Line'¹, and at the request of UNDP, Seoul National University conducted 'Research on environmentally sound and sustainable development in the northern Gyeonggi region'² has been conducted. (EHI, 2021) During the Kim Dae Jung administration, the promotion of a DMZ TBR was proposed to the North in 2001, but it was not implemented due to North Korea's opposition and lack of response.

In September 2011, the Ministry of Environment, Gyeonggi-do, and Gangwon-do submitted a BR application for 2,979km² including the southern part of the DMZ, but the decision was postponed. Since then, the strategy changed into designating the South Korean part first, and later expanding to the North depending on changes in the political and military situation (EHI, 2021). In September 2018, Yeoncheon-gun, Gyeonggi-do, and five counties in Gangwon-do, excluding the DMZ, each submitted applications for biosphere reserves. As a result, in June 2019, the Yeoncheon Imjin River Biosphere Reserve (58,412 ha) and the Gangwon Eco-Peace Biosphere Reserve (Cheorwon, Hwacheon, Yanggu, Inje, and Goseong, 182,815 ha) were designated and approved (EHI, 2021).

¹ 민통선지역의 생태계 보전과 지역사회 활성화 동시달성을 위한 조사연구

² 경기북부지역에서의 환경적으로 건전하고 지속가능한 개발 조사연구

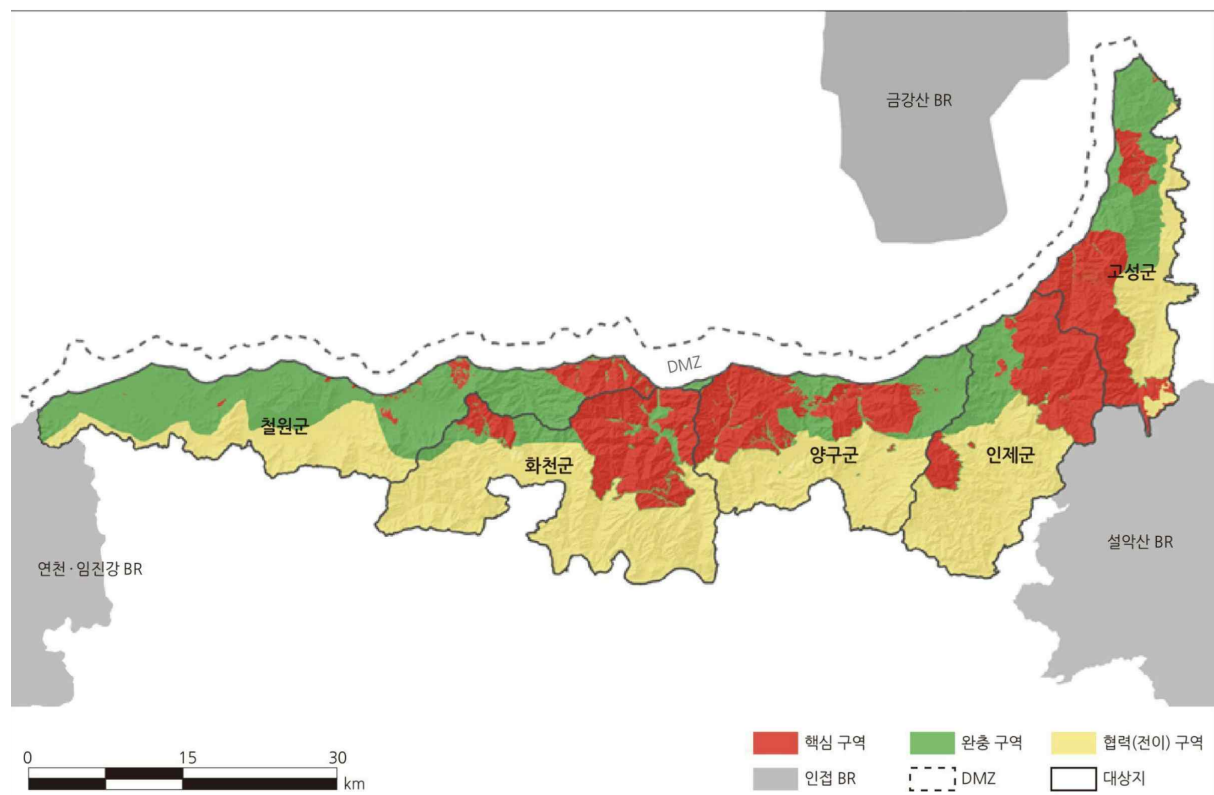
Timeline

- Late 1990s: Review of the plan of BR designation of DMZ
- 2001: Proposal for DMZ TBR was failed due to North Korea's opposition and lack of response (Kim Dae Jung)
- 2011: Submission of BR application for 2,979km² including the southern part of the DMZ → Postponed
- 2019: Designation of Yeoncheon Imjingang BR (58,412 ha) and the Gangwon Ecological Peace BR (182,815 ha) excluding DMZ (Figure 11)

(The timeline was organized with reference to EHI (2021))

Figure . Gangwon Eco-Peace Biosphere Reserve

강원 생태 평화 생물권 보전 지역



자연생태정책과(2019)

Source: NGII (2020)

6.3 Challenges of Inter-Korean Forest Cooperation

Considering the experience of inter-Korean forestry cooperation so far, the following challenges exist for future inter-Korean forestry cooperation.

- Gap of interests and capacity
 - Lack of aligning in goals and interest
- Unstable communication process
 - Ineffective communication among key stakeholders
- Unclear accountability
 - Success depends on political climate, ideological conflicts, and public perception
- Lack of rules
 - No clear foundation or institutionalization of the process
- Unequitable sharing of costs and benefits
 - North's reluctance to accept substantial funding impedes sustainability
- Limited participation by actors
 - Success depends on political climate, ideological conflicts, and public perception

7 Biodiversity ODA in North Korea

7.1 ODA in North Korea

Official development assistance (ODA) refers to a category used by the Development Assistance Committee (DAC) of the Organisation for Economic Co-operation and Development (OECD) to measure foreign aid. ODA refers to material resources given by the governments of richer countries to promote the economic development and welfare of developing countries. ODA can be provided bilaterally, from donor to recipient, or through multilateral development agencies such as the United Nations or the World Bank. The main objective of ODA is to help developing countries achieve the Sustainable Development Goals (SDGs) and address global challenges (OECD, 2021).

Although officially adhering to the ideology of *juche*, emphasizing independence and self-reliance, the Democratic People's Republic of Korea has consistently received foreign aid since its inception. During the Cold War, assistance came from the Soviet Union and China. In the post-Cold War period, Western donors, multilateral agencies, and non-governmental organizations (NGOs) took over this role. Faced with reduced support from its communist allies, a struggling economy, and acute food shortages, North Korea reluctantly sought international assistance (Jung et al., 2021). In reaction to this situation the global community initiated the provision of ODA to North Korea. According to OECD CRS Between 1995 and 2022, around 25 countries affiliated with the OECD and multilateral agencies and non-DAC countries collectively offered an estimated sum of USD 2,297 million to North Korea.

Numerous studies have delved into the characteristics of foreign aid to North Korea, particularly from the United States. These studies operate under the assumption that North Korea is distinct from other aid recipients, implying a need for differentiated aid policies. Consequently, there is an anticipation that donor countries' aid strategies for North Korea should align due to a shared perception of the country. However, significant

divergence persists among donors in terms of their respective aid approaches to North Korea (Jung et al., 2015). For instance, while some donors refrained from providing any aid to North Korea for extended periods, others consistently delivered humanitarian assistance to the nation. This section focuses extensively on the ODA connections between donors and North Korea, especially ODA targeting biodiversity indicators.

7.2 ODA with biodiversity markers

Supportive aid for the environment and the Rio Conventions includes actions identified by either the "aid to environment" marker or any of the four Rio markers: biodiversity, desertification, climate change mitigation, and climate change adaptation. Aid specifically dedicated to environmental issues as a primary objective comprises only activities labeled as "principal" by the "aid to environment" marker (OECD, 2022). The Rio markers were initially introduced to assist members in preparing their National Communications or National Reports to the Rio Conventions, emphasizing activities that integrate the Conventions' objectives into development cooperation. DAC members are required to specify whether each development finance activity has environmental goals. The Rio markers related to biodiversity, climate change mitigation, and desertification were introduced in 1998 and became mandatory information in 2006. Subsequently, the fourth marker on climate change adaptation was introduced and made mandatory information for flows starting in 2010 (OECD, 2023).

Aid directed towards achieving the objectives of the CBD is defined as an activity that supports at least one of the three main goals of the CBD: 1. The preservation of biodiversity, sustainable use of its components such as ecosystems, species, or genetic resources, or equitable sharing of the benefits derived from the use of genetic resources. Activities are categorized as biodiversity-related based on principal or significant indicators. Consequently, these activities contribute to: (1) the protection or enhancement of ecosystems, species, or genetic resources through in-situ or ex-situ

conservation, or addressing existing environmental damage; (2) the integration of biodiversity and ecosystem services considerations into the development goals and economic decision-making of recipient countries through institution building, capacity development, strengthening regulatory and policy frameworks, or research; or (3) supporting developing countries in fulfilling their obligations under the CBD (Table 1).

Activities are classified as having a "principal objective" if they explicitly and directly aim to fulfill one or more of the three specified criteria. Essentially, this means that the development aid project's objectives align with the "criteria for eligibility" of the Rio marker, and the activity would not proceed without this specific objective. The forest sector serves as a notable example of an activity that incorporates biodiversity concerns into its sectoral policy, planning, and programs. For instance, efforts to combat deforestation and land degradation while simultaneously maintaining or enhancing biodiversity in affected areas are included. Concerning forest land linked to agriculture, sustainable agricultural practices, including the substitution of harmful uses and extractions with out-of-area plantations, alternative cultivation methods, or equivalent substances; integrated pest management strategies; soil conservation; in-situ conservation of genetic resources; and the promotion of alternative livelihoods are all considered in biodiversity development aids (OECD, 2023). If the development aid project objectives align with the "criteria for eligibility" of the Rio marker, but the activity would have proceeded even without this specific objective, the significant marker is applied instead of the principal.

Table 1. Aid targeting the objectives of the Convention on Biological Diversity (CBD)

Biodiversity	Activity contribution
Principal objective	Protection or enhancing ecosystems, species or genetic resources through in-situ or ex-situ conservation, or remedying existing environmental damage
	Integration of bio-diversity and ecosystem services concerns within recipient countries' development objectives and economic decision making, through institution building, capacity development, strengthening the regulatory and policy framework, or research
	Developing countries' efforts to meet their obligations under the Convention

Example in forest sector	Combating deforestation and land degradation while maintaining or enhancing biodiversity in the affected areas
---------------------------------	--

7.3 ODA in North Korea with biodiversity markers

To find ODA projects that support biodiversity, CRS with Aid activities targeting Global Environmental Objectives was used. This dataset is sourced from the DAC Creditor Reporting System (CRS) database and includes bilateral commitment data related to aid supporting environmental sustainability, aid to biodiversity, climate change mitigation, climate change adaptation, and desertification. Donors reporting to the DAC CRS are required to specify, for each activity, whether it is directed towards the environment and the Rio Conventions, which include biodiversity, climate change mitigation, climate change adaptation, and desertification. A scoring system with three values is employed, categorizing aid activities as "marked" if they target the environment as the "principal objective" or a "significant objective," or as not targeting the objective.

According to the CRS with Aid activities targeting Global Environmental Objectives, from 2002 to 2021, the total ODA with environmental objectives in North Korea is accounted as USD 515 million. Among these, the ODA projects with biodiversity principal and significant markers are USD 60.49 million, approximately 12% of the total environmental ODA. In terms of the overall environmental ODA, a total 19 countries in order of Sweden, United States, EU Institutions, Switzerland, Germany, Australia, Ireland, Norway, Finland, Italy, United Kingdom, Belgium, New Zealand, France, Greece, Netherlands, Spain, Canada, and Poland remarked their ODA commitment. Among these countries, only 9 countries contributed to biodiversity markers. The countries are in order of Germany, Switzerland, Ireland, Sweden, Italy, United Kingdom, Canada, Poland, and Greece (Figure 12). The countries that support biodiversity projects supported the most amounts in 2016 and 2017, each year contributing more than 10 million USD (Table 5).

Figure . Share of ODA commitment from donor countries (Unit: million USD)

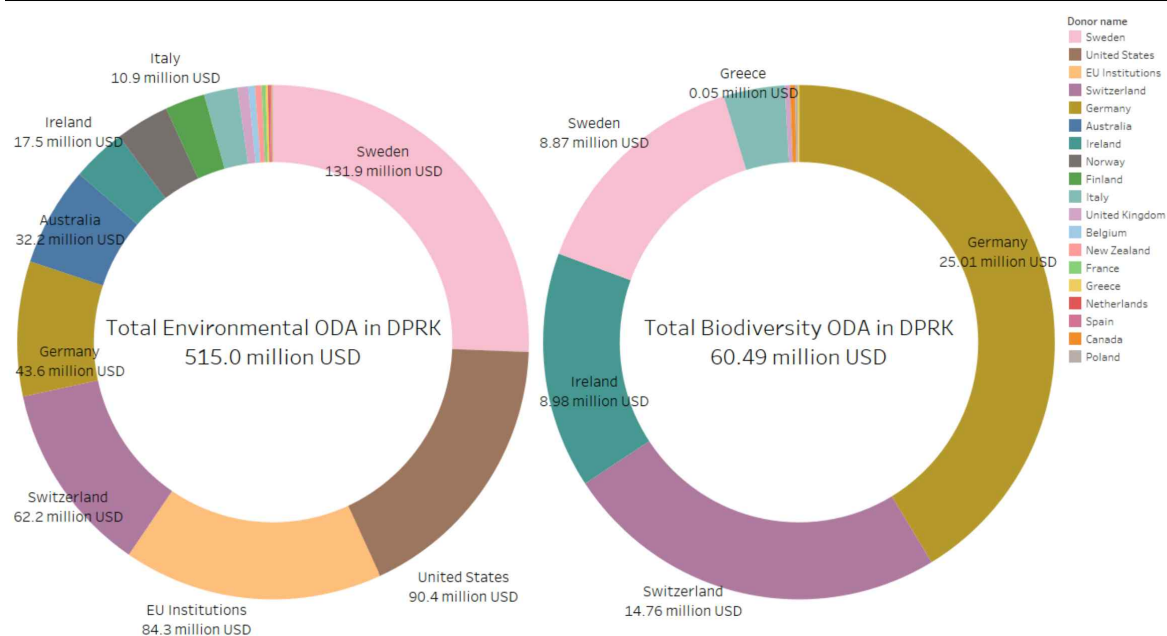


Table . Biodiversity ODA commitment by donor and year (Unit: million USD)

Donors	Year															Total
	2003	2005	2007	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021		
Canada						0.20									0.20	
Germany		0.74	0.66				4.31		8.29			10.98		0.03	25.01	
Greece		0.05													0.05	
Ireland						1.54			2.21	0.27		1.65	1.01	2.31	8.98	
Italy								1.88					0.45		2.33	
Poland						0.09									0.09	
Sweden				4.45	4.42										8.87	
Switzerland	0.45							0.78	0.79	12.19	0.56				14.76	
United Kingdom							0.20								0.20	
Total	0.45	0.78	0.66	4.45	4.42	1.83	4.51	2.66	11.29	12.46	0.56	12.63	1.46	2.34	60.49	

The ODA initiatives marked with principal biodiversity indicators were implemented in four nations: Sweden, Ireland, Germany, and Switzerland, each contributing a distinct project (Table 6). The ODA project from Sweden was not explicitly directed toward the North Korea but rather intended to support FAO projects that also support Chad, Niger, and Sahel. The project primarily focused on coordinating activities to enhance food security and providing livelihood support to marginalized groups. The relevant sector of this project is emergency response. In the case of Ireland, the project aimed to mitigate vulnerability to environmental risks such as floods and droughts. The relevant sector of the project is water supply and sanitation. Germany, in 2012, contributed to the management of global genetic resources. The relevant sector of this project was the

agriculture sector. This project stands out as the one most directly associated with the conservation of biodiversity. Lastly, Switzerland implemented a sloping land project within the general environmental protection sector. Among these four projects, the sloping land project from Switzerland contained the most detailed information available from academic literature, while information on the others was comparatively limited.

Table . ODA projects with principal biodiversity markers

Year	Donors	Project title	Sectors	USD commitment
2003	Sweden	FAO agreement 2012 Humanitarian Programmes	Emergency Response	4.42
2007	Ireland	Civil Society Programme Funding: 3(a). Reduced vulnerability to environmental risks (flood, drought)	Water Supply & Sanitation	0.80
2012	Germany	Managing the Global Genetic Resources	Agriculture	0.66
2016	Switzerland	Sloping Land	General Environment Protection	0.45

The Swiss Agency for Development and Cooperation (SDC) initiated the Sloping Land Management program (SLM) in North Korea in 2004, after establishing a partnership with a focus on agriculture and food security in 2002. The project expanded into a multilateral collaboration in 2008 with the involvement of the International Center for Research in Agroforestry (ICRAF) (Swiss Agency for Development and Cooperation 2016). The program aimed to sustainably manage sloping land environmentally, economically, and socially, emphasizing the transitory use of forests as exacerbating the risk of natural disasters. The objective was to make the soil fertile, preventing soil erosion and meeting diverse food demands of the residents, thereby addressing both food and energy shortages. To facilitate the sustained production of rice, potatoes, wheat, and fruits on sloping land, efforts were made to construct embankments surrounded by orchards and grass. This initiative not only prevented erosion on sloping surfaces but also led to the cultivation of fruits and grains. The establishment of Sloping Land User Groups (SLUGs) generated income and enhanced community cohesion (Swiss Agency for Development and Cooperation, 2016). Park & Park (2017) states that the SLM project had

participation of 300 users across 11 districts. Over 80% of the members are women, benefiting around 10,000 families directly or indirectly. The authors suggest that this project demonstrated regional governments and communities expanding the scope of the project through direct collaboration with contributing agencies.

In terms of ODA projects with significant biodiversity markers, more countries and projects were observed, compared to principal marker (Table 7). The projects span a total of 10 various sectors, Government & Civil Society-general (19.35 million USD), Agriculture (14.57 million USD), Disaster Prevention & Preparedness (7.42 million USD), General Environment Protection (7.11 million USD), Basic Health (4.31 million USD), Other Multisector (1.07 million USD), Post-Secondary Education (0.23 million USD), Conflict, Peace & Security (0.04 million USD), Trade Policies & Regulations (0.04 million USD), Industry (0.04 million USD). The most fund is located in government & civil society-general and agriculture sectors, yet disaster prevention, environmental protection, basic health also remarked as main contributing sector to significant biodiversity marker.

The project with significant biodiversity marker contributions come from Germany (24.36 million USD), Switzerland (14.31 million USD), Ireland (8.19 million USD), Sweden (4.45 million USD), Italy (2.33 million USD), United Kingdom (0.20 million USD), Canada (0.20 million USD), Poland (0.09 million USD), Greece (0.05 million USD). This result shows the top four donors are the same with the principal biodiversity marker, but in different orders. In significant marker, Germany and the Switzerland came across as the main donor, followed by Ireland and Sweden. These countries funded one projects each for the principal biodiversity marker. In significant marker, except for Sweden, Germany, Switzerland, and Ireland funded multiple projects. Overall, these projects reflect a multifaceted approach to addressing environmental challenges in North Korea, emphasizing sustainable agricultural practices, and promoting biodiversity conservation.

Table ODA Projects with Significant Biodiversity Markers

Year	Donors	Project title	Sectors	USD commitment
2005	Germany	Agricultural research	Agriculture	0.74
2014		Community-based Food Security	Basic Health	4.31

		Programme in DPRK- SEWOH		
2016		Promotion of the Korean reconciliation process and regional development	Government & Civil Society-general	8.30
2019		Promotion of the Korean reconciliation process and regional development	Government & Civil Society-general	10.98
2021		Study Grants for doctoral students from Democratic People's Republic of Korea	Post-Secondary Education	0.03
			Sub-Total	24.36
2015	Switzerland	DPRK: CABI, Improved Agroforestry	Disaster Prevention & Preparedness	0.78
2016		Sloping Land Management (SLM)	Agriculture	0.79
2017		DPRK SLDM Sust. Livelihood. Disaster Mitig.	Agriculture, General Environment Protection, Disaster Prevention & Preparedness	12.19
2018				0.56
			Sub-Total	14.31
2013	Ireland	CIVIL SOCIETY PROGRAMME FUNDING SUPPORT SCHEME - 1(a.) sustainable Inc in crop yields on sloping l	Agriculture	1.54
2016		Civil Society Programme Funding: 1(a.) sustainable increase in crop yields on sloping lands, through suitable choice of integrated CA models	Agriculture	0.77
		Civil Society Programme Funding: 2(a) Seasonal workload for crop production is reduced especially for women and poor vulnerable farmers.	Agriculture	0.64
2017		Civil Society Programme Funding: Increased resilience to natural disasters and climate change impacts	Disaster Prevention & Preparedness	0.27
2019		Increased production, access to and utilisation of safe and nutritious food	Agriculture	1.44
		Increased resilience to natural disasters and climate change impacts	Other Multisector	0.211
2020		Increased production, access to and utilisation of safe and nutritious food	Agriculture	0.87
		Increased resilience to natural disasters and climate change impacts	Other Multisector	0.14
2021		Performance-based partnership scheme focusing on quality programming, understanding change and results for poor households and communities	Agriculture, Other Multisector	2.31
			Sub-Total	8.19
2011	Sweden	ITP Climate course	General Environment	0.45

			Protection	
			Sub-Total	0.45
2015	Italy	Improving traditional farming system to concur to food security in Kangwon Province	Agriculture	1.88
2020		Food security in Kangwon Province	Agriculture	0.45
			Sub-Total	2.33
2014	United Kingdom	To provide Chevening scholarships to students from ODA-eligible countries in the region, enabling them to pursue postgraduate study at UK higher education	Post-Secondary Education	0.20
			Sub-Total	0.20
2013	Canada	Support for Responsible Business Conduct in the Extractive Sector	Government & Civil Society-general, Conflict, Peace & Security, Industry, Trade Policies & Regulations, General Environment Protection	0.20
			Sub-Total	0.20
2013	Poland	MORZE Seal counter oil dam: elementary environmental security in port of Chongjin	General Environment Protection	0.10
			Sub-Total	0.10
2005	Greece	Foreigner's Scholarship for Studies in Greece	Other Multisector	0.05
			Sub-Total	0.05

The analysis of biodiversity-related ODA in North Korea reveals a dynamic landscape of international support. Despite North Korea's official stance on independence, it has consistently received foreign aid from Western donors and organizations. The exploration of ODA projects with biodiversity markers demonstrates a diverse array of approaches by donor countries, emphasizing emergency response, water supply, genetic resource management, and sloping land initiatives.

This chapter underscores the significance of ODA in promoting environmental sustainability, especially for biodiversity conservation. However, variations in donor approaches and limited information on some projects highlight the challenges of future cooperation projects. For future success, strategies like inclusive participation among

donors and the North Korean government will be vital. These efforts hold the potential to long-term conservation of biodiversity in the Korean Peninsula, contribute to regional sustainability, and foster shared responsibility for the unique ecosystems in Korea. ODA, particularly focusing on biodiversity, remains pivotal for shaping a sustainable and resilient future amid global environmental challenges.

8 Inter-Korean Biodiversity Cooperation Strategies

8.1 Transboundary Cooperation Governance Principles

In the context of the Korean Peninsula, where the two nations, North and South Korea, have distinct political systems and histories, the pursuit of biodiversity cooperation strategies becomes a compelling avenue for fostering reconciliation, environmental conservation, and mutual understanding. Incorporating lessons learned from the 12 criteria of effective transboundary biodiversity governance (Lim, 2016) and experience from inter-Korean cooperation, transboundary cooperation governance principle form for the Korean Peninsula. The success of such strategies relies on six key principles of inclusive participation, mutual interests, integration, accountability, communication, and institutionalization.

Inclusive Participation

Inclusive participation involves guaranteeing the active engagement of a diverse array of stakeholders, including governmental entities, non-governmental organizations (NGOs), international bodies, local communities, and scientists, as a crucial element for the success of biodiversity cooperation between North and South Korea. In the execution phase of transboundary collaboration, the establishment of joint committees or task forces featuring representation from both Koreas and other countries with a track record in biodiversity-related projects—such as Switzerland, Germany, Sweden, and Ireland—would provide valuable expertise and enhance communication, irrespective of political complexities. In addition to government representatives, the inclusion of scientists, policymakers, and community representatives ensures a broad spectrum of perspectives and expertise.

One specific example of inclusive participation would be SLM project funded by Switzerland presented in biodiversity ODA. SLM in DPRK was reached in 2003 with the aim of advancing ecologically sustainable, economically viable, and socially beneficial practices for the management of sloping land. This involved enhancing soil fertility, preventing soil erosion, and addressing the food diversity requirements of the local population. Starting in 2004, SDC and the Ministry of Land and Environment Protection (MoLEP) introduced Agroforestry with new approaches on SLM by establishing Sloping Land User Groups, consisted of local people. The inclusive participation of foreign aid agency, government, and local people formed legally recognized entity of County Forest Management Board to manage slopes for reforestation and environmental protection and generate income for land user groups through agroforestry. SLM has been recognized as a win-win approach through structural and nonstructural measures in preventing soil erosion and fostering sustainable farming production for households of members of the user groups. In 2012, to enhance sustainability, Disaster Risk Reduction (DRR) and Water Shed Management were piloted for the first time in the field (Swiss Agency for Development and Cooperation, 2016). South Korea can also benchmark the successful SLM project in transboundary cooperation project targeting biodiversity conservation. Similar to SLM project, designing a project with inclusive participation involving DPRK government and local people along with Korean aid agency would be an important factor for long-term project implementation.

Mutual Interests

Mutual interest indicates identifying and targeting common interests that both North and South Korea share in biodiversity conservation. Instances of unsuccessful cooperation, such as the unsuccessful establishment of the DMZ Eco-peace park and the designation of DMZ TBR, highlight the importance of solid mutual interests. Without such shared interests, North Korea may be reluctant to participate, and South Korea may lack motivation to fund projects that do not align with its interests. Emphasizing the significance of biodiversity to the well-being of both nations can facilitate cooperation

based on shared goals, particularly in working towards global biodiversity objectives. Establishing a common goal, such as contributing jointly to global biodiversity targets, can serve as a motivational factor. Drawing from the experience of inter-Korean cooperation, North Korea's interest in risk management related to forest fires and pest control has been identified. Additionally, active engagement in rural income generation projects through Sloping Land Management (SLM) with Switzerland has been recognized in the context of biodiversity-related ODA. Targeting these shared interests in biodiversity cooperation programs can serve as a starting point to discover new potential areas of mutual concern for both countries.

Integration

Biodiversity, encompassing the variety of life on Earth, plays a pivotal role in maintaining ecological balance, resilience, and the overall health of our planet. Recognizing its intricate interconnections with various aspects of human well-being, the approach to biodiversity conservation has evolved into a multi-sectoral framework. This approach acknowledges that the preservation of biodiversity is not solely an environmental concern but extends across diverse sectors such as agriculture, forestry, tourism, health, and disaster preparedness.

Biodiversity targeting projects in DPRK showcases a diverse array of projects and countries spanning 10 sectors, including Government & Civil Society-general, Agriculture, Disaster Prevention & Preparedness, General Environment Protection, Basic Health, Other Multisector, Post-Secondary Education, Conflict, Peace & Security, Trade Policies & Regulations, and Industry. This diversified sectoral approach underscores the interconnectedness of environmental conservation with a comprehensive range of socio-economic and governance objectives, emphasizing the importance of integrating biodiversity considerations across various development sectors. The imperative of integrating biodiversity into economic development plans, land-use policies, and infrastructure projects is evident in ODA projects from Sweden, Ireland, Germany, and Switzerland. This holistic approach ensures that conservation efforts seamlessly align

with broader socio-economic contexts and contribute to the overall sustainability of development initiatives, eventually leading to the successful transboundary cooperation project between two Koreas.

Accountability

Establishing mechanisms for accountability ensures that commitments made by both parties are upheld. Accountability can be assigned by role arrangement of two countries and various stakeholders. Specifically, developing joint monitoring and reporting systems where both Koreas can transparently share progress, challenges, and achievements, fosters a sense of responsibility and mutual accountability.

Communication

Establishing effective communication channels is essential for fostering trust and comprehension between North and South Korea. Biodiversity projects, particularly those involving long-term monitoring, necessitate continuous and regular dialogues, as well as the sharing of data and knowledge. Creating a collaborative platform to exchange research findings, conservation strategies, and environmental data can enhance knowledge dissemination and enable timely project assessments, contributing to the success of cooperative endeavors.

Institutionalization

Institutionalizing cooperation ensures the sustainability of biodiversity efforts beyond short-term agreements. Establishing permanent institutions or frameworks for biodiversity cooperation ensures that collaborative efforts persist across changes in political administrations. The institution solidifies the roles of various participants and plays the role of arbitrator in time of dispute resolution. The institutionalization may

involve creating a joint biodiversity commission, formalizing cooperative agreements, and integrating biodiversity considerations into existing inter-Korean institutions.

8.2 Cooperation Agenda

This study outlines the four cooperation agendas of forest management, water management, symbolic animal or plant management and ecological corridor for the possible immediate cooperation agenda.

Forest management

The inter-Korean cooperation experience shows that two Koreas have experience in forest management. Two countries share many regions with common landscapes, and have experience in co-pest control projects and nursery building projects. The current Kim Jong-Un regime highlights the importance of afforestation and greening of mountains. Considering, there are many rooms for the cooperation regarding the forest management as the forest inhabits multiple ecosystem services and biodiversity habitat.

Water management

Water management efforts center around the Han River can emphasize strategies to safeguard its ecological integrity and promote sustainable usage. Given the river's crucial role as a water source and habitat, initiatives for water management include pollution control, habitat restoration, and sustainable water use practices. These measures are pivotal for ensuring the health of aquatic ecosystems and maintaining the river's significance for both biodiversity and human communities.

Symbolic animal and plant management

Symbolic animal and plant management, particularly the conservation of iconic species like the crane (*Grus japonensis*) and spoonbill (*Platalea minor*), holds significance as symbols of biodiversity conservation. Preserving these emblematic species is not only essential for maintaining biodiversity but also carries cultural and symbolic importance. These species are often indicative of the overall health of ecosystems and serve as ambassadors for broader conservation goals, fostering public awareness and support.

Ecological corridor

The establishment of an ecological corridor, designating specific areas for protection and research can also be a future biodiversity cooperation agenda. Ecological corridors are vital for facilitating the movement of species across landscapes, promoting genetic diversity, and supporting the resilience of ecosystems in the face of environmental changes. Designating and protecting these corridors contribute to the overall connectivity of habitats, enhancing the effectiveness of conservation efforts and enabling scientific research to better understand and address ecological challenges.

9 Conclusion

This study has developed transboundary cooperation principles focusing on biodiversity management in the Korean Peninsula. The research involved four key steps, starting with an analysis of biodiversity issues and policies in North Korea, followed by an examination of Inter-Korean Forest Cooperation Experiences, an analysis of biodiversity targeting ODA in North Korea, and, finally, the formulation of transboundary cooperation principles.

Drawing from the inter-Korean biodiversity cooperation experience, the study identified critical governance principles for transboundary cooperation. The success of such strategies relies on inclusive participation, mutual interests, integration, accountability, communication, and institutionalization. Inclusive participation ensures engagement from diverse stakeholders, while mutual interests emphasize common goals for both North and South Korea. Integration involves linking biodiversity cooperation with other sectors, as demonstrated by biodiversity targeting ODA projects. Accountability mechanisms, such as joint monitoring and reporting systems, establish responsibility. Effective communication channels and institutionalization ensure long-term success and sustainability.

Inter-Korean Biodiversity Cooperation Strategies that incorporate these key elements have the potential to transcend political divides, contribute to regional environmental sustainability, and foster a sense of shared responsibility for the unique ecosystems present on the Korean Peninsula. As both nations recognize the intrinsic value of their natural heritage, biodiversity cooperation can serve as a diplomatic bridge, bringing mutual benefits while addressing shared environmental challenges.

The study outlines a cooperation agenda, focusing on forest management, water management, symbolic animal or plant management, and ecological corridors. Forest management, with a focus on afforestation and pest control, aligns with the current emphasis on greening mountains in North Korea. Water management efforts center

around the Han River, emphasizing pollution control, habitat restoration, and sustainable water use. Symbolic animal or plant management highlights the conservation of iconic species, contributing to cultural and symbolic significance. The establishment of ecological corridors aims to facilitate species movement, promote genetic diversity, and enhance overall ecosystem resilience. Collectively, these four components form a comprehensive agenda that addresses various aspects of biodiversity and promotes cross-border cooperation in the pursuit of environmental sustainability and resilience in the Korean Peninsula.

This comprehensive approach underscores the potential for fostering reconciliation, environmental conservation, and mutual understanding between North and South Korea through transboundary biodiversity cooperation. The identified principles and cooperation agenda provide a roadmap for guiding future collaborative efforts in managing transboundary biodiversity conservation on the Korean Peninsula.

10 Reference

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