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A Sustainability Assessment of Border Areas

The Cases of Biosphere Reserves in Korea and Germany

접경지역 지속가능성 평가: 한국과 독일의 생물권보전지역 사례

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Foreword

The UNESCO designation of the Gangwon Eco-Peace Biosphere Reserve (GWBR) in 2019 marked a judicious conservation effort in border areas, fostering a Sustainable Region that has catalyzed regional economic vitality, elevated the values of a peaceful region, and laid the foundation for internationalization. As we approach the 10-year mark since the inclusion of the GWBR on the UNESCO biosphere reserve list, we are currently formulating detailed plans to respond to the upcoming regular evaluation. This entails assessing the extent of implementation of sector-specific project plans and evaluating the latent potential of the region.

In this pursuit, our research draws inspiration from Germany's proactive border region development and domestic GWBR cases, and has brought us to the development of an assessment tool for sustainable regions. This tool allows for the quantitative evaluation of the growth environment in the designated area. Moreover, this border area sustainability assessment tool transcends the confines of biosphere reserves, and has proven to be a versatile instrument that can be used to evaluate regions facing potential decline. We anticipate the results of this report to serve as crucial reference material for future planning in the designated biosphere reserve and similar areas, contributing significantly to the development of comprehensive and flexible conservation strategies and the promotion of sustainable development in diverse regions.

Finally, the authors would like to express their deep gratitude to Ji-Young Lee, a Research Fellow in KEI's Division for Environmental Planning, Marco Neubert, research associate in Leibniz Institute of Ecological Urban and Regional Development, Sangyong Park, a Director of Center for STC in Gangwon Institute, and the entire research team, as well as the esteemed members of the advisory committee, for their invaluable contributions to this research. Special thanks are extended to Ulrike Schade, the esteemed head of the Thuringian BR administration, for her invaluable support.

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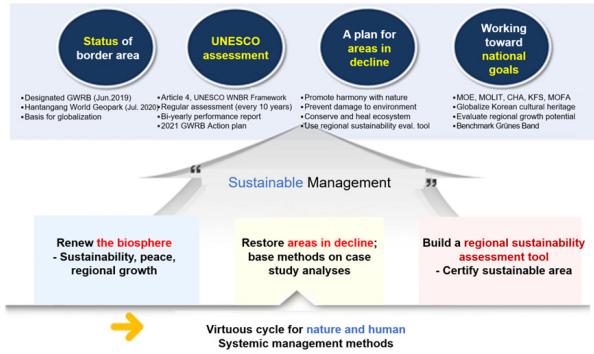
Executive Summary

1. Introduction

❑ Background and purpose of the study

- ㅇ In 2019, UNESCO officially designated five counties in the border region at the watershed of the Taebaek Mountain Range in the northern part of the province of Gangwon-do in the Republic of Korea as the Gangwon Eco-Peace Biosphere Reserve (GWBR).
- ㅇ To guide the development of the area into a global asset, preserve and restore the ecological value of the reserves, and prevent unplanned development, there is a need for concrete guidelines.
- ㅇ The recent designation of the border area in Gangwon Province necessitates the formulation of a novel regional management model, emphasizing the harmonious coexistence of nature and human activities.
  - To realize this objective, it is imperative to develop a comprehensive plan for the management of the border area in alignment with the national responsibilities of relevant ministries.

Figure 1. Policy issues and research objectives



Source: The authors.

- ㅇ The study aims to enhance the value of biosphere reserves in border zones and outline approaches to rejuvenate declining areas.
  - The ultimate aim is to augment the intrinsic value of border areas by cultivating a diversified understanding of various approaches.

❑ Research objectives and scope

- ㅇ The main objective is to delineate the importance of biosphere reserves in border regions and develop strategies to ameliorate flagging areas by examining developmental schemes within those regions.
- ㅇ The study is designed to systematically analyze development cases in border areas and strategically address challenges linked to regional decline.
  - The Grünes Band and GWBR serve as case studies.
- ㅇ The conclusive phase of the research involves the construction and implementation of a regional sustainability assessment tool, accompanied by a pilot assessment intended to validate its efficacy in fostering sustainable growth and development within border areas.

2. Status of Biosphere Reserves in (former) Border Areas

❑ Biosphere reserves in (former) border areas

- ㅇ In this study, the ecological, social, economic, and cultural characteristics of biosphere reserves in South Korea and Germany were analyzed.
- ㅇ This information was then utilized as foundational data for the development of a regional sustainability assessment tool in three chapters.

❑ Review of relevant laws, policies, and plans

- ㅇ This study analyzed the laws, policies, and plans related to biosphere reserves in Germany and South Korea. As a result, four key policy implications were identified.
  - Biosphere reserves implementation plan: Mission, tasks, and necessary resources for stakeholders

- Incorporating the designation and management of biosphere reserves in the Natural Environment Conservation Act of the Ministry of Environment
- Promoting local industry and developing programs that allow communities and local governments to participate in biosphere reserves located in border areas
- Overcoming structural differences between the state-specific administrative bodies of the Rhön biosphere reserve

❑ The value of biosphere reserves in Korea and Germany

ㅇ In the context of sustainable development, the biosphere reserves in South Korea and Germany hold value in the following 12 aspects:

- ① Eradicate poverty (SDG 1), ② Foster healthy living (SDG 3), ③ Provide education & life-long learning opportunities, ④ Ensure safe water and hygienic sanitation, ⑤ Guarantee access to energy, ⑥ Promote robust economic growth, ⑦ Promote sustainable industrialization, ⑧ Promote sustainable consumption and production patterns, ⑨ Promote action to address climate change, ⑩ Protect and restore terrestrial ecosystems and halt biodiversity loss, ⑪ Achieve peaceful and inclusive societies, rule of law, and effective institutions, and ⑫ Strengthen means of implementation and global partnerships.

3. Border Area Case Study Analyses

❑ Case study analyses in relevant areas

ㅇ The criteria for selecting a pilot evaluation site include administrative districts at the Myeon level in Korea and Gemeinde level in Germany.

- Sites with available administrative statistics and relevant data are prioritized, and consideration is given to comparable characteristics like population density, natural resources, and industrial sectors. Additionally, preference is given to areas with active community involvement and collaborative relationships between local governments.

ㅇ The selected pilot evaluation sites are as follows:

- In Korea, the target GWBR areas are coastal regions and Yanggu-gun, home to several active community businesses, as well as Sangnam-myeon in Inje-gun.

- In Germany, the selected areas are the Dermbach municipality in the district of Wartburgkreis and the municipality of Rhönblick in the district of Schmalkalden-Meiningen, located in the province within the Rhön BR (Hessen, Bayern, Thüringen), where the UNESCO-BR Rhön's visitor center is situated.

❑ Development of a regional sustainability assessment tool using a scoring model

ㅇ The development of regional sustainability assessment tools utilizing scoring models involves the systematic formulation and implementation of evaluative frameworks designed to gauge the ecological, social, and economic dimensions of sustainability within a specific geographic area.

- The final selection of indicators for the regional sustainability assessment tool, constructed through an analysis of status data within the pilot evaluation target area, necessitates the development of a comprehensive assessment model.
- This model incorporates indicators at the eup (읍), myeon (면), and Gemeinde levels, which are representative of the smallest administrative districts within the designated pilot assessment area.
- This model covers both macro- and micro-levels within each spatial hierarchy, resulting in a total of 60 indicators distributed across 13 sectors.
- At the macro level, six sectors have been identified that integrate ecological and cultural resources.
- Each sector contains 4 to 6 indicators. At the micro level, seven sectors have been delineated, each composed of 2 to 8 indicators.

ㅇ The four sites (Haean-myeon in Yanggu-gun, Sangnam-myeon in Inje-gun, Wartburgkreis Dermbach, Schmalkalden-Meiningen Rhönblick) under evaluation were assessed and scored based on the direction of each subcriterion.

ㅇ Using the resulting scores, it is possible to comparatively evaluate the area under assessment and identify priority areas for improvement in an objective manner.

4. Pilot Testing

❑ Establishing directions for evaluation directions

ㅇ The establishment of evaluation methods involves determining the evaluation criteria for each indicator within each sector through consultation with internal and external researchers.

- The criteria include considerations such as the existence of relevant legal plans and building plans, distance from administrative centers (district offices, community centers) to the relevant facility, and the ratios of official indicators specified in administrative statistics.

❑ Pilot assessment results

ㅇ The comparative analysis of results reflecting assigned weights reveals divergent scores among the assessed regions.

- On a scale of 5 points, Haean-myeon obtained 3.44 points, Sangnam-myeon scored 3.362 points, Dermbach achieved 3.133 points, and Rhönblick secured 3.287 points. Notably, the values for the two regions within GWBR surpass the average, categorizing them into the upper-middle group (middle group: 1.66 to 3.33, upper group: 3.33 to 5).
- Within the four regions, Rhönblick attained the highest Macro score (1.61) within the Rhön biosphere reserve, attributed to a population increase since 2020, notwithstanding the absence of planned expressways or railways until 2029.
- An examination of the Yanggu-gun coastal area within GWBR from a macroscopic standpoint unveils lower values for sustainable transportation and the built environment (0.287) and conservation of natural and historical-cultural resources (1.140). Conversely, from a microscopic perspective, diminished values are evident for sustainable economy (0.239) and leisure and cultural resources. The pinnacle value is observed in conservation (0.484), surpassing the total score of Sangnam-myeon, Inje-gun (3.362) by 0.78 points. This implies a necessity for enhancements to reveal and invigorate regional potential at the Yanggu-gun level.

5. Conclusion and Implications

- Ensuring objectivity in the quantitative and qualitative assessment of ecological, historical, socio-cultural, and economic value within declining areas is paramount. Strategies to preserve regional potential in these declining areas can be extrapolated in consideration of each sector. The incorporation of evaluation indicators facilitates the development of a case model for sustainable regional development in declining areas.
- The refinement of evaluation indicators encompasses the systematic acquisition, thorough review, and incorporation of statistical data established by local governments in Germany and other pertinent countries to ensure an objective international comparison. This process includes the application of detailed indicators at Level 4, allowing for the qualitative evaluation of statutory plans and related aspects. Additionally, there is an undertaking to expand and develop the Sustainable Regional Certification System, alongside the extension of the Regional Sustainability Assessment Tool from the building-level green building certification system (G-SEED) to the regional level.
- Prospective improvement measures may encompass the refinement of evaluation indicators, entailing the systematic acquisition, meticulous review, and incorporation of statistical data established by local governments in Germany and other pertinent countries to facilitate an objective international comparison. In addition, detailed indicators (Level 4) could be applied to facilitate the qualitative evaluation of statutory plans and related factors.

Keywords: Regional Sustainability Assessment Tool (RSAT), Biosphere Reserves, Border Areas in Korea and Germany, Case Study, Pilot Testing

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Abbreviations and Acronyms

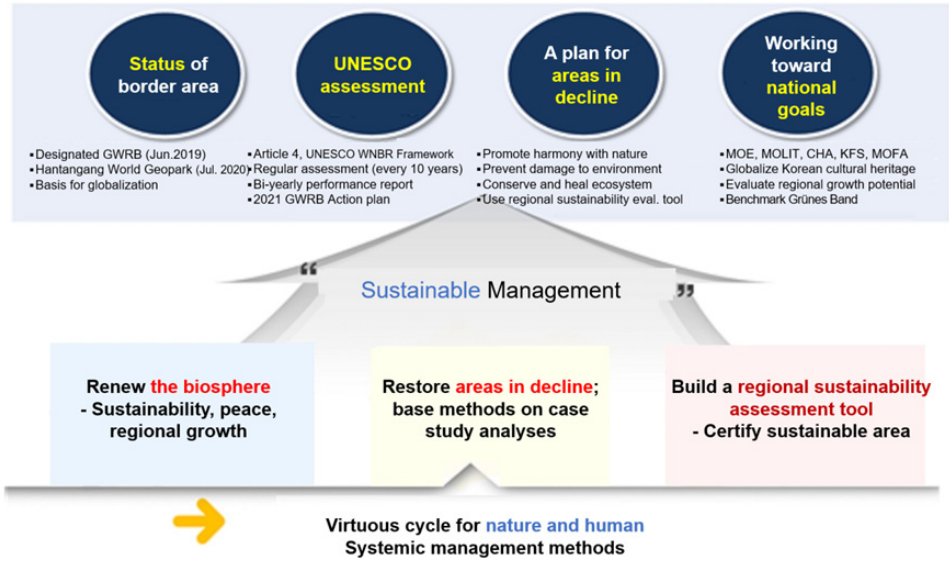
BfN	Bundesamt für Naturschutz
FFH	Fauna-Flora-Habitat
FFH-RL	Fauna-Flora-Habitat-Richtlinie, Fauna-Flora-Habitat Guideline
RSAT	Regional Sustainability Assessment Tool

1 Introduction

1.1 Background

In 2019, UNESCO officially designated five counties in the border region at the watershed of the Taebaek Mountain Range in the northern part of the province of Gangwon-do in the Republic of Korea as the Gangwon Eco-Peace Biosphere Reserve (GWBR). In the years since, the region has sought to establish a foundation for pursuing sustainability, economic growth, regional value, and globalization. A year later, in July 2020, UNESCO recognized the Hantangang River as a global geopark by UNESCO.

Figure 1. Policy issues and research objectives



Source: The authors.

To guide the development of the area into a global asset, preserve and restore the ecological value of the reserves, and prevent unplanned development, there is a need for concrete guidelines. Planning strategies aimed at conserving, developing, and supporting the GWBR can draw inspiration from the Lima Action Plan (2016-2025) and the Korean Man and Biosphere (MAB) strategy. In this context, the terms preservation, utilization, and support, as per the Korean Sustainable Development Goals (K-SDG), carry the following implications.

- Conservation: Conserve marine and land ecosystems, restore vitality of ecological layers
- Utilization: Achieve economic growth through the efficient use of resources, create quality jobs
- Support: Strengthen various global partnerships (global BR network)

The recent designation of the border area in Gangwon Province necessitates the formulation of a novel regional management model, emphasizing the harmonious coexistence of nature and human activities. To realize this objective, it is imperative to develop a comprehensive plan for the management of the border area in alignment with the national responsibilities of relevant ministries. The proposed measures should adhere to the plans and projects of the GWBR, under the purview of the Ministry of Environment (MOE), Ministry of Land, Infrastructure and Transport (MOLIT), Cultural Heritage Administration (CHA), Korea Forest Service (KFS), Ministry of Foreign Affairs (MOFA), and Gangwon provincial agencies. This strategic plan must encompass long-term visions, objectives, and assessment systems to ensure the sustainable and balanced development of the region.

Table 1. Related government agencies and national agenda

Agencies	Relevance
MOLIT	- Promote regional development of areas in decline by utilizing cultural heritage and assets - Build housing and community infrastructure
CHA	- Suggest support measures for residents in protected areas - Invigorate the local economy by utilizing cultural heritage in a sustainable way and building a virtuous cycle (conservation-utilization-value creation)
MOIS	- Improve quality of life in rural communities - Initiate rural area restructuring projects (400 areas by 2031)
MOE	- Support biodiversity conservation with activities - Restore natural ecosystems on fallow and damaged lands
MOFA	- Contribute to achieving SDGs

Source: The authors.

Figure 2. GWBR designation-related plans

Source: Gangwon Institute (2021).

UNESCO conducts status assessments of biosphere reserves a decade after official designation, which requires relevant agencies to devise action plans. Evaluating the progress of these plans is imperative. This report conducts two case studies: one of the Grünes Band in Germany and one on the GWBR in the Republic of Korea. The regional sustainability assessment tool (RSAT) described later in the work is based partially on the findings of these studies. The results of evaluations made using the RSAT can be leveraged to enhance efficiency in regional growth. Moreover, the RSAT can serve as a valuable instrument for analyzing the growth potential of areas experiencing decline.

Figure 3. The urgency of the research

Source: Gangwon Institute (2021).

1.2 Research objectives and scope

The study aims to enhance the value of biosphere reserves in border zones and outline approaches to rejuvenate declining areas. The Grünes Band and GWBR serve as case studies. The main objective is to delineate the importance of biosphere reserves in border regions and develop tactics to ameliorate flagging areas by examining developmental schemes within those regions. A preliminary version of the Regional Sustainability Assessment Tool will be established and tested to evaluate its effectiveness.

The study will outline techniques for managing sustainable regional development in border areas, addressing issues such as the utilization of regional resources, contemporary marketing strategies, and eco-friendly technologies. Additionally, the study integrates green infrastructure based on Nature-Based Solutions (NbS).

The study aims to assess the growth potential of border regions, many of which are in some stage of decline. Emphasis is placed on identifying resources to vitalize local-development.

Table 2 outlines the key contributions of this work to the literature. This paper describes a specialized regional sustainability assessment tool (RSAT) tailored for biosphere reserves situated in border areas. The research methodology encompasses a meticulous analysis of contemporary theories and policies, supplemented by targeted interviews with focus groups to elicit valuable insights. The investigation entails a comprehensive examination of both domestic and international instances of border area development, with the overarching goal of creating an all-encompassing tool.

The ultimate aim of the work is to augment the intrinsic value of border areas by cultivating a diversified understanding of various approaches. The study is designed to systematically analyze development cases in border areas and strategically address challenges linked to regional decline. The work describes the construction and implementation of RSAT and the results of a pilot assessment intended to validate its efficacy in fostering sustainable growth and development within border areas.

Table 2. Literature review summary and main contributions of the study

Research		Content		
		Purpose	Methods	Content
Literature review	1	- Title: GWBR action plan - Author: Sangyong Park (2021) - Purpose: Prepare for UNESCO's after-10-year assessment and biennial performance reports	- Analyze policies and projects - Survey residents - Consult government agencies	- Establish a vision and action plans for five counties in GWBR

Table 2. (continued)

Research		Content		
		Purpose	Methods	Content
	2	- Title: An Analysis of Land-Use and Land-Cover Change Exemplified at Korean Demilitarized Zone (DMZ) and Inner-German Green Belt Based on Historical Map Database (Part II) - Author: Oh-seok Kim (2019) - Purpose: Analysis and projection of the DMZ land cover map, including changes based on restored historical maps	- Study historical documents - -Build DMZ land cover data through geographical information systems and collect data on DPRK's population	- Develop methodology for building environmental and spatial data using historical maps - Research the case of German DMZ - Forecast the utilization of the western area of DMZ
	3	- Title: Erlebnis Grünes Band - Author: BfN (2011) - Purpose: Information sharing on tour programs to Grünes Band biosphere reserves	- Research local status - Conduct interviews	- Study tourism in Grünes Band - Suggest methods for developing tourism in biosphere reserves - Make projections
This study		- Develop a regional sustainability assessment tool for biosphere reserves in the border area	- Study trends in theory and policy - Interview focus groups - Research domestic and foreign cases of border area development - Develop a regional sustainability assessment tool	- Raise the value of border areas - Analyze border area development cases to overcome regional decline - Build a regional sustainability assessment tool and conduct a pilot assessment

Source: The authors.

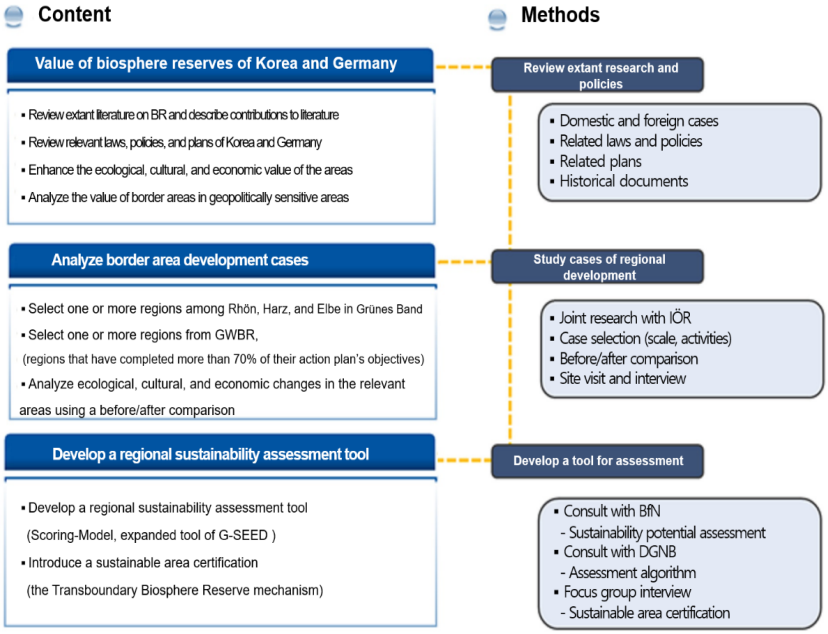
The scope of the study is visualized in Figure 4. The exploration of biosphere reserves in the border areas of Korea and Germany includes a thorough examination of theoretical and policy trends. This investigation entails a thorough review of existing research on biosphere reserves in the border areas, with a particular emphasis on identifying academic contributions. The analysis involves examining the relevant laws, policies, and plans of both Korea and Germany. The aim is to increase the ecological, cultural, and economic worth of these regions while taking into account their geopolitical sensitivity.

The study examines border area development cases, focusing on Rhön, Harz, and Elbe regions in Grünes Band, as well as areas from the GWBR that have achieved over 70% of the objectives outlined in their related action plans. To analyze ecological, cultural, and economic shifts, the investigation employs before/after comparisons.

A crucial aspect of the investigation centers on the design and implementation of the aforementioned RSAT. This tool, an extension of G-SEED tailored to evaluate individual structures, can be used to appraise the potential for sustainable development in regions that border one another. To support this objective, our research strategy incorporates the introduction of sustainable area certification and utilization of the Transboundary Biosphere Reserve mechanism in regional development planning. The approach we employ aims to enhance sustainability while upholding the principles of sound regional planning.

Some of the key research outcomes are as follows. First, the paper includes a detailed report on biosphere reserve management in bordering regions, integrating important insights from relevant regional development planning case studies. In addition, the creation and testing of a regional tool for assessing sustainability will aid in achieving the ultimate objective of promoting sustainable management practices in these vital border areas.

Figure 4. Core content of the research



Source: The authors.

The implementation and utilization of the preliminary version of the RSAT have the potential generate significant practical and academic impacts. In practical terms, the tool will play a critical role in the creation of detailed plans designed to enhance UNESCO's status assessment of biosphere reserves and facilitate the implementation of improved management strategies. RSAT can also be used to evaluate the sustainable growth potential of areas experiencing decline, providing valuable insights for revitalization efforts. In addition, RSAT can be employed in the establishment of certification systems for sustainable areas.

Academically, the tool can be utilized to enhance the ecological, cultural, and economic value of border areas, while providing substantial contributions to the understanding and promotion of sustainable development in these regions. Doing so may yield valuable insights and strategic recommendations for sustainable development cases in border areas, establishing a strong academic foundation for the advancement of eco-friendly practices and cultural preservation.

1.3 Research methodology

This study uses several methodologies, including a critical survey of current research and policies related to biosphere reserves in border areas. The joint research efforts carried out in collaboration with the Leibniz Institute of Ecological Urban and Regional Development (IÖR) concentrate on specific case studies regarding the development of border regions. The results of comprehensive research on areas within Grünes Band and the GWBR are major components of this work.

Several organizations, including the German Federal Agency for Nature Conservation (Bundesamt für Naturschutz, or BfN) and the German Sustainable Building Council (Deutsche Gesellschaft für Nachhaltiges Bauen, or DGNB) contributed valuable insights to this study, making significant improvements to RSAT. Consultations with these organizations focused on providing guidance regarding the selection of evaluation indicators, factors, and algorithms used for RSAT. The study also employs a qualitative approach, and this report describes the results of focus group interviews to explore perspectives on the possible implementation of a certification system for designating sustainable areas.

Figure 5. Institutes and researchers

Institutes and researchers	Roles	Responsibilities
KEI 한국환경연구원 Korea Environment Institute Dr.-Ing. Ji-Young Lee / Dr. Jiyoon Song / Seul-ki Song	Host	✓ Overall management ✓ Conduct a pilot assessment in Korea
Leibniz Institute of Ecological Urban and Regional Development · Gangwon Institute Dr. rer.nat Marco Neubert / Ph. D. Sangyong Park	Joint research institute	✓ (IOER)Case study of border area development in Germany ✓ (IOER)Conduct a pilot assessment in Germany ✓ (GI) Case study of border area development in Korea ✓ (GI) Advice on GWBR case

Source: The authors.

2 The Status of Biosphere Reserves in (former) Border Areas

2.1 Biosphere reserves in border areas

The purpose of biosphere reserves supported by the World Network of Biosphere Reserves under the Man and Biosphere Program is to promote regional sustainable development by increasing biodiversity, improving the quality of life of local residents, and improving social, economic, cultural, and environmental conditions in an integrated manner.[1] In planning of the biosphere reserves, three main functions of conservation, logistical support, and development are integrated, and these three functions are pursued through three main zones: core areas, buffer areas and transition areas.[2]

Figure 6. Three main zones of the Biosphere Reserves

Source: UNESCO, "What are Biosphere Reserves?", accessed on November 23, 2023.

1) Kim (2021), p.2.
2) UNESCO, "What are Biosphere Reserves?", accessed on November 23, 2023.

Table 3. Definition of main functions and zones of the Biosphere Reserves

Functions and zones	Description
Three main functions	- Conservation of biodiversity and cultural diversity - Sustainable economic development - Logistical support for underpinning development through research, monitoring, education and training
Three main zones	- Core Areas: Strictly protected zones that contribute to the conservation of landscapes, ecosystems, species and genetic variation - Buffer Zones: Areas that surround or adjoin one or more core areas, and are used for activities compatible with sound ecological practices that can reinforce scientific research, monitoring, training and education. - Transition Areas: Transition areas are where communities foster socio-culturally and ecologically sustainable economic and human activities

Source: UNESCO, "What are Biosphere Reserves?", accessed on November 23, 2023.

The Biosphere Reserves in Border Areas are essentially cooperation programs in non-political domains such as the environment, devised to resolve conflicts and build long-lasting relationships in border areas susceptible to military and political conflict.[3)]

In this chapter, we will examine the current status of biosphere reserves in the border areas of South and North Korea and former East and West Germany, focusing on the purpose and function of biosphere reserves.

3) Heo (2021), p.46.

2.1.1 South Korea

As of 2020, eight biosphere reserves have been designated in South Korea, of which the aforementioned Gangwon Eco-Peace Biosphere Reserve and Yeoncheon Imjin River Biosphere Reserve are designated in the border area known as the Korean Demilitarized Zone (DMZ).[4)]

Figure 7. Biosphere reserves in South Korea

Source: Kim (2021), p.6.

The DMZ was created in July 1953 as part of the armistice agreement between North Korea and South Korea, serving as their border. It runs along the 38th parallel for 250km and has an average width of 4 km, with buffer areas on each side that extend its area; these buffer zones run from 4-16 km. Despite covering less than 0.5% of the peninsula's total area, the DMZ is ecologically important and contains a diverse range of ecosystems. The DMZ is considered a treasure trove of

4) Kim (2021), p.6.

ecosystems as it encompasses diverse examples of almost every type of biome found on the Korean peninsula. It was originally an agricultural region and supported the capital cities of two kingdoms in the past. Today, it is a heavily militarized zone that separates families and nations. In other words, the DMZ has multiple layers of meaning that make it difficult to understand, but it is clear that it holds cultural significance as both a repository of historical tragedies and as an ecological treasure. Against this backdrop, in 2019 much of the DMZ's southern boundary area was included in the UNESCO Man and Biosphere (MAB) reserve system.[5)]

Figure 8. Various landscapes in the DMZ

Notes: A: Razor wire and landmine warning sign in the DMZ.
B: Yellow-throated martens in the DMZ.
C: At the Third Infiltration Tunnel Site as an ecological tourist site in the DMZ.
Source: Brady (2021), pp.191-192, p.204.

(1) The Gangwon Eco-Peace Biosphere Reserve[6)]

The Gangwon Eco-Peace Biosphere Reserve (GWBR) is a mountainous area of 182,815 hectares located in the watershed of the Taebaek Mountain Range in northern Gangwon Province. It shares a border with the southern boundary of the DMZ to the north and extends toward the eastern coast of the Korean Peninsula. This reserve is a habitat for a diverse range of rare and endangered plant and animal species.[7)] The GWBR area is the nexus where the DMZ Ecological Axis, the

5) Brady (2021), pp.191-195.

6) This section is written based on the Final Report on the Study for the Establishment of the Detailed Management Plan for the UNESCO Gangwon Ecology Peace Biosphere Reserve (GWBR), conducted by Gangwon Province in 2021.

7) UNESCO, "18 New Sites Join UNESCO's World Network of Biosphere Reserves", accessed on

Baekdudaegan Ecological Axis, and the Island Coastal Ecological Axis intersect, and represent the three core ecological pillars of the Korean Peninsula, as designated by the MOE. They are rich in biodiversity and home to many species representative of the Korean Peninsula.[8)]

Figure 9. Current status of three key ecological axes and ecological conservation areas on the Korean Peninsula

Source: Gangwon Province(2021), p.88.

The core areas, buffer zones, and transition areas of GWBR were constructed based on the criteria in Table 4. The GWBR places significant emphasis on the strict conservation of its ecological resources. To achieve this, the core areas have been designated by selecting areas that necessitate intensive protection, including existing legal protection areas corresponding to different sectors (environment, forests, and cultural assets). The core areas aim to prioritize the preservation and safeguarding of the GWBR's ecological assets. The buffer zones were established to encase the

November 23, 2023.

8) Gangwon Province (2021), p.87.

migratory paths of rare and endangered animals and plants, in close proximity to the core areas. This arrangement facilitates their crucial role in effectively safeguarding the ecological environment by enabling seamless protection and conservation measures. Lastly, the transition areas within the GWBR are hubs designated for regional economic activities and income generation programs for local communities. They are envisioned as areas where business initiatives tailored to the region, such as community enterprises and eco-tourism, are planned to contribute to the overall economic revitalization of the entire area.[9)]

Table 4. Establishment criteria for GWBR zones

Zones	Establishment Standard	Description
Core Areas	Ecologically important areas	- Regions with exceptional ecological value, high conservation significance, and that serve as habitats for rare/endangered species
	Legal protection areas	- Protected areas designated based on five domestic laws,* wetland protection areas, wildlife protection districts, cultural heritage protection zones, forest conservation zones, and the Baekdu-daegan protected area
Buffer Zones	Ecologically important areas	- Areas surrounding core areas that protect their ecological environment and other features - Areas of ecological value and movement corridors for rare and endangered wildlife
Transition Areas	Regional economic zones and residential areas	- Residential, industrial, and/or commercial areas surrounding the core areas and buffer zones
	Regional economic Revitalization Zones	- Areas designed to facilitate income generation for local communities utilizing ecological resources, such as ecotourism and community-based businesses

Note: *Baekdu-daegan Protection Act, Cultural Heritage Protection Act, Forest Protection Act, Wetlands Conservation Act, Wildlife Protection And Management Act.
Source: Gangwon Province (2021), p.60.

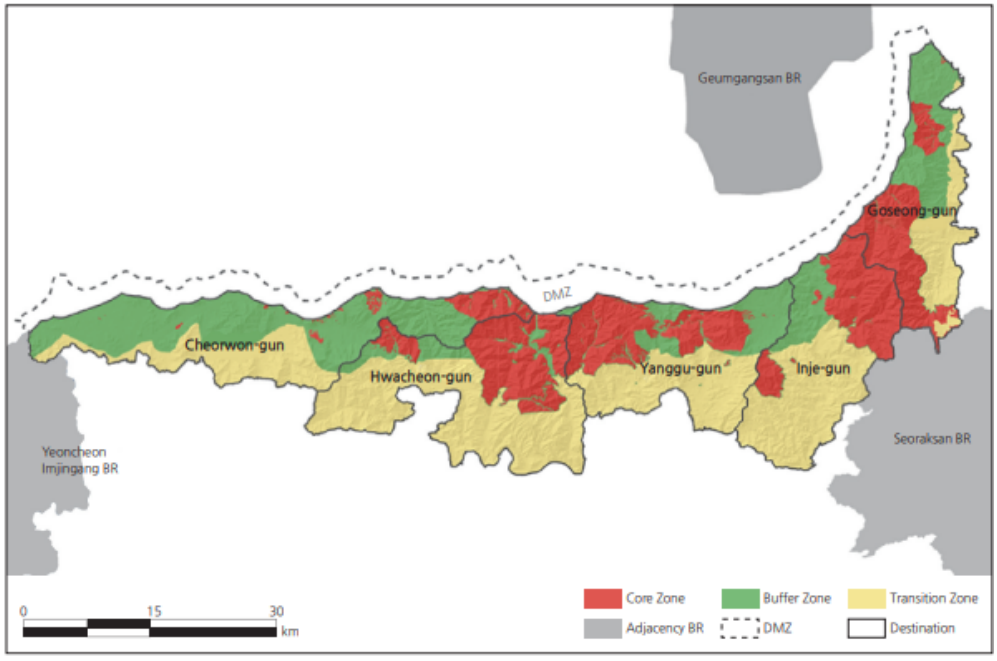
9) Gangwon Province (2021), pp.60-64.

Table 5. Surface area of the GWBR

Zoning	Total	Cheorwon -gun	Hwacheon -gun	Yanggu -gun	Inje-gun	Goseong -gun
Total	182,815	42,209	42,725	34,623	33,941	29,317
Core Areas (ha)	50,671	3,413	12,462	12,092	11,306	11,398
Buffer Zones (ha)	53,256	27,074	4,080	7,718	5,076	9,308
Transition Area (ha)	78,888	11,722	26,183	14,813	17,559	8,611

Source: Ministry of Environment (October 1, 2018), p.3.

Figure 10. GWBR zones



Source: National Geographic Information Institute (2020), p.98.

(2) Ecological characteristics of the GWBR

The GWBR is one of the key ecological axes of the Korean Peninsula, and possesses a diverse range of environmental landscapes, including flatlands in the west, mountains, in the east, as well as plains, grasslands, farmlands, rivers, and moorland. Moreover, it serves as a significant stopover location along bird migration routes in East Asia. It is home to a variety of flora and fauna, including endangered species. This remarkable variety makes it a valuable conservation site and a great source of academic research opportunities, given its diverse ecosystems.[10)]

Table 6. Major biota of the GWBR

Type	Description
Vegetation	- Within the GWBR area, a total of 86 species, including endangered wildlife and endemic plants, inhabit and thrive in their respective habitats. - Total of 40 species of endangered plants, including *Aconitum koreanum, Ranunculus kazusensis, Paeonia obovata, Astilboides tabularis, Cirsium setidens, Eleutherococcus senticosus, Lilium dauricum, Menyanthes trifoliata, Cicuta virosa* and so on. - Total of 81 species of plants native to the Korean peninsula, including *Asarum glabrata, Clematis brachyura, Clematis trichotoma, Thalictrum actaefolium, Berberis koreana, Celtis choseniana, Echinosophora koreensis* and so on. - The habitat for *Echinosophora koreensis* located within the GWBR Yanggu-gun site is designated and protected as Natural Monument No. 372.  *Echinosophora koreensis*

10) UNESCO, "Gangwon Eco-Peace Biosphere Reserve, Republic of Korea", accessed on November 23, 2023.

Table 6. (continued)

Type	Description
Mammals	- A total of 13 species, including endangered species and Natural Monuments within the GWBR area - Several Level I endangered species, including *Naemorhedus caudatus, Moschus moschiferus, Lutra lutra, Myotis formosus,* and *Ursus thibetanus* - Several Level II endangered species, *Martes flavigula, Prionailurus bengalensis, Pteromys volans,* and *Mustela nivalis* - Among them, *Naemorhedus caudatus, Moschus moschiferus, Lutra lutra, Myotis formosus, Ursus thibetanus* and *Pteromys volans* are also designated as Natural Monuments.  *Naemorhedus caudatus* and *Lutra lutra*
Birds	- A total of 53 species, including endangered species and Natural Monuments within the GWBR area - Several Level I endangered species, including *Grus japonensis* and *Haliaeetus albicilla* - Several Level II endangered species, including *Anser fabalis, Accipiter gularis, Aegypius monachus, Dryocopus martius*, and *Emberiza yessoensis* - Several species designated as Natural Monuments, including *Aix galericulata, Aegypius monachus, Grusvipio, Grus monacha, Accipiter nisus,* and *Accipiter gentilis*  *Anser fabalis* and *Accipiter gularis*

Table 6. (continued)

Type	Description
Amphibians and reptiles	- Several endangered species, including *Hyla suweonensis* (Level I), *Kaloula borealis*(Level Ⅱ), *Chinemys reevesii*(Level Ⅱ) and *Elaphe schrenckii*(Level Ⅱ) - Among them, *Chinemys reevesii* is designated as Natural Monument No. 453.   *Kaloula borealis* and *Elaphe schrenckii*
Fish	- A total of 33 species, including endangered species and Natural Monuments within the GWBR area - Several endangered Level II species, including *Rhynchocypris semotilus, Brachymystax lenok tsinlingensis, Cottus hangiongensis, Pungitius sinensis, Gobiobotia brevibarba, Pseudopungtungia tenuicorpa, Acheilognathus signifer, Lethenteron reissneri,* and *Lethenteron japonica* - *Hemibarbus mylodon* is designated as Natural Monument No. 259.   *Gobiobotia brevibarva* and *Gobiobotia macrocephalus*
Insects	- Several endangered species, including *Aporia crataegi, Fabriciana nerippe* - Several Korean endemic species including *imenitis helmanni Lederer, Piletoceraluteosignata Park, Stenopsyche marmorata Navas, Leptocarabus koreanus koreanus Reitter, Panorpa coreana,* and *Trichocera latilobata*   *Aporia crataegi* and *Leptocarabus koreanus koreanus Reitter*

Table 6. (continued)

Type	Description
Benthic invertebrates	- A total of 12 endemic Korean species, including *Ephemera separigata, Rhoenanthus (Potamanthindus) Coreanus,* and *Semisulcospira forticosta* within the GWBR area   *Ephemera separigata* and *Semisulcospira forticosta*

Source: Gangwon Province (2021), pp.93-195.

The GWBR strictly restricts human economic activity due to various domestic laws regulating indiscriminate development in the area following the Korean War. Consequently, the site's natural landscape is well-preserved. Regarding administrative districts, Cheorwon-gun within the GWBR features a flat terrain, comprising rice paddies, grasslands, rivers, wetlands, and mountains. Notably, Cheorwon-gun plays a vital role as a stopover for East Asian migratory birds along their migration route. Hwacheon-gun, Yanggu-gun, Inje-gun, and Goseong-gun, all within the GWBR, have pristine forests ecologies. These regions are home to temperate forests, including deciduous broad-leaved forests, coniferous forests, and mixed forests. The MOE has assigned these forests its top rating on its ecological and natural map of Korea. These sites also have developed unique wetlands.[11)]

11) Gangwon Province (2021), p.196.

Table 7. Major natural ecosystems of the GWBR

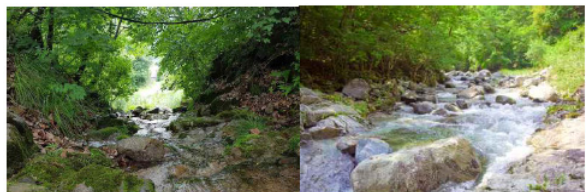
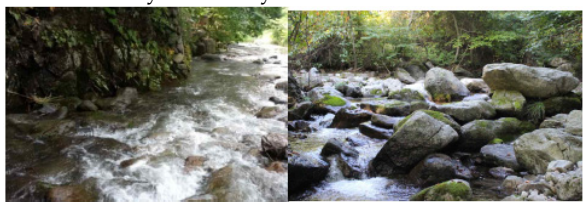
	Description
Cheorwon-gun	- Home to a Cheontong-ri migratory bird sanctuary, large wetland area near the Yongyang weir, and Jaesongpyeong Plain of Mt. Soi.  Cheontong-ri and Dongsong Reservoir  Large wetland area near the Yongyang weir and Jaesongpyeong Plain of Mt. Soi
Hwacheon-gun	- Home to Bisugumi Valley, Ice Valley, Yanguidae Wetlands, and Hwarang Valley  Bisugumi Valley and Ice Valley  Ttansan Mountain and Yanguidae Wetlands

Table 7. (continued)

	Description
Yanggu-gun	- Home to Dutayeon Valley, the Punchbowl, Palang Falls, and Yangsu Rock Valley  Dutayeon Valley and the Punchbowl  Palang Falls and Yangsu Rock Valley
Inje-gun	- Home to Daeamsan and Daeusan Mountains Natural Reserve and Dragon Marsh  - Daeamsan and Daeusan Mountains Natural Reserve and Dragon Marsh
Goseong-gun	- Home to the Natural Reserve of Hyangnobong Peak and Geonbongsan Mountain and the Jinburyeong pass  Natural Reserve of Hyangnobong Peak and Geonbongsan Mountain and the Jinburyeong pass

Source: Gangwon Province (2021), pp.196-207.

(3) Socioeconomic and cultural characteristics of the GWBR

The GWBR consists of 5 gun (counties), and the total population sat at 27,698 as of 2018.

Table 8. Population of the GWBR (2018)

Gun	Total population (person)	In GWBR (person)	Ratio (%)
Cheorwon-gun	46,686	12,226	26.19
Hwacheon-gun	25,720	4,133	16.07
Yanggu-gun	23,474	5,048	21.50
Inje-gun	32,298	4,408	13.65
Goseong-gun	28,114	1,883	6.70
Total	156,292	27,698	17.72

Source: Gangwon Province (2021), p.207.

Within the GWBR, there are 29 so-called Minbuk villages, products of the division of the South and the North, which was formed within the Civilian Access Control Zone.[12)]

The Minbuk villages are distinguished from other rural villages due to their unique tangible and intangible heritage, including collective experiences and memories related to therelated to the Korean war and the postwar division, as well as their distinctive landscapes and environments. Modeled after Israel's kibbutz system, the Minbuk villages bear a resemblance to Mödlareuth, the "divided village" on the border between the German states of Bavaria and Thuringia.In the South, these villages operate both as genuine agricultural communities and as instruments of propaganda against the North. People are incentivized to settle in these communities with offers of land and housing, but this has occasionally resulted in conflicts between long-time residents and newcomers over property rights. In the Minbuk villages adjacent to the DMZ, military installations exist side-by-side with

12) Gangwon Province (2021), pp.215-216.

nature. These landscapes remain inaccessible to the general public, embodying the legacy of the Cold War and serving as intangible heritage that vividly represents the division of the Korean Peninsula. These villages too are in possession of tangible cultural heritage.[13)]

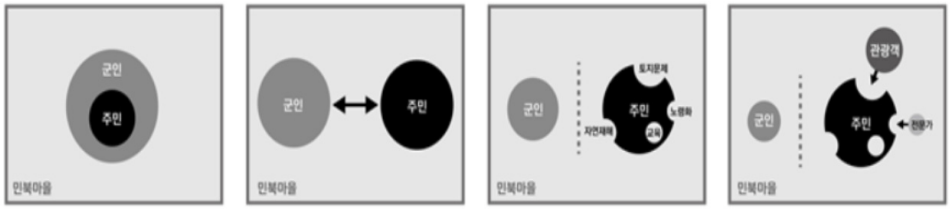
Figure 11. An air raid shelter and checkpoint in Igil-ri

Source: Park, Yun, and Zoh (2020), p.99.

The communities in the Minbuk villages have undergone significant changes over time. Until the 1970s, the daily lives of residents in these villages were tightly regulated by the military. However, with shifting relations between the two Koreas in the 1990s, these controls gradually relaxed, reaching a point where the military only managed passage in and out of the villages. Nonetheless, during this period, the village communities began to encounter demographic challenges such as aging, which weakened community dynamics. From the 2010s onwards, the Minbuk villages started to see physical improvements due to public support projects. Additionally, the villages sought alternative sources of income, branching out into tourism alongside their traditional agricultural activities. This transformation attracted a new influx of tourists and experts to the Minbuk villages, contributing to their revitalization and overall transformation.[14)]

13) Park, Yun, and Zoh (2020), pp.90-100.
14) Park, Yun, and Zoh (2020), p.101.

Figure 12. The changing community of Minbuk villages over time



Source: Park, Yun, and Zoh (2020), p.101.

Next, the GWBR is subject to strict land use regulations under various environmental, forestry, agricultural, cultural, and military laws (Table 9). Regulations govern land use over 4,349,800 ha within GWBR. This figure represents 235.28% of the entire GWBR administrative area, suggesting significant regulatory overlap.[15)]

Table 9. Laws regulating land use within the GWBR

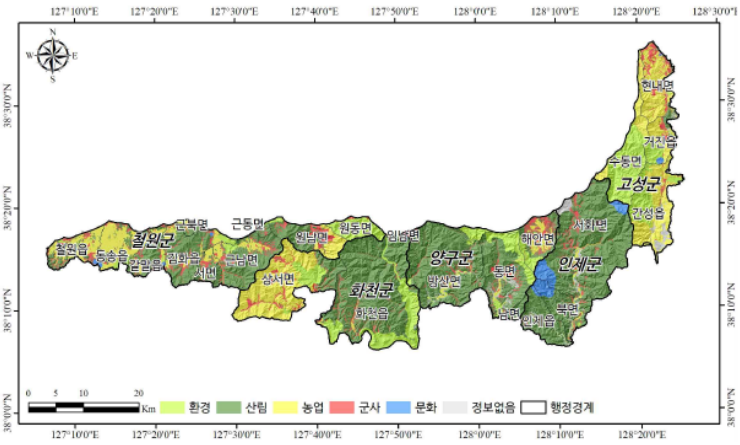
Field	Law
Environment	- Natural Parks Act - Natural Environment Conservation Act - Wildlife Protection and Management Act - Promotion of Installation of Waste Disposal Facilities and Assistance to Adjacent Areas Act - Act on the Improvement of Water Quality and Support for Residents of the Han River Basin - Water Environment Conservation Act - Wetlands Conservation Act - Water Supply and Waterworks Installation Act
Forestry	- Erosion Control Work Act - Grassland Act - Forest Protection Act - Mountainous Districts Management Act - Baekdu-daegan Protection Act
Agriculture	- Farmland Act
Military	- Protection of Military Bases and Installations Act
Culture	- Cultural Heritage Protection Act

Source: Gangwon Province (2021), p.226.

15) Gangwon Province (2021), pp.226-227.

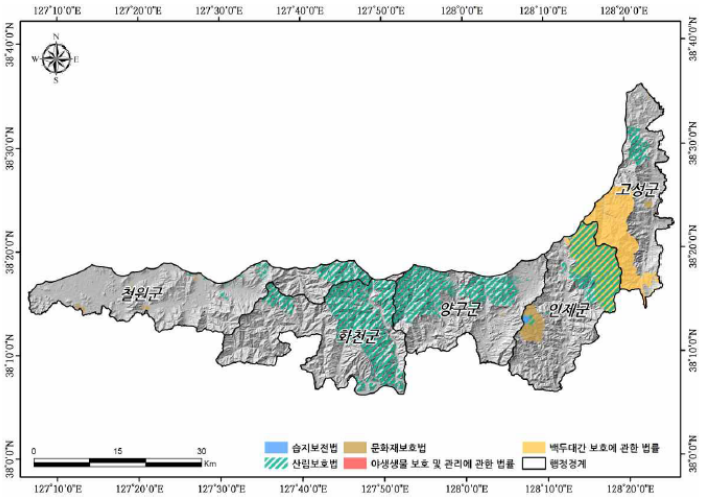
Figure 13 illustrates the areas subject to land use restrictions within the GWBR. Figure 14 depicts the parts of the core areas subject to land use restrictions.

Figure 13. Areas subject to land use restrictions within the GWBR



Source: Gangwon Province (2021), p.227.

Figure 14. Areas subject to land use restrictions in the core areas of the GWBR



Source: Gangwon Province (2021), p.61.

These laws have imposed restrictions on residents' economic activities. Consequently, many environmental initiatives have faced opposition from the local population. However, ongoing efforts by public servants, experts, and the residents themselves have sought to address these resentments. These endeavors have shifted the focus of residents towards utilizing the region's resources to boost the local economy. Outreach programs have emphasized the ecological importance and unique socio-cultural characteristics of the area, including its pristine ecology, historical value, and natural resources. These features can be leveraged to stimulate the local economy, through the development of various regional tourism programs for the region.[16)]

Figure 15. GWBR landscapes

Source: UNESCO, "Gallery: Gangwon Eco Peace Biosphere Reserve - Republic of Korea", accessed on November 23, 2023.

16) UNESCO, "Gangwon Eco-Peace Biosphere Reserve, Republic of Korea", accessed on November 23, 2023.

Within GWBR, many community enterprises using local resources operate with government support. There are many types of community enterprises based around a diverse array of activities, from agritourism and ecotourism to sales of agricultural products and local specialties.[17)]

Table 10. Major tourism resources of the GWBR

	Description
Cheorwon-gun	- Natural landscapes: Migratory birds sanctuary, large wetlands near the Yongyang Weir, Jaesongpyeong Plain of Mt. Soi - History and culture: Cheorwon DPRK Communist Party Building Site, Mt. Geumgang electric train track, Cheorwon ice storage, Cheorwon Methodist Church, Cheorwon Agricultural Product Inspection Office, Cheorwon 2nd Financial Cooperative Building Site, Dopian Temple (Iron Vishnu Buddha Statue, Three Story Stone Pagoda), Cheorwon Station (Woljeong-ri station), Cheorwon Water Department Site water tower - Military tourism: 2nd Tunnel, Cheorwon Peace Observatory, Triumph Observatory, Iron Triangle Observatory, Amjeong Bridge, mined (anti-tank) area, site of the Battle of Triangle Hill, Sabseul Summit Smoke Tower, Ice-cream Highland, Cross Tower Trail, Battle of White Horse Memorial, and the Iron Triangle Museum - Tourism resources: DMZ Peace Town for Migratory Birds, Cheorwon Peace Observatory, Suiri Eco Park - Agricultural activities: Odaemi Village (Peaceful Crane Town) - Festivals: Migratory Bird Village, Saebaragi Festival, Odaemi Village (Peaceful Crane Town), Hwagang Freshwater Snail Festival  DMZ Eco Peace Park and DMZ Peace Town for Migratory Birds,  Cheorwon Migratory birds sanctuary and Hwagang Freshwater Snail Festival

17) Gangwon Province (2021), pp.217-219.

Table 10. (continued)

	Description
Hwacheon-gun	- Natural landscapes: Bisugumi Valley, Ice Valley, Yanguidae Wetland, and Hwarang Valley - History and culture: Gamseong Literature Theme Park, DPRK Communist Army Command Site - Military tourism: Peace Dam, Bimok Memorial Park, Haesan Observatory, Andong Iron Bridge, International Peace and Art Park - Tourism resources: Peace Dam, Korean Otter Research Center, Gamseong Village, Medical Herb Town, Wolha Literature Museum, Hwacheon Youth Camping Site, Minbuk Forest Ecology Management Center - Agricultural activities: Mountain Lake Village, Dongjihwa Village in Sineup-ri, Haesan Recreation Farm in Dongchon-ri - Festival: World Peace and Security Culture Festival  Peace Dam and Medical Herb Town
Yanggu-gun	- Natural landscapes: Dutayeon Valley, the Punchbowl, Palang Falls, and Yangsu Rock Valley - History and culture: Haean Prehistoric Ruins, Dolsanryeong Jige Festival (Jige referring to an A-frame carrier strapped to one's back) (Intangible Cultural Heritage) - Military tourism: Eulji Observatory, Tunnel No. 4, War Memorial, Battle of Bloody Ridge Memorial Monument, and the Battle of Punchbowl District Memorial Monument - Tourism resources: Bangsan Porcelain Museum, Yanggu Natural Ecology Park, Yanggu Palang Folk Museum, Yanggu Reunification Museum, Mt. Geumgang Road (Highway 31), Dutayeon Valley Gallery, Yanggu National Ecotrail, Yanggu Natural Healing Center for Youth, Amur Goral Restoration and Reproduction Center in Yanggu, Punchbowl Trail - Agricultural activities: Omiri Village, Jige Village - Festival: DMZ Punchbowl Siraegi Festival - Education: Yanggu DMZ ecological academy  Eulji Observatory and Yanggu Natural Ecology Park

Table 10. (continued)

	Description
Inje-gun	- Natural landscapes: Daeamsan and Daeusan Mountains Natural Reserve and Dragon Marsh - History and culture: Seohwa War Victim Memorial Monument - Military tourism: DMZ Peace-Life Valley, Livingston Bridge - Tourism resources: Yongneup Marsh Ecotown Ecology School, Inje Agricultural Product Market - Agricultural activities: Naetgang Village, Wildflower Village, Gwangchiryeong Mountain Village, Yongneup Marsh Ecotown, Sound of Moonlight Village, Peace Village, Songhak Village, Mt. Gaemi Village, Mt. Gwangchiryong Village  DMZ Peace-Life Valley and Yongneup Marsh Ecotown Ecology School
Goseong-gun	- Natural landscapes: Natural Reserve of Hyangnobong Peak and Geonbongsan Mountain - History and culture: Geonbong Temple (Neungpa Bridge, Buri Gate), Geonbong Temple Site - Military tourism: Unification Observatory, DMZ Museum - Tourism resources: DMZ Museum, Jinburyeong Art Gallery Tourism Info Center, Korea Ski Museum, Goseong Jinburyeong Art Gallery, Korea Rehabilitational Equestrian Education Center - Agricultural activities: Rural Experience Village: Sandu Village, Sottongryeong Village  Unification Observatory and Sandu Village

Source: Gangwon Province (2021), pp.285-301.

2.1.2 Germany

According to UNESCO (2023a), Germany has 18 Biosphere Reserves, which together covering about 3.9% of the country's terrestrial surface (Nationale Naturlandschaften 2023a, see Figure 16 and Table 11). The majority (16) of these reserves have been designated by UNESCO's MAB programme, with two others federally recognized but awaiting official UNESCO designation. Two biospheres, the Elbe River Landscape and the Rhön, cross state borders within Germany. The Palatinate Forest-Northern Vosges Biosphere Reserve is a transboundary biosphere, shared with France. Three other marine areas are designated, protecting the tidal areas of the Wadden Sea, which stretches along the North Sea Coast.

Figure 16. Location of the Biosphere Reserves in Germany

Source: BfN (2022), "Karte UNESCO-Biosphärenreservate in Deutschland", accessed on May 30, 2023.

Table 11. Biosphere reserves in Germany

Name	Year of UNESCO designation	Area [km²]	State
Berchtesgadener Land	1990 (extension and renaming 2010)	840	Bavaria
Black Forest	2017	630	Baden-Wuerttemberg
Bliesgau	2009	361.5	Saarland
Elbe River Landscape	1979 (extension 1997)	2,822.5	Lower Saxony, Mecklenburg-Western Pomerania, Brandenburg, Saxony-Anhalt
Palatinate Forest (D) – Northern Vosges (F)	1998	German part: 1,809.2 (Transboundary with France total 3,018)	Rhineland-Palatinate
Rhön	1991 (extension 2014)	2,433,2	Bavaria, Hesse, Thuringia
Schaalsee	2000	310	Mecklenburg-Western Pomerania
Schorfheide-Chorin	1990	1.292	Brandenburg
South-East Rügen	1991	228	Mecklenburg-Western Pomerania
Spree Forest	1991	475	Brandenburg
Swabian Alb	2009	850	Baden-Wuerttemberg
Upper Lausitz Heath and Pond Landscape	1996	301	Saxony
Thuringian Forest	1979 (extensions 1986, 1990, 2018)	337	Thuringia
Wadden Sea and Hallig Islands of Schleswig-Holstein	1990 (extension and renaming 2004)	4,431	Schleswig-Holstein
Wadden Sea of Lower Saxony	1992	ca. 2,400	Lower Saxony
Wadden Sea of Hamburg	1992	117	Hamburg
Drömling	- (2019 based on federal law only)	278	Saxony-Anhalt
South Harz Karst Landscape	- (2009 based on federal law only)	300	Saxony-Anhalt

Source: The authors [data from UNESCO (2023b) and Nationale Naturlandschaften (2023b)].

As Germany was divided into two states from 1949 to 1990, the Schaalsee and Dromling reserves sit right on the former border between the two countries, while the Elbe River Landscape and the Rhon cross it. This concerns the biosphere reserves Schaalsee and Drömling (bordering) as well as Elbe River Landscape and Rhön (crossing).

The history of this former border within Germany, which is today called the Grünes Band (GB), or Green Belt, shares many similarities with Korea's DMZ. Before German reunification, the GB was the border region between East and West Germany. It was often called the "Death Strip." Access was strictly limited due to the heavy fortification and military presence on the eastern side. Over the decades, the region developed a rich biodiversity, as nature thrived largely undisturbed by human activity. After reunification, this unique landscape has been gradually and systematically protected. The GB was created at the behest of pressure from Bund für Umwelt und Naturschutz Deutschland (also known as Friends of the Earth Germany, or BUND) and other non-government organizations and conservation initiatives, and it is now supported by the German federal government. Today, Germany's Green Belt is considered to be the most well-preserved part of the European Green Belt, which runs along the former Iron Curtain.[18)]

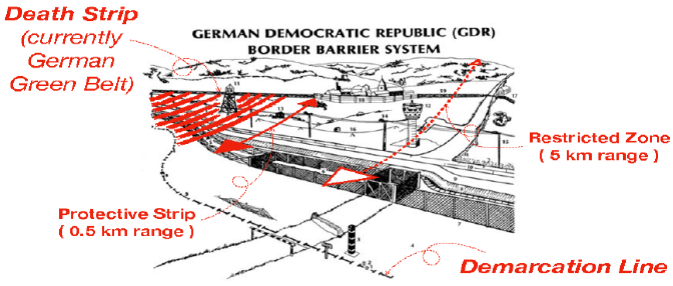
In comparison to the situation on the Korean Peninsula, the spatial extent of the Germany's Green Belt is clear. Germany was partitioned in the aftermath of World War II, leading to the creation of the German Democratic Republic (GDR, or East Germany), under Soviet control, and the Federal Republic of Germany (FRG, or West Germany), controlled by the Allied Forces, which comprised the United Kingdom, France, and the United States of America. This division lasted from 1949 to 1990, a period in which the East German government constantly fortified the inner-German border. This was part of the so-called Iron Curtain, which, running more than 12,500 km from Scandinavia to the Mediterranean, divided the Soviet bloc from Western Europe. The inner-German border, often referred to as the Death Strip, served in part to prevent citizens of East Germany from migrating to the West. The long period of separation, the massive border fortifications, and the different political systems of the two Germanys has had a strong impact on land use. Here are some pertinent facts: The Green Belt is 1,393 km in length and covers

18) Kim and Neubert (2018).

an area of 177.12 km². Over 1,200 endangered species that are on Germany's Red List can be found in 146 different habitats. Hence, the Federal Environment Ministry (Bundesumweltministerium) has sponsored a project called Closing Gaps in the Green Belt Germany (Lückenschluss Grünes Band) under the Federal Programme for Biodiversity. The BUND is using this project to realize its goal of closing gaps that since 1989 have emerged in the habitat networks of the GB, part of a larger effort to preserve the "memorial landscape" as a reminder of the painful era of German division. Specifically, 64% of the area consists of endangered habitats appearing on Germany's Red List: 29% are nature reserves, 64% are EU-protected areas (Natura 2000), 21% are inland waters, 21% are extensive grasslands, 7% are unused fallow lands, and 29% are woodlands. No less than 87% of the Green Belt is in a near-natural state, with just 13% of it damaged or destroyed, largely through agriculture or the creation of grasslands. In 2007, the German Federal Government adopted a National Strategy for Biodiversity, of which the flagship project is the Conservation of the Green Belt.[19)]

In 2009, the protection of the GB was enshrined in law, through in Article 21 of the German Federal Nature Conservation Act (Bundesnaturschutzgesetz).[20)] Large parts of the GB are currently protected as national natural monuments (Thuringia, Saxony-Anhalt, Brandenburg, Hesse). There are plans to extend such protection to the entire length of the GB.

Figure 17. Schematic diagram of inner-German border fortifications, the so-called Death Strip, part of the Iron Curtain



Source: Kim and Neubert (2019), p.7.

19) Kim and Neubert (2018); BUND (2021).

20) BUND (2017).

(1) Overall of Rhön River Biosphere Reserve

The Rhön Biosphere Reserve spans three German states – Bavaria, Hesse, and Thuringia. It provides sanctuary to approximately 100 endangered species of flora and fauna, underscoring the need for conservation efforts. This rich biodiversity mirrors the diverse geographical features of the region, including raised bogs, semi-natural streams, granite boulder fields, hedgerows, meadows, pastures, and semi-natural deciduous forests. Through collaboration with agricultural and culinary partners, the Rhön Biosphere Reserve offers a variety of nature-based activities such as walks, hikes, sports, and recreation, engaging all the senses.[21)]

Surface: 184,939 ha[22)]

- Core area(s): 4,199 ha
- Buffer zone(s): 67,483 ha
- Transition zone(s): 107,557 ha

Table 12. Facts and figures, Rhön River Biosphere Reserve

	Description
Location	- Tri-state region of Bavaria, Hesse, and Thuringia.
Area	- 2,433 square kilometers
Elevation	- 180 to 950 meters above sea level
History	- Recognized by UNESCO in 1991.
Geographic features	- Uplands with prominent crests and cones, raised bogs, wide floodplains, meadows and pastures, semi-natural forests

Source: UNESCO (2021), p.52.

21) UNESCO (2021), p.49.

22) UNESCO, "Rhön Biosphere Reserve, Germany", accessed on November 23, 2023.

(2) Ecological characteristics of the Rhön River Biosphere Reserve

In its natural state, beech forests (Fagus sylvatica) would blanket the area, yet extensive farming and dairy cow cultivation have altered the landscape, leading to montane and sub-montane humid grasslands on siliceous soils. Transformative land use has shifted the primary character of the forests. Two bogs in the region harbor a multitude of endangered animal and plant species and thus carry ecological significance. Renowned for its black grouse (Tetrao tetrix) habitat, the Rhön won biosphere reserve status after German reunification, encompassing three states (Länder). A comprehensive management plan, involving all stakeholders, outlines strategies for the protection, upkeep, and advancement of the Rhön Biosphere Reserve.[23] According to the report 30 Years of the Rhön UNESCO Biosphere Reserve (2021), over 50% of climate crisis species inhabit these regions, totaling 32 species out of 63. The forest cover is substantial, accounting for 42.08% (102,383.4 ha).[24]

Table 13 lists animal species whose rarity, uniqueness and endangerment attest to the special responsibility the UNESCO Rhön Biosphere Reserve has to protect them.[25]

Table 13. List of animal species in the UNESCO Rhön Biosphere Reserve

German name	Scientific name	ZAK	FFHRL		VSRL VArt	VArt	
			Ⅱ	Ⅳ	I	Nationwide	BfN
Mammals							
Wildkatze	*Felis silvestris*			○			○
Alpenspitzmaus	*Sorex alpinus*	○				TH, HE	
Mopsfledermaus	*Barbastella barbastellus*		○	○		TH, HE	○
Bechsteinfledermaus	*Myotis bechsteinii*	○	○	○		TH, HE	○
Großes Mausohr	*Myotis myotis*	○	○	○			
Fransenfledermaus	*Myotis nattereri*	○		○		BY, TH	
Graues Langohr	*Plecotus austriacus*			○		BY, TH	

23) UNESCO, "Rhön Biosphere Reserve, Germany", accessed on November 23, 2023.
24) The administrations of the Rhön UNESCO Biosphere Reserve (2021), pp.10-11.
25) UNESCO-Biosphärenreservat Rhön (2018), pp.49-51.

Table 13. (continued)

German name	Scientific name	ZAK	FFHRL		VSRL VArt	VArt	
			Ⅱ	Ⅳ	Ⅰ	Nationwide	BfN
Fish							
Bachneunauge	*Lampetra planeri*	○	○			BY, HE, TH	
Amphibians & Reptiles							
Geburtshelferkröte	*Alytes obstetricans*	○		○		BY, TH	
Gelbbauchunke	*Bombina variegata*	○	○				○
Feuersalamander	*Salamandra salamandra*	○					○
Kammmolch	*Triturus cristatus*	○	○			BY, HE, TH	
Kreuzotter	*Vipera berus*	○				BY, HE, TH	
Birds							
Eisvogel	*Alcedo atthis*	○			○	BY, HE, TH	
Wiesenpieper	*Anthus pratensis*	○					
Uhu	*Bubo bubo*	○			○	BY, HE, TH	
Ziegenmelker	*Caprimulgus europaeus*				○	BY, HE, TH	
Schwarzstorch	*Ciconia nigra*	○			○	BY, HE, TH	
Wasseramsel	*Cinclus cinclus*	○					
Rohrweihe	*Circus aeruginosus*				○	BY	
Wachtelkönig	*Crex crex*	○			○	BY, HE	
Mittelspecht	*Dendrocopos medius*				○		○
Bekassine	*Gallinago gallinago*	○				BY, TH	
Neuntöter	*Lanius collurio*	○			○	TH, HE	
Raubwürger	*Lanius excubitor*	○				BY	
Heidelerche	*Lullula arborea*	○			○	BY, HE, TH	
Rotmilan	*Milvus milvus*	○			○		○
Steinschmätzer	*Oenanthe oenanthe*	○				BY, HE, TH	
Rebhuhn	*Perdix perdix*	○					
Wespenbussard	*Pernis apivorus*	○			○	BY, HE	
Grauspecht	*Picus canus*				○		
Braunkehlchen	*Saxicola rubetra*	○				BY, HE, TH	
Schwarzkehlchen	*Saxicola torquata*	○				BY, HE, TH	
Birkhuhn	*Tetrao tetrix*	○				HE, TH	○
Schleiereule	*Tyto alba*	○				BY, TH	
Butterflies							
Streifen-Bläuling	*Polyommatus damon*	○					
Hochmoor-Perlmutterfalter	*Boloria aquilonaris*	○				BY, HE	
Berghexe	*Chazara briseis*	○				BY, TH	
Hochmoorgelbling	*Colias palaeno*	○				HE	

Table 13. (continued)

German name	Scientific name	ZAK	FFHRL		VSRL VArt	VArt	
			Ⅱ	Ⅳ	Ⅰ	Nationwide	BfN
Skabiosen-Scheckenfalter	*Euphydryas aurinia*		○			TH, HE	○
Großpunkt-Bläuling	*Glaucopsyche alexis*	○				BY	
Rostbinde	*Hipparchia semele*	○				BY	
Großer Eisvogel	*Limenitis populi*	○				BY	
Himmelblauer	*Bläuling Lysandra bellargus*	○					
Schwarzgefleckter Bläuling	*Maculinea nausithous*	○	○			BY	
Heller Wiesenknopf-Ameisenbläuling	*Maculinea teleius*		○			BY, TH	
Ulmenzipfelfalter	*Satyrium w-album*	○					
Schwarzer Apollo	*Parnassius mnemosyne*	○		○		HE	○
Randring-Perlmutterfalter	*Boloria eunomia*	○					
Dragonflies							
Hochmoor-Mosaikjungfer	*Aeshna subarctica*	○					
Gestreifte Quelljungfer	*Cordulegaster bidentata*	○				BY	
Arktische Smaragdlibelle	*Somatochlora arctica*	○				BY, HE	
Locusts							
Wanstschrecke	*Polysarcus denticauda*	○					
Rotflügelige Schnarrschrecke	*Psophus stridulus*	○					
Schwarzfleckiger Grashüpfer	*Stenobothrus nigromaculatus*	○				BY	
Beetle							
Mondflecklaufkäfer	*Callistus lunatus*	○				BY	
Hirschkäfer	*Lucanus cervus*		○			BY, HE	
Laufkäfer	*Trechus rivularis*	○				BY	
Molluscs							
Rhönquellschnecke	*Bythinella compressa*	○				HE	
Flussperlmuschel	*Margaritifera margaritifera*		○				○
Gemeine Flussmuschel	*Unio crassus*		○				
Other species							
Springspinne	*Heliophanus dampfi*	○				BY	
Wolfsspinne	*Pardosa sorditata*	○				BY	

Source: UNESCO-Biosphärenreservat Rhön (2018), pp.49-51.

The UNESCO Rhön Biosphere Reserve harbors a diverse array of plant species owing to the variety of habitat types and the extensive cultural-historical use of many areas (Table 14).[26)]

Table 14. List of plant species (Pflanzenarten) in the UNESCO Biosphere Reserve with special protection status

German name	Scientific name	ZAK	Red list status				BfN	FFH appendix
			D	BY	HE	TH		
Steinquendel	*Acinos arvensis*	○			*			
Eisenhut (blaublühend)	*Aconitum napellus*	○		3	V	R		
Sommer-Adonisröschen	*Adonis aestivalis*	○		3	2	3		
Kelch-Steinkraut	*Alyssum alyssoides*	○			V			
Großes Windröschen	*Anemone sylvestris*	○		3	3			
Katzenpfötchen	*Antennaria dioica*	○			2	2		
Glanz-Kerbel	*Anthriscus nitidus*	○			*			
Berg-Wohlverleih	*Arnica montana*	○		3	2	2	○	V
Nordischer Streifenfarn	*Asplenium septentrionale*	○		3	*			
Berg-Aster	*Aster amellus*	○		3	2	3		
Echte Mondraute	*Botrychium lunaria*	○		3	2	2		
Breitblättrige Glockenblume	*Campanula latifolia*	○		2	*			
Berg-Distel	*Carduus personata*	○			R	1		
Schwarzschopf-Segge	*Carex appropinquata*	○		3	2	1		
Davalls Segge	*Carex davalliana*	○		3	2	2		
Hartmans Segge	*Carex hartmanii*	○			3	3		
Schlamm- / Draht-Segge	*Carex limosa* / *C. diandra*	○		3	1			
Silberdistel	*Carlina acaulis*	○			3			
Acker-Haftdolde	*Caucalis platycarpos*	○		R	2	3		
Berg-Flockenblume	*Centaurea montana*	○			*	3		

26) UNESCO-Biosphärenreservat Rhön (2018), pp.51-54.

Table 14. (continued)

German name	Scientific name	ZAK	Red list status				BfN	FFH appendix
			D	BY	HE	TH		
Perücken-Flockenblume	*Centaurea pseudophrygia*	○			3			
Guter Heinrich	*Chenopodium bonus henricus*	○		3	3	3		
Alpen-Milchlattich	*Cicerbita alpina*	○			R	2		
Stengellose Kratzdistel	*Cirsium acaule*	○			V			
Pyrenäen-Löffelkraut	*Cochlearia pyrenaica*	○		2	2			
Feld-Rittersporn	*Consolida regalis*	○		3	3			
Hohler / Mittlerer Lerchensporn	*Corydalis cava / intermedia*	○		3	*		○	
Weicher Pippau	*Crepis mollis*	○		3	3	3	○	
Abgebissener Pippau	*Crepis praemorsa*	○		2	2	2		
Deutsche Hundszunge	*Cynoglossum germanicum*	○		3	*			
Frauenschuh	*Cypripedium calceolus*	○		3	2	2		II+IV
Geflecktes Knabenkraut	*Dactylorhiza maculata*	○		3	3			
Breitblättriges Knabenkraut	*Dactylorhiza majalis*	○			3	2	○	
Pfingst-Nelke	*Dianthus gratianopolitanus*	○		2	R		○	
Pracht-Nelke	*Dianthus superbus*	○		R	2	2		
Zypressen-Flachbärlapp	*Diphasiastrum tristachyum*		2	2		1		V
Rundblättrig. Sonnentau	*Drosera rotundifolia*	○		3	2	2		
Schwarze Krähenbeere	*Empetrum nigrum*	○		2	3	2		
Sumpf-Stendelwurz	*Epipactis palustris*	○		3	2	2		
Breitblättriges Wollgras	*Eriophorum latifolium*	○		3	2	2		
Scheidiges Wollgras	*Eriophorum vaginatum*	○			3	3		
Nordischer Augentrost	*Euphrasia frigida*	○		R	1	0		

Table 14. (continued)

German name	Scientific name	ZAK	Red list status				BfN	FFH appendix
			D	BY	HE	TH		
Scheiden-Goldstern	*Gagea spathacea*	○		3	*		○	
Nordisches Labkraut	*Galium boreale*	○			3			
Färber-Ginster	*Genista tinctoria*	○			*			
Fransen-Enzian	*Gentianella ciliata*	○			3			
Deutscher Enzian	*Gentianella germanica*	○			2	3		
Wald-Storchschnabel	*Geranium sylvaticum*	○			*			
Sumpf-Weichorchis	*Hammarbya paludosa*		2	2		1		
Honigorchis	*Herminium monorchis*	○		2	2	1		
┐hrchen-Habichtskraut	*Hieracium lactucella*	○			3	3		
Geflecktes Ferkelkraut	*Hypochaeris maculata*	○		3	2	2		
Wacholder	*Juniperus communis*	○			V			
Kleiner Frauenspiegel	*Legousia hybrida*	○		1	3	2		
Märzenbecher	*Leucojum vernum*	○		3	3			
Silberblatt	*Lunaria rediviva*	○		3	*			
Keulen-Bärlapp	*Lycopodium clavatum*	○		3	3	3		V
Fieberklee	*Menyanthes trifoliata*	○		3	3	2		
Fliegen-Ragwurz	*Ophrys insectifera*	○		3	3			
Stattliches Knabenkraut	*Orchis mascula*	○		3	V	3		
Kleines Knabenkraut	*Orchis morio*	○		2	2	1		
Purpur-Knabenkraut	*Orchis purpurea*	○		2	3			
Sommerwurzen	*Orobanche spp.*	○		2	2	2		Ⅳ
Sumpf-Herzblatt	*Parnassia palustris*	○		3	2	2		
Wald-Läusekraut	*Pedicularis sylvatica*	○		3	2	2		
Weiße Pestwurz	*Petasites albus*	○			*			
Hirschwurz	*Peucedanum cervaria*	○			V			
Kugelige Teufelskralle	*Phyteuma orbiculare*	○			3	3		
Berg-Waldhyazinthe	*Platanthera chlorantha*	○		3	*			
Sumpf-Kreuzblume	*Polygala amarella*	○			3			

Table 14. (continued)

German name	Scientific name	ZAK	Red list status				BfN	FFH appendix
			D	BY	HE	TH		
Weißzüngel-Orchidee	*Pseudorchis albida*	○		3	1	1		
Gewöhnl. Kuhschelle	*Pulsatilla vulgaris*	○		3	3	3		
Flutender Wasserhahnenfuß	*Ranunculus fluitans*	○		3	*			
Platanenblättriger Hahnenfuß	*Ranunculus platanifolius*	○		3	*	3		
Zottiger Klappertopf	*Rhinanthus alectorolophus*	○			V			
Begrannter Klappertopf	*Rhinanthus glacialis*	○			3	3		
Alpen-Johannisbeere	*Ribes alpinum*	○			*			
Großer Wiesenknopf	*Sanguisorba officinalis*	○			*			
Blasenbinse	*Scheuchzeria palustris*		2	3		1		
Spanische Schwarzwurzel	*Scorzonera hispanica*	○		2	3	3		
Sumpf-Fetthenne	*Sedum villosum*	○		1	2	1		
Kümmel-Silge	*Selinum carvifolia*	○			3			
Färber-Scharte	*Serratula tinctoria*	○			2			
Blaugras	*Sesleria albicans*	○			*			
Baltisches Torfmoos	*Sphagnum balticum*					R		V
Braunes Torfmoos	*Sphagnum fuscum*			R		R		V
Großes Torfmoos	*Sphagnum majus*					R		V
Sumpfblättriges Torfmoos	*Sphagnum obtusum*		2	R		1		V
Rötliches Torfmoos	*Sphagnum rubellum*			3		1		V
Zartes Torfmoos	*Sphagnum tenellum*			0		1		V
Trauben-Gamander	*Teucrium botrys*	○		3		B		
Berg-Gamander	*Teucrium montanum*	○			R			
Wiesen-Leinblatt	*Thesium pyrenaicum*	○		3	3	2		
Arznei-Thymian	*Thymus pulegioides*	○		3	D			
Moor-Klee	*Trifolium spadiceum*	○		2	2	2		
Sumpf-Dreizack	*Triglochin palustre*	○		3	2	2		
Trollblume	*Trollius europaeus*	○		3	2	3		
Moosbeere	*Vaccinium oxycoccos*	○		R	3	2		

Table 14. (continued)

German name	Scientific name	ZAK	Red list status				BfN	FFH appendix
			D	BY	HE	TH		
Rauschbeere	*Vaccinium uliginosum*	○			3	2		
Preiselbeere	*Vaccinium vitis-idaea*	○			3			
Waldwicke / Hecken-Wicke	*Vicia sylvatica / dumetorum*	○			V			
Südlicher Wimperfarn	*Woodsia ilvensis*	○		1	2	1		

Source: UNESCO-Biosphärenreservat Rhön (2018), pp.52-54.

Table 15 provides an overview of various protected areas, including their absolute and relative surface area dimensions and spatial distribution.[27)]

Table 15. Overview of the most important protected areas of the UNESCO Rhön Biosphere Reserve

Protected areas	BR Rhön gesamt		BR Rhön Bayern		BR Rhön Hessen		BR Rhön Thüringen	
	Number	Area [ha] and [%]	Number	Area [ha] and [%]	Number	Area [ha] and [%]	Number	Area [ha] and [%]
Nature reserves *Core and Care zones (TH)	55+53*	12.436 ha	22	7.732 ha	33	4.704 ha	53*	5.959 ha*
		5.11 %		5.97 %		7.26 %		10.86 %*
Natural forest reserves	22	1.460 ha	10	322 ha	10	836 ha	2	302 ha
		0.6 %		0.25 %		1.29 %		0.6 %
FFH areas	54	63.463,6 ha	25	26.502 ha	10	23.547 ha	19	13.414,6 ha
		26.08 %		20.45 %		36.4 %		27.43 %

27) UNESCO-Biosphärenreservat Rhön (2018), pp.55-56.

Table 15. (continued)

Protected areas	BR Rhön gesamt		BR Rhön Bayern		BR Rhön Hessen		BR Rhön Thüringen	
	Number	Area [ha] and [%]	Number	Area [ha] and [%]	Number	Area [ha] and [%]	Number	Area [ha] and [%]
Bird sanctuaries (SPA)	35	74.289 ha	2	19.603 ha	1	36.051 ha	32	18.635,3
		30.53 %		15.13 %		56%		38.1 %
Landscape protection areas *Development zone (TH)	9	193,632 ha	1	96.025 ha	7	48.697 ha	1*	48.910 ha*
		79.57 %		74.1 %		75.1 %		89.1 %*
Natural parks	2	188.436ha	1	123.608ha	1	72.77070 ha		0ha
		77.44 %		95.4 %		85.959595 %		0%

Source: UNESCO-Biosphärenreservat Rhön (2018), p.56.

(3) Socioeconomic and cultural characteristics of the Rhön River Biosphere Reserve

As of 2004, approximately 162,000 residents inhabit this rural expanse. Beyond agriculture, economic activity revolves around small enterprises and tourism. Collaborations among hotels, eateries, farmers, and artists aim to interconnect diverse activities within the biosphere reserve. The Rhön is famed for promoting regional products through direct marketing channels. Notably, goods from the endangered Rhön sheep, well-suited to the harsh local climate, and apple products from nearby orchards find their way to the market. Numerous visitor centers (36 in total)[28] offer a range of environmental education programs, engaging the public in diverse ways.[29] There are 216 brands of agricultural products from the area, including 62 organic brands, and web traffic data points to an increase in visitors engaging in activities such as hiking (6.24 times more interest than in 2010).

28) The administrations of the Rhön UNESCO Biosphere Reserve (2021), p.10.

29) UNESCO, "Rhön Biosphere Reserve, Germany", accessed on November 23, 2023.

Moreover, the region has a high birth rate (1,824 births in 2019), and efforts are underway to expand the adoption of electric vehicles (2,504 units as of 2019). Since being designated as an official biosphere reserve, 349 studies have been conducted on the region (44 of which are ongoing, with 38 more in some stage of progress; 77 research projects are monitoring programs).[30] A 2004 paper published by the Friedrich Schiller University of Jena studied the marketing potential of Rhön Biosphere Reserve agricultural products. Consumer surveys showed strong acceptance of Rhön products, associated them with security, quality of life, and pristine nature. Rhön goods were perceived as both high-quality and environmentally friendly. As a result, in 2005, two quality labels were launched under an umbrella brand, one for organic and one for conventional products, reflecting these findings.[31]

The Rhön quality label is granted to products and companies that align with the principles of the Rhön Biosphere Reserve in their production and marketing. Beyond adhering to legal regulations, mineral water brand Förstina Sprudel had to meet additional criteria. This criteria encompassed aspects such as vocational training, ongoing education, and the use of environmentally friendly, reusable crates for packaging.[32]

30) The administrations of the Rhön UNESCO Biosphere Reserve (2021), pp.10-11.
31) UNESCO (2007), p.31.
32) UNESCO (2007), p.23.

Table 16. Overview of the Rhön hiking trails

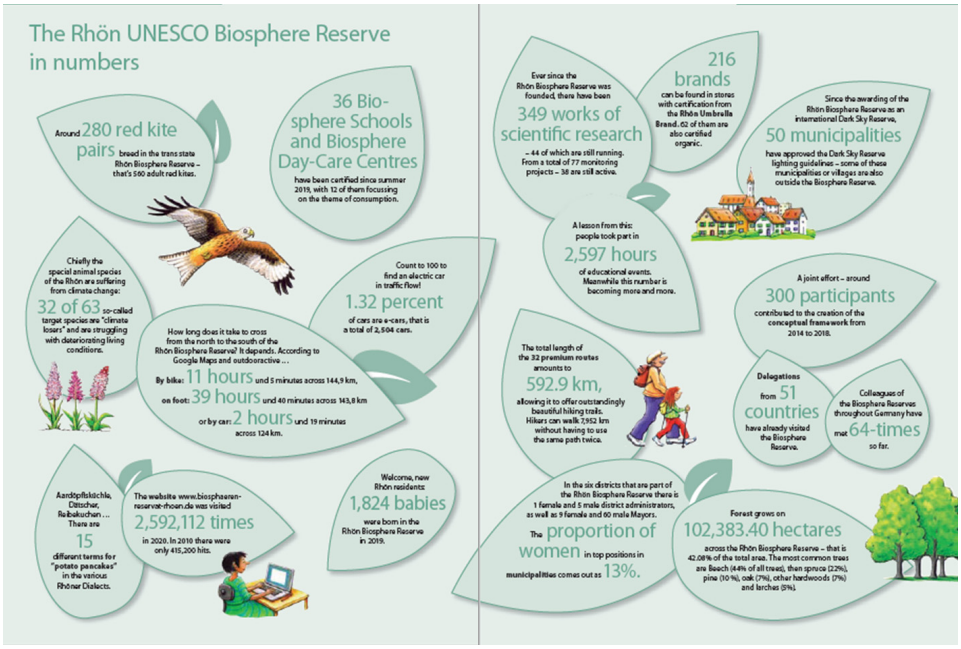
Category	Subcategory	2017		2008	
		Km	Number	Km	Number
Rhönklub trails and hiking trails managed by the Rhönklub	Main hiking trails	1,231	14	1,394	15
	Rhönklub circular paths	196	8		
	Secondary hiking trails	1.389	94	2.373	155
	River routes			179	3
	Ways of St. James	211	4	211	4
	European long-distance hiking trails	190	2	190	2
	Hiking without luggage			744	5
		3,216	124	5,091	184
Premium paths	THE HOCHRHÖNER®	173	1	173	1
	Feeder	172	44	189	47
	Extra tours	345	25	316	20
		690	70	678	68
Local hiking trails	Rhön circular routes Bavaria	1.760	272	2.045	346
	Rhön circular routes Hesse	1.681	271	1.809	193
	Rhön circular routes Thuringia	334	50	622	89
		3,775	593	4,476	628
Other hiking trails		271	24	222	16
Total		7,952	811	10,467	896

Source: UNESCO-Biosphärenreservat Rhön (2018), p.155.

Figure 18. Rhön quality label

Source: UNESCO (2007), p.23.

Figure 19. The Rhön UNESCO Biosphere Reserve, by the numbers



Source: The administrations of the Rhön UNESCO Biosphere Reserve (2021), pp.10-11.

2.2. Review of relevant laws, policies, and plans

This chapter introduces international, national, and regional laws, policies, and plans related to the biosphere reserves located at the current border of North and South Korea and the former border East-West border in Germany. In particular this chapter will explore the main content of several UNESCO planning documents, including the Seville Strategy and the Statutory Framework of the World Network, the Lima Action Plan for UNESCO's Man and the Biosphere (MAB) Programme and its World Network of Biosphere Reserves 2016-2025), and the MAB Strategy (2015-2025) for UNESCO's Man and the Biosphere Programme and its World Network of Biosphere Reserves. It will also examine relevant guidelines related to other effective area-based conservation measures (OECM).

Biosphere Reserves and relevant laws, policies, and plans

Launched in 1971 as one of UNESCO's intergovernmental science programs, the MAB Program is an international initiative that designs, implements, and disseminates innovative approaches to improving the relationship between humans and the environment through research in the natural and social sciences, education and training, and international cooperation.[33)]

MAB program initiatives are carried out at Biosphere Reserves. Below is a quote from the 1996 UNESCO report Biosphere reserves: The Seville Strategy and the Statutory Framework of the World Network offering a definition of biosphere reserves.

> *"Biosphere reserves are areas of terrestrial and coastal/marine ecosystems or a combination thereof, which are internationally recognized within the framework of UNESCO's programme on Man and the Biosphere (MAB), in accordance with the present Statutory Framework."*

We can see that UNESCO defines a biosphere reserve as a kind of wilderness protected by international agreement. Similar areas protected by international covenant include World Heritage sites and Ramsar wetlands. However, unlike traditional protected areas, biosphere reserves serve to facilitate sustainable

33) Gwangneung Forest UNESCO Biosphere Reserve, "What is a Biosphere Reserve?", accessed on August 9, 2023.

development that harmonizes conservation with the utilization of biodiversity, and exist not only to legally protect major ecosystems but also to vitalize their neighboring communities. In other words, biosphere reserves are places biodiversity conservation efforts are part and parcel of larger economic and social development models. As of 2022, 738 regions in 134 countries have been designated as biosphere reserves.[34)]

In the early days of the MAB program (1976-1984), existing legally protected areas such as national parks were designated as biosphere reserves, with an emphasis on the conservation of natural resources, scientific research, and education. In 1995, with the establishment of norms such as the Seville Strategy for Biosphere Reserves and the Statutory Framework of the World Network of Biosphere Reserves, the MAB program entered a new phase. At the 3rd World Congress of Biosphere Reserves in 2008, a new vision for biosphere was reserves was laid out in the form of the Madrid Action for Biosphere Reserves 2008-2013.[35)]

The three major biosphere policies and plans are the UNESCO Biosphere Reserves Seville Strategy and the Statutory Framework of the World Network, the Lima Action Plan for UNESCO's Man and the Biosphere (MAB) Programme and its World Network of Biosphere Reserves (2016-2025), and the MAB Strategy (2015-2025) for UNESCO's Man and the Biosphere (MAB) Programme and its World Network of Biosphere Reserves.

The Seville Strategy

The Seville Strategy and Statutory Framework was signed in 1996. It proposes a definition for biosphere reserves, describes the role of the network and the functions of biosphere reserves, outlines criteria for biosphere reserve designation and the procedures thereof, and delineates guidelines for operating the network. The document is the first to define the term biosphere reserve and describe the procedure by which they are designated at such. The procedure is as follows.

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34) Gwangneung Forest UNESCO Biosphere Reserve, "What is a Biosphere Reserve?", accessed on August 9, 2023.

35) Gwangneung Forest UNESCO Biosphere Reserve, "What is a Biosphere Reserve?", accessed on August 9, 2023.

1. Biosphere reserves are designated for inclusion in the Network by the International Co-ordinating Council (ICC) of the MAB programme in accordance with the following procedure:

(a) States, through National MAB Committees where appropriate, forward nominations with supporting documentation to the secretariat after having reviewed potential sites, taking into account the criteria as defined in Article 4;

(b) The secretariat verifies the content and supporting documentation: in the case of incomplete nomination, the secretariat requests the missing information from the nominating State;

(c) Nominations will be considered by the Advisory Committee for Biosphere Reserves for recommendation to ICC;

(d) ICC of the MAB programme takes a decision on nominations for designation.

The Director-General of UNESCO notifies the State concerned of the decision of ICC.

2. States are encouraged to examine and improve the adequacy of any existing biosphere reserve, and to propose extension as appropriate, to enable it to function fully within the Network. Proposals for extension follow the same procedure as described above for new designations.

3. Biosphere reserves which have been designated before the adoption of the present Statutory Framework are considered to be already part of the Network. The provisions of the Statutory Framework therefore apply to them.

The MAB strategy

The action plan and MAB strategy are designed to discover and implement local solutions to global challenges such as biodiversity loss, climate change, poverty, and water and food insecurity in and around biosphere reserves around the world, as part of a greater effort to achieve the targets of the Sustainable Development Goals (SDGs).[36]

Approved during the twenty-seventh session of the MAB program, the MAB Strategy serves as a comprehensive and concise framework upon which to base SDG initiatives. The strategic objectives and action areas outlined in the MAB

36) Gwangneung Forest UNESCO Biosphere Reserve, "What is a Biosphere Reserve?", accessed on August 9, 2023.

Strategy are intended to be executed through the corresponding MAB Action Plan, which was presented at the Fourth World Congress on Biosphere Reserves in 2016. The plan summarizes the vision and mission of the MAB Programme, outlines strategic objectives and anticipated results, delineates strategic action areas and courses of action, and presents a framework for evaluation. The plan specifically names four strategic objectives:

(1) *Strategic Objective 1. Conserve biodiversity, restore and enhance ecosystem services, and foster the sustainable use of natural resources*
(2) *Strategic Objective 2. Contribute to building sustainable, healthy and equitable societies, economies and thriving human settlements in harmony with the biosphere*
(3) *Strategic Objective 3. Facilitate biodiversity and sustainability science, education for sustainable development (ESD) and capacity building.*
(4) *Strategic Objective 4. Support mitigation and adaptation to climate change and other aspects of global environmental change*

The Lima Action Plan

The Lima Action Plan is a blueprint outlining strategies and activities of the biosphere reserves network. It was officially accepted during the 28th MAB congress in Lima, Peru, on March 19, 2016, and subsequently endorsed by the 200th session of UNESCO's Executive Board on October 11, 2016. It defines actions, outputs, responsible agencies, implementing agencies, timelines, and performance indicators in five strategic action areas. These areas are:

(1) *Strategic Action Area A. The World Network of Biosphere Reserves consisting of effectively functioning models for sustainable development*
(2) *Strategic Action Area B. Inclusive, dynamic and result-oriented collaboration and networking within the MAB Programme and the World Network of Biosphere Reserves*
(3) *Strategic Action Area C. Effective external partnerships and sufficient and sustainable funding for the MAB Programme and the World Network of Biosphere Reserves*
(4) *Strategic Action Area D. Comprehensive, modern, open, and transparent communication, information and data sharing*

(5) Strategic Action Area E. Effective governance of and within the MAB Programme and the World Network of Biosphere Reserves

Other effective area-based conservation measures (OECMs)

Other Effective Area-based Conservation Measures (OECMs) refer to sites outside of protected areas that are governed and managed in a manner that ensures the long-term in situ conservation of biodiversity. The UN Environment Programme (UNEP) oversees the World Database on Other Effective Area-based Conservation Measures (WD-OECMs). A November 2023 WD-OECM report states that a total of 872 sites have been documented in the WD-OECM, covering 1,589,090 km^2 worldwide.[37)]

An (OECM) is defined by the Convention on Biological Diversity as:

> *"A geographically defined area other than a Protected Area, which is governed and managed in ways that achieve positive and sustained long-term outcomes for the in situ conservation of biodiversity, with associated ecosystem functions and services and where applicable, cultural, spiritual, socio-economic, and other locally relevant values."*[38)]

There are four criteria for identifying OECMs:

(a) The area is not currently recognized as a protected area
(b) The area is governed and managed
(c) The area achieves sustained and effective contribution to in situ conservation of biodiversity;
(d) Associated ecosystem functions and services and cultural, spiritual, socio-economic and other locally relevant values are conserved and respected.[39)]

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37) Protected Planet, "Discover the World's Protected and Conserved Areas", accessed on November 22, 2023.

38) Convention on Biological Diversity (2018), p.1.

39) Convention on Biological Diversity (2018), pp.12-13.

Under the four criteria above, there are 26 sub-criteria.[40)]

Table 17. Comparison of criteria between OECMs and biosphere reserves

Criteria for OECMs (CBD/COP/DEC/14/8 Annex III)	- Criteria for biosphere reserves (Statutory Framework of the World Network of Biosphere Reserves and Technical guidelines for Biosphere Reserves)
Criterion A: Area is not currently recognized as a protected area	- In most cases, biosphere reserve buffer zones and transition areas are not protected areas
Criterion B: Area is governed and managed	- Each biosphere reserve is a geographically defined space - Biosphere reserves have legitimate governance authorities - Biosphere reserves are managed to achieve positive and sustained outcomes for the conservation of biological and biocultural diversity with the participation of relevant stakeholders and rightsholders
Criterion C: Achieves sustained and effective contribution to in situ conservation of biodiversity.	- Effective - Sustainable over the long term - In situ conservation of biological diversity

Source: UNESCO (2022), p.4.

Relationship between OECMs and protected areas

Protected areas and OECMs are separate yet mutually supportive components within landscapes, seascapes, and river basins. Protected areas are specifically designated for the purpose of biodiversity conservation and are managed accordingly. However, OECMs are not necessarily designated exclusively for conservation even as they are required to effectively contribute to the long-term preservation of biodiversity in its natural habitat. OECMs can achieve this by implementing supportive conservation measures, secondary conservation efforts, and occasionally even primary conservation actions in areas that cannot, or will not, be recognized as protected areas.[41)]

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40) Convention on Biological Diversity (2018), pp.12-13.

Figure 20. Comparison of criteria between OECMs and biosphere reserves

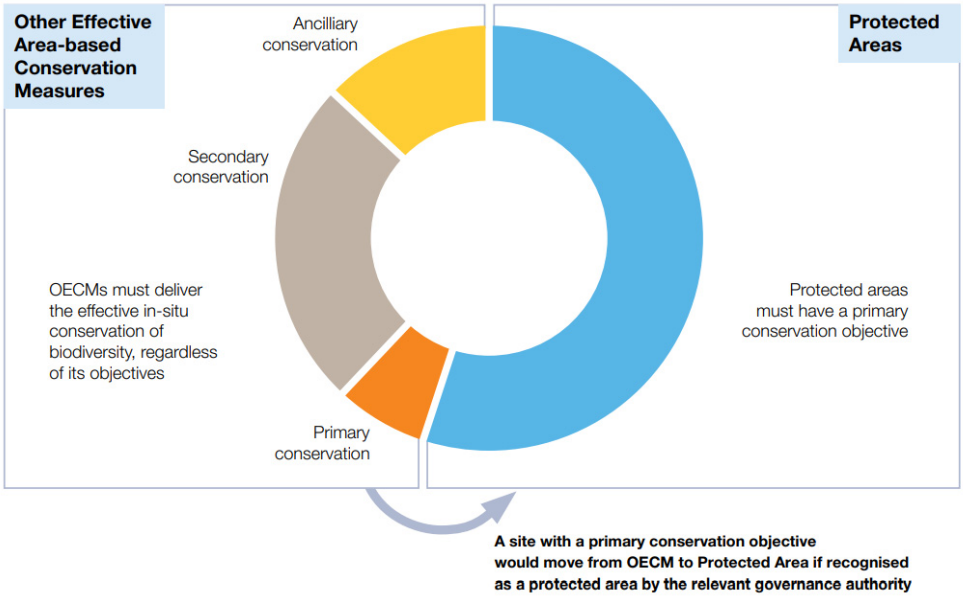

Figure 1. The relationship between OECMs and protected areas
(Note: sizes of segments are illustrative only and not based on actual data).

Source: IUCN (2019), p.4.

Differences between OECMs and UNESCO BR[42)]

Biosphere reserves can contribute to achieving the area-based goals outlined in the Global Biodiversity Framework. These reserves are areas that promote fair and inclusive planning for biodiversity, incorporating protected areas and other effective conservation measures within their boundaries. The Convention on Biological Diversity recognizes OECMs as areas that effectively conserve not only biodiversity, but also ecosystem functions, ecosystem services, and local values. The Convention's 2018 adoption of this definition of OECM acknowledges that areas beyond established protected networks can still play a crucial role in conserving biodiversity and supporting the Global Biodiversity Framework's area-based targets. Biosphere

41) IUCN (2019).
42) UNESCO (2022).

reserves have the potential to significantly contribute to Target 3 of the Global Biodiversity Framework by meeting the criteria set by the Convention on Biological Diversity for identifying OECMs. These criteria are outlined in the Seville Strategy, the Lima Action Plan, and the MAB strategy. The selection and evaluation criteria for biosphere reserves, as defined in the Statutory Framework signed by Member States, are adapted and applied to specific national, regional, and local conservation contexts.

Approximately 18% of the global area consists of core areas in biosphere reserves, which are typically designated as protected areas. The remaining 82% of these reserves are comprised of buffer zones and transition areas. In cases where these zones and areas do not overlap with existing protected areas, they may be eligible for OECM status by engaging in activities that are compatible with the conservation of biological and biocultural diversity. Additionally, biosphere reserves have the potential to support proposed Target 1 and Target 2 by promoting ecosystem restoration and sustainable economic development through the implementation of socio-culturally and environmentally sustainable practices. They may also contribute to development by hosting research, monitoring, education, and training initiatives. In order to be designated as biosphere reserves, sponsor organizations and/or authorities must develop and implement comprehensive management plans for these areas, foster participation by relevant stakeholders and rightsholders, and promote and monitor biodiversity, ecosystem services, and sustainable development indicators. By employing effective and equitable management practices, biosphere reserves can contribute to an ecologically representative and well-connected system of areas that together make significant contributions to biodiversity conservation efforts. The successful and fair implementation of these practices within biosphere reserves varies across different countries and even within them. During its 33rd session in September 2021, the MAB International Coordination Council made a decision to consider biosphere reserves as a unified entity, allowing Member States to decide whether they want to pursue the designation of OECMs within their respective biosphere reserves.

2.2.1 Republic of Korea

Several government ministries of the Republic of Korea are responsible for major policies and plans related to biosphere reserves in border areas. Key authorities include the Korea Forest Service (KFS), the Ministry of Environment (MOE), the Ministry of the Interior and Safety (MOIS), and the Ministry of Agriculture, Food and Rural Affairs (MAFRA). The following is a summary of the relevant policies and plans organized by the respective ministries in charge.

The KFS is developing laws and plans related to forests in border area biosphere reserves. These include the 3rd Basic Plan for Forest Biodiversity (2018-2022) under Article 42(1) of Creation and Management of Forest Resources Act, the 2nd Basic Plan for Baekdu-daegan Protection (2016-2025) under Article 4 of the Baekdu-daegan Protection Act, the 2nd Basic Plan for Forest Genetic Resources Protection Zone Management (2018-2022) under Article 10(3) of the Forest Protection Act, and the 6th Basic Plan for Forests (2018-2037) under Article 11 and related provisions of the Forest Basic Act and its Enforcement Decree.

The MOE is responsible for formulating plans related to environmental conservation and biodiversity. These plans include the 5th National Comprehensive Environmental Plan (2020-2040) under Article 14 of the Framework Act on Environmental Policy, the 3rd Basic Plan for Sustainable Development (2016-2035) under Article 50 of the Framework Act on Carbon Neutrality and Green Growth for Coping with Climate Crisis, the 3rd Basic Plan for Natural Environment Conservation (2016-2025) under Article 8 of the Natural Environment Conservation Act, and the 4th National Biodiversity Strategy (2019-2023) under Article 7 of the Act on the Conservation and Use of Biological Diversity. The 5th National Comprehensive Environmental Plan (2020-2040) is the top-level environmental plan in Korea. It explicitly refers to the designation of the DMZ border area as a world heritage site and border area biosphere reserve, and describes how its conservation is crucial to connecting the country's core ecological axes. The plan also discusses the promotion of an ecological peace belt for international cooperation projects, such as the protection of migratory birds. In addition, the Natural Environment Conservation Act provides the legal basis for financial support for the conservation and management of biosphere reserves.

Article 21-2 (Support for Biosphere Reserves)

The head of a relevant administrative agency may provide necessary financial support to conserve and manage biosphere reserves selected by UNESCO.

[This Article Newly Inserted on Mar. 22, 2013]

Article 49 (Purpose of Use of Ecosystem Conservation Charge)

(1) The ecosystem conservation charge and the grants issued pursuant to Article 46 (5) shall be used for the following purposes: Provided, That the ecosystem conservation charges raised from mining defined in subparagraph 2 of Article 3 of the Mining Industry Act, which are conducted on the forests and mountainous areas, shall be used for the ecosystem restoration projects in the damaged forests and mountainous areas: <Amended on Oct. 4, 2006; Apr. 11, 2007; Jul. 28, 2011; Feb. 1, 2012; Mar. 22, 2013; Dec. 10, 2019; May 26, 2020; Jan. 5, 2021>

1….

2….

13. Conservation and management of biosphere reserves selected by UNESCO

MOIS is responsible for enforcing the Special Act on Support for Border Areas, of which Article 7 explicitly targets border areas. In accordance with this act, MOIS formulated the Comprehensive Development Plan for Border Areas (2011-2030). This plan includes an overview of the overall status and regulatory environment of border areas, in addition to development strategies. The plan sets forth a vision for border areas, as quoted below:

"Nurturing of an Eco-Peace Belt centered around the Korean Peninsula, utilizing the excellent ecological resources of the border areas and the symbolic significance of the unique divided region."

The plan contains three specific objectives: (1) maximizing the conservation and utilization value of the ecological resources in the border areas for ecological and peaceful purposes, (2) inducing international interest by utilizing the uniqueness

of the DMZ to promote inter-Korean exchanges and establish a hub for international peace, and (3) fostering low-carbon advanced green industries as a driving force for new growth in the era of reunification.

Finally, MAFRA has promulgated its own plan with some relevance to border area biosphere reserves, the 3rd Basic Plan for Conservation, Management, and Utilization of Agricultural Genetic Resources (2019-2023) in accordance with Article 5 of the Act on the Conservation, Management, and Use of Agricultural Bio-resources. The plan places particular emphasis on the conservation and utilization of agricultural biological resources. Table 18 summarizes the relevant plans and legal bases for biosphere reserve conservation in border areas and the relevant ministerial authorities.

Table 18. Plans and legislation related to biosphere reserve conservation in Korea

Ministries	Plans	Laws
Korea Forest Service	Basic Plan for Forest Biodiversity (2018-2022)	Article 42(1) of Creation And Management Of Forest Resources Act
	2nd Basic Plan for Baekdu-daegan Protection (2016-2025)	Article 4 of the Baekdu-daegan Protection Act
	2nd Basic Plan for Forest Genetic Resources Protection Zone Management (2018-2022)	Article 10(3) of the Forest Protection Act
	6th Basic Plan for Forests (2018-2037)	Article 11 and related provisions of the Forest Basic Act and its Enforcement Decree
Ministry of Environment	5th National Comprehensive Environmental Plan (2020-2040)	Article 14 of the Framework Act on Environmental Policy
	3rd Basic Plan for Sustainable Development (2016-2035)	Article 50 of the Framework Act on Carbon Neutrality and Green Growth for Coping with Climate Crisis
	3rd Basic Plan for Natural Environment Conservation (2016-2025)	Article 8 of the Natural Environment Conservation Act
	4th National Biodiversity Strategy (2019-2023)	Article 7 of the Act on The Conservation and Use of Biological Diversity
Ministry of the Interior and Safety	Comprehensive Development Plan for Border Areas (2011-2030)	Article 7 of the Special Act on Support for Border Areas
Ministry of Agriculture, Food and Rural Affairs	3rd Basic Plan for Conservation, Management, and Utilization of Agricultural Genetic Resources (2019-2023)	Article 5 of the Act on the Conservation, Management, and Use of Agricultural Bio-resources

Source: Gangwon Institute (2021).

On September 25, 2020, the regional government of Gangwon Province promulgated and implemented a new regulation concerning biosphere reserves, the Gangwon Province Regulations on the Management and Operation Support of Biosphere Reserves. This set of measures was established to regulate matters the management of biosphere reserves located within Gangwon Province and to promote the conservation, development, and support of these areas. The regulation outlines the responsibilities of the government and residents of Gangwon Province, and directs the government to articulate management and implementation plans for biosphere reserves. For example, the regulation ordered the government to establish a Gangwon Province Biosphere Reserves Management Committee to advise and deliberate on important policies related to the management and development of biosphere reserves. The committee is responsible for designating biosphere reserves, formulating management plans, and carrying out other related functions.[43)]

The government of Gangwon Province has several other relevant strategies in place, including the Gangwon Province Comprehensive Plan (2021-2040), in accordance with Article 13 of the Framework Act on the National Land, the 3rd Gangwon Province Environmental Conservation Plan (2018-2025), based on Article 10 of the Gangwon Province Basic Environmental Regulation, the 1st Gangwon Province Biodiversity Strategy (2015-2020), which is in line with Chapter 26, Article 6 of the Gangwon Province Natural Environment Conservation Regulation, the 2nd Gangwon Province Climate Change Adaptation Detailed Implementation Plan (2017-2021), under Article 48 of the Framework Act on Carbon Neutrality and Green Growth for Coping with Climate Crisis, the 2020 Gangwon Environmental Work Plan, which is based on the Gangwon Province Comprehensive Plan 2012-2020, and the Gangwon Province Medium-Term Local Finance Plan (2020-2024), which is in accordance with Article 33 of the Local Finance Act.

In the Gangwon Province Comprehensive Plan (2021-2040), the border areas of Gangwon Province are officially designated as the Border Area Peace Belt. The plan aims to utilize the ecological and environmental characteristics of the DMZ to develop the tourism industry and transform border areas into industrial complexes. The goal is

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43) U-LEX, "Gangwon Province Regulations on the Management and Operation Support of Biosphere Reserves [implemented on September 25, 2020] [Gangwon Province Regulation 4602, enacted on September 25, 2020]", accessed on August 9, 2023.

to ease political and military tensions and promote peaceful settlement of the region. Furthermore, the border areas of Gangwon Province, which run adjacent to the DMZ, are one of the four major zones in Gangwon Province. The government envisions these areas as hotbeds for inter-Korean exchanges and the creation of ecological value. In order to establish a specialized development base for the DMZ border areas, the government has designs in place to create a DMZ World Ecological Peace Park, install a DMZ Peace Cable Car, build a combined experience space at the Unification Observation Tower, and construct a tourism complex tower at the Unification Observation Tower, aiming to improve the tourism infrastructure of the region.

In 2014, the government of Gangwon Province established the First Gangwon Province Biodiversity Strategy (2015-2020) in accordance with the National Biodiversity Strategy, the country's pan-ministerial national plan. It was developed to enhance international cooperation and raise the status of Gangwon Province as the host of the 12th Conference of the Parties to the Convention on Biological Diversity (CBD COP12) in 2014, which was held in Pyeongchang, Gangwon. The strategy aimed to align provincial programs with international initiatives and goals set forth at the conference. The legal foundations of this strategy include Articles 4 and 7 of the Biodiversity Conservation and Utilization Act and Article 26 of the Gangwon Province Natural Environment Conservation Ordinance.

The strategy described Gangwon Province as a visionary region that practices nature conservation, harmony of life, and peace. It set 6 strategies and 16 practical objectives for implementation. Following the conclusion of the 1st Gangwon Province Biodiversity Strategy (2015-2020), in line with national biodiversity-related laws and ordinances and the 4th National Biodiversity Strategy (2019-2023), Gangwon Province formulated the 2nd Gangwon Province Biodiversity Strategy (2021-2025) at the provincial level to ensure systematic biodiversity conservation and sustainable use of biological resources. The second strategy envisions a "happy Gangwon Province where biodiversity and a dignified ecological economy thrive" and aims to connect rational ecological conservation with sustainable regional economic development, ultimately improving the quality of life in Gangwon Province. It consists of 6 strategies and 17 sub-strategies for implementation.[44)]

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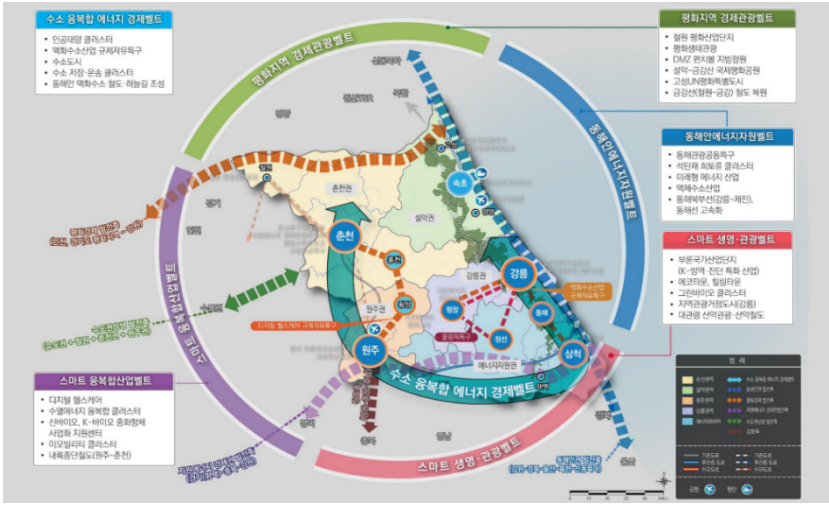
44) Gangwon Institute (2021).

Table 19. Plans and legal basis for the conservation of biosphere reserves in the border areas of Gangwon Province

Plans	Laws
Gangwon Province Comprehensive Plan (2021-2040)	Article 13 of the Framework Act on the National Land
Third Gangwon Province Environmental Conservation Plan (2018-2025)	Article 10 of the Gangwon Province Basic Environmental Regulation
First Gangwon Province Biodiversity Strategy (2015-2020)	Chapter 26, Article 6 of the Gangwon Province Natural Environment Conservation Regulation
Second Gangwon Province Climate Change Adaptation Detailed Implementation Plan (2017-2021)	Article 48 of the Framework Act on Low Carbon, Green Growth
2020 Gangwon Environmental Work Plan	Gangwon Province Comprehensive Plan 2012-2020
Gangwon Province Medium-Term Local Finance Plan (2020-2024)	Article 33 of the Local Finance Act

Source: The authors.

Figure 21. 2040 Gangwon Province Comprehensive Development Future Vision



Source: Gangwon Province (2021), p.25.

2.2.2 Germany

The implementation of the Lima Action Plan and MAB program in Germany

Germany formulated an implementation plan for the Lima Action Plan on September 14, 2017. In this section, we introduce the core tenets of the Lima Action Plan, which include: (1) the Federal Government's main responsibilities and tasks, (2) the mission and essential resources of biosphere reserves, (3) the responsibilities and tasks of local governments, (4) the responsibilities of business sector, (5) the responsibilities of universities and research institutions, (6) the responsibilities of the Permanent Working Group of the German Biosphere Reserves (AGBR) and Europarc Germany, (7) the responsibilities of the German MAB National Committee, (8) the responsibilities of the Federal Foreign Office, (9) the responsibilities of the Federal Ministry for Economic Cooperation and Development, (10) the responsibilities of the Federal Ministry of Education and Research, and (11) the responsibilities of the German Commission for UNESCO.

National-level regulations

The main legal basis for biosphere reserves in Germany is the German Federal Nature Conservation Act (Bundesnaturschutzgesetz). It covers biosphere reserves in § 25.

The German Commission for UNESCO does not have a formal responsibility for the biosphere reserves in Germany, but for their formal designation as UNESCO biosphere reserves in MAB program. Since the MAB National Committee works in close cooperation with the Federal Ministry for the Environment, the German Commission for UNESCO supports biosphere reserves domestically and internationally through a number of initiatives.

In addition to the legal basis for biosphere reserves, it is also important to have a holistic understanding of the system of environmental protection. Categories of environmental protection differ according to level of protection, and are based on the classification system of the International Union for Conservation of Nature (IUCN) (Dudley, 2008) (Table 20). Biosphere reserves fall under IUCN category IV. But due to zoning, some areas of these reserves may be subject to stronger protections, especially in their core zones.

Table 20. Protected area categories and corresponding IUCN categories in Germany

IUCN Category (Dudley, 2008)	Protected area category
I (a,b)	
II	National Park
III	National Nature Monument
IV	Biosphere Reserve, Nature Protected Area
-	Natura 2000, Bird Reserve, Ramsar SPA, SCI
V	Nature Park, Landscape Protected Area
Other national protection status	E.g. Flood Protection Areas

Note: Ordered according to level of protection, from high (top) to low (bottom).
Source: Adapted from Bianchin and Neubert (2013).

Federal regulations

The national government in Germany has only framework laws in place for the protection of nature. Implementation is the responsibility of the states, and so there are corresponding laws in place at the state level. For example, the following laws apply to the Rhön biosphere reserve in the three states upon which it sits:

- Thuringia: Thuringia Act on the Implementation of the Federal Nature Conservation Act and for the further regulation of nature conservation and landscape management under state law (Thuringian Nature Conservation Act), § 13
- Bavaria: Law on the Protection of Nature, the Maintenance of the Landscape and Outdoor Recreation (Bavarian Nature Conservation Act), Article 14
- Hesse: Hessian Implementing Act to the Federal Nature Conservation Act, § 12

In addition, each of the respective federal states has a formal spatial development plan. These define the main principles that each state is to abide by in the pursuit of spatial organization and development, including such development as it regards environmental conservation or tourism. However, only the state development programs of Thuringia and Hesse mention the Rhön biosphere reserve specifically.

- Thuringia: Federal State Development Program Thuringia 2025, entered into force in 2014, currently under revision
- Bavaria: Federal State Development Program Bavaria, entered into force 2013, last amended in 2023
- Hesse: State Development Plan Hesse 2020, entered into force 2001, last amended in 2021

The three states of Thuringia, Hesse and Bavaria are jointly responsible for the administration of the Rhön biosphere. Cooperation is based on a joint administrative agreement from 2002.

In addition, a document promulgated by the Bavarian State Ministry of the Environment and Consumer Protection in 2014 regarding the Bavarian part of the Rhön reserve defines it as a biosphere reserve under state law. The policy document does not obligate any one party to any duty; rather, it outlines the basic tasks of the administrative body and the Bavarian Rhön Nature Park and Biosphere Reserve Association.

In contrast to the Bavarian and Hessian parts of the Rhön, the Thuringian part is protected by binding legal ordinance: the Thuringian Ordinance on the Rhön Biosphere Reserve (1990, currently under revision). In addition to prohibitions, exceptions and exemptions, the ordinance also describes the nature of administrative to be carried out by the Thuringian office of the Rhön biosphere reserve.

Regional regulations

The most important instrument at the regional level is the so-called framework concept. As guiding principles, framework concepts define objectives and outline paths for implementation. With regards to biosphere reserves, the first relevant framework concept was drawn up immediately following UNESCO designation of the Rhön in 1991, and following deliberations came into force in 1995. With the expansion of the BR Rhön in Bavaria in 2014, a revision of this mission statement was necessary. The new framework concept came into force in 2018.

The process by which the concept was revised began in 2014 and lasted three years, only coming to a conclusion in 2017. Deliberations featured unprecedented levels of participation: 300 people and stakeholders living in the Rhön worked together

with those responsible at the Rhön biosphere reserve administration office to develop coordinated project proposals, objectives, and measures through a total of eleven supranational working groups. Questions regarding demographic change, integration and migration, climate change, mobility requirements, the energy transition, structural change, and digitalization were addressed. New topics such as education for sustainable development, sustainable production, processing and marketing, as well as transnational structures were also given greater focus (UNESCO-Biosphärenreservat Rhön, 2018).

In terms of formal spatial planning at the regional level, each respective state has a regional planning region with a specific regional plan in place. The regional plans specify the spatial and content-related specifications of state development programs or plans. The Rhön biosphere reserve is situated in the following planning regions:

- Thuringia: Southwest Thuringia, regional plan from 2012, currently under revision
- Bavaria: Main-Rhön, regional plan from 2008, last amended in 2017
- Hesse: North Hesse, regional plan from 2009, last amended in 2020

All regional plans cover several aspects of the protection and development of the Rhön region. In terms of implementation, all respective county administrations as well as community administrations are involved.

2.2.3 Policy recommendations

(1) Biosphere reserves implementation plan: Mission, tasks, and necessary resources for stakeholders

Biosphere reserves are not protected by binding domestic or international laws. Rather, detailed implementation plans are used to protect them. The German implementation plan for biosphere reserves includes specific sub-plans outlining the responsibilities and tasks of key stakeholders, which include federal states, local authorities, local industry, universities and research institutions, the Permanent Working Group of the German Biosphere Reserves, the German MAB National Committee, the Federal Foreign Office, the Federal Ministry for Economic Cooperation and Development, the Federal Ministry of Education and Research, and the German Commission for UNESCO. In Korea, in order to conserve biosphere reserves and

regional sustainable development, it is necessary to establish an implementation plan that align with relevant plans and strategies such as the Lima Action Plan, and to develop plans for government, businesses, and academia.

(2) Incorporating the designation and management of biosphere reserves in the Natural Environment Conservation Act of the Ministry of Environment

In Korea, Article 21-2 (Support for Biosphere Reserves) currently allows for financial support, but the law lacks specific provisions regarding the designation and management of biosphere reserves. MOE is considering adding provisions that address the designation and management of biosphere reserves to laws such as the Natural Environment Conservation Act.

It is crucial that Korea enacts domestic legislation concerning the management of biosphere reserves, as the existing regulatory framework under which they are governed lacks the strength of international or domestic laws, such as the international convention governing World Heritage sites and the domestic laws regulating cultural heritage. The ambiguous legal status of the biosphere reserves arises from the limitations to the regulatory framework. In order to properly conserve biodiversity and promote the sustainable use of the biosphere reserves, it is essential to establish binding and enforceable measures.

(3) Promoting local industry and developing programs that allow communities and local governments to participate in biosphere reserves located in border areas

UNESCO biosphere reserves are internationally recognized terrestrial, coastal, marine, or combined ecosystems designated by the UNESCO MAB within the framework of MAB International Coordinating Council (ICC). Biosphere reserves are designated in areas that represent geographically significant ecosystems and levels of biodiversity, where the concept of sustainable development can be applied, and where public institutions, local communities, and private entities can participate. As emphasized in OECM designation, it is important for the communities in the respective areas to stay and protect their community. In this context, in order to promote economic and social development in the region while conserving ecosystems, the development

of industrial models that foster industries is required, with the participation of all stakeholders in the region. Furthermore, in order to enhance local activation and promote ecosystem and landscape conservation in biosphere reserves, programs aimed at promoting community participation need to be developed in collaboration with local residents and the private sector. For this purpose, it is necessary to prioritize the designation of biosphere reserves for government-supported projects that require community participation, such as village development and urban regeneration, and to develop programs within this context.

(4) Overcoming structural differences between the state-specific administrative bodies of the Rhön biosphere reserve

The framework concept of the Rhön biosphere reserve identifies the different structures that exist due to state-specific circumstances as an obstacle to improved cross-state task management. For example, there are three administrations with different ranges of tasks, and in Bavaria there is also the Bavarian Rhön Nature Park and Biosphere Reserve Association which manage environmental education. The overall situation has caused some frustration, as the legal framework conditions, state planning requirements, and the division of tasks between the three administrative bodies show clear differences. This severely restricts the efficiency of cross-state task management. As a proposed solution, the concentration of individual tasks, such as communication, which is important for the external perception of the Rhön as a unified UNESCO biosphere reserve, in one administrative office with the appropriate technical expertise is considered to be more expedient (UNESCO-Biosphärenreservat Rhön 2018, p.25).

2.3 The value of biosphere reserves in Korea and Germany

Sustainable development objectives of biosphere reserves[45)]

1) Eradicate poverty (SDG 1): Create a profit model that benefits local communities and contributes to local economic stimulation through the promotion of community projects and job creation in local areas. Such efforts could involve establishing theme villages and promoting community businesses. These endeavors can ultimately contribute to tackling poverty at both regional and national levels.

2) Foster healthy living (SDG 3): Utilize the ecological, natural, cultural, and historical resources in candidate areas to provide local communities and visitors with the opportunity to enjoy a healthy lifestyle.

3) Provide education & life-long learning opportunities: Develop and implement education and outreach programs for men and women of all ages that leverage local ecological and natural assets.

4) Ensure safe water and hygienic sanitation: Protect and improve water quality through conservation and sustainable management practices in every municipality.

5) Guarantee access to energy: Enhance local communities' access to eco-friendly energy through small-scale renewable energy projects, including the establishment of eco-friendly energy towns.

6) Promote robust economic growth: Expand sources of income for local communities through local development projects involving eco-tourism and local specialties that leverage ecological and natural resources and the status of the area as a biosphere reserve.

7) Promote sustainable industrialization: Promote smart industry that encompasses ICT and tourism (processing and sales of eco-friendly products and service provisions).

8) Promote sustainable consumption and production patterns: Explore sustainable lifestyles and identify ways to develop them under the leadership of the GWBR steering committee and municipal centers.

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45) Gangwon Institute (2021), p.37.

9) Promote action at all levels to address climate change: Protect carbon sinks through forest conservation in the core and buffer areas in recognition of their pristine ecosystems, accompanied by environmental education for residents.

10) Protect and restore terrestrial ecosystems and halt all biodiversity loss: Perform continued monitoring and restoration activities in the GWBR ecosystems, and operate an invasive species management group that will be tasked with removing said species as well as identifying potential ways to use them as resources.

11) Achieve peaceful and inclusive societies, rule of law, effective and capable institutions: Ensure effectiveness of conservation, development, and logistical support functions of the proposed biosphere reserve through the Gangwon Province-led GWBR steering committee and GWBR center, as well as the GWBR municipal centers in the five counties (Cheorwon, Hwacheon, Yanggu, Inje, and Goseong) and a consultative group that involves residents.

12) Strengthen and enhance the means of implementation and global partnership for sustainable development: Strengthen the network of cooperation through information-sharing and engagement with other biosphere reserves at home and abroad.

3 Analysis of Border Area Case Studies

3.1. Analysis of relevant cases

3.1.1 South Korea

The basic status of the evaluation target areas in South Korea, Inje-gun and Yanggu-gun, is provided in the following Table 21.

Table 21. The status of Inje-gun and Yanggu-gun in 2020

Category		Inje-gun	Yanggu-gun
Local government administrative districts (Unit: number)	Eup	1	1
	Myeon	5	4
	Dong	0	0
Population trends (Units: number of households, persons, %, people per m^2)	Households	15,900	10,828
	Male	17,203	11,935
	Female	14,756	10,591
	Population increase rate	-0.1	-2.1
	Person 65 years old and over	6,530	4,702
	Population density	19.4	31.9
Land area and category (Unit: m^2)	Dry-paddy-field	53,484,642	47,630,977
	Paddy-field	14,768,180	24,909,677
	Orchards	189,795	195,792
	Pasture	2,320,563	486,875
	Forests	1,472,069,504	530,225,090
	Minerals / Springs	0	0
	Buildings	7,125,886	4,111,011
	Factories	258,824	318,488
	Schools	563,365	413,345
	Parking	148,309	28,545
	Gas stations	65,946	13,469

Table 21. (continued)

Category			Inje-gun	Yanggu-gun
	Warehouses		345,315	294,389
	Roads		16,468,833	9,705,632
	Railroads		0	0
	Banks		28,538,922	1,133,317
	Rivers		1,237,695	10,650,884
	Parks		143,011	82,210
	Gymnastics		1,167,115	113,790
	Recreation		186,890	3,225
	Religious sites		147,389	70,921
	Historic sites		1,982	4,727
	Burial sites		148,641	360,021
	Miscellaneous area		15,794,079	12,017,463
	Others		451,349	43,431,561
Number of business establishments and workers (Units: number, persons)	Agriculture · Forestry and Fishing	Establishments	48	30
		Workers	219	188
	Mining and quarrying	Establishments	3	4
		Workers	20	27
	Manufacturing	Establishments	240	159
		Workers	911	598
	Wholesale and retail trade	Establishments	980	499
		Workers	1,791	972
	Transportation and storage	Establishments	130	88
		Workers	212	205
	Hotels and restaurants	Establishments	1,331	672
		Workers	2,365	1,305
	Professional, scientific and technical activities	Establishments	65	42
		Workers	369	154
	Business facilities management and and technical activities	Establishments	65	50
		Workers	226	156
	Public administration & defense, compulsory social security	Establishments	29	25
		Workers	1,326	1,455

Source: Inje-gun (2021); Yanggu-gun (2021).

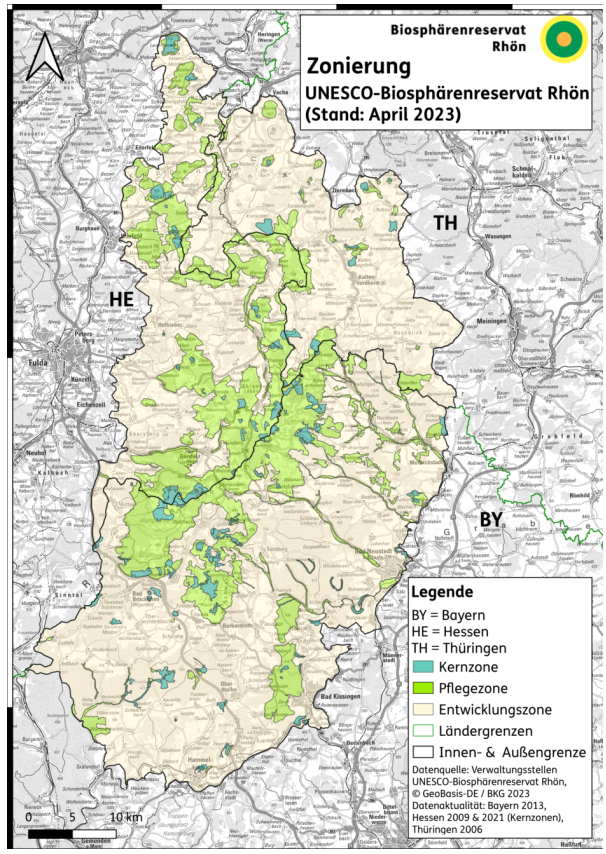
3.1.2 Germany

The Rhön Biosphere Reserve in Germany was chosen as a comparison to the Yanggu Biosphere Reserve, which lies in South Korea on the border with the North. Although it is not located on a current national border, the former Inner German Border, which is the current border between the German states of Thuringia (formerly in East Germany), and Bavaria and Hesse (formerly in West Germany) intersect it. It is thus located on the so-called Green Belt, which stretches along the former Inner German Border: the Iron Curtain of the Cold War.

Figure 22. Location of the Rhön Biosphere Reserve in Germany

Source: Wikipedia (2023), "Rhön Biosphere Reserve", accessed on May 30, 2023.

Figure 23: Zones of the Rhön Biosphere Reserve



Note: Core zones in dark green, buffer zones in green, and transition zones in light yellow.
Source: Biosphärenreservat Rhön (2023a), "Zonierung UNESCO-Biosphärenreservat Rhön", accessed on May 30, 2023.

The total area of the Rhön biosphere reserve is 184,939 ha, whereof core areas cover 4,199 ha, buffer zones 67,483 ha, and transition zones 107,557 ha.

In this chapter, we will identify one area in the Rhön Biosphere Reserve suitable for comparison with Korea. In the Rhön, almost all municipalities are more densely populated than the comparable Korean communities surrounding the GWBR, but the following German municipalities have roughly comparable population densities: Gerstengrund (14 people/km²), Erbenhausen (27 people/km²), Haussen (28 people/km²) and Rhönblick (34 people/km²).

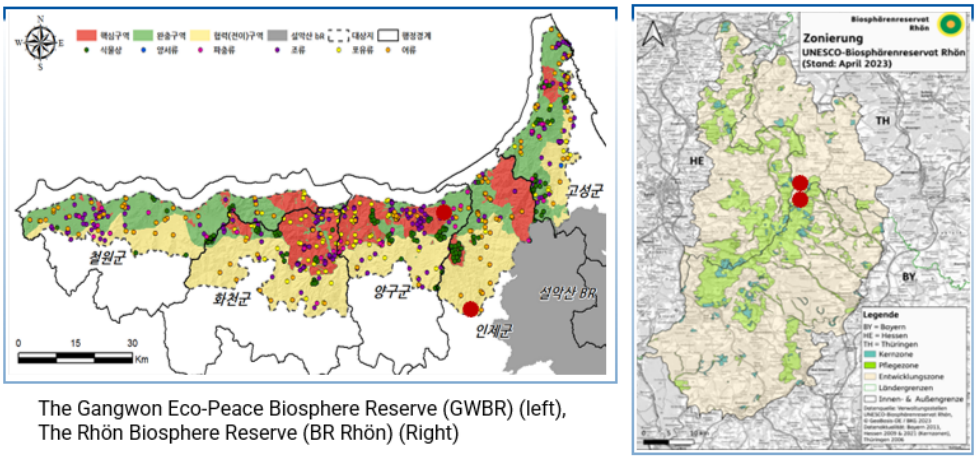
3.1.3 Target areas

The criteria for choosing a pilot evaluation site include the administrative districts at the Myeon (면) level in Korea and the Gemeinde level in Germany. Emphasis is placed on locales where administrative statistics and other relevant data are present or can be compiled. Furthermore, sites with comparable characteristics, such as population density, natural resources, and industrial sectors are taken into consideration during the selection process. In addition, priority is given to areas that are characterized by active community involvement and a collaborative relationship between local governments.

In Korea, the target GWBR areas are coastal regions and Yanggu-gun, home to several active community businesses, as well as Sangnam-myeon in Inje-gun.

In Germany, the selected areas are the Dermbach municipality in the district of Wartburgkreis and the municipality of Rhönblick in the district of Schmalkalden-Meiningen, located in the province within the Rhön BR (Hessen, Bayern, Thüringen), where the UNESCO-BR Rhön's visitor center is situated.

Figure 24. Target areas in Korea and Germany



The Gangwon Eco-Peace Biosphere Reserve (GWBR) (left),
The Rhön Biosphere Reserve (BR Rhön) (Right)

Source: The authors [data from Gangwon Province(2021), p.96 (left); Biosphärenreservat Rhön (2023a)(right)].

3.2. Development of a regional sustainability assessment tool using a scoring model

The development of regional sustainability assessment tools utilizing scoring models involves the systematic formulation and implementation of evaluative frameworks designed to gauge the ecological, social, and economic dimensions of sustainability within a specific geographic area.

3.2.1 Scoring model

According to Lyles and Stevens (2014), plans for objective evaluation incorporate qualitative evaluation methodologies such as protocol design, application and usability, scoring, personal assessment, coding procedures, pretesting, sampling, and reliability assessment.

In the present study, a regional sustainability assessment tool is developed utilizing a scoring model. Scoring models have several advantages, including the ability to quantify qualitative evaluation factors through a prescribed quantification process, dependence solely on commands outlined in the coding protocol, and the establishment of clear definitions for each item indicator with a composition that is mutually exclusive and complete.

The main drawback of this approach is the inconvenience associated with the need to ascertain weightings between items to facilitate meaningful score comparisons among them.

Table 22. Planning indicator evaluation methodology

Category	Rationale
Protocol design, usage, and availability	Protocol items should involve choices between mutually exclusive scoring options, employ objective criteria that can be applied by other researchers (or coders), and be identified before analysis of plans (Krippendorff 2004; Singleton and Straits 2005). Providing clearly written coding items and specific rules for assigning scores is critical for generating reliable content analysis data (Putt and Springer 1989; Krippendorff 2004; Singleton and Straits 2005).
Scoring	In quantitative content analysis, measurements are coded in numerical form (Putt and Springer 1989). To allow replication, coders must rely solely on the instructions in a coding protocol to make their scoring determinations (Krippendorff 2004). Thus, each item must be clearly defined, exhaustive, and mutually exclusive (Krippendorff 2004; Singleton and Straits 2005). When combining item scores into total scores or when comparing scores across items, researchers must also decide how much weight to assign to each item.
Descriptions of coders	Content analysis relies on individual coders to apply the coding protocol to a set of plans.[a] Coders make the critical judgments on the scores assigned to each item (Putt and Springer 1989). Researchers must ensure that coders possess the relevant cognitive abilities and should also take into consideration the coders' substantive backgrounds with the material they are content analyzing (Krippendorff 2004).
Coding procedures	Reliable content analysis data will be stable across repeated measurement by the same coder, reproducible by separate coders, and accurate in comparison to an accepted standard (Krippendorff 2004). Coders must work independently of each other (Krippendorff 2004). Upon completion of independent coding, coders should engage in a reconciliation process whereby coders identify differences in their independently derived scores and then refer back to the plan document to arrive at consensus on the appropriate score to assign the item for the plan.
Pretesting	Pretesting of data collection instruments is recommended practice for the social sciences in general (e.g., survey research) and content analysis specifically (Putt and Springer 1989; Singleton and Straits 2005; Dillman, Smyth, and Christia 2008). Pretesting is especially important when proven measures are not available (Putt and Springer 1989), which is often the case in the plan quality literature as authors develop protocols to apply to new areas of planning (e.g., climate change).
Sampling	Sampling consists of identifying the target population of units to which the researcher intends to generalize results, operationalizing the target population as a sampling frame from which the units of analysis will be selected, and following sampling design and procedures to identify the sample of units that will be analyzed (Putt and Springer 1989; Singleton and Straits 2005). Sampling is relevant to content analysis because under most circumstances, all the potentially relevant units (e.g., newspapers, speeches, or plans) cannot be analyzed (Krippendorff 2004).
Assessing reliability	Reliability of prereconciled content analysis data can be calculated using a variety of different statistics suggested in the literature, including percentage agreement, Krippendorff's alpha, and others. These reliability statistics are calculated for individual coding items and can be reported at the individual item level or can be averaged for groups of items. Reliability statistics can then be compared to published standards of what is acceptable, although such standards must be considered in the context of the consequences of assuming data are reliable when they are not (Krippendorff 2004).

Source: Lyles and Stevens (2014), p.440.

The scoring model is widely utilized as an evaluative framework, appraising the extent to which a specific target or reference value has been achieved. This model accommodates both quantitative and qualitative criteria, enabling the incorporation of diverse evaluation indicators, and facilitates the definition of minimum and maximum score intervals through strategic weight-setting.

In the formulation of evaluation metrics, it is imperative that these metrics are objectively quantifiable and operationally feasible. To ensure objectivity, a collaborative process involving participation by multiple experts is employed to determine the relative weights of each metric. The engagement of more than one assessor is essential to accommodate subjective perspectives. Moreover, the cyclical nature of the evaluation process contributes to the reinforcement and refinement of objectivity.

One advantage of Decision Support Tools is their ability to increase transparency in decision-making processes by unveiling evaluation indicators. However, they are susceptible to manipulation.

Figure 25. Scoring model example

Kriterien		Gewichtung in %						Bewertung (Schwäche … Stärke)					Berechnung des Scores (Gewichtung x Bewertung)					
		Wichtung	Beurteilungs-kriterien	Wichtung	Beurteilungs-kriterien	Wichtung	Bewertungs-faktoren	mangelhaft	ausreichend	befriedigend (neutral = 3)	gut	sehr gut	Punkte-faktoren	Faktoren gewichtet	Gesamt-punkte Kriterien	Gesamt-Score (Kriterien gewichtet)	Gesamt-punkte Ebenen	Gesamt-Score (Ebenen gewichtet)
1.	**Makrostandort**	1.0	16.7%	6.0	100.0%												0.000	0.000
1.1.	**Lage & Verkehrsanbindung**			1.5	25.0%	3.5	100.0%								0.000	0.000		
1.1.1.	Zentralität					1.5	42.9%						0	0.000				
1.1.2.	Anbindungen an Autobahn (nach REN)					1.0	28.6%						0	0.000				
1.1.3.	Entfernung zum internationalem Flughafen					1.0	28.6%						0	0.000				
1.2.	**Bevölkerungsstruktur**			1.0	16.7%	4.0	100.0%								0.000	0.000		
1.2.1.	Altersstruktur Prognosen aus der Kreisbeobachtung					1.0	25.0%						0	0.000				
1.2.2.	Bisherige Bevölkerungsentwicklung					1.0	25.0%						0	0.000				
1.2.3.	Zukünftige Bevö					1.0	25.0%						0	0.000				
1.2.4.	Potenzielle Haushaltsgründer					1.0	25.0%						0	0.000				
1.3.	**Freizeitwert**			1.5	25.0%	2.0	100.0%								0.000	0.000		
1.3.1.	Erreichbarkeit der umliegenden Wald- & Wasser-flächen mit dem Auto					1.0	50.0%						0	0.000				
1.3.2.	Kulturelle Einrichtungen					1.0	50.0%						0	0.000				
1.4.	**Bauland**			1.0	16.7%	5.0	100.0%								0.000	0.000		
1.4.1.	Entwicklung Baugenehmigungen im Vergleich mit RLP					1.0	20.0%						0	0.000				
1.4.2.	Preisentwicklung für Bauland					1.0	20.0%						0	0.000				
1.4.3.	Entwicklung Wohnungsbestand					1.0	20.0%						0	0.000				
1.4.4.	Bestehende Bauleitpläne und Stadtentwicklungskonzepte					1.0	20.0%						0	0.000				
1.4.5.	Mietspiegel					1.0	20.0%						0	0.000				
1.5.	**Wirtschaft**			1.0	16.7%	2.0	100.0%								0.000	0.000		
1.5.1.	Verfügbares Haushaltseinkommen					1.0	50.0%						0	0.000				
1.5.2.	Prognose der Wirtschaftsentwicklung					1.0	50.0%						0	0.000				
2.	**Mikrostandort**	2	33.3%	6.0	100.0%												0.000	0.000
2.1.	**Nutzungsstruktur**			1.0	16.7%	4.0	100.0%								0.000	0.000		
2.1.1.	Handelsstruktur (Entfernungen zu Bäckerei, Apotheke, Supermarkt)					1.0	25.0%						0	0.000				
2.1.2.	Soziale Dienstleistungsstruktur (Entfernungen zu Ärzten, Betreuungs- und Pflegeeinrichtungen)					1.5	37.5%						0	0.000				
2.1.3.	Gemeinbedarfseinrichtungen (Entfernungen zu Grundschule, Kindertagesstätte, Kindergarten)					1.5	37.5%						0	0.000				
2.2.	**Mieterstruktur**			1.5	25.0%	2.0	100.0%								0.000	0.000		

Source: The authors.

3.2.2 Scoring model indicators

The following items were reviewed to establish the evaluation index of this study's scoring model.

The Lima Action Plan outlines five strategic action areas: (1) the World Network of Biosphere Reserves, consisting of effectively functioning models for sustainable development, 2) inclusive, dynamic and result-oriented collaboration and networking within the MAB Programme and the World Network of Biosphere Reserves, (3) effective external partnerships and sufficient and sustainable funding for the MAB Programme and the World Network of Biosphere Reserves, (4) comprehensive, modern, open, and transparent communication, information and data sharing, and (5) effective governance of and within the MAB Programme and the World Network of Biosphere Reserves. The Lima Action Plan proposes strategies and activities for the Network of Biosphere Reserves to undertake. Based on the actions, outputs, and performance indicators included in the Lima Action Plan, this study derived a representative set of indicators to assess sustainability in MAB Program plans and policies. The derived indicators represent the five strategic action areas described above.

The Lima Action Plan includes a variety of relevant indicators that can be integrated in the scoring model. Potential indicators include: the number of specific initiatives or activities contributing to SDG targets, the number of specific initiatives or activities contributing to MEA, the number of climate change-related projects/strategies, national guidelines and/or policies for the process leading to nomination of biosphere reserves, the number of references to biosphere reserves in policies and/or programs, the existence of biosphere reserve business plans, biosphere reserve funding, biosphere reserve compliance with the Statutory Framework on the basis of periodic review reports submitted on time, the quality and quantity of ecosystem services provided by biosphere reserves as indicated in periodic reviews, the number of programs established related to global education, capacity building and training, the number and diversity of participants in networks, the existence of a business and a marketing plan to be endorsed by the ICC, and open access availability for MAB documents, data, information and other materials. Considering the hierarchy among sustainability indicators, this study adopts only essential indicators that can evaluate the designation and operation of biosphere reserves.

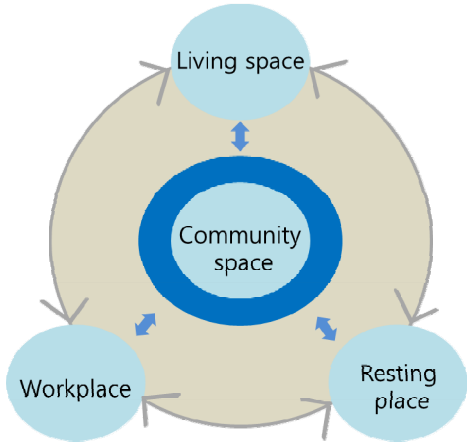
For this work we derive a total of four indicators from the Lima Action Plan. They all correspond to macro locations, and are essential to evaluate whether there are policies, plans, funding, and education programs necessary for biosphere reserves to be continuously designated and managed, and to discern whether their foundation for sound and continued operation is in place.

Two indicators, (national guidelines and/or policies for the process leading to nomination of biosphere reserves and the existence of a business plan for biosphere reserves) are included under a long-term regional plans for sustainability category. The other two indicators, (sustained biosphere reserve funding and the number of programs established related to global education, capacity building, and training) are included under a sustainable finance and governance category.

In this study, we reviewed six sustainability-related assessment indicators for the establishment of a scoring model. First, we considered the Regional Development Index (RDI), originally developed by the Korea Rural Economic Institute (KREI). KREI built the RDI 85 in 2007-2008 to function as a region-based index to assess regional quality of life conditions and levels of development, inform the establishment of planning goals and the formulation of policies based on these goals, and to measure performance against objectives. Some of the index's indicators have been revised and improved. KREI evaluates regional sustainability annually using the RDI. The index is broadly structured into four categories: quality of life services, regional economic vitality, leisure and space, and community vitality.[46)]

46) KREI (2020), pp.3-4, pp.15-16.

Figure 26: Concept of the Regional Development Index



Source: KREI (2020), p.15.

Next, there is the Gross National Happiness (GNH) index. The GNH Index is a measure of the overall wellbeing and happiness of the Bhutanese population, with values ranging from 0 to 1. A higher GNH Index value indicates greater happiness and wellbeing, while a lower value represents the opposite. It is based on 33 indicators that assess nine GNH domains, including psychological well-being, health, education, time use, cultural diversity and resilience, good governance, community vitality, ecological diversity and resilience, and living standards (figure 27). Unlike GDP, which focuses solely on economic activity, the GNH framework offers a holistic and sustainable approach to measuring progress that considers impacts on quality of life and the environment.[47)]

47) Centre for Bhutan & GNH Studies (2023), pp.7-9.

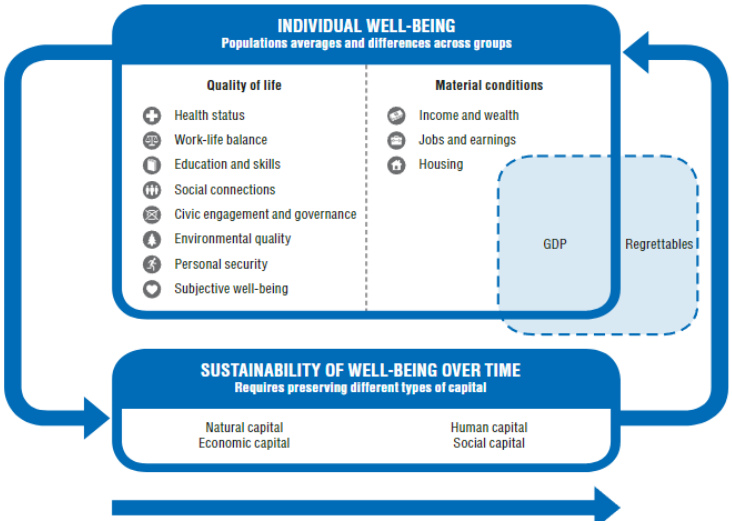
Figure 27: GNH indicators and domains

Source: Centre for Bhutan & GNH Studies (2023), p.9.

The third index we reviewed for this study is OECD's Better Life index. The Better Life Index is created to engage people in conversations about well-being and, in doing so, understand what holds the most significance for them. It is an interactive tool that permits users to assign their own importance to the 11 dimensions within the OECD well-being framework. This index is founded on 24 indicators that evaluate 11 domains, encompassing housing, income, jobs, community, education, the environment, civic engagement, health, life satisfaction, safety, and work-life balance.[48)]

48) OECD (2013), "How's Life? 2013: Measuring Well-being The OECD Better Life Initiative: Concepts and indicators", accessed on October 13, 2023; OECD.Stat, "Better Life Index", accessed on October 13, 2023.

Figure 28. The OECD well-being conceptual framework

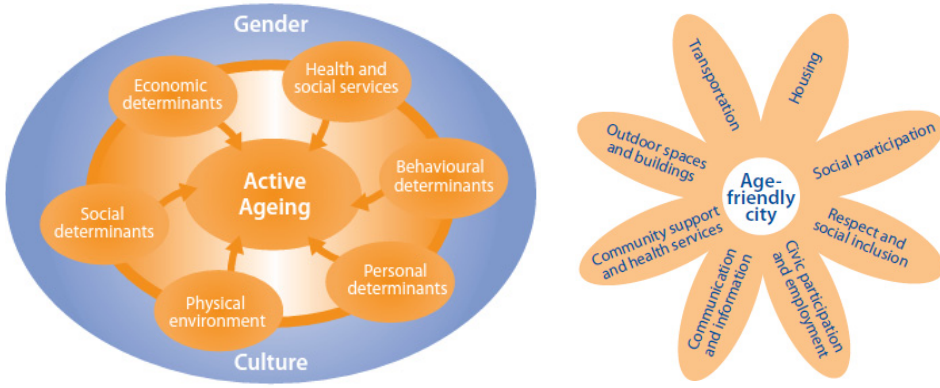


Source: OECD (2013), "How's Life? 2013: Measuring Well-being The OECD Better Life Initiative: Concepts and Indicators", accessed on October 13, 2023

The fourth set of indicators we reviewed is a checklist for WHO's Age-Friendly City certification. This checklist is based on WHO's Active Ageing Framework and was examined in this study to consider the sustainability of biosphere reserve areas with a high proportion of elderly populations. The checklist is organized into seven categories: transportation, housing, social participation, respect and social inclusion, civic engagement and employment, communication and information, health, and outdoor activities.[49)]

49) WHO (2007a, pp.1-10, 2007b, pp.1-4).

Figure 29. WHO's Active Ageing Framework and Age-friendly city topic areas



Source: WHO (2007a), p.5, p.9.

Fifth, a self-assessment tool for UNICEF's Child-Friendly Cities Initiative and 10 components of UNICEF's Child-Friendly Cities Initiative were reviewed. In the rapid urbanization process of today, many cities and communities in Korea have developed without sufficient consideration for their users. This has resulted in a significant lack of consideration for the physical, cognitive, and emotional capabilities of children, which are distinct from those of adults. Furthermore, there is a considerable disparity in conditions among regions. Therefore, to achieve regional sustainability, it is crucial to assess whether regions have formulated child-friendly plans and policies.[50] UNICEF provides a self-assessment tool to support local governments interested in participating in the Child Friendly Cities initiative. This questionnaire is divided into six areas of Child Friendly Cities (Participation & Citizenship, Environmental Sustainability & Living Conditions, Play & Recreation, Education, Safety & Protection), addressing current status and future plans through a series of questions.[51] In addition, The Child-Friendly Cities Initiative should include 10 components, which are as follows: dedicated organization for children's rights, child-friendly legal system, system for children's participation, independent

50) Yoo, Lee, and Park (2021), pp.137-139.

51) UNICEF, "Child Friendly Cities Initiative (CFCI): Self-Assessment Tool for Local Authorities", accessed on October 17, 2023.

advocates for children's rights, education and promotion of children's rights, analysis and securing of child budgets, regular surveys on the status of children's rights, development of strategies for creating child-friendly cities, child impact assessments, measures for child safety. The last component, measures for child safety, is a specific criterion designated by UNICEF Korea Committee itself. UNICEF Korea Committee utilizes these 10 components as certification criteria.[52)]

The last set of indicators we reviewed is the International Slow City Indicators, by the Cittaslow Network. The Cittaslow Slow City movement promotes urban life that is livable and sustainable, and works to move away from the quantitative growth and rapid pace of modern society, recognize common urban issues, and propose alternatives. The project seeks to pursue a sustainable balance to pass on a more valuable viable future to the following generations.[53)] To obtain certification, cities must meet certain criteria established by Cittaslow and have certain policies in place. These policies should address key concerns in the fields of energy and the environment, infrastructure, quality of life, agriculture, tourism, traditional arts, visitor hospitality, education, social cohesion, partnerships, and more. There are 72 evaluation criteria to assess these policies.[54)]

3.2.3 Weight-setting for the scoring model

An Analytic Hierarchy Process (AHP) analysis was conducted to set the weights. Fifteen experts from the private sector, local government, and academia participated in the AHP analysis. Initially, experts evaluated the macro and micro priorities through pairwise comparisons, and subsequently assessed the priorities between the sub-criteria within macro and micro. The weights were determined by using the average AHP results from each expert. The results are as shown in the figures below.

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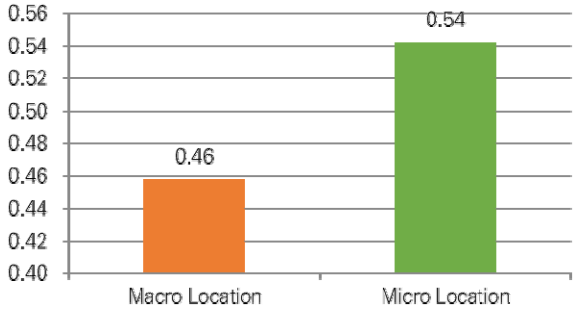
52) UNICEF Korea, “Child-Friendly Cities”, accessed on October 17, 2023

53) Cittaslow Corea Network, Main Page and ”Understanding of Slow City“, accessed on October 17, 2023.

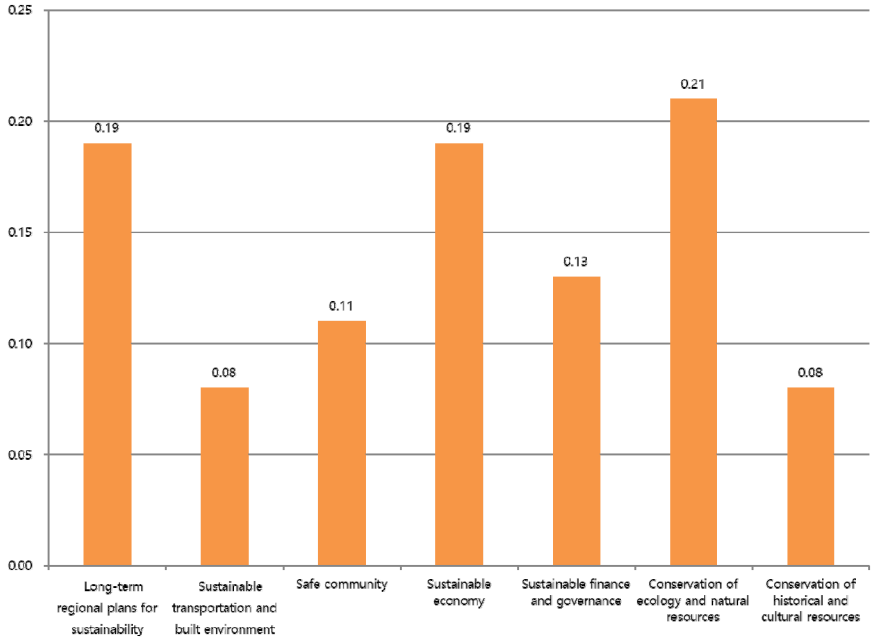
54) Cittaslow Network, ”How to Become”, accessed on October 17, 2023.

Figure 30. Weights between macro and micro locations



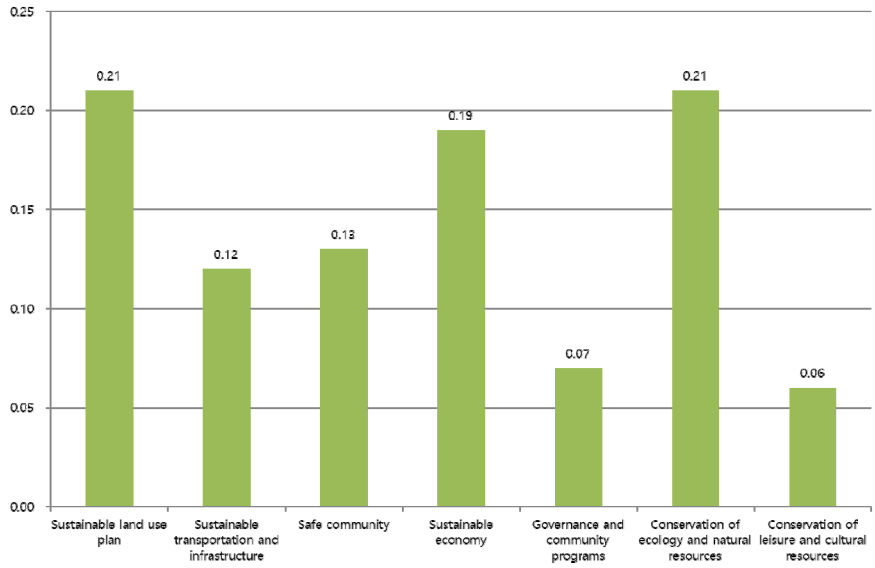
Source: The authors.

Figure 31: Intersectoral weights within the macro location



Source: The authors.

Figure 32: Intersectoral weights within micro locations



Source: The authors.

Figure 33. Weighted scoring model

Level 1	Criteria	Weight in %			Evaluation					Score calculation (Rating x score)					
					Weakness				Strength						
		Rating Criteria	Rating Criteria	Rating Criteria	inadequate (1)	adequate (2)	satisfaction (neutral = 3)	good(4)	very good(5)	Points Factors	Weighted factors	Criteria total points	Total points (weighted criteria)	Total Score Levels	Total score (weighted levels)
1	Macro location (Indikatoen auf Landes-, Regional)	45.8%	100.0%											0.685	0.314
1.1.	Long-term regional plans for sustainability		18.9%	100.0%								3.400	0.644		
1.1.1.	on the national level			20.0%			x			3	0.600				
1.1.2.	on the provincial level			20.0%		x				2	0.400				
1.1.3.	on the community level : Bestehende Bauleitpläne und Stadtentwicklungskonzepte / Existing urban land use plans and urban development concepts			20.0%				x		4	0.800				
1.2.	Sustainable transportation and built environment		8.2%	100.0%								0.500	0.041	Level 2	
1.2.1.	Anbindungen an Autobahn (nach REN) / Connections to highways			16.7%			x			3	0.500				
1.2.2.	Entfernung zum internationalem Flughafen / Distance to international airport			16.7%						0	0.000	Level 3			
1.x.	...														
2.	Micro-location / Gemeinde Ebene	54.2%	100.0%											0.345	0.187
2.1.	Sustainable land use plan		21.4%	100.0%						0		1.000	0.214		
2.1.1.	Handelsstruktur (Entfernungen zu Bäckerei, Apotheke, Supermarkt) / retail structure (distances to bakery, pharmacy, supermarket)			12.5%			x		x	8	1.000				
	...														
2.2.	Sustainable Transportation and Infrastructure		13.0%	100.0%								1.000	0.130		
2.2.1.	Erreichbarkeit des Gebietes über ÖPNV /Accessibility of the area by public transport Public transportation costs are consistent, clearly displayed, and affordable. Public transportation is reliable and frequent, including at night and on weekends and holidays.			20.0%					x	5	1.000				
2.x.	....														
	SUMME	100.0%											Total Score:		0.501

Source: The authors.

3.2.4 Developing a regional sustainability assessment tool

The indicators for the scoring model were determined through three critical revisions.

Building the primary selection indicators entails establishing spatial hierarchical levels consisting of macro, micro, and property levels, which in turn produce a total of 19 sectors and around 140 indicators. At the macro level, 8 sectors with 3 to 10 indicators per sector exist, while at the micro level, there are 5 sectors with 2 to 9 indicators per sector, and at the property level, 6 sectors with 3 to 10 indicators per sector.

The second selection index involves selecting meaningful indicators from the pool identified in the first selection. This process includes assessing the availability of statistical data in Germany and the feasibility of objective measurement, as well as determining weight distribution. Macro and micro-level parameters are established within each spatial hierarchy, resulting in a total of 14 categories and 90 indicators. Specifically, at the macro level, there are 7 categories with 2 to 13 indicators per sector. At the micro level, there are 7 sectors with 3 to 8 indicators per sector. The weight reflection exhibited the values obtained from III-2-3.

The final indicator selection involves the formulation of a comprehensive assessment model that includes indicators at the *eup* (읍), *myeon* (면), and *Gemeinde* levels, which represent the smallest administrative districts within the pilot assessment target areas. This model covers both macro- and micro-levels within each spatial hierarchy, resulting in a total of 60 indicators distributed across 13 sectors. At the macro level, six sectors have been identified that integrate ecological and cultural resources. Each sector contains 4 to 6 indicators. At the micro level, seven sectors have been delineated, each composed of 2 to 8 indicators. During the weight analysis, seven categories were established for each macro and micro location. However, during the pilot application in Germany, only one set of statistical data was available to evaluate the historical and cultural resources of the macro location. As a result, this data was combined with the ecological and natural resources sector.

Figure 23. presents the final model of the RSAT used to analyze and evaluate sustainability factors within the designated regions.

Table 23. The RSAT

	Criteria	Weight in %					Evaluation					Score calculation (Rating x score)					
							Weakness			Strength							
		weight	Rating Criteria	weight	Rating Criteria	weight	Rating Criteria	inadequate (1)	adequate (2)	satisfaction (neutral = 3)	good(4)	very good(5)	Points Factors	Weighted factors	Criteria total points	Total points (weighted criteria)	Total Score Levels	Total score (weighted levels)
1	**Macro location (Indikatoen auf Landes-, Regional)**	**1.0**	**45.8%**		**100.0%**												**0.114**	**0.052**
1.1.	**Long-term regional plans for sustainability**				18.9%		100.0%								0.600	0.114		
1.1.1.	on the national level						20.0%			X			3	0.600				
1.1.2.	on the provincial level						20.0%						0	0.000				
1.1.3.	on the community level : Bestehende Bauleitpläne und Stadtentwicklungskonzepte / Existing urban land use plans and urban development concepts						20.0%						0	0.000				
1.1.4.	National guidelines and/or policies for the process leading to nomination of BRs.						20.0%						0	0.000				
1.1.5.	Whether there is a business plan for BRs						20.0%						0	0.000				
1.2.	**Sustainable transportation and built environment**				8.2%		100.0%								0.000	0.000		
1.2.1.	Anbindungen an Autobahn (nach REN) / Connections to highways						16.7%						0	0.000				
1.2.2.	Entfernung zum internationalem Flughafen / Distance to international airport						16.7%						0	0.000				
1.2.3.	High-speed rail or roads planned to be constructed by 29						16.7%						0	0.000				
1.2.4.	Fluctuation Rate of Land Price						16.7%						0	0.000				
1.2.5.	Housing Supply Ratio						16.7%						0	0.000				
1.2.6.	Promotion of private/public and sustainable urban planning (passive housing, construction, LEED etc.)						16.7%						0	0.000				
1.3.	**Safe region**				10.6%		100.0%								0.000	0.000		
1.3.1.	Percentage of elderly population						25.0%						0	0.000				
1.3.2.	Homicide rate						25.0%						0	0.000				
1.3.3.	Outdoor safety, Feeling safe walking alone at night Number of police stations, number of police officers per 1,000 people, street lights						25.0%						0	0.000				
1.3.4.	Community emergency planning takes into account the vulnerabilities and capacities of older people.						25.0%						0	0.000				
1.4.	**Sustainable economy**				19.2%		100.0%							0.000	0.000	0.000		
1.4.1.	Gross income per person						20.0%						0	0.000				
1.4.2.	Bisherige Bevölkerungsentwicklung / Past population development						20.0%						0	0.000				
1.4.3.	Potenzielle Haushaltsgründer /Potential household founders						20.0%						0	0.000				
1.4.4.	Economically active population						20.0%						0	0.000				
1.4.5.	Schooling.						20.0%						0	0.000				
1.5.	**Sustainable Finance and Governance**				13.3%		100.0%								0.000	0.000		
1.5.1	Political participation						20.0%						0	0.000				
1.5.2	consistent outreach to include people at risk of social isolation. community support services Availability of and Access to Social Services and Counseling Services						20.0%						0	0.000				
1.5.3	Welfare Budget						20.0%						0	0.000				
1.5.4	Whether the BR has sustained funding						20.0%						0	0.000				
1.5.5	Number of programmes established related to global education, capacity building and training programmes						20.0%						0	0.000				
1.6.	**Conservation of ecology and natural resources**				29.7%		100.0%						0		0.000	0.000		
1.6.1.	Erreichbarkeit der umliegenden Wald- & Wasser-flächen mit dem Auto / Accessibility of surrounding forest & water areas by car						16.7%						0	0.000				
1.6.2.	Registration of an international organization for the natural environment (World Heritage and Common Heritage, Ramsar Wetlands, etc.)						16.7%						0	0.000				
1.6.3.	Natural parks (national, provincial, county, geological)						16.7%						0	0.000				
1.6.4.	Protected wetland						16.7%						0	0.000				
1.6.5.	Lagoon						16.7%						0	0.000				
1.6.6.	Designated Cultural Property (natural monuments, places of scenic beauty, provincial designation, etc.)						16.7%						0	0.000				

Table 23. (continued)

2.	**Micro-location / Gemeinde Ebene**	1	54.2%	100.0%												0.000	0.000
2.1.	**Sustainable land use plan**			21.4%	100.0%						0		0.000	0.000			
2.1.1.	Handelsstruktur (Entfernungen zu Bäckerei, Apotheke, Supermarkt) / retail structure (distances to bakery, pharmacy, supermarket)				12.5%						0	0.000					
2.1.2.	Soziale Dienstleistungsstruktur (Entfernungen zu Ärzten, Betreuungs- und Pflegeeinrichtungen)/Social service structure (distances to doctors, care and nursing facilities)				12.5%						0	0.000					
2.1.3.	Gemeinbedarfseinrichtungen (Entfernungen zu Grundschule, Kindertagesstätte, Kindergarten) /Community facilities (distances to elementary school, day care center, kindergarten)				12.5%						0	0.000					
2.1.4.	Environmentally friendly wind turbines				12.5%						0	0.000					
2.1.5.	Environmentally Friendly Solar Power Systems				12.5%						0	0.000					
2.1.6.	Environmentally friendly energy supply %				12.5%						0	0.000					
2.1.7.	Environmentally friendly charging facilities (electricity, hydrogen)				12.5%						0	0.000					
2.1.8.	Development of Building Construction Permits				12.5%						0	0.000					
2.2.	**Sustainable Transportation and Infrastructure**			13.0%	100.0%								0.000	0.000			
2.2.1.	Erreichbarkeit des Gebietes über ÖPNV /Accessibility of the area by public transport Public transportation costs are consistent, clearly displayed, and affordable. Public transportation is reliable and frequent, including at night and on weekends and holidays.				20.0%						0	0.000					
2.2.3.	Rate of low-emission vehicles : ÖPNV				20.0%						0	0.000					
2.2.4.	Specialized transportation is available for disabled people. A voluntary transport service is available where public transportation is too limited.				20.0%						0	0.000					
2.2.5.	Bicycle Road				20.0%						0	0.000					
2.3.	**Safe community**			19.1%	100.0%								0.000	0.000			
2.3.1	Barrierefreie Durchquerbarkeit des Gebietes / Barrier-free accessibility of the area				33.3%						0	0.000					
2.3.2	Existence of Community Solidarity Networks				33.3%						0	0.000					
2.3.3	Safety of Movement within Community				33.3%						0	0.000					
2.4.	**Sustainable economy**			7.0%	100.0%								0.000	0.000			
2.4.1.	Number of Community Business				20.0%						0	0.000					
2.4.2.	Number of commentators (on environmental education, the geopark, the natural environment, cultural tourism, the rural experience, etc.)				20.0%						0	0.000					
2.4.3.	Development of ecological agriculture				20.0%						0	0.000					
2.4.4.	Use local organic products in community public restaurants(school restaurants, etc.) as much as possible				20.0%						0	0.000					
2.4.5.	eco-tourism area				20.0%						0	0.000					
2.5.	**Governance and Community Programs**			20.9%	100.0%						0		0.000	0.000			
2.5.1.	Number of experts (fauna, flora, geology, topography, tourism, culture, etc.) participants				20.0%						0	0.000					
2.5.2.	Social cohesion Gatherings including older people Inclusive community activities and events Integration with the disabled				20.0%						0	0.000					
2.5.3.	Voluntary services by people of all ages				20.0%						0	0.000					
2.5.4.	A basic, effective communication system/ Clear and accessible information				20.0%						0	0.000					
2.5.5.	Managememt Program				20.0%						0	0.000					
2.6.	**Conservation of ecology and natural resources**			6.3%	100.0%								0.000	0.000			
2.6.1.	Green space rate				50.0%						0	0.000					
2.6.2.	Community environmental protection programs				50.0%						0	0.000					
2.7.	**Conservation of leisure and cultural resources**			12.1%	100.0%								0.000	0.000			
2.7.1.	Spiel- & Sportplätze / Playgrounds & sports fields				50.0%						0	0.000					
2.7.2.	Community cultural facilities(libraries, museums etc)				50.0%						0	0.000					

Source: The authors.

4 Pilot Assessment

4.1 Establishing evaluation directions

The establishment of evaluation methods involves determining the evaluation criteria for each indicator within each sector through consultation with internal and external researchers. The criteria include considerations such as the existence of relevant legal plans and building plans, distance from administrative centers (district offices, community centers) to the relevant facility, and the ratios of official indicators specified in administrative statistics. Table 2 contains a list of suggestions for specific evaluation directions for all subcriteria.

Table 24. Evaluation directions for all subcriteria

Criteria		Evaluation direction
1	Macro location (Regional)	
1.1.	Long-term regional plans for sustainability	
1.1.1.	At the national level	The presence or absence of a plan 3 points if a plan exists 1 point if no plan exists
1.1.2.	At the provincial level	
1.1.3.	At the community level: Existing urban land use plans and urban development concepts	
1.1.4.	National guidelines and/or policies for the process leading to nomination of biosphere reserves	
1.1.5.	Whether there is a business plan for biosphere reserves	

Table 24. (continued)

Criteria		Evaluation direction
1.2.	Sustainable transportation and built environment	
1.2.1.	Connections to highways	Shortest distance from the administrative office (*guncheong*, *Landkreisverwaltung*) to the highway (by car) 1 point for more than or equal to 50 km 2 points for less than 50 km and more than or equal 40 km
1.2.2.	Distance to international airport	Shortest distance from the administrative office (*guncheong*, *Landkreisverwaltung*) (by car) 1 point for more than or equal to 100 km 2 points for less than 100 km and more than or equal 80 km
1.2.3.	High-speed rail or roads to be constructed by 29	Construction (planned) of high-speed rail lines and highways at the state level by 29 5 points if yes 1 point if not
1.2.4.	Fluctuations in price of land	Rate of increase over prior year end (if possible, use the most current data (2022)) 5 points, if less than or equal to 0.1% 4 points, if less than or equal to 0.2%
1.2.5.	Housing supply ratio	At county level (if possible, use the most current data (in Germany, 2017)) 5 points for more than or equal to 100% 4 points for more than or equal to 80%
1.2.6.	Promotion of private/public and sustainable urban planning (passive housing, construction, LEED etc.)	5 points for more than 5 4 points for 4
1.3.	Safety	
1.3.1.	Percentage of elderly population	Percentage of population over 65 years old 1 point, if more than 50%
1.3.2.	Homicide rate	At state level 5 points for less than or equal to 0% 4 points for less than or equal to 20%
1.3.3.	Outdoor safety, feeling safe walking alone at night number of police stations, number of police officers per 1,000 people, street lights	Number of police officers per 100,000 persons 5 points for more than or equal to 250 persons 4 points for more than or equal to 200 persons

Table 24. (continued)

Criteria		Evaluation direction
1.3.4.	Community emergency planning takes into account the vulnerabilities and capacities of older people	Planning for seniors and children at the state level 5 points if a plan exists 1 points if no plan exists
1.4.	Sustainable economy	
1.4.1.	Gross income per person	on county level 5 points for greater than or equal to USD 3500 4 points for greater than or equal to USD 3500
1.4.2.	Past population development	5 points for areas with growing population 1 point for areas with decreasing population
1.4.3.	Potential household founders	Current population between the ages of 10 and 20 (in 2022) 5 points for more than 25% of the total population 4 points for more than 20% of the total population
1.4.4.	Economically active population	Employment rate 5 points for more than 60% of the total population 4 points for more than 50% of the total population
1.4.5.	Education	College attainment rate for the 25 to 64 year old age group 5 points for more than 60% of the total population 4 points for more than 50% of the total population
1.5.	Sustainable finance and governance	
1.5.1	Political participation	Voter turnout at state level 5 points for more than 80% 4 points for more than 70%
1.5.2	Consistent outreach to include people at risk of social isolation, community support services; Availability of and access to social services and counseling cervices	Ratio of civil servants on state level (Number of civil servants / total population*100) 5 points for more than 80% 4 points for more than 70%
1.5.3	Welfare budget	Pubic Social Spending as % of GDP 5 points for more than 30% 4 points for more than 25%

Table 24. (continued)

Criteria		Evaluation direction
1.5.4	Whether biosphere reserve has continued source of funding	5 points if yes 1 point if not
1.5.5	Number of programs related to global education, capacity building, and training	At state and county level 5 points for more than 10 4 points for more than 8
1.6.	Conservation of ecology and natural resources	
1.6.1.	Accessibility of surrounding forest & water areas by car	Shortest distance from the administrative office ((*guncheong*, *Landkreisverwaltung*) to nature parks (for example, national parks) 1 point for more than or equal to 50 km 2 points for less than 100 km and more than or equal 40 km
1.6.2.	Registration of an international organization for the natural environment (World Heritage and Common Heritage, Ramsar Wetlands, etc.)	UNESCO registered heritage at national, state, and county levels 5 points for more than 100 4 point for more than 80
1.6.3.	Nature parks (national, provincial, county, geological)	At national, state, and county levels 5 points for more than 10 4 point for more than
1.6.4.	Protected wetlands	At state and county levels 5 points for more than 5 4 point for more than 4
1.6.5.	Lagoons	At state and county levels 5 points for more than 5 4 points for more than 4
1.6.6.	Designated cultural properties (natural monuments, places of scenic beauty, provincial designation, etc.)	At state and county levels 5 points for more than 500 4 points for more than 400
2.	Micro-location / Local	
2.1.	Sustainable land use plan	
2.1.1.	Retail structure (distance to bakeries, pharmacies, and supermarkets)	Shortest distance from the administrative office (*myeon samuso*, *Gemeindeverwaltung*) to stores 5 points for less than or equal to 0.5 km 4 points for less than 100 km and more than or equal 1 km

Table 24. (continued)

Criteria		Evaluation direction
2.1.2.	Social service structure (distance to doctors, health care, and nursing facilities)	Shortest distance from the administrative office (*myeon samuso*, *Gemeindeverwaltung*) to facilities 5 point for less than or equal to 0.5 km 4 points for less than 100 km and more than or equal 1km
2.1.3.	Community facilities (distance to elementary schools, day care centers, and kindergartens)	
2.1.4.	Environmentally friendly wind turbines	Number of facilities
2.1.5.	Environmentally friendly solar power systems	Number of facilities
2.1.6.	Proportion of environmentally friendly energy	%
2.1.7.	Environmentally friendly charging facilities (electricity, hydrogen)	Number of facilities
2.1.8.	Development of building construction permits	At municipality level (*Gemeinde*/*gun*) 5 points for more than 10, 4 points for more than 8
2.2.	Sustainable transportation and infrastructure	
2.2.1.	Accessibility of the area by public transport Public transportation costs are consistent, clearly displayed, and affordable Public transportation is reliable and frequent, including at nights and on weekends and holidays	Number of daily public transportation trips (buses) 1 point for one trip per hour 5 points for more than or equal to 5 trips per hour
2.2.3.	Rate of low-emission vehicles	
2.2.4.	Specialized transportation is available for disabled people A voluntary transport service is available where public transportation is too limited	5 points for more than or equal to 50% 4 points for more than or equal to 40%
2.2.5.	Bicycle lanes	5 points if yes 1 points if no
2.3.	Safe community	
2.3.1	Barrier-free accessibility of the area	Barrier free access to public buildings such as administrative offices (*eup samuso, Gemeindeverwaltung*)

Table 24. (continued)

Criteria		Evaluation direction
2.3.2	Existence of community solidarity networks	5 points if present
2.3.3	Safety of movement within the community	5 points if present
2.4.	Sustainable economy	
2.4.1.	Number of community businesses	
2.4.2.	Number of commentators (on environmental education, the geopark, the natural environment, cultural tourism, the rural experience, etc.)	Number of docent
2.4.3.	Development of ecological agriculture	
2.4.4.	Use of local organic products in community public restaurants (e.g. schools) as much as possible	
2.4.5.	Eco-tourism areas	Number of programs
2.5.	Governance and community programs	
2.5.1.	Number of expert (fauna, flora, geology, topography, tourism, culture, etc.) participants	Number
2.5.2.	Social cohesion Gatherings including older people Inclusive community activities and events Integration with the disabled	
2.5.3.	Voluntary services by people of all ages	
2.5.4.	A basic, effective communication system, and clear and accessible information	
2.5.5.	Management programs	Number
2.6.	Conservation of ecology and natural resources	
2.6.1.	Green space percentage	5 points for more than or equal to 50% 1 point for more than or equal to 10%
2.6.2.	Community environmental protection programs	5 points if present

Table 24. (continued)

Criteria		Evaluation direction
2.7.	Conservation of leisure and cultural resources	
2.7.1.	Playgrounds & sports fields	Shortest distance from the administrative office (*eup samuso, Gemeindeverwaltung*) to facilities 5 point for less than or equal to 0.5 km 4 points for less than 100 km and more than or equal 1 km
2.7.2.	Community cultural facilities (libraries, museums etc)	

Source: The authors.

4.2 Pilot assessment results

The following results can be derived through pilot assessment.

In configuring weight distribution by sector, careful consideration is given to capturing the unique characteristics of the site undergoing evaluation, specifically, a biosphere reserve within the border area.

- Emphasizing the direct impact on the evaluation site, microscopic factors are accorded a higher weight (0.54) compared to macroscopic factors (0.46).
- At the macro level, an equitable distribution of approximately 20% weight is allocated to ecological-natural resource conservation (0.21), regional mid- to long-term planning (0.19), and sustainable economy (0.19).
- Similarly, at the micro level, an even allocation of 20% weight is designated for the conservation of natural resources in the ecological context (0.21), sustainable land use (0.21), and sustainable economy (0.19).

The comparative analysis of results reflecting assigned weights reveals divergent scores among the assessed regions.

- On a scale of 5 points, Haean-myeon obtained 3.44 points, Sangnam-myeon scored 3.362 points, Dermbach achieved 3.129 points, and Rhönblick secured 3.275 points. Notably, the values for the two regions within GWBR surpass the average, categorizing them into the upper-middle group (middle group: 1.66 to 3.33, upper group: 3.33 to 5).

- Within the four regions, Rhönblick attained the highest Macro score (1.61) within the Rhön biosphere reserve, attributed to a population increase since 2020, notwithstanding the absence of planned expressways or railways until 2029.
- An examination of the Yanggu-gun Haean-myeon within GWBR from a macroscopic standpoint unveils lower values for sustainable transportation and the built environment (0.287) and conservation of natural and historical-cultural resources (1.140) than Inje-gun Sangnam-myeon. Conversely, From a micro perspective, sustainable economy (0.239) and preservation of leisure and cultural resources (0.484) were derived as the highest values.
- The value is 0.78 points higher than the total score of Sangnam-myeon, Inje-gun (3.362). This implies a necessity for enhancements to reveal and invigorate regional potential at the Yanggu-gun level.

Limitations and areas for improvement are discerned in the initial establishment of indicators. The procedure encompasses the selection of the first indicator relying on domestic research data and statistical information, employing the annual statistical yearbook for each local government, followed by a validation check using data from Germany. This methodology introduces the potential for bias in favor of indicators reflecting the domestic situation. To augment objectivity and equity in international comparisons, it is crucial to integrate supplementary checks on detailed indicators. In addition, during the actual evaluation, some items were measured at the micro level, but some items were given a median value because they did not have official statistics. Therefore, there is a limitation in that a fair evaluation was not conducted in the micro-level evaluation.

Table 25. Pilot assessment results

Target areas		Level		Total score of 2 Levels	Total score (weighted)	Total score of 1 Levels	Total score (weighted)	Total score (weighted 5)
GWBR	Yanggu-gun Haean-myeon	1. Macro	1.1.	3	0.568	3.410	1.561	3.440
			1.2.	3.5	**0.287**			
			1.3.	4.25	0.451			
			1.4.	2.8	0.537			
			1.5.	3.2	0.428			
			1.6.	3.833	**1.140**			
		2. Micro	2.1.	3.125	0.670	3.465	1.879	
			2.2.	1	0.130			
			2.3.	5	0.957			
			2.4.	3.4	**0.239**			
			2.5.	3.8	0.795			
			2.6.	3	0.190			
			2.7.	4	**0.484**			

Table 25. (continued)

Target areas		Level		Total score of 2 Levels	Total score (weighted)	Total score of 1 Levels	Total score (weighted)	Total score (weighted 5)
	Inje-gun Sangnam-myeon	1. Macro	1.1.	3	0.568	3.384	1.549	3.362
			1.2.	4.167	0.342			
			1.3.	4	0.425			
			1.4.	2	0.384			
			1.5.	3.2	0.426			
			1.6.	4.167	1.239			
		2. Micro	2.1.	3.25	0.697	3.343	1.813	
			2.2.	1	0.13			
			2.3.	5	0.957			
			2.4.	3	0.211			
			2.5.	3.8	0.795			
			2.6.	3	0.190			
			2.7.	3	0.363			

Table 25. (continued)

Target areas		Level		Total score of 2 Levels	Total score (weighted)	Total score of 1 Levels	Total score (weighted)	Total score (weighted 5)
Rhön-BR	Wartburgkreis Dermbach	Macro	1.1.	3	0.568	3.350	1.534	3.129
			1.2.	2.833	0.233			
			1.3.	4.75	0.505			
			1.4.	2	0.384			
			1.5.	2.8	0.372			
			1.6.	4.333	1.288			
		2. Micro	2.1.	2.750	0.590	2.942	1.595	
			2.2.	1	0.13			
			2.3.	3	0.574			
			2.4.	3	0.169			
			2.5.	3	0.169			
			2.6.	4	0.253			
			2.7.	5	0.605			

Table 25. (continued)

Target areas		Level		Total score of 2 Levels	Total score (weighted)	Total score of 1 Levels	Total score (weighted)	Total score (weighted 5)
	Schmalkalden-Meiningen Rhönblick	Macro	1.1.	3	0.568	3.517	1.610	3.275
			1.2.	3	0.246			
			1.3.	4.75	0.505			
			1.4.	2.8	0.537			
			1.5.	2.8	0.372			
			1.6.	4.333	1.288			
		2. Micro	2.1.	3.375	0.724	3.070	1.664	
			2.2.	1	0.13			
			2.3.	3	0.574			
			2.4.	3	0.211			
			2.5.	3	0.627			
			2.6.	3.5	0.221			
			2.7.	5	0.605			

Source: The authors.

5 Conclusion and Implications

The proposed framework constitutes a foundational structure for the development of an RSAT tailored to local governments. It is designed to facilitate the exploration of regional potential.

This RSAT is adaptable to administrative districts at the *eup* (읍), *myeon* (면), and *dong* (동) levels. In the context of the GWBR, the target area of the RSAT pilot assessment, this framework serves as the basis for formulating a step-by-step improvement plan in response to the 29th UNESCO biosphere reserve evaluation.

Furthermore, the applicability of this framework extends to areas experiencing decline, providing a systematic means to evaluate sustainability potential of *eup, myeon,* and *dong* units. It is thus a valuable tool for assessing the capacity of these units to achieve regional sustainability goals, and sits in alignment with national priorities such as the Guidelines for the Conservation and Management of Border Areas, the long-term K-vision, and goal-setting for preservation for more than 30 years.

The foundational framework delineates roles, grounded in sectoral indicators, and serves as a basis for assigning responsibilities to pertinent ministries.

Ensuring objectivity in the quantitative and qualitative assessment of ecological, historical, socio-cultural, and economic values in declining areas is paramount. Strategies to preserve regional potential in these declining areas can be derived by considering each sector. The incorporation of evaluation indicators facilitates the development of a case model for sustainable regional development in declining areas.

The refinement of evaluation indicators encompasses the systematic acquisition, thorough review, and incorporation of statistical data established by local governments in Germany and other pertinent countries to ensure an objective international comparison. This process includes the application of detailed indicators at Level

4, allowing for the qualitative evaluation of statutory plans and related aspects. In addition, we here note an initiative to expand and develop the Sustainable Regional Certification System alongside the RSAT from the building-level green building certification system (G-SEED) to the regional level.

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Executive Summary in Korean

접경지역 지속가능성 평가: 한국과 독일의 생물권보전지역 사례

1. 연구의 배경 및 목적

❑ 강원 접경지역의 여건 변화에 따라 자연과 인간의 상생이 가능한 선순환적 모델 필요

- ㅇ UNESCO 강원생태평화 생물권보전지역(GWBR)으로 등재('19.6)는 접경지역의 "지속가능한 지역"으로의 현명한 보전을 통한 지역경제활성, 평화지역의 가치제고 및 국제화의 기반을 마련
- ㅇ 접경지역의 체계적인 보전관리를 위한 가이드라인 마련을 통해 난개발 및 자연환경 훼손가능성에 대한 선제적인 대응과 보전·복원을 통한 생태환경 제고, 문화유산의 가치의 국제적인 자산으로의 확장 필요
- ㅇ 다부처의 국정과제에 부합한 접경지역의 관리 방안 마련 필요
  - 강원생태평화 생물권보전지역에 대한 환경부, 국토교통부, 문화재청, 산림청, 외교부, 강원도 유관부처의 계획 및 사업등과 연계성이 고려되야하며 독일의 사례에 비추어 중장기적인 측면의 비전과 목표설정 및 평가 관리체계 필요
  - UNESCO 생물권보전지역의 등재 이후, 10년 후의 UNESCO 정기평가에 대응하여 세부계획을 수립하였으며 분야별 사업계획의 이행 정도 및 지역의 잠재력을 평가할 필요가 있음

2. 주요 추진내용

❑ (이론적, 정책적 동향 고찰) 두 국가의 접경지역내 생물권보전지역의 의미

- ㅇ 접경지역내 생물권보전지역의 선행연구 검토 및 이론적 의미 도출
- ㅇ 접경지역의 정책검토: 독일 및 우리나라의 현행 접경지역의 관련 법령 및 계획 고찰
- ㅇ 정책검토를 통한 생태적, 역사·사회문화적, 경제적 가치 제고

- 지리적, 정치적으로 특수한 의미를 갖는 접경지역의 공통적 가치 분석 및 제고

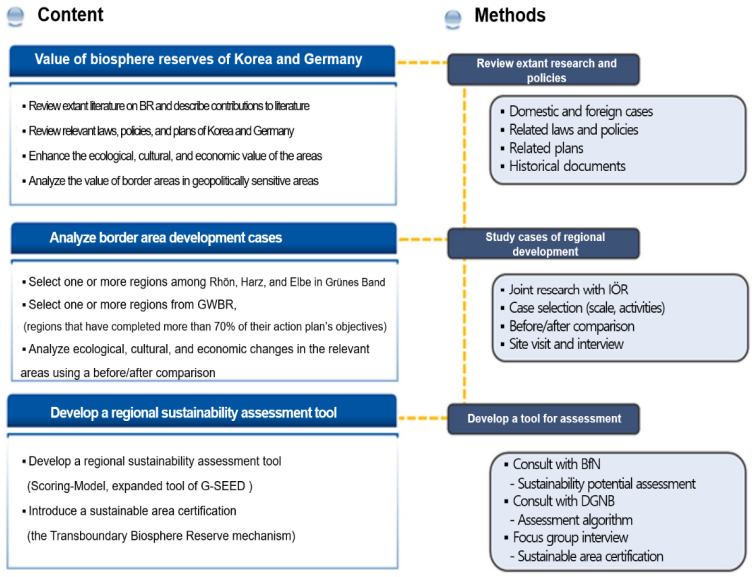
❑ (개발사례 분석) 접경지역 개발이행 사례 분석

- 지역개발 전후의 생태적, 역사사회문화적, 경제적 변화 분석
- 국내: 강원평화생물권보전지역 내의 양구군 해안면, 인제군 상남면
- 독일: 그륀네트반트(륀) 생물권보전지역 내의 튀링엔주의 뎀바흐(Dermbach)와 륀블릭(Rhönblick)

❑ (지역의 지속가능평가 방법론 구축 및 시범 평가) 접경지역의 지속가능성 잠재력 분석 툴 개발 및 시범 적용

- 선행연구 및 유사 평가지표 분석
- 평가지표 도출 및 평가프레임워크 구축, 전문가 AHP 설문을 통한 부문 간 가중치 설정
- Scoring Model을 적용한 시범평가 및 결과분석

〈요약 그림 1〉 Core content of the research



출처: 저자 작성.

3. 결론 및 정책 제언

❑ 기초 지자체의 지속가능성 평가 모델 개발 및 지역 잠재성 발굴에 근거활용

- ㅇ 행정구역상 읍면동(법정동) 단위까지 지역 지속가능성평가 모델 활용 가능
- ㅇ 시범평가 대상지인 GWBR의 경우, UNESCO 생물권보전지역 지정의 정기평가('29년)에 대응한 단계적 개선 방안 마련 근거 활용: "접경지역 보전관리 가이드라인", 30년 이상의 보전을 위한 중장기적 K-비전 및 목표 설정 등
- ㅇ 지역 지속가능성에 대한 읍·면·동단위의 잠재력 평가 수단으로 활용 가능
- ㅇ 지역의 객관적 평가 수단인 "지속가능한 지역 인증제"로 개발 활용 가능

❑ 부문별 지표에 따른 유관 부처별 역할 설정 근거활용

❑ 지속가능한 지역발전 사례 모델 제시

- ㅇ 쇠퇴지역의 생태적, 역사·사회문화적, 경제적 가치의 정량적 및 정성적인 평가 객관성 확보
- ㅇ 쇠퇴지역의 부문별 지역 잠재력 확보 방안 도출
- ㅇ 평가지표를 통해 쇠퇴지역의 지속가능한 지역발전 사례 모델 제시 가능

❑ 정책제언

- ㅇ (평가지표의 정교화) 객관적 국제비교를 위해 독일 및 기타 적용 국가의 지자체 단위 구축 통계자료 확보, 검토, 반영: 법정계획의 질적인 평가를 위한 세부지표(Level4) 적용 등
- ㅇ ("지속가능한 지역인증제"로 확대 개발) 건물단위의 녹색건축물인증제(G-SEED)에서 지역단위의 "지속가능한 지역인증제" 확장

주제어 : 지역지속가능성 평가 툴, 생물권보전지역, 한국과 독일의 접경지역, 사례조사, 파일럿테스트

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- Classification and Institutionalization for Carbon-Neutral City Infrastructure (탄소중립도시 기반시설의 유형구분 및 제도화 방안) (2023)
- A Study Proposing the Strengthening of the Unification of Integrated Management of Local Government Land-Environment Planning (지자체 국토-환경계획 통합관리 이행강화 방안 마련 연구) (2023)
- Characteristics and Implications of Germany's Land Consumption Policy: Status Analysis of "The 30ha Goal" (독일의 토지소비 정책의 특징과 시사점: "30ha 목표" 추진 현황 분석) (2022)

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A Sustainability Assessment of Border Areas

The Cases of Biosphere Reserves in Korea and Germany

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