

The Republic of Korea's Fourth National Biodiversity Strategy 2019 – 2023

November 2018

Jointly prepared by the Ministry of Education (MOE), the Ministry of Science and ICT (MSIT), the Ministry of Foreign Affairs (MOFA), the Ministry of Culture, Sports and Tourism (MCST), the Ministry of Agriculture, Food and Rural Affairs (MAFRA), the Ministry of Trade, Industry and Energy (MOTIE), the Ministry of Health and Welfare (MOHW), the Ministry of Environment (ME), the Ministry of Oceans and Fisheries (MOF), the Rural Development Administration (RDA) and the Korea Forest Service (KFS)

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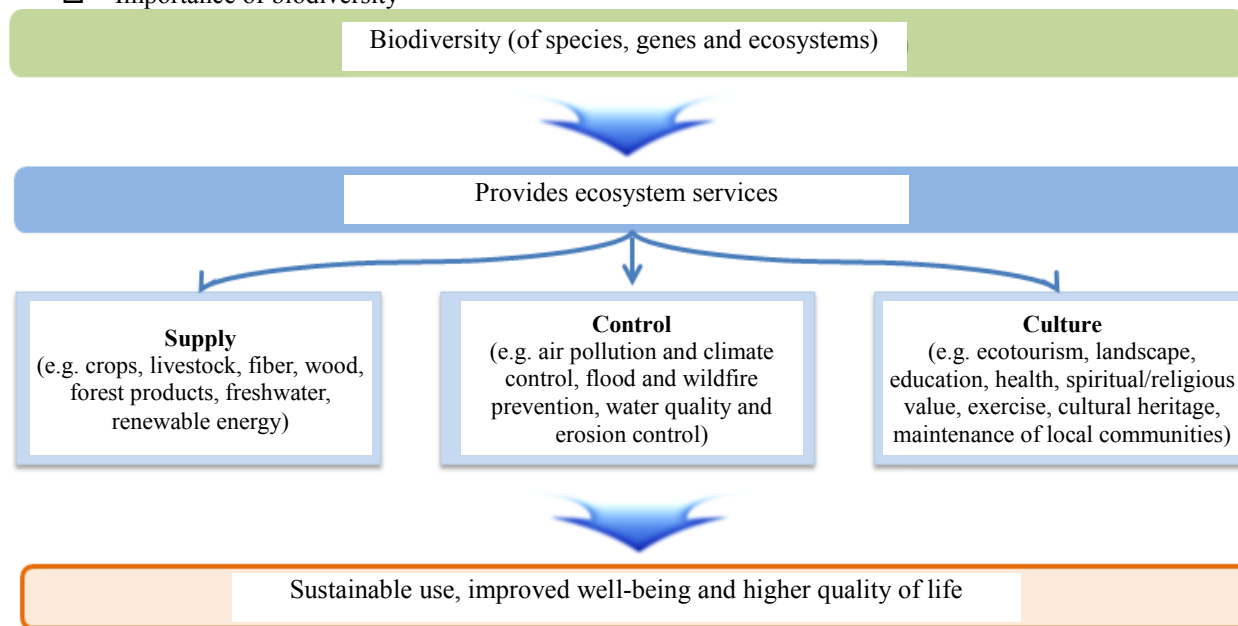
Section 1.

Background

I. Background

1. Importance of biodiversity

- Definition of biodiversity
 - (International) **Diversity of species** on the planet, of the **ecosystems** of which they are part, and of the **genes** of living organisms (Article 2 of the Convention on Biological Diversity (CBD)).
 - (Republic of Korea, ROK) **Diversity among all living organisms arising from all sources** including terrestrial and aquatic ecosystems and the complex ecosystems thereof, and **diversity within species, among species and of ecosystems** (Article 2 of the Act on the Conservation and Use of Biological Diversity).
- Importance of biodiversity



☑ As **biodiversity provides a variety of ecosystem services and greatly affects the sustainability of the planet and its ecosystems** as well as **the lives of the people, strategies for its systematic conservation and sustainable use** should be prepared at the national level.

2. National Biodiversity Strategies and Action Plans (NBSAP)

- Background
 - An NBSAP is a legal strategy to ensure the **conservation of biodiversity and the sustainable use of its components** that is developed every five years and approved by the Cabinet.
 - * (Legal basis) Article 7 of the Act on the Conservation and Use of Biological Diversity
 - The ROK's first NBSAP was developed in 1997, and since the **third NBSAP (2014-2018)**, NBSAPs **have had the legal status of official plans**.
 - * The first and second NBSAPs were non-legal in nature.
 - **NBSAPs are established to facilitate the steadfast implementation of the Convention as a Party to the CBD.**
 - * Article 6 of the CBD indicates the obligation of contracting parties to develop NBSAPs.
- Progress
 - July – November 2017: Forum held for area-specialized experts to formulate strategies
 - December 2017: **Framework and proposed indicators developed for the fourth NBSAP (and reported to the National Biodiversity Committee)**
 - * The National Biodiversity Committee comprises a Vice Minister of Environment and nine Director General-level representatives from relevant ministries (MOEF, MSIT, MOFA, MCST, MAFRA, MOTIE, MOHW, and MOF) and 10 private sector members.
 - April 2018: Relevant ministries and agencies invited to submit action plans for each strategy

- May 2018: Committee organized for the development of the fourth NBSAP
 - * The Committee comprises 16 experts in their respective fields including environment, agriculture, oceans, forestry, bio science, health and civil society organizations, recommended by different government agencies.
- October 2018: Public hearing
- October 2018: Opinions solicited from relevant ministries and agencies
- November 2018: **NBSAP reported to the National Biodiversity Committee**
- November 2018: **NBSAP tabled for approval in the Cabinet**

Section 2.

Biodiversity Status

□. Biodiversity status

1. Global status

- Continued decline in biodiversity
 - The vertebrate population dropped 58% from 1970 to 2012 due to habitat degradation, climate change, environmental pollution and overexploitation, with a notable decline in freshwater species (WWF Living Planet Report (2016)).
 - * (Population decline rate) terrestrial species (38%), freshwater species (81%) and marine species (36%)
 - By 2050, global terrestrial biodiversity is expected to see a 10% decrease from the 2010 level (OECD Environmental Outlook to 2050 (2012)).
- Increased awareness of biodiversity
 - International cooperation has been strengthened by a greater need for species protection and heightened interest in the use values of biological resources.
 - 196 countries have **signed the CBD for conservation of biodiversity and its sustainable use**.
 - The CBD was created in 1993 for the purpose of conservation of species. In 2010, the Strategic Plan for Biodiversity 2011-2020 was developed to outline global biodiversity goals.
 - * CBD (Convention on Biological Diversity): A multilateral treaty adopted at the Rio Earth Summit in 1992 dedicated to protection of species around the world
 - In 2020, the Fifteenth meeting of the Conference of the Parties to the Convention on Biological Diversity (CBD COP 15) is expected to adopt a “post-2020 global biodiversity framework.”
 - A total of 106 countries have ratified the Nagoya Protocol, an international agreement on access to genetic resources and benefit-sharing.
 - The Nagoya Protocol was adopted at the CBD COP 10 in 2010 and entered into force in October 2014, following the deposit of the 50th instrument of ratification in July 2014.

2. National status

- Continued decline in biodiversity
 - Habitat loss and fragmentation continue to occur due to urban sprawl, which is expected to cause a continued loss of biodiversity.
 - In 2017, urban development was in progress on a total area of 151km² at 452 locations (MOLIT).
 - Ecosystem degradation will accelerate as land conversion and development continues in natural green areas such as forests and in coastal areas such as mud flats and coastal wetlands.
 - The areas of forests, farmland and mud flats have decreased respectively by 2.1%, 15.9% and 20.4% over the last two decades (ME (2014)).
 - Protected areas for conservation of biodiversity do not meet the internationally-required levels, including that of the CBD.
 - The CBD recommends that 17% of a country’s terrestrial area be designated as protected by 2020. As of 2017, 11.57% of the ROK’s terrestrial area was conserved as protected areas.
- Increased awareness of biodiversity
 - Globally, a range of activities were implemented under the **CBD for conservation of biodiversity and its sustainable use**, and the **Nagoya Protocol on Access to Genetic Resources and Benefit-Sharing** has taken effect (October 2014).
 - Interest in **biodiversity conservation and sustainable use of biological resources** has also surged in the ROK.
 - The need for biodiversity conservation is reflected in the designation of protected areas and in propagation and recovery projects for endangered species.
 - * The ROK has designated 44 wetland protected areas (January 2018), 245 special islands (December 2016) and 22 national parks (late 2017).
 - ** Recovery and propagation of endangered species: *Ursus thibetanus ussuricus* (26 in 2012 to 56 in 2017), *Naemorhedus caudatus* (39 in 2020 to 89 in 2017) and *Vulpes vulpes peculiosa* (0 in 2012 to 17 in 2019)
 - The Act on Access to and Utilization of Genetic Resources and Benefit-Sharing was introduced in the ROK for the national implementation of the Nagoya Protocol (August 2017).

Section 3.

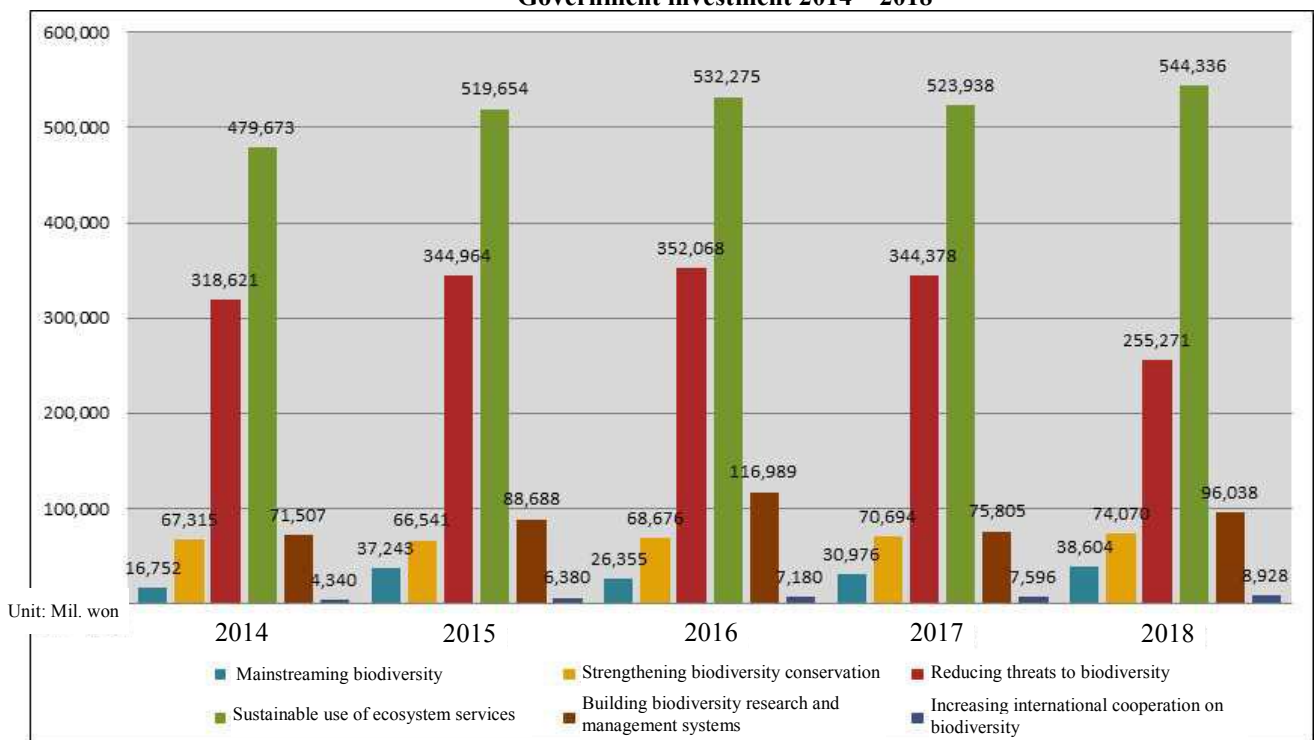
Progress and Limitations

□. Progress and limitations

1. Progress made in biodiversity-related policies

- Policy momentum gained
 - (Legal strategies) **Since the third NBSAP (2014-2018)**, NBSAPs and their corresponding action plans have had legal status, which has **provided momentum to policy implementation**.
* (Interim assessment of implementation in 2016) In terms of the designation and management of protected areas, progress of over 90% was achieved toward the goal, while some plans on database establishment and monitoring showed less than 50% progress. → Efforts continue to increase the momentum for implementation, including through an interim assessment.
 - (National Biodiversity Committee) The National Biodiversity Committee was created as an official consultative body to facilitate cooperation among biodiversity-related agencies.
- The third NBSAP implemented
 - (Government investment) **Eight ministries and three agencies** made a combined investment of over KRW 1 trillion per year during the NBSAP period.

Government investment 2014 – 2018



Source: 2018 NBSAP (Jointly prepared by relevant ministries and agencies, May 2018)

- The largest share of spending was on “Sustainable use of ecosystem services,” accounting for over 50% of the total investment every year.
- “Reducing threats to biodiversity” was the second largest investment made every year, but there was a slight decrease in the amount after 2016 with the completion of a large-scale ecological river restoration project.
- Investments in “Mainstreaming biodiversity” have been small, but they saw the largest growth in 2018, up 130% from 2014.
- (Outcomes) Compared to the first and second NBSAPs, there has been a **reinforcement of biodiversity mainstreaming, threat management, ecosystem services and improved sectoral biodiversity**.
 - Developed as a legal plan, the third NBSAP included annual action plans, which affected the strategies of local governments and thus contributed to biodiversity mainstreaming.
* As of 2018, nine metropolitan governments (Seoul, Busan, Incheon, Ulsan, Gangwon-do Province, Gyeongsangbuk-do Province, Gyeongsangnam-do Province, Chungcheongnam-do Province and Jeju Island) have completed the development of local biodiversity strategies.
 - The third NBSAP helped incorporate biodiversity values in legal plans for different areas including forestry and oceans, thereby facilitating biodiversity mainstreaming within ministries and agencies.
 - It also helped lay the groundwork for biodiversity research, including the establishment of new

institutes and the development of research programs.

* Wild Animals Rescue Centers (2018, 16 locations, ME), Research Center for Endangered Species (2017, ME), Marine Animals Rescue & Care Centers (2017, 8 locations, MOF), Conservatories for Endemic Plants (2015, 9 locations, KFS).

- The NBSAP encouraged greater investment in ecosystem services and the development of national strategies, increasing overall interest in ecosystem services.

* National Agenda item No. 59, “Creating a sustainable national land environment” included revisions to the Act on the Conservation and Use of Biological Diversity to expand the application and utilization of ecosystem services (from 2018).

** Developed national assessment framework for ecosystem services, assessed and mapped local ecosystem services (from 2014, ME), developed ecological forest management technology to enhance forest ecosystem services (from 2016, KFS), performed valuation of rice paddy ecosystem services and conducted research on climate change adaptation (2018, RDA)

2. Limitations and challenges

- Lack of biodiversity mainstreaming across society
 - Despite some successful mainstreaming attempts, such as legal plans developed by relevant ministries and agencies, there has not been much progress in society-wide mainstreaming, including in production and consumption.
 - Mainstreaming is insufficient across the central government, local governments and the private sector.
- Insufficient improvement in biodiversity at the fundamental level
 - Despite progress in the recovery of key endangered species and ecological axis connection, comprehensive habitat restoration was not achieved, which resulted in insufficient improvement in biodiversity at the fundamental level.
 - * (Endangered species) Progress was made in certain areas including the recovery of *Ursus thibetanus ussuricus* → A comprehensive national recovery strategy is lacking.
 - (Ecological axes) Connectivity has been increased, including through newly-created ecological corridors → Greater management efforts are needed given the ecological axes’ significance.
- Lack of efficient cooperation and response systems for biodiversity conservation
 - Policies and systems for biodiversity conservation are decentralized, leaving areas such as ecosystem services and sustainable agriculture, forestry and fisheries without a systematic cooperation system.
 - * The ME, MOF, KFS, and RDA evaluate ecosystem services and develop relevant technologies individually, making it difficult to conduct a comprehensive assessment at the national or regional level.
 - A systematic response to threats to biodiversity such as climate change and alien species invasion is lacking between ministries and between the private and public sectors.
 - * The ME (stations in Mt. Jeombongsan and Mt. Jirisan) and KFS (station in Mt. Gariwangsan) are both operating long-term ecological research stations, but there is no network connecting them.
- Lack of quantitative assessment for biodiversity policies
 - It has been pointed out that the “Pressure – State – Response” framework used for evaluating the implementation and progress of the third NBSAP had an incomplete indicator system.
 - * Most indicators (92%) focused on policy response (R) including laws and systems. More research is needed to quantify the outcomes. For example, indicators should be developed for pressures (P) leading to biodiversity loss, such as climate change and pollution and for the current state (S) of biodiversity.

Section 4.

Vision and Strategies

□. **Vision and strategies**

1. Vision and strategies

Vision	To promote the sustainable use of the environment of the ROK by conserving its rich biodiversity
Objective	To ensure the equitable sharing of benefits arising from the utilization of nature with all people through the conservation and promotion of biodiversity

Strategy 1	Mainstreaming biodiversity	
Action plans	<ul style="list-style-type: none"> ① Raising public awareness ③ Expanding positive initiatives 	<ul style="list-style-type: none"> ② Integrating biodiversity values into strategies and plans ④ Promoting biodiversity-friendly production and consumption
Strategy 2	Managing threats to biodiversity	
Action plans	<ul style="list-style-type: none"> ① Mitigating habitat loss ③ Controlling species invasion 	<ul style="list-style-type: none"> ② Reducing pressures on vulnerable ecosystems ④ Reducing pollutants
Strategy 3	Strengthening biodiversity conservation	
Action plans	<ul style="list-style-type: none"> ① Improving the coverage and management of protected areas ③ Protecting endangered and endemic species 	<ul style="list-style-type: none"> ② Achieving ecosystem restoration ④ Promoting genetic diversity
Strategy 4	Benefit-sharing and sustainable use of biodiversity	
Action plans	<ul style="list-style-type: none"> ① Laying the foundation for ecosystem services ③ Implementing the Nagoya Protocol 	<ul style="list-style-type: none"> ② Promoting the sustainable use of ecological resources ④ Advancing sustainability in agriculture, forestry and fisheries
Strategy 5	Laying the groundwork for implementation	
Action plans	<ul style="list-style-type: none"> ① Strengthening international cooperation ③ Fostering scientific knowledge and advancing policy cooperation 	<ul style="list-style-type: none"> ② Preserving and utilizing traditional knowledge

2. Performance indicators by strategy

Strategy	Indicators	Status (2018)	Target (2023)
Strategy 1. Mainstreaming biodiversity	Level of biodiversity awareness	78.00%	90.00%
	Number of metropolitan governments with local biodiversity strategies and action plans (LBSAPs)	9	17
	Number of biodiversity programs by private sector organizations	No system available to collect data on activities by private sector organizations	- Develop data collection system (2019) - Raise number of programs by 200% from 2019 level (2023)
	Number of businesses participating in the BNPB	31	66
Strategy 2. Managing threats to biodiversity	Annual increase/decrease of mountain areas	-48 km ²	+20 km ²
	Subalpine regions' sensitivity to climate change (Habitat areas for climate change-sensitive <i>Abies koreana</i>)	809 km ²	Maintain status quo (e.g. alternative habitats created)
	Number of species on government-designated list of potentially-invasive alien species	115 species	209 species
	River water quality as a percentage of target (Ratio of rivers meeting the water quality target out of 115 sub-basins nationwide)	69.6%	74.8%
Strategy 3. Strengthening biodiversity conservation	Size of protected areas	Terrestrial 15.18% Marine 1.90%	Terrestrial 17% (2021) Marine 10% (2021)
	Entries in the National Species List of Korea	49,027 species	60,000 species
	Number of endangered species (animals) being propagated/recovered	40 species	52 species
	National rare plants conservation as a percentage of target	84.9% (483 out of 571 species in total)	95.1% (543 out of 571 species in total)
Strategy 4. Benefit-sharing and sustainable use of biodiversity	Policy and legislative activities	- Legislation to enable the measurement and assessment of ecosystem services - Restoration policies implemented for individual ecosystems	- Legislation to enable the promotion of and compensation for ecosystem services - Develop comprehensive ecosystem restoration policy
	Local eco-tourism revenues (4 model areas)	KRW 1.564 billion	KRW 1.875 billion
	Cases of information sharing through the ABSCH* (* Access and Benefit-Sharing Clearing-House)	2	10
	Share of sustainably grown produce	3.53%	5%
Strategy 5. Laying the groundwork for implementation	Share of biodiversity-related ODA projects	1.12%	4.10%
	Number of data records (both oral and written) accumulated in the NIBR traditional knowledge database	830,000	120,000
	Number of biodiversity research projects	60 per year (average during the third NBSAP period)	85 per year (average during the fourth NBSAP period)

Section 5.

Action Plans by Strategy

□. Action plans by strategy

Strategy 1. Mainstreaming biodiversity

Target ① Raising public awareness

- Developing biodiversity education programs
 - (At school) Include more biodiversity content in the school curriculum and cross-curricular subjects (environment and sustainable development education) by 2020.
 - * Years 1 and 2 of elementary school (2017), years 3 and 4 of elementary school/year 1 of middle school/year 1 of high school (2018), years 5 and 6 of elementary school/year 2 of middle school/year 2 of high school (2019), year 3 of middle school/year 3 of high school (2020)
 - (Outside school) Provide biodiversity education programs tailored to audience needs
 - More hands-on field programs for different age groups and participatory programs on biological resources (ongoing)
 - Forest education programs to be developed, certified and deployed (2023)
 - * 100 programs (2017) → 250 programs (2023)/25 new programs to be certified and deployed every year
 - Research and development for ecological education programs linking agriculture and diet (from 2019)
 - (Workforce training) Offer advanced courses on natural ecology to nurture experts/curators dedicated to each ecosystem (e.g. wetlands, oceans) from 2019 and for forest educators (ongoing)
 - * Target number of forest educators: 12,000 (2017) → 22,000 (2023)
- Operating biodiversity promotion programs
 - (Exhibitions) Use biodiversity-related venues to develop and provide specialized biodiversity exhibition programs (ongoing)
 - * (ME) National Institute of Biological Resources, National Institute of Ecology, Nakdonggang National Institute of Biological Resources
 - (MOF) Korea National Maritime Museum, National Marine Biodiversity Institute of Korea
 - (KFS) Korea National Arboretum, Korea Forest Welfare Institute, Korea Institute of Arboretum Management
 - (Promotion) Engage in promotional activities using various channels such as publications, online and offline, with the goal of improving public awareness of biodiversity (ongoing).
- Increasing support for biodiversity activities in the private sector
 - (Budget support) Continue support for nature conservation organizations in the areas of education on/promotion of natural resources conservation and the management of preserved properties.
 - (Assessment) Ensure projects are selected in a fair manner by using a public-private joint assessment committee. Encourage the participation of private sector organizations by increasing project budgets and diversifying the areas of participation.

Target ② Integrating biodiversity values into strategies and plans

- Incorporating biodiversity values into legal plans
 - Reflect biodiversity values in the development and implementation of legal plans in the environmental, forestry and marine sectors (ongoing).

Responsible ministry/agency	Legal plan(s)
MAFRA	The Third Master Plan for Agricultural Bio-resources (2019-2023)
MOF	The Second Master Plan for the Conservation and Management of Marine Ecosystem (2019-2028)
ME	The Fourth Comprehensive National Plan for the Environment (2016-2035) The Third Master Plan for Wildlife Protection (2016-2020) The Third Master Plan for Sustainable Development (2016-2035) The Third Master Plan for the Conservation of the Natural Environment (2016-2025) The Second Master Plan for Water Management (2016-2025)
KFS	The Third Master Plan for Forest Biodiversity (2018-2022) The Second Master Plan for the Protection of Baekdudaegan (2016-2025) The Second Master Plan for the Management of Forest Genetic Resources Reserves (2018-2022) The Second Comprehensive Measures for the Management of Forests in the DMZ area (2018-2022)

- Developing local biodiversity strategies
 - Lay the groundwork for the development of local biodiversity strategies.
 - Set up guidelines for developing and implementing local biological strategies (2020).
 - Form a consultative body between the central and local governments to support the development of

biological strategies (from 2020).

Target ③ Expanding positive initiatives

- Expanding implementation of payments for ecosystem services (PES)
 - Continue to implement contract projects for biodiversity management and marine biodiversity management.
 - Review areas of improvement for the current biodiversity management contract system, including more target activities to be covered by the contracts (2020).
 - Propose ways to boost the implementation of marine biodiversity management contracts, and revise relevant laws (2020).
 - Review the introduction of PES.
 - Conduct pilot PES projects to provide financial incentives for activities that improve the ecosystem services of private property within protected areas, and review the results for actual introduction (2018-2020).
- Laying the foundation to expand the Direct Payment Program for Eco-Friendly Agriculture
 - Encourage eco-friendly agricultural practices by offering an increase in the unit price for direct payment for eco-friendly agriculture.
 - Introduce and gradually expand Agri-Environment Conservation Programs (2019).
- Enhancing the operation of the Forest Offset Program
 - Create an integrated management system to improve fee charging and collection for the Forest Offset Program. Fees will be adjusted in consideration of the public value of forests.
- Improving the operation of the Ecosystem Conservation Fund
 - Explore ways to improve the current system to better reflect the value of ecosystems and expand the fund's collection and refund scheme.
 - Consider the value of ecosystems when imposing fees to be deposited into the Ecosystem Conservation Fund. Make revisions to the Natural Environment Conservation Act, including expanding the scope of projects to deposit fees into the fund (2019). Adjust fees to a realistic level by revising lower-level regulations (2020).
 - Consider the value of ecosystems when imposing fees to be deposited into the Marine Ecosystem Conservation Fund (2020). Improve the current system by encouraging the wider use of the refund scheme (2021).

Target ④ Promoting biodiversity-friendly production and consumption

- Ensuring production that considers biodiversity conservation
 - Operate the Biz N Biodiversity Platform (BNBP) in a systematic manner to help improve biodiversity awareness among businesses.
 - * BNBP: A platform for businesses and biodiversity
 - Prepare and distribute guidelines for the conservation of biodiversity and its sustainable use by businesses. Identify and distribute best practices for CBD implementation in the ROK and abroad (from 2019).
 - Offer customized information to producers to increase their biodiversity awareness
 - Issue eco-friendly tree felling guidelines for eco-friendly timber production from 2018). Continue training and monitoring to ensure the system takes root (by 2023).
 - Continue to identify natural materials and products that put less of a burden on ecosystems to encourage eco-friendly product re-naturalization.
- Encouraging consumption practices that enhance biodiversity conservation
 - Provide financial benefits for consumption practices that consider biodiversity
 - The Integrated Green Card System for eco-friendly products (2023)
 - Increase brand value of products from protected areas
 - Use the marine protected area logo on major fishery products from marine protected areas. Improve the current priority purchase program by the central and local governments for certified fishery products (from 2020).
 - Develop a protected area certification program to increase the value of agricultural products and eco-tour products from protected areas (from 2020).

Strategy 2. Managing threats to biodiversity

Target ① Mitigating habitat loss

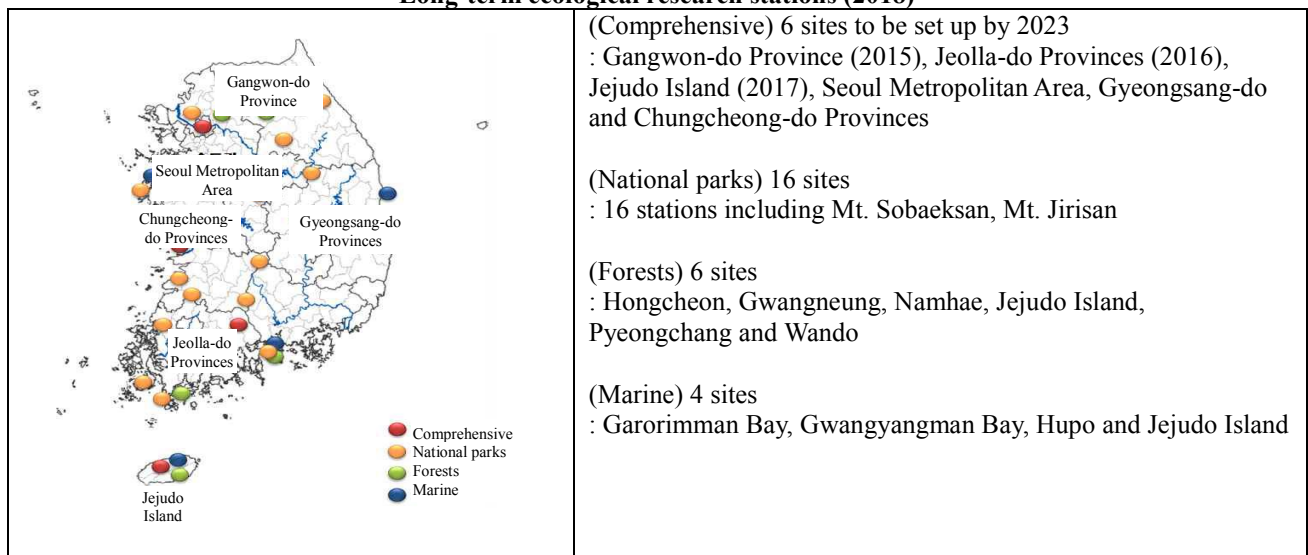
- Restoring habitat connectivity
 - Clarify the responsibility to restore the ROK's ecological axes by establishing a management system based

- on a national-metropolitan-local hierarchy. Develop measures to manage ecological axes across the Korean Peninsula including marine ones.
- Launch projects to ensure effective habitat connectivity, while taking into account the characteristics of ecosystems (ongoing).
 - Efficient installation and better management of ecological corridors, restoration projects for urban ecosystems and a green network based on urban forests.
- Mechanisms for integrated management of natural resources
 - Design a “no-net-loss” Natural Resources Policy* in connection with existing systems such as environmental impact assessments and the Ecosystem Conservation Fund. Launch trial projects to test the policy (May 2018 – April 2019).
 - * (“No-net-loss” Natural Resources Policy) A policy aiming to offset the destruction or loss of an ecosystem due to development to ensure that the predefined total conservation area of a development project or an urban area remains constant.
 - Build an integrated platform on environmental geographic information to keep track of the “no-net-loss” Natural Resources Policy (2019).
- Integrated management of land and environment planning
 - Implement the Fifth Comprehensive National Territorial Plan (2020-2040) and the Fifth Comprehensive National Plan for the Environment (2020-2040) in a way that promotes the integrated management of land and environmental planning.
 - Upgrade the existing National Environmental Zoning Map, which currently focuses on ecosystems to allow for spatial mapping of environmental information by medium as well as information sharing.
 - * Enhance mapping methodologies and deploy the system after a trial run, starting with areas under high development pressure (by 2022).

Target ② Reducing pressures on vulnerable ecosystems

- Climate change response for biodiversity
 - Create consultative bodies to discuss climate change responses for the ROK’s biodiversity.
 - Establish a joint group on long-term ecological research (2019). Launch a (tentatively-named) Working-Level Committee to Address Climate and Ecosystem Change Adaptation (2020).
 - Develop systems to manage fixed stations for biodiversity monitoring
 - Develop systems to ensure the monitoring of phenological changes and the sharing of biodiversity information accumulated at different fixed stations (2019). Prepare guidelines for long-term ecological research by common ecosystem (2020) and an integrated platform for long-term ecological research (2021).

Long-term ecological research stations (2018)



- Select species vulnerable to climate change for each ecosystem and develop adaptation measures using forecasting models to clarify the adaptation process and functions of the species (2022).
 - * (Forests) Subalpine coniferous forests including *Abies koreana* / (tropical ocean) coral, etc.
- Develop tree species resistant to weather-related disasters caused by climate change. Estimate the resilience required to restore the genetic resources of livestock in the event of a natural disaster (ongoing).

Target ③ Controlling species invasion

- Preventing the invasion of alien species
 - Strengthen government-wide systems to prevent the introduction of alien species.
 - Work with related ministries and agencies to monitor areas such as airports, ports and import warehouses where alien species can be unintentionally introduced (ongoing).
 - Develop technology to evaluate and manage risks of alien species and increase the number of species under monitoring and control
 - Predict current distribution and potential spread of invasive species and species that could disrupt ecosystem structure and functions; build database on genetic information of alien pest species; expand the list of confirmed and potential invasive species under government management (e.g. potentially invasive, invasive, marine invasive); and expand the number and scope of ecosystem risk assessment of potentially invasive species (continued)
- Strengthen policy responses and post control of invasive alien species
 - Shorten the cycle period of the national habitat survey of alien species from five to three years. Expand the list of invasive species that requires monitoring to enable early detection of and timely responses to invasive alien species (from 2019).
 - Develop sustainable control and eradication technologies and expand the scale of eradication projects (continued). Work with local governments and civil society organizations to eradicate six species expanding their range* (continued).
 - * *Micropterus salmoides*, *Lepomis macrochirus Rafinesque*, *Myocastor coypus*, *Sicyos angulatus*, *Ambrosia trifida*, *Aster pilosus*
- Securing biological safety for LMOs
 - Strengthen the risk review and safety management of living modified organisms (LMOs) introduced to the ROK and reinforce an environmental risk assessment for post-management.
 - Designate LMO risk assessment institutes for different areas. Reinforce risk management systems to prevent accidents at laboratories and industrial facilities.
 - * Responsible ministries: (test and research) MSIT, (agriculture and livestock) MAFRA / (health and medical services) MOHW / (environmental remediation) ME / (marine industry and fisheries) MOF (industry) MOTIE
 - Expand the environmental risk assessment and environmental release monitoring of LMOs (from 2019).
 - * LMO nationwide natural ecosystem monitoring (ME, 800 locations, 2018), marine ecosystem monitoring (from 2019, MOF)

Target ④ Reducing pollutants

- Ensuring the preemptive management of pollutants
 - Ensure the robust, proactive management of water pollutants that have the biggest impact on the ecosystem.
 - (Total pollution load management, TPLM) Revise the four-stage total water pollution load management system, including an increase in the target water quality and the study on the introduction of new pollutants (e.g. TOC) (from 2021).
 - * TOC (Total Organic Carbon): Total amount of carbon found in an underwater organic pollutant
 - (Bioremediation) Identify indigenous biological resources to break down water pollutants and dyeing wastewater, and develop eco-friendly bioremediation technology (from 2018).
 - * Target (accumulated) number of bioremediative enzymes based on microbial resources: 10 (2018) → 20 (2019)
 - Improve the marine environment through the collection and disposal of submerged marine debris in ports and coasts and through awareness campaigns to reduce marine litter (from 2018).
- Strengthening the integrated management of pollutants
 - Lay the groundwork to incorporate the TOC into the TPLM considering changes in water management conditions (2020). Prepare next steps including deciding on management criteria (2018) and consider introducing tributary total pollution load control (2020).
 - Develop and execute a master plan and an implementation plan for the TPLM by sea area and assess the outcome to ensure the TPLM for environmental management sea areas.
 - Adjust development projects in coastal areas, develop and implement plans to reduce pollutants, launch public awareness campaigns, and create and operate a public-private-industrial-academic committee.
 - * Masanman Bay (from 2008, COD/total phosphorous), Sihwaho Lake (from 2013, COD/total phosphorous), Busan coast (from 2015, COD), Ulsan coast (2017, heavy metals)
- Improving the management of non-point pollutants
 - Enhance the integrated non-point pollutants management system to improve the health of aquatic

ecosystems.

- Develop and disseminate ROK-style low-impact development (LID) techniques (2020). Introduce a mandatory performance test for maintenance (2020) along with mandatory post monitoring (2019).
- Increase the number of sites covered by aquatic ecosystem health survey* and ensure Good (B) or higher results.
* Increase sites covered by river aquatic ecosystem survey and assessment from 960 to 3,000 and set the survey cycle to three years.

Strategy 3. Strengthening biodiversity conservation

Target ① Improving the coverage and management of protected areas

- Expanding protected areas
 - (Terrestrial) Continue to expand terrestrial protected areas to achieve the 17% target.
 - Expand the coverage of wetland protected areas, ecology and scenery conservation areas and special islands (2018 – 2022).
 - Target coverage: 10,000km² of protected forest areas by 2030, over 8,500km² of protected areas by 2023 and 3,000km² of Baekdudaegan protected areas by 2025
* Protected forest areas: 7,200km² (2017) → 8,500km² (2022) → 9,000km² (2025) → 10,000km² (2030)
 - (Marine) Continue to expand marine protected areas to achieve the 10% target.
 - Designate at least one new marine protected area every year based on the results of the Comprehensive National Survey on Marine Ecosystems.
 - Continue to expand protected areas through in-depth survey of coastal wetlands and an integrated management system.
* Marine protected areas (MOF): 229km² (2017) → 600km² (2020)
- Reinforcing the management of protected areas
 - Improve management systems for protected areas, taking into consideration their characteristics, and evaluate the systems' effectiveness.
 - Carry out survey and evaluation to designate and manage protected areas by type (2019 – 2023). Develop projects to support privately-owned protected areas (from 2019).
 - Explore ways to conserve and manage national parks (e.g. introduction of special conservation districts in parks), and evaluate their effectiveness. Conduct a survey of marine habitats and coastal wetlands in national parks and categorize the results by type.
 - Improve the management system for forest protected areas and conduct the management effectiveness evaluation (MEE) on a larger scale (128 locations, 31% in 2017 → 318 locations, 100% in 2022).
 - Develop a master plan for the management of marine protected areas by region. Make requests for Ramsar wetland and wetland city accreditation (from 2019). Develop a mud flat ecology grading system to keep track of progress towards goals for each mud flat (2019).

Target ② Achieving ecosystem restoration

- Laying the foundation for ecosystem restoration
 - Lay the groundwork to manage the restoration of terrestrial ecosystems (from 2019).
 - Develop planting techniques for urban regeneration areas (2019 – 2021). Survey the status of natural environment degradation, and launch restoration projects based on their priorities. Build a framework to pursue cross-ministry restoration projects across different ecosystems and explore new restoration businesses.
 - Integrate different concepts of forest restoration, address restoration methods in detail and prepare specific manuals as well as institutional mechanisms (a master plan for forest restoration, revisions to forest restoration guidelines).
 - Lay the groundwork to manage the restoration of marine ecosystems (from 2019).
 - Overhaul the Conservation and Management of Marine Ecosystems Act (by 2019). Develop and implement a master plan for marine ecosystem conservation management (2019 – 2028). Legislate the Act on the Sustainable Use and Restoration of Mud Flats (2019).
- Launching restoration efforts for damaged ecosystems
 - (Ecological axes) Restore damaged areas of key ecological axes including Baekdudaegan and the DMZ, Baekdudaegan areas divided by roads and railroads, hotspots for roadkill, ridges and spurs (*jeongmaek and jimaek*) or large damaged zones in human habitats such as quarries (ongoing).
 - (Forests) Carry out systematic restoration work in key forest ecosystems including an Olympic downhill

- venue in Mt. Gariwangsan and forests on islands and in coastal areas (from 2019).
- (Marine) Launch restoration projects in national parks and mud flat ecosystems. Restore key habitats for marine species through the release of natural enemies and transplantation of seaweeds (from 2019, Dokdo Island).
- (Protected areas and others) Increase the number of target areas for restoration, including restoration of a key community ecological axes (by 2022). Develop a database to keep track of planting in urban regeneration areas and index ecosystem services (2019 – 2021). Promote technology development to strengthen the functions of urban ecosystems (2019 – 2022).

Target ③ Protecting endangered and endemic species

- Conserving and recovering endangered species
 - Open the Research Center for Endangered Species and launch a comprehensive restoration policy.
 - Under the center’s initiative, secure original species of endangered wild animals and develop, spread and apply propagation and recovery technologies (from 2019). Continue to conduct a nationwide survey of endangered wildlife distribution (ongoing).
 - Survey the inhabitation of and threats to marine protected species. Designate and manage protected areas for marine species, as well as *ex situ* conservation centers for marine species and rescue and care centers (from 2019).
- Strengthening the management of internationally endangered species (CITES)
 - Build a dedicated facility to protect confiscated CITES species from smuggling and illegal trade (2020).
 - Streamline the legal system and strengthen scientific research to ensure the efficient management of internationally endangered species.
 - Streamline relevant laws including improvements to the transfer and acquisition process for CITES species (by 2020). Collect data to support the scientific management of internationally endangered species and enhanced public services and draw up relevant guidelines (by 2022).
- Ensuring wildlife disease control and research
 - Open the National Wildlife Disease Control Center (2020).
 - Strengthen research on and response to wildlife diseases, along with an improved wildlife rescue and care system.
 - Develop a scientific foundation through research of domestic species.
 - Develop the National Species List of Korea (by 2023, 60,000 species) and collect empirical taxonomic evidence of endemic species (by 2023, 55 species). Update the National Marine Species List.
 - Inform the IUCN of the assessment results of the Korean Peninsula’s endemic species (from 2019). Develop national statistics on the Korean Red List Index (by 2023).

Target ④ Promoting genetic diversity

- Conserving and utilizing biological and genetic resources
 - Improve conservation and propagation technologies to facilitate the sustainable use of biological resources.
 - * e.g. Techniques for conservation and restoration of microorganisms, and diversity assessment of livestock genetic resources
 - Study genetic resources and develop a database based on the characteristics of each species.
- Establishing an institutional basis to improve genetic diversity
 - Secure a wider range of wildlife genetic resources to enhance genetic diversity.
 - Operate biological material repositories to ensure the conservation and sustainable use of biological materials.
 - Collect the samples of unsecured and endemic species in priority for conservation. Collect cultures of useful freshwater organisms for stable preservation and develop mass culture technology.
 - * Wildlife genetic resources (170,000 samples in 2018 → 300,000 samples in 2023 (accumulated))
 - * A total of 11,000 strains of freshwater biological resources to be conserved by 2023 (including 3,000 strains secured between 2015 and 2017)
 - Diversify genetic resource banks to secure a diverse range of biological and genetic resources.
 - International standardization of the National Culture Collection for Pathogens, research materials and research materials banks.
 - * Pathogen resources to be secured: 2,228 strains from 499 species for disclosure/distribution, 10,000 strains for distribution (by 2023)
- Conducting genetic research on important biological resources
 - Carry out trial research to identify and monitor on a regular basis the genetic diversity of endangered species, endemic species and species with high economic value.
 - Use the results for group conservation by species and as scientific evidence to support the identification of priority species for management, listing/delisting of endangered species and selection of species

to be introduced for recovery.

* 202 cases analyzed as of 2018. 356 species will be analyzed from 2019 and 2026 (32 cases/year).

- Develop a standardized system to manage national biological resources. Collect DNA barcode data on the biome of the Korean Peninsula to lay the foundation of the bio industry based on national biological resources.
 - * Accumulated number of species whose DNA barcode data is registered: 8,581 species (2018) → 10,400 species (2023)

Strategy 4. Benefit-sharing and sustainable use of biodiversity

Target ① Laying the foundation for ecosystem services

- Laying the foundation for ecosystem services assessment
 - Establish policy foundation through legislation on ecosystem services.
 - Revise the Act on the Conservation and Use of Biological Diversity, which lays the legal foundation for the definition of ecosystem services and their measurement and valuation (2019). Prepare guidelines for assessing ecosystem services (2021).
 - Establish an ecosystem service assessment system considering ecosystem characteristics.
 - Operate a working group on ecosystem services for the early establishment of the assessment system (from 2019).
 - Build an ecosystem categorization system (2020) and a forest ecosystem assessment system (2021). Develop a marine ecosystem service and technologies for cumulative effect assessments (2021).
- Providing public ecosystem services
 - Create a map of ecosystem services as a visual tool to enhance the public's understanding.
 - Develop an integrated spatial analysis information system and integrated mapping technologies (by 2021). Develop maps to measure ecosystem services at the local government level (ongoing).
 - Provide measures to utilize the ecosystem service spatial information policy (2023).
 - Create an environment that ensures equal access to ecological and cultural services for the public.
 - Expand and support leisure and ecotourism services by turning ecological themes into tourism assets, refurbishing old tourism facilities by connecting them to cultural content, and bolstering and supporting ecotourism.
 - Enhance leisure and recreation services including hiking trails, forest healing and recreational areas, and urban ecological resting places.

Target ② Promoting the sustainable use of ecological resources

- Finding growth engines with the use of biological resources
 - Verify the basic biological usefulness of indigenous biological resources (374 species in 2017 → 1,200 species in 2023). Identify eco-friendly biological resources to reduce environmental pollution.
 - Identify functionally active ingredients. Identify and manage genetic data of wildlife resources whose usefulness are proven.
- Laying the foundation for sustainable development through biomimicry technology
 - Conduct research on ecological data that can be used in biomimicry technology (ongoing).
 - * Study on the cut characteristics of *Cyrtorhynchites (Cyrtorhynchites) ursulus quercuphillus* (2016 - 2017), Study on the characteristics of self-developing structural colors of birds' feathers (2018)
 - Develop new technology integrating ecology (biology) and engineering through biomimicry R&D (2018-2022).

Target ③ Implementing the Nagoya Protocol

- Building the groundwork for national implementation of the Nagoya Protocol
 - Reinforce pan-governmental response and collaboration by actively operating the Council and the Working Groups involving ministries related to the Act on Access to and Utilization of Genetic Resources and Benefit-Sharing.
 - Prepare the implementation system by developing guidelines for handling tasks related to the Act on Access to and Utilization of Genetic Resources and Benefit-Sharing as well as benefit-sharing, and revising laws under the jurisdiction of related ministries (2019 – 2023).
 - Continue international cooperation to secure overseas biological resources from countries with rich biological resources in Asia (ongoing). Pursue further bilateral agreements on biological and genetic resources at the country level (ongoing).
 - Build and operate the pan-governmental information sharing system for biological research resources (ongoing).

- Providing support for private implementation of the Nagoya Protocol
 - Provide support to raise awareness in the private sector of the Nagoya Protocol and reinforce its response capacity (ongoing).
 - Operate a help desk for access and benefit-sharing, provide customized consulting for businesses, distribute ABS guidebooks, and run a marine bio-resources ABS information support center.

Target ④ Advancing sustainability in agriculture, forestry and fisheries

- Encouraging sustainable agriculture
 - Facilitate eco-friendly agriculture through certification management, expansion of the production base and improvement of the distribution structure.
 - Redefine eco-friendly agriculture centering on environment and ecological conservation and introduce hygiene and safety management standards (2019).
 - Create eco-friendly agricultural districts focusing on specialized local products (100 districts from 2017 – 2022).
 - Improve the distribution structure and find additional sales channels by promoting eco-friendly logistics centers (2 centers) and adding regional distribution organizations in areas of production (9 locations from 2017 – 2022).
 - Draw up joint measures for conservation management in rice paddy wetlands by related ministries including the designation of rice paddy wetlands and support measures (2021).
- Expanding sustainable forestry
 - Carry out forestation according to function to optimize the various functions of forests and to improve the public value of forest resources.
 - Establish a mid- to long-term plan, the Five-year Four-stage Forestation Plan (2019-2023).
 - * (Six functions of forests) ① Production of wood, ② Development of water sources, ③ Prevention of forest disasters ④ Preservation of a living environment, ⑤ Forest recreation ⑥ Preservation of the natural environment
- Sustainable use of fishery resources
 - Cultivate sea forests (3,000 ha per year) to recover coastal ecosystems (forests of 15,252 ha in 129 locations had been created as of 2017). Release strategic species and monitor their genetic diversity. Build habitats and spawning areas for specialized species according to marine area.
 - Increase the management efficiency of fishery resources through a gradual reduction of the Total Allowable Catch (TAC) and secure sustainable fishery resources by expanding the number of fish species subject to the TAC (2022).

Strategy 5. Laying the groundwork for implementation

Target ① Strengthening international cooperation

- Building and implementing international cooperation systems
 - Enhance the implementation of the CBD.
 - Broaden cooperation on detailed initiatives by biodiversity area with the Secretariat.
 - * Operate and expand the following projects: Bio-Bridge initiative (BBI, ME), Peace and Biodiversity Dialogue (PBDI, ME), Korea Biosafety Capacity Building Initiative (KBCI, MOTIE), Forest Ecosystem Restoration Initiative (KERI, KFS), Sustainable Ocean Initiative (SOI/SOI Global Dialogues, MOF)
 - Enhance cooperation for the implementation of related international agreements in each field.
 - Operate and expand the Korean office (KBIF) of the Global Biodiversity Information Facility (GBIF).
 - Seek international cooperation for the sustainable preservation of crops related to food and agriculture.
 - Build a system for joint research and cooperation regarding overseas biological resources and join consultative groups on safety management of LMOs, biodiversity, marine and forest protection.
- Providing overseas support for biodiversity
 - Launch a project to provide support to resource-rich countries to help them build a biological resources information system.
 - * Develop the information cooperation system between biological resources research centers (2019). → Provide support on informatization with a focus on Southeast Asian countries (2020 – 2021). → Expand the target areas of the project (2022).
 - Nurture educational leaders in the conservation of marine life and promote a project to provide educational

support (CBD-SOI Training of Trainers Workshop) for site managers in developing countries (by 2020).

- Building a natural ecosystem cooperation system between the ROK and the Democratic People's Republic of Korea (DPRK).
 - Secure inter-Korean communication and cooperation channels related to the natural environment and lay the foundation for cooperation.
 - Provide support for natural resources research in the DPRK such as ecosystem changes and biodiversity in biosphere reserves (from 2019)
 - Designate DMZ areas with superior biodiversity as a biosphere reserve (2019).
 - Prepare a ROK-DPRK joint survey to find ecological and environmental resources.

Target ② Preserving and utilizing traditional knowledge

- Finding traditional knowledge and building a database
 - Explore and conduct surveys to find orally-transmitted traditional knowledge associated with indigenous biological resources.
 - Explore and conduct surveys to discover traditional knowledge related to indigenous biological resources in oral traditions and old literature (2020). Develop a comprehensive list of traditional knowledge-based biological resources (2021).
 - Create a system to find and manage traditional knowledge related to agriculture and rural areas (by 2023) and obtain traditional forest knowledge by examining literature such as old books and surveying mountain villages on the Baekdudaegan.
 - Discover traditional ocean and fishery knowledge through field surveys of inhabited islands, fishing villages and traditional markets, and introduce an ocean traditional knowledge information system (by 2023).
 - Build a database for old literature on the traditional medicine of East Asia (by 2023).
- Seeking measures to expand and utilize traditional knowledge
 - Verify and tap into the usefulness of traditional knowledge-based biological resources.
 - Devise ways to utilize biological resources in ways based on traditional knowledge by verifying the usefulness of the relevant resources (by 2023), conducting research to develop technologies using traditional knowledge-based freshwater biological resources (by 2023) and studying the functional effect of new materials and biological activities (by 2023).
 - Promote local marketing of agriculture and create new value using traditional knowledge.
 - Carry out research on access to, utilization and benefit-sharing of the ROK's traditional knowledge, and explore ways to facilitate local marketing using local products. (from 2019)
 - Discover and restore traditional village forests.
 - Restore village forests considering their traditional functions such as landscape/feng shui, environmental control, culture/religion, recreation/tourism and nature/ecosystem.
 - * Designate a forest as a cultural forest asset if it has value in terms of history, culture, legend and/or indigenous religion.
 - Form the basis for research into the extraction of natural ingredients from species related to traditional knowledge (by 2023).

Target ③ Fostering scientific knowledge and advancing policy cooperation

- Developing a biodiversity information system
 - Conduct basic surveys for each ecosystem.
 - Carry out the Fifth National Natural Environment Survey (2019 – 2023) and the National Park Biodiversity Survey and Assessment, build the Integrated Archive for Forest Biological Diversity, and conduct a Comprehensive National Survey on Marine Ecosystem (by 2022).
 - Establish a biodiversity clearing house mechanism.
 - Operate the biodiversity information linkage system (6 ministries and 60 agencies). Reinforce interagency information-sharing especially between local municipalities and related ministries (from 2018).
- Strengthening the policy base for biodiversity
 - Develop a cooperative decision-making mechanism by facilitating the operation of the National Biodiversity Committee.
 - Implement projects to nurture biodiversity experts.
 - Carry out a program for the undiscovered taxa of the ROK and the project to foster experts in biodiversity-economics (ongoing). Train experts to respond to international agreements regarding biodiversity (from 2019).

- Develop technologies for conserving and utilizing urban and coastal biological resources and open the Honam National Institute of Biological Resources to support their commercialization and industrialization (2020).
- Expanding the utilization of citizen science monitoring
 - Draw up citizen science monitoring guidelines (2019), form a monitoring network connecting experts, NGOs and local residents (2020) and collect data provided by citizens into a database for use in policy development (2021).
 - Formulate a plan and guidelines for the long-term ecological monitoring and the Fifth National Natural Environment Survey (2019 – 2023) using ICT and citizen science (from 2019).
 - Lay out guidelines for wetlands surveys and organize a group of civilian experts (2019). Conduct a trial project for the civilian expert-led wetlands survey (2020) and integrate the management of citizen monitoring (from 2019).

Section 6.

Implementation Timeline and Responsible Government Authorities

□. Implementation timeline and responsible government authorities

Action plans	Responsible government authorities	2019		2020	2021	2022	2023
		H1	H2				
Strategy 1. Mainstreaming biodiversity							
① Raising public awareness	MOE, MSIT, MAFRA, ME, MOF, KFS						
② Integrating biodiversity values into strategies and plans	ME, MOF, KFS						
③ Expanding positive initiatives	MAFRA, ME, MOF, KFS						
④ Promoting biodiversity-friendly production and consumption	MAFRA, ME, MOF, KFS						
Strategy 2. Managing threats to biodiversity							
① Mitigating habitat loss	ME, MOF, KFS						
② Reducing pressures on vulnerable ecosystems	ME, MOF, RDA, KFS						
③ Controlling species invasion	MSIT, MAFRA, MOTIE, ME, MOF, RDA, KFS						
④ Reducing pollutants	MAFRA, ME, MOF, KFS						
Strategy 3. Strengthening biodiversity conservation							
① Improving the coverage and management of protected areas	ME, MOF, KFS						
② Achieving ecosystem restoration	ME, MOF, RDA, KFS						
③ Protecting endangered and endemic species	ME, MOF, RDA, KFS						
④ Promoting genetic diversity	MSIT, MOHW, ME, MOF, RDA, KFS						
Strategy 4. Benefit-sharing and sustainable use of biodiversity							
① Laying the foundation for ecosystem services	MCST, ME, MOF, KFS						
② Promoting the sustainable use of ecological resources	ME						
③ Implementing the Nagoya Protocol	MSIT, MOTIE, ME, MOF, RDA, KFS						
④ Advancing sustainability in agriculture, forestry and fisheries	MAFRA, ME, MOF, RDA, KFS						
Strategy 5. Laying the groundwork for implementation							

① Strengthening international cooperation	MSIT, MOFA, MAFRA, MOTIE, ME, MOF, RDA, KFS								
② Preserving and utilizing traditional knowledge	MSIT, ME, MOF, RDA, KFS								
③ Fostering scientific knowledge and advancing policy cooperation	ME, MOF								

Section 7.

Action Plans

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Strategy 1 Mainstreaming Biodiversity

Responding to the root causes of biodiversity loss

Overview

I Aichi Target – A

Mainstream biodiversity across the government and society to respond to the root causes of biodiversity loss

I Relevance to the Sustainable Development Goals (SDGs)

Use facilities, systems and education programs to improve universal access for the public and to lay the relevant groundwork

As an issue cutting across the country and society, biodiversity should be taken into account in public awareness campaigns, national planning, policy implementation and a variety of economic activities.

Indicators and references

I Level of biodiversity awareness

Proportion of adults over 18 who understand biodiversity

I Local biodiversity strategies and action plans (LBSAPs) developed

Development of LBSAPs has been facilitated.

I Number of biodiversity programs by private sector organizations

The number of programs identified based on a system that tracks the activities of private sector organizations

I Number of businesses participating in the BNPB

The number of businesses taking part in the Biz N Biodiversity Platform (BNBP) since the establishment and operation of its secretariat

Target 1. Raising public awareness

□ Current status and needs

- Public understanding and awareness of biodiversity values lays the groundwork for the conservation and promotion of biodiversity.
- The target corresponds to Aichi Target 1 on “raising awareness.”

Action plan 1-11-1	Developing biodiversity education programs	MOE, MSIT, MAFRA, ME, MOF, KFS
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□ Key points

A. [MOE] Strengthening in-school education programs

- Reinforce school education and link it to Education for Sustainable Development (ESD) programs.
 - Integrate ecosystem protection and biodiversity into the school curriculum (e.g. science, environment) and cross-curricular subjects* for students**.
 - * Environment and sustainable development education
 - ** Years 1 and 2 of elementary school (2017), years 3 and 4 of elementary school/year 1 of middle school/year 1 of high school (2018), years 5 and 6 of elementary school/year 2 of middle school/year 2 of high school (2019), year 3 of middle school/year 3 of high school (2020)
 - Conduct relevant policy research. Develop and disseminate teaching and learning materials on cross-curricular subjects (by February 2019).

B. [Joint] Organizing out-of-school education programs

- (KFS) Develop, certify and distribute forest education programs.
 - Develop and offer forest education programs tailored to audience needs.
 - Expand forest education programs* through a simplified certification program, a certification advisory group and consulting support. * 100 programs (2017) → 250 programs (2023)/25 new programs to be

- certified and provided every year
- **(ME)** Provide training for government officials and teachers, hands-on field programs for undergraduates and classes on biological resources and biodiversity for elementary, middle and high school students.
- **(MAFRA)** Support a preliminary survey and research to develop ecological education programs linked to community agriculture and diet (from 2019, 5 *si* (city)/*gun/gu* per year)
- **(MOF)** Organize more participatory, hands-on programs on oceans and fisheries.
 - Hands-on programs for children
 - Offer programs that cater to different age groups (from elementary school students to adults).

C. [Joint] Connecting biodiversity programs in and out of school

- **(MSIT)** Organize hands-on programs to explore biodiversity.
 - Natural History Research Society (10 sessions, 520 participants)
- **(MAFRA)** Emphasize agroecological and biodiversity content in diet education programs.
 - Outline a roadmap to developing a database of teaching content for use by childcare and education organizations and implement the roadmap each year (from 2018).
 - Develop diet education materials at the level intended for undergraduates with improved agroecological content. Offer support to education for diet majors (from 2018).
- **(ME)** Organize more participatory education programs on biological resources (12 courses).
 - Encourage program participation by local residents (expand from Yeongnam to Chungcheongnam-do and Gangwon-do Provinces).
 - □ Number of people who completed the course: 13,000 per year (2019) → 20,000 per year (2023)
- **(KFS)** Develop and coordinate forest ecosystem education programs tailored to different age groups.
 - Programs for infants and children currently underway
 - Develop forest ecosystem education programs targeting different age groups from elementary school students to adults, and link them to nature education programs at schools.

Action plan 1-□-②	Operating biodiversity promotion programs	MSIT, ME, MOF
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□ **Key points**

A. [Joint] Operating promotional programs for raising public awareness

- **(MSIT)** Strengthen public information services for domestic and overseas biological resources.
 - Publish a statistical report on national biological resources.
 - Organize an information-sharing workshop on biological resources.
- **(MOF)** Coordinate programs to raise public awareness of marine biodiversity.
 - Select a protected marine animal of the month and hold a marine animal-themed competition.
 - Improve existing systems, for example, by changing the names of protected marine animals and introducing a grading system for management.
 - Work with NGOs and aquariums to provide programs to raise awareness of protection and strengthen promotional activities in which citizens can take part.
 - Develop and distribute promotional items related to marine animals under protection.
- **(ME)** Organize awareness campaigns on the conservation of biological resources and expand existing exhibition and promotion programs to raise awareness of biodiversity.
 - Select middle and high school students to engage in promotional activities online and offline (youth leaders, from 2006). Appoint high school or undergraduate reporters to report, carry out promotional activities and publish newsletters (Green Reporters, from 2010). Appoint student ambassadors from middle and high schools and universities to observe biodiversity in their communities and promote conservation (K-BON Junior, from 2016).
 - Offer spaces for exhibits and hands-on programs to increase awareness of the value of biodiversity (Ecorium at the National Institute of Ecology, eco-experience centers at national parks, exhibition halls at the National Institute of Biological Resources).
 - Organize more programs targeting the marginalized (the disabled and those living in remote areas).
 - Use different media channels (e.g. new media and public facilities) for promotion and organize events that the public can participate in and relate to.

Action plan 1-①-③	Training professionals	MSIT, ME, MOF, KFS
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□ **Key points**

A. [Joint] Training professionals through biodiversity education

- (MSIT) Educate professionals specialized in natural ecology.
 - Educate specialists in natural ecology through experiential learning and theory lessons.
- (ME) Organize specialized training programs for ecology experts.
 - Provide training programs to nurture natural environment interpreters and ecosystem interpreters.
- (MOF) Offer training courses for marine ecosystem interpreters.
 - Provide theory and field training on marine biodiversity and marine ecology to train marine ecosystem interpreters.
 - Designate institutions to train ocean interpreters.
- (KFS) Produce forest education experts.
 - Train experts including forest interpreters, forest instructors for children and forest trail instructors to provide forest education to the public and highlight the importance of conserving forest biodiversity.
 - Target number of trainees: 12,000 experts (2017) → 22,000 experts (2023)
 - Designate institutions to train forest education experts.
 - Send forest education experts to major forest education facilities nationwide to provide forest education services to the public. Provide capacity building programs to existing experts.

Target 2. Integrating biodiversity values into strategies and plans

□ **Current status and needs**

- The Aichi Biodiversity Targets and the Sustainable Development Goals (SDGs) call for biodiversity values to be integrated into national and local planning.
- The central and local governments should reflect biodiversity in their policies to facilitate its mainstreaming in government operations.
- The target corresponds to Aichi Target 2 on “integrating biodiversity values.”

Action plan 1-②-①	Integrating biodiversity values into legal plans	ME, MOF, KFS
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□ **Key points**

A. [MOE] Integrating biodiversity values into natural environment management plans

- Establish the Fourth National Biodiversity Strategy (2018 – 2023).
 - Develop strategies on the conservation and sustainable use of national biodiversity in accordance with the Act on the Conservation and Use of Biological Diversity.
 - Create and operate a Committee for the Development of the Fourth NBSAP to draft the strategy to be tabled by the Cabinet for approval.
- The Fourth Comprehensive National Plan for Environment (2016-2035)
 - The plan provides a vision and a long-term strategy for the ROK’s environmental policy. The vision is “Nature plus, Safety up, Happy Korea.”
 - The first of the seven key strategies is “1. Managing natural resources to increase ecological value.” The other strategies also address biodiversity.
- The Third Master Plan for Sustainable Development (2016 – 2035)
 - The UN SDGs have been tailored in the ROK to meet local needs. The plan is intended to enhance integration between different sectors including the environment, society and the economy.
 - Among the plan’s 14 strategies, “1-2. Increasing the values of ecosystem services” corresponds to SDGs 14 and 15. The other strategies also address biodiversity.
- The Third Master Plan for the Conservation of the Natural Environment (2016 – 2025)
 - The plan lays out a vision of “Living in harmony with rich nature” along with 6 targets, 5 strategies and 17 action plans.
 - The plan embraces the concept of a cycle that considers the conservation of natural capital and the sustainability of ecosystem services.
- The Second Master Plan for Water Management (2016 – 2025)
 - “The highest-level plan for the government’s water management to facilitate water quality and quantity management and the conservation of aquatic ecosystems.” The plan outlines five key strategies.

- Under the banner of “coexistence of nature and humanity,” the plan specifies directions for water management, including water management by region, total pollution load management (TPLM), and non-point pollutant management.

B. [MOF] Integrating biodiversity values into ocean management plans

- o Establish and implement the Second Master Plan for the Conservation and Management of the Marine Ecosystem
 - The plan aims to legally ensure the comprehensive and systematic conservation and management of marine ecosystems, and is established every 10 years in accordance with Article 9 of the Conservation and Management of Marine Ecosystems Act.
 - Survey and observe marine ecosystems, conserve and manage marine ecosystem habitats as well as marine biodiversity, and lay the foundation for the conservation and management of marine ecosystems.
 - A report on the analysis and assessment of the results of the master plan is published every two years for submission to the National Assembly.

C. [KSF] Integrating biodiversity values into forest management plans

- o The Third Master Plan for Forest Biodiversity (2018 – 2022)
 - Continue to expand forest protected areas to cover over 1 mil. ha by 2030 (10% of the national territory). 720,000 ha (2017) → 850,000 ha (2022) → 1 mil. ha (2030)
 - Ensure constant monitoring of external threats to forest ecosystems, such as soil acidification, invasive alien species and anthropogenic damage, and take prevention measures.
 - Establish a system to allow for species-level management for rare plants including their *in situ* and *ex situ* conservation.
 - Reintroduce rare plants *in situ* and develop DNA markers.
- o The Second Master Plan for the Protection of Baekdudaegan (2016 – 2025)
 - Create forest resources in a systematic manner to maintain and improve biodiversity and strengthen the prevention of and response to wildfires and landslides.
 - Develop measures to manage areas with high conservation value or rich biodiversity such as intact forests, alpine regions, habitats for rare and useful plants and prioritize their management.
 - Prepare a vulnerability assessment for climate change and develop corresponding management measures. Strengthen the monitoring of species and ecosystems under climate change.
 - Prevent the introduction of and eradicate alien species that threaten or may threaten the ecosystem.
- o The Second Comprehensive Measures for the Management of Forests in the DMZ area (2018 – 2022)
 - Expand forest genetic resources reserves to ensure the systematic conservation of forest biodiversity across the DMZ and secure the horizontal ecological axis. □ 57,000 ha (2017) → 60,000 ha (2022)
 - Promote the prevention of disasters such as wildfires and landslides and facilitate the ecological restoration of damaged areas.
 - Launch robust wildfire prevention activities and simplify the entry process to enable early containment. * Fire hydrants and water collection systems installed: 10 locations (2019) → 28 locations (2022)
 - Implement ecological restoration in a way that matches the surrounding ecosystem for 1,044 lots that have been identified in a survey as requiring recovery and restoration (2015 – 2017).
- o The Second Master Plan for the Management of Forest Genetic Resources Reserves (2018 – 2022)
 - Expand forest genetic resources reserves to cover over 200,000 ha by 2022.
 - Increase coverage to 300,000 ha in the mid-to-long term to achieve the relevant Aichi Target.
 - Increase the execution rate of management effectiveness evaluations (MEE) conducted on forest genetic resources protection zones to over 75%.
 - Expand the implementation of MEE: 128 locations (31%, 2017) → 318 locations (100% of state forests, 2022)
 - Enhance the health of forest genetic resources reserves through their systematic survey and management.

Action plan 1-2]-2)	Developing local biodiversity strategies and action plans	ME
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□ **Key points**

A. [ME] Laying the groundwork for the development and implementation of local biodiversity strategies

- o Review the mandatory development of local biodiversity strategies and action plans required by law.
 - Review the possibility of achieving the targeted increase the number of local biodiversity strategies

- and action plans.
- Promote the development of local biodiversity strategies and action plans based on the natural environment conservation action plans of local governments.
- Create a consultative body between the central government and local governments to check the implementation progress of biodiversity strategies.
 - Build and run a system for cooperation between the central government and local governments to assist in the development and effective management of local biodiversity strategies that are linked to national biodiversity strategies.
 - Operate the consultative body to check the implementation progress of local biodiversity strategies and improve capacity for implementation (Body to comprise biodiversity researchers, civil society organizations and businesses; body to meet once a year).
- Encourage good biodiversity practices in local governments
 - Select local governments with good biodiversity practices (metropolitan and *si (city)/gun/gu* governments) and provide with administrative and specialized support for the development and implementation of local biodiversity plans in connection with national biodiversity.
 - Offer awareness training to departments and officers at local governments in charge of biodiversity strategies.
 - Organize an interregional forum on a regular basis to address topics related to local biodiversity cooperation such as interregional cooperation.

Target 3. Expanding positive initiatives

□ Current status and needs

- Incentives useful for the conservation and sustainable use of biodiversity encourage the implementation of biodiversity strategies and plans.
- Encouraging activities beneficial to biodiversity will improve biodiversity conservation and promotion and contribute to mainstreaming biodiversity across society and the economy.
- The target corresponds to Aichi Target 3 on “reforming harmful incentives.”

Action plan 1-3-1	Expanding implementation of payments for ecosystem services (PES)	ME, MOF
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□ Key points

A. [Joint] Promoting biodiversity management contract projects

- **(MOF)** Offer support for marine biodiversity management contracts
 - Develop measures to boost the implementation of the contract program by, for example, changing and expanding the scope of support directed to marine biodiversity management contracts. Revise relevant laws.
 - Consider ways to improve the Marine Ecosystem Conservation Fund program to encourage the wider use of the refund scheme. Launch a trial project that could pave the way to such wider use.
- **(ME)** Promote biodiversity management contract projects
 - Enter an ecological conservation management contract with the owners of private property within protected areas to directly pay them the cost associated with the provision of ecosystem services.
 - Diversify crops subject to management to enable stable food supplies for migratory birds. Expand target areas for the project by increasing the ratio of subsidies provided by local governments (30% → 50%).

B. [ME] Launching and evaluating trial ecosystem service projects for conserving ecosystem services

- Develop a reasonable reward system for ecosystem service providers to encourage them to voluntarily manage and promote ecological resources.
- Prepare manuals on measuring ecosystem services for areas with good ecosystem services (private property within protected areas). Carry out trial projects offering incentives (from 2018).

Action plan 1-3-2	Improving the operation of the Ecosystem Conservation Fund	ME, MOF
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□ Key points

A. [Joint] Improving the Ecosystem Conservation Fund program

- **(ME)** Improve the Ecosystem Conservation Fund program by reflecting ecological values
 - Minimize the damage to the natural environment, restore damaged areas and create more ecological spaces by adjusting fees to a realistic level, reflecting the value of ecosystems and increasing the scope of projects to deposit fees into the fund.
 - Make revisions to the Natural Environment Conservation Act based on the results of a commissioned analysis of the impact of regulations and costs to improve the Ecosystem Conservation Fund program (February – May 2018).
 - Revisions to the Natural Environment Conservation Act submitted to the National Assembly (November 2018) and incorporated into the Act (2019).
 - Revisions to be made to the Enforcement Decree and Enforcement Rule of the Natural Environment Conservation Act (2020).
- **(MOF)** Reinforce the Marine Ecosystem Conservation Fund program
 - Increase to a reasonable level the scope of projects that deposit fees into the fund in a way that guarantees that entities using marine environment and resources pay the associated social costs.
 - Improve relevant systems to ensure the fair collection of fees by taking into consideration gaps in the ecological environment between marine areas and the level of damage done to the marine ecosystem by different development activities.

Action plan 1-③-③	Laying the foundation to expand the Direct Payment Program for Eco-Friendly Agriculture	MAFRA, MOF
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□ **Key points**

A. [Joint] Laying the foundation to expand the Direct Payment Program for Eco-Friendly Agriculture

- **(MAFRA)** Encourage a shift to eco-friendly agriculture and ensure continued eco-friendly agricultural practices by modifying the program, including an increase in the unit price for direct payments for eco-friendly agriculture (2018).
 - Introduce agricultural environment conservation programs that support conservation activities for ecosystems, the environment and landscapes to areas requiring improvements in agriculture and the rural environment, with the goal of expanding the direct payment program.
 - Run a trial program for selected districts (3 communities) and conduct policy research to further develop the program’s initial plan and improve its feasibility (2018).
 - Introduce and gradually expand Agri-Environment Conservation Programs (2019).
- **(MOF)** Encourage eco-friendly fishery practices (Direct Payment Programs for Eco-Friendly Aquaculture and Fisheries)
 - Encourage the use of mixed feeds to bring about a shift to eco-friendly aquaculture and ensure continued eco-friendly aquaculture practices.
 - Promote the Direct Payment Program for Eco-Friendly Fisheries to ensure the conservation of fishery environments.

Action plan 1-③-④	Enhancing the operation of the Forest Offset Program	KFS
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□ **Key points**

- **(KFS)** Create an integrated management system to improve fee charging and collection for the Forest Offset Program. Fees will be adjusted in accordance with the public value of forests.

Target 4. Promoting biodiversity-friendly production and consumption

□ **Current status and needs**

- Excessive use of resources is one of the main threats to biodiversity. Biodiversity conservation requires collective efforts by the government, different stakeholders, individuals and businesses.
- Biodiversity should be mainstreamed by encouraging businesses and citizens to engage in biodiversity activities and raise public awareness of biodiversity.
- The target corresponds to Aichi Target 4 on “sustainable production and consumption.”

Action plan 1-④-①	Increasing biodiversity conservation in production	MAFRA, ME, MOF, KFS
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□ **Key points**

A. [Joint] Promoting production that contributes to biodiversity conservation

- **(KFS)** Ensure eco-friendly timber production
 - Develop follow-up measures in line with revisions made to lower-level laws on eco-friendly timber production.
 - Introduce notifications of eco-friendly felling techniques (2018).
 - Ensure eco-friendly felling practices take root through expanded training and monitoring (by 2023).
 - Enhance domestic timber self-sufficiency rate by supplying stable timber products through eco-friendly felling
 - Self-sufficiency rate (%): 19.0 (2019) → 21.7 (2023) / Supply (10,000 m³) 5.95 (2019) → 6.96 (2023)
- **(MAFRA)** Promote eco-friendly materials development
 - Support R&D on industrializing agro-bio materials to ensure supplies of reliable natural materials and products to the public.
 - Bring added value to agriculture through material development in seven areas*.
 - * ① natural antibacterial materials, ② health promoting materials, ③ natural polymer materials, ④ materials for biological crop protection, ⑤ biological plant-based active materials, ⑥ materials for animal health promotion, and ⑦ animal vaccine materials
- **(ME)** Step up efforts to discover biological materials that reduce environmental pollution for eco-friendly renaturalization.
 - Research decomposition pathways of pollutants by microbial enzyme characterization for bioremediation (20 cases by 2023)
 - Develop customized technology to detoxify and eliminate pollutants such as organic materials and heavy metals. Develop industrial biological materials to minimize secondary damage.
- **(MOF)** Replace non-biodegradable nylon fishing gear with eco-friendly biodegradable gear and expand its uptake.
 - Supply volume: 460 ships in 8 business types (2017) → 500 ships in 9 business types (2018)

B. [ME] Operating the Biz N Biodiversity Platform (BNBP)

- Run the BNBP* Secretariat (from March 2016)
 - Set up a year-round system to reinforce government-industry cooperation and the industry's awareness of the conservation and sustainable use of biodiversity
 - * Biz N Biodiversity Platform: Co-hosted by the Korea Business Council for Sustainable Development and the Korea Biotechnology Industry Organization
 - Prepare and distribute guidelines for the conservation and sustainable use of biodiversity by businesses (2018).
 - Identify and distribute best practices for CBD implementation in the ROK and abroad (from 2019).

Action plan 1-④-②	Encouraging consumption practices that enhance biodiversity conservation	ME, MOF
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□ **Key points**

A. [Joint] Promoting consumption activities that advance biodiversity conservation linked to the Green Card System

- **(MAFRA)** Link the purchase of eco-friendly produce to the Green Card to promote biodiversity-friendly consumption (ongoing).
- **(ME)** Establish an Integrated Green Card System that can be applied to all eco-friendly products.
 - Apply the system to all eco-friendly products produced in the agriculture, fishery and forestry sectors as well as secondary and tertiary industries.
 - e.g. A product made of eco-friendly materials will be given a Green Card.

B. [Joint] Enhancing the brand value of protected areas

- **(MOF)** Use the marine protected area logo for fishery products produced within marine protected areas to promote an image of the areas as clean (from 2020).
 - Upgrade the program so that the central and local governments are given priority to purchase certified

- fishery products with proven safety.
- **(ME)** Develop an area-specific certification program for ecosystem services produced in protected areas (from 2020).
 - Develop a unique certification mark for each protected area to be used for ecosystem services produced in that area (national parks, wetland conservation areas and landscape protected areas).
 - Set up a quality control system and create a stakeholder committee to ensure effective management.

Strategy 2. Managing threats to biodiversity

Reducing direct threats and enhancing sustainable use

Overview

I Aichi Target – B

Reduce direct pressures on biodiversity and promote its sustainable use

I Relevance to the Sustainable Development Goals (SDGs)

Reduce negative impacts on the environment such as natural disasters and pollutants

Stop the loss of biodiversity and promote sustainable production and utilization

Measures are prepared to promote the mitigation of habitat loss and pressure, the management of alien species, the reduction of pollutants and the sustainable production to ensure the elimination of threats to biodiversity and its sustainable use.

Indicators and references

I Annual increase/decrease of mountain areas

A year-on-year increase/decrease in mountain areas

I Subalpine regions' sensitivity to climate change

Habitat areas for the climate change-sensitive *Abies koreana*

I Number of species on government-designated list of potentially-invasive alien species

The number of potentially invasive species that could disrupt the ecosystem's diversity, structure and functions when deliberately imported or introduced to the ROK

I River water quality as a percentage of target

Ratio of rivers meeting the water quality target out of 115 sub-basins nationwide

* Target standard of water quality and aquatic ecosystems: The river points and lake and marsh points identified in the Target for Water Quality and Aquatic Ecosystems by Sub-Basin are assessed in terms of all items under the human health protection criteria. They are also assessed in terms of biochemical oxygen demand, total organic carbon and total phosphorus. If the annual arithmetic mean of any individual item exceeds the target, the point in question is considered "behind the target."

Target 1. Mitigating habitat loss

□ Current status and needs

- Habitat loss caused by habitat fragmentation, among other factors, is one of the major causes of global biodiversity loss. Reducing habitat loss contributes to the conservation of biodiversity and the provision of essential ecosystem services.
- The target corresponds to Aichi Target 5 on "reducing habitat loss."

Action plan 2-1-1	Restoring connectivity	ME, MOF, KFS
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□ Key points

D. [KFS] Building a green network of urban forests

- Create various types of urban forests
- Establish meditation forests (school forests) to provide a venue for eco-friendly learning and green spaces.
- Plant more roadside trees that ecologically connect urban forests and suburban forests.
- Build a network of Mugunghwa (The ROK's national flower) parks.

E. [Joint] Continuing to promote ecological axis connection and restoration projects and to improve their efficiency

- (ME) Continue to promote ecological axis connection and restoration projects and to improve their

efficiency.

- Legislate the management, improved connection and recovery of ecological axes (2018 – 2022) as part of the second phase of the Connection and Restoration Plan for the Ecological Axes on the Korean Peninsula (2013-2017).
- **(ME)** Promote urban ecosystem restoration
 - Launch restoration projects for different types of ecosystems that together form a city, taking into account ecosystem connectivity.
- A. **(MOF)** Establish measures to manage the marine ecological axis and launch conservation and restoration projects.
 - Develop measures to manage the marine ecological axis to maintain the continuity of the structure and functions of marine ecosystems (2018).
 - Incorporate plans to streamline marine ecosystem-related laws and systems as well as conservation and restoration plans into the Second Master Plan for the Conservation and Management of Marine Ecosystem (2019 – 2028).

F. [ME] Facilitating research for restoring functional connectivity of the aquatic ecological axis

- A. Evaluate the functional disconnection caused by hydraulic structures of the aquatic ecological axis at the basin level.
 - ※ Functional connectivity of the aquatic ecological axis: This approach, breaking from the structural approach focused on existing facilities such as fishways, aims to improve the connectivity of energy flow through carbon movement and the biological food web.
- Promote research on the foundation for restoring the aquatic ecosystem connecting the land and the ocean.
 - Conduct comprehensive research on the restoration of the aquatic ecosystem, considering the connectivity between the terrestrial and marine ecosystems, with an emphasis on the movements of substances, including carbon and nitrogen and of species (e.g. salmon), and energy flow through the food web.
 - Carry out joint research with other ministries to achieve an integrated understanding and restoration of the aquatic ecosystem.

G. [Joint] Improving the management of ecological corridors

- A. **(ME)** Build a system to enhance the effect of ecological corridors created in national parks.
 - Operate an ecological corridor inspection team consisting of experts from various fields to monitor the flora, the rootage of planted species within ecological corridors and their use by wildlife, and to identify areas for improvement.
- B. **(MOF)** Create a system to enhance the effect of fishway installations in artificial structures in rivers.
 - Monitor and evaluate their use by fish and identify areas for improvement.

H. [ME] Collecting basic data on connectivity

- Develop a survey and analysis system to evaluate the connectivity of freshwater habitats.
 - Survey and evaluate freshwater biodiversity, for example, by collecting basic data on major habitats and species of all areas of the Four Major Rivers (head – tributary, branch river – large river).
- Use scientific statistics to reduce roadkill.
 - Collect scientific statistics on roadkill locations from the Roadkill Information System mobile app used by road patrols (approximately 2,500 users) nationwide.
 - Quickly identify why a given location shows a high incident of roadkill and request road management agencies to develop measures to reduce roadkill, *e.g. installation of fences, ecological corridors, signs, electronic displays.

Action plan 2-①-②	Integrated management of natural resources	ME
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□ Key points

A. [ME] Introducing a “no-net-loss” Natural Resources Policy

- Introduce a “no-net-loss” Natural Resources Policy* that considers the quality of green areas.
 - Design a “no-net-loss” Natural Resources Policy in connection with existing systems such as environmental impact assessments and the Ecosystem Conservation Fund. Launch trial projects to test the policy (May 2018 – April 2019).

* (**“No-net-loss” Natural Resources Policy**) A policy aiming to offset the destruction or loss of an ecosystem due to development, so that the predefined total conservation area of a development project or urban area remains constant.

(“No-net-loss” Natural Resources Policy) A policy based on no-net-loss, proactive prevention (consideration) and the “causer pays” principle.

Principle 1	Ensure the conservation of quality ecosystems that cannot be replaced or restored (avoid their use in development areas).
Principle 2	Replace or restore to an equivalent or improved condition where damage is unavoidable (using inside/surrounding areas of the project site, different or alternative sites).
Principle 3	Reject project permit requests or impose restoration fees where restoration or alternative measures are not possible.

B. [ME] Updating the Environmental Impact Assessment Support System (EIASS)

- Use environmental impact assessment data, such as the current conditions of natural resources, as found in the National Natural Environment Survey, the Winter Waterbird Census of Korea and the Report on the Survey on Natural Resources of National Parks and others, to forecast the impacts of development projects, prepare reduction plans and analyze post-development conditions.
- Enhance the Environmental Impact Assessment in ways such as acquiring field survey data on key nature conditions, and promote the development of convergence technology focusing on impact forecasts and reduction plans.

C. [ME] Introducing the integrated management of land and environment planning

- Incorporate the integrated approach to the Fifth Comprehensive National Territorial Plan (2020 – 2040) and the Fifth Comprehensive National Plan for Environment (2020 – 2040).
- The existing National Environmental Zoning Map, which currently focuses on ecosystems, will be upgraded to enable the spatial mapping of environmental information by medium as well as information sharing.
 - Enhance mapping methodologies and deploy the system after a trial run, starting with areas under high development pressure (by 2022).

Target 2. Reducing pressures on vulnerable ecosystems

□ **Current status and needs**

- Climate change contributes to habitat degradation, which in turn results in biodiversity loss and vulnerability.
- According to the Intergovernmental Panel on Climate Change (IPCC), species extinctions caused by future climate change will affect the functions and processes of entire ecosystems. This calls for the development of adaptive measures and relevant research.
- The target corresponds to Aichi Target 10 on “reducing pressure on vulnerable ecosystems.”

Action plan 2-2-1	Establishing climate change adaptation measures for biodiversity	ME, MOF, RDA, KFS
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□ **Key points**

A. [ME] Creating consultative bodies to discuss climate change adaptation and develop a joint management system

- Establish a systematic joint management system to oversee the management of vulnerable species and long-term monitoring.
 - Operate a consultative body to discuss the management of subalpine coniferous forests (from 2016) and create a tentatively-named Working-Level Committee on Climate Change Adaptation under the Biodiversity Committee (2020).
 - Form a joint research panel on long-term ecological research to communicate with fixed sites for long-term monitoring; develop monitoring guidelines and enable information sharing (2019).
 - Establish a joint management system involving the public to oversee the Phenological Eyes Network.

<Research plans of institutes and organizations under the ME>

- **(National Institute of Ecology)** National long-term ecology research, survey of climate change in ecosystems, evaluation of ecosystem changes caused by climate change, and research on adaptation processes and functions of species vulnerable to climate change in subalpine ecosystems
- **(National parks)** Monitoring of climate change in national park ecosystems, monitoring of subalpine

<p>coniferous forest ecosystems in national parks, and monitoring of marine climate change indicator species in national parks</p> <ul style="list-style-type: none"> ○ (Nakdonggang National Institute of Biological Resources) Research on prediction of changes in biological factors to climate change, research on microbial ecosystem management, and research on the estimated diversity of freshwater species based on climate change in freshwater habitats.

B. [Joint] Long-term monitoring of climate change and developing a system to manage fixed monitoring stations

- **(ME)** Establish a system to facilitate the sharing of long-term monitoring data on climate change and to connect fixed monitoring stations by ecosystem type.
 - Promoting the monitoring of changes in biodiversity, for example in species vulnerable to climate change, indicator species and microorganisms.
 - Create an information sharing system to ensure the exchange of climate and environment monitoring data such as CO₂ and soil moisture levels at fixed stations.
 - Increase the number of long-term ecological research stations to collect climate change data by region and ecosystem type*.
 - * 3 sites (Gangwon-do and Jeolla-do Provinces and Jeju Island) (2015 – 2017) → add 6 more sites (Seoul Metropolitan Area, Gyeongsang-do and Chungcheong-do Provinces) (2020 – 2022)
- **(ME)** Launch and operate an integrated platform for long-term ecological research that connects the long-term monitoring sites of different ministries and agencies (MOF, RDA, KFS) to conduct comprehensive assessments and forecasting of the impact of climate change on vulnerable ecosystems.
- **(MOF)** Conduct long-term monitoring of marine ecosystems and research their transformation.
- **(KFS)** Carry out long-term monitoring of changes in forest ecosystems and assess the health and vitality of forests.
 - Monitoring of long-term changes in forest ecosystems caused by climate change
 - At six fixed sites nationwide for long-term forest ecological research and for subalpine coniferous forests
 - Research how climate change affects the distribution and species diversity of forest animals and plants.
 - Survey and monitor the health and vitality of forests and improve the survey system.
- **(RDA)** Carry out research on how climate change affects rice paddy species and their distribution.
 - Monitor and analyze changes in rice paddy species such as aquatic species, arthropods and amphibians.
 - Survey the decoupling of vegetation and major pollinator insects in the agricultural ecosystem.

C. [Joint] Developing climate change adaptation measures by ecosystem

- **(ME)** Develop a prediction model that anticipates the impact of climate change on vulnerable ecosystems and identify how the ecosystems adapt and function.
 - Develop a prediction model for the distribution of phenological changes and potential risks.
 - Develop monitoring technology, including an automatic monitoring device, to be used at fixed sites.
 - Research species adaptation and function in response to climate change.
- **(MOF)** Develop a prediction model to respond to environmental changes based on long-term monitoring of marine ecosystems.
- **(KFS)** Evaluate the impact of climate change on forests and their vulnerability and execute adaptation measures.
 - Assess climate change impact and vulnerability based on long-term monitoring of forests.
 - Develop indicators for forest health assessments and evaluation techniques.
 - Collect and propagate the seeds of forest species vulnerable to climate change and establish *in* and *ex situ* conservation forests.
 - Prepare measures to adapt to forest damage caused by unexpected abnormal weather events and climate disasters.
- **(RDA)** Assess the impact of climate change on the agricultural ecosystem and the resilience of livestock genetic resources.
 - Carry out an assessment based on the monitoring of changes in rice paddy species and lay out adaptation measures.
 - Evaluate the resilience of livestock genetic resources and their ability to recover from climate-related disease.

Target 3. Controlling species invasion

- **Current status and needs**
 - Alien species, living modified organisms (LMOs) and other species that disturb the natural ecosystem reduce the

- habitats of the ROK's endemic species and reduce biodiversity in endemic species.
- Monitoring of ecosystem disturbance by alien species is being conducted in the ROK. Further research is needed on ecosystem disturbance by LMOs.
- The target corresponds to Aichi Target 9 on “preventing and controlling alien species.”

Action plan 2-3-①	Preventing the invasion of alien species	MAFRA, ME, MOF
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□ **Key points**

A. [Joint] Ensuring a preventive management system against the invasion of alien species

- (ME) Establish a preventive management system against alien species.
 - Develop the Second Management Plan for Alien Species (2019 – 2023) and draw up a roadmap to stronger preventive control over alien species, including goals, strategies and action plans (December 2018).
 - Designate potentially harmful species as high risk species for introduction*, make them subject to management and introduce a mandatory risk assessment prior to species introduction (H2 2018, revisions made to the Act on the Conservation and Use of Biological Diversity).
- (ME, MAFRA) Develop technology for alien species management.
 - Promoting R&D projects on risk assessment techniques and technology to eradicate invasive species and to ensure the effective management of alien species (2017 – 2023, joint effort by ME and MAFRA).

B. [MOF] Monitoring the invasion of marine alien species and study its prevention

- Study the invasion of alien species mediated by ballast water of trade and other vessels and operate a jellyfish monitoring and alert system.
 - Survey and study the invasion of alien species through ballast water of vessels, in line with the Ballast Water Management Convention, which took effect on September 8, 2017 and through the full implementation of the Ballast Water Management Act.
 - Establish and operate a system to monitor jellyfish pathways and coasts.

Action plan 2-3-②	Post-control of alien species	ME, MOF, MAFRA, KFS
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□ **Key points**

A. [Joint] Eradicating invasive species

- (KFS) Respond to invasive alien species such as vines.
 - Prioritize the control of species that have high likelihood of invading protected areas.
 - Identified invasive alien plant species increased from 134 (2015) to 186 (2016)
 - Strengthen the removal of species, such as vines, that present risks to forest ecosystems.
- (MOF) Carry out jellyfish control projects and manage *spartina alterniflora*.
 - Launch a government and private joint relief initiative using ships equipped with removal nets in the event of jellyfish alerts prompted by their mass occurrence.
 - Jellyfish removal pilot project launched in Geoje, Gyeongsangnam-do Province in 2018 (population reduced from 228 to 187).
 - Prevent the spread of *spartina alterniflora*, which has invaded parts of the west coast including the mud flats at the southern tip of Ganghwa Island. Monitor and respond to any new invasions.
- (ME) Survey the distribution and habitats of alien species and ensure the effective eradication and removal of invasive species.
 - Conduct an in-depth survey of alien species of high potential ecosystem risks every year and a national habitat survey of alien species every three years. Carry out monitoring of confirmed invasive species every year.
 - Work with local governments and civil society organizations to eradicate alien species in the habitats of endangered species or other areas with high conservation value before the breeding (fruiting) season, with an emphasis on species expanding their range.*
 - * *Micropterus salmoides*, *Lepomis macrochirus Rafinesque*, *Myocastor coypus*, *Sicyos angulatus*, *Ambrosia trifida*, *Aster pilosus* (6 species)
- (RDA) Develop eco-friendly technologies for controlling invasive insect pests.
 - Eco-friendly control of thrips using *Hypoaspis aculeifer* (Canestrini) and *Cucumis melo*

- Eco-friendly control of insect pests such as *Ricania sublimata* and scales

B. [Joint] Developing a system to survey alien species and update their information

- **(ME)** Conduct an in-depth and nationwide survey of alien species every year.
 - Strengthen the in-depth survey of rapidly spreading alien species with a high risk of damaging the ecosystem* (January – December 2018), conduct ecosystem risk assessment and produce a list of candidates for government-designated invasive species (December 2018).
 - * 6 species subject to in-depth surveys in 2018 (4 animal species: raccoon, *ocadia sinensis*, guppy and *procambarus clarkia*, 2 plant species: *Alliaria petiolata* and *Coreopsis lanceolata*).
 - Survey the distribution of alien species introduced to the ROK* to develop preemptive and effective management measures* Surveyed 70 out of 96 *si* (city)/*gun/gu* in Seoul, Gyeonggi-do and Gangwon-do Provinces in 2018
 - Divide the country into three regions* to survey inhabitation and distribution trends in each region every three years and create a database on introduced alien species (including invasive species and Risk Level 2 species).
 - * Chungcheongbuk-do and Chungcheongnam-do Provinces and Jeollabuk-do and Jeollanam-do Provinces (37,485km²) and Jeju Island (1,833km²) in 2019, Gyeongsangbuk-do and Gyeongsangnam-do Provinces (32,279km²) in 2020; Seoul and Gyeonggi-do and Gangwon-do Provinces (28,691km²) in 2021
- **(ME)** Monitor invasive species at key locations around the country. Continue to survey population inhabitation and distribution by species and their distribution areas, as well as any changes in population size.
- **(ME)** Ensure the management of invasive species in national parks. Survey the distribution of invasive and harmful marine species.
 - Lay the groundwork for the systematic management of invasive species in national parks (inhabitation database, distribution survey and monitoring, evaluation on the impact of removal and research on management measures).
 - Prioritize the management (capture and removal) of a total of 54 alien species including invasive species.
 - 21 invasive species, 1 species that became feral (feral cat), 4 species of released animals and grazing animals (e.g. *Capra hircus*), 29 species of priority management alien plants (e.g. *Phytolacca americana*)
 - Identify the status of invasive marine species and (potentially) harmful marine species in national parks and survey their distribution.
- **(RDA)** Trajectory and spreading study for major invasive insect pests and establishment of identification system using morphological and genetic technology
 - Develop the identification system for invasive insect pests and track their origin places (e.g. Family Fulgoroid, Thripidae).
 - Develop technology to track the origin of long migratory planthoppers (using multiple isotopes and metabolites).
 - Collect large amounts of genetic information on invasive insect pests and establish an identification system.

Action plan 2-3-3	Managing LMOs	MSIT, MAFRA, MOTIE, ME, MOF
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□ **Key points**

A. [ME] Strengthening the risk management system

- Manage the safety of living modified organisms (LMOs).
 - Create and designate an institute for LMO natural environment risk assessment (December 2018), and develop* and distribute technology to detect the release of LMOs into natural ecosystems.
 - * 53 single detection methods and 48 multiplex detection methods developed (by December 2017) → 7 single detection methods and 6 multiplex detection methods to be developed in 2018.
 - Environmental release monitoring of LMOs at 800 sites across 6 regions nationwide including key management areas where LMOs have been detected more than once. Remove LMOs when detected and notify the relevant ministries and agencies.

B. [Joint] Ensuring safety through effective management of LMOs

- (MSIT) Ensure safety and effective management of LMOs for research and testing purposes.
- (MOTIE) Implement the Cartagena Protocol on Biosafety, enforce LMO laws and ensure safety management of industrial LMOs.
 - Improve laws and systems related to LMOs and promote international cooperation in relevant areas.
 - Promote safety management of LMOs used in industries such as textiles, machinery, chemistry, electronics, energy and resources.
- (MOF) Ensure safety management of LMOs for fishery and marine purposes.
 - Establish safety management standards for R&D, import, production, use and follow-up management. Strengthen monitoring and continue to offer training and awareness for professionals in relevant fields (from 2019).
 - Monitor the distribution of LMOs and develop technologies and infrastructure to assess and monitor the risk that their release into the environment poses to the aquatic and marine ecosystems (2018-2022).
- (MAFRA) Ensure safety management of LMOs in agriculture and diet.
 - Establish safety management standards for R&D, import, production, use and follow-up management.
 - Monitor the distribution of LMOs and develop technologies and infrastructure to assess and monitor the risk that their release into the environment poses to the ecosystem.

Action plan 2-3-4	Preventing and managing risk to ecosystems	ME, MOF
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Key points

A. [MOF] Monitoring red tides and offer red tide alerts

- Establish a year-round red tide monitoring system.
 - Monthly monitoring of red tides and toxic plankton for each marine area (March – December / 102 stations)
 - Monitoring of the seas neighboring the South Sea and the East China Sea (June and August / 45 stations)
 - Intensive monitoring of harmful red tides (from occurrence to disappearance / 30 stations)
- Minimize damage to the fishery industry through early alerts and improved control.

B. [ME] Preventing and managing forest disease and pest in national parks

- Strengthen forecasting and prevention activities before the outbreak of diseases and pests in national parks.
 - Prevent the introduction of diseases and pest species through stronger scientific forecasting and monitoring.
 - Prevent their spread in national parks through cooperation with relevant organizations and expanded prevention and control activities.

Target 4. Reducing pollutants

Current status and needs

- Pollutants have been identified as a threat to biodiversity, human health and the environment in all countries. They are also a major cause of biodiversity loss and functional deterioration in the aquatic ecosystem where they are ultimately collected in the material cycle.
- Efforts to study and reduce pollutants in the aquatic ecosystem help identify the state of pollution across the entire ecosystem and lead to the conservation and promotion of biodiversity in the ecosystem.
- The target corresponds to Aichi Target 8 on “reducing pollution.”

Action plan 2-4-1	Strengthening pre- and post-management of pollutants	MAFRA, ME, MOF, KFS
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Key points

A. [Joint] Ensuring the preemptive management of point pollution sources

- (KFS) Establish a system to manage forest areas near industrial complexes that are vulnerable to pollutants.
 - (Short-term) Select vulnerable areas → survey the level of damage done to the forests → develop restoration measures
 - (Long-term) Ensure continued monitoring, control pollutants and create an alert system.

- ※ Apply soil conditioner on a regular basis and renew tree species as pollution-resistant.
- **(KFS)** Respond to forest soil acidification in a preemptive manner through monitoring and monitor the impact of forest soil acidification on the affected forest.
- **(MAFRA)** Develop a system to manage soil contaminants such as nitrogen, phosphorus, chemical fertilizers and pesticides, as well as a system to manage livestock wastewater on small cattle farms.
- **(ME)** Strengthen the existing system of domestic and industrial wastewater management and identify biological resources capable of breaking down pollutants.
 - **(Total pollution load management, TPLM)** Revise the four-stage total water pollution load management system, including an increase in the target water quality and the study on the introduction of new pollutants (e.g. TOC) (from 2021).
 - **(Bioremediation)** Identify indigenous biological resources to break down water pollutants and dyeing wastewater, and develop eco-friendly bioremediation technology (from 2018).
 - Target (accumulated) number of bioremediative enzymes based on microbial resources: 10 (2018) → 20 (2019)
- **(MOF)** Improve the marine environment through the collection and disposal of submerged marine debris in ports and coasts and awareness campaigns to reduce marine litter.
 - Promptly collect and treat marine litter scattered along the coasts of islands and remote areas to improve the marine environment (50% funded by the central government).
 - Project cost (2018): Local governments (31 locations in 7 metropolitan cities) / KRW 5,997,000,000
 - Collect and treat submerged debris in major ports and sea areas considering urgency and efficiency.
 - Launch public awareness campaigns using a video on reducing marine debris and through public interest ads, host an international conference (NOWPAP ICC-TEMM) (June) and fund activities for International Coastal Cleanup Day organized by private sector organizations (September, 12 locations nationwide).
 - Project cost (2018): Organized by the Korea Marine Environment Management Corporation with central government funding / KRW 8,028,000,000

B. [ME] Strengthening the preemptive management of non-point pollution sources

- Enhance the integrated non-point pollution source management system to improve the health of aquatic ecosystems.
 - Develop and disseminate ROK-style low-impact development (LID) techniques (2020). Introduce a mandatory performance test for maintenance (2020) along with mandatory post monitoring (2019).
 - Encourage LID and expand the permeable layer of green stormwater infrastructure (GSI) by providing incentives, such as rainfall outflow water fees*. (2025)
 - * The cost of managing rainfall outflow water is offset by fees collected from the owner and users of land, depending on the non-permeable area of the given land.
 - Establish a GIS system for pollution-prone farmland, strengthen regulations on pollution-causing farming practices, designate rural areas that require non-point pollution management and review the nationwide implementation of eco-friendly agricultural contracts.
- Encourage everyday non-point pollution management by the public.
 - Develop training strategies tailored to different groups (urban residents, farmers, business owners, environment engineers) and offer training programs to raise awareness of the management of non-point pollution sources.
 - Establish and expand a collaborative network or governance with participation from local experts and residents to facilitate non-point pollution management that caters to community needs (2020).

C. [ME] Improving the effectiveness total pollution load management (TPLM) and developing measures to streamline the system

- Improve the effectiveness of the TPLM considering changes in water management conditions.
 - Lay the groundwork to incorporate the TOC into the TPLM (2020). Prepare for the next steps, which include deciding on management criteria (2018), and consider introducing tributary total pollution load control (2020).
- Streamline and simplify the implementation of the TPLM (2025).
 - Develop a computer system that enables systematic load management. Use it to manage local development projects, and approve a shift between point and non-point development loads.

D. [MOF] Introducing and implementing total coastal pollution load management in environmental management sea areas

- Develop and execute a master plan and an implementation plan for total coastal pollution load management for each sea area and assess the outcome to ensure the TPLM of environmental management sea areas.

- Adjust development projects in coastal areas, develop and implement plans to reduce pollutants, launch public awareness campaigns, and create and operate a public-private-industrial-academic committee.
 - Masanman Bay (from 2008, COD/total phosphorous), Sihwaho Lake (from 2013, COD/total phosphorous), Busan coast (from 2015, COD), Ulsan coast (2017, heavy metals)

Strategy 3. Strengthening biodiversity conservation

Improving the current state by protecting ecological, species and genetic diversity

Overview

I Aichi Target – C

Improve the current state of biodiversity by protecting ecological, species and genetic diversity

I Relevance to the Sustainable Development Goals (SDGs)

Preserve terrestrial and marine ecosystems including their biodiversity, improve their restoration and sustainable use, and maintain the genetic diversity of species including seeds, produce and livestock.

Seek ways to improve the current state of protected areas, reduce the impact of invasive species and maintain and manage genetic diversity in order to ensure the maintenance and improvement of biodiversity and the ecosystem of which it is part.

Indicators and references

I Size of protected areas

The land area of protected areas listed in the WDPA in the integrated database on protected areas in the ROK

I Entries in the National Species List of Korea

The number of species included in the National Species List of Korea

I Number of endangered species (animals) being propagated/recovered

The number of endangered animals under propagation and recovery in line with the Comprehensive Plan for Endangered Wildlife Conservation

I National rare plants conservation as a percentage of target

Proportion of *ex situ* conservation target achieved for rare plants in the ROK in line with the *ex situ* conservation target for rare plants under the Global Strategy for Plant Conservation 2020 of the Convention on Biological Diversity

Target 1. Improving the coverage and management of protected areas

□ Current status and needs

- Protected areas are those with minimal levels of human interference where a variety of habitats are developed for the habitation of diverse species, which is the most basic prerequisite for the conservation and improvement of biodiversity.
- The expansion and improved management of protected areas encourages the development of ecosystems in various ways through habitat protection and enhancement, which contributes to the preservation of biodiversity and the provision of numerous ecosystem services.
- The target corresponds to Aichi Target 11 on “expanding and improving protected areas.”

Action plan 3-①-①	Expanding the coverage of protected areas	ME, MOF, KFS
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□ Key points

A. [Joint] Expanding protected areas

▶ (Aichi Target Protected Areas) 17% of terrestrial areas, 10% of marine areas

▣ (Current status) 15.18% of terrestrial areas, 1.90% of marine areas (KDPA registration as of October 2018)

- (KFS) Plan to secure 1 million ha to achieve the Aichi Target and secure over 850,000 ha by the deadline of the Fourth National Biodiversity Strategy in 2023.
 - Currently, 720,000 ha are designated as protected areas, accounting for approximately 7% of the national territory.
 - ※ 276 ha for Baekdudaegan protection, 268 ha for water resources conservation, 152 ha for forest genetic resources protection, 19 ha for landscape protection, 5 ha for other

※ 720,000 ha (2017) → 850,000 ha (2022) → 900,000 ha (2025) → 1 million ha (2030)

- **(ME)** Expand the designation of wetland protected areas, ecological and scenery conservation areas, and specified islands, and designate special protected areas in national parks.
 - Newly designate and expand wetland protected areas by discovering different types of wetlands with high ecological conservation value (2018 – 2022), increase the purchase of private land in existing protected areas to secure ecological connectivity and to promote restoration projects for degraded lands (from 2018).
 - Promote additional registration of Ramsar wetlands by identifying eligible wetlands in the wetland protected areas that meet the requirements for registration (2018 – 2022).
 - Prepare detailed survey guidelines for wetland protected areas (from 2019), conduct monitoring based on the detailed survey results and prepare an integrated database management system (from 2019), implement and expand surveys focusing on coastal wetland protected areas (from 2018).
- **(MOF)** Continue the expansion of marine protected areas with the aim of designating at least one new protected area per year based on the results of basic surveys on the marine ecosystem and coastal wetlands.
 - 14 coastal wetland protected areas, 13 areas for protecting marine ecosystems, 1 protected area for marine organisms

[Plan for expanding wetland protected areas]

Classification	Current status of wetland protected areas (as of Dec. 2017)	2020 target (cumulative total)	Note
ME	128.016 km ² (24 locations)	200 km ²	Inland wetlands
City mayor/ <i>do</i> governor	8.254 km ² (7 locations)		
MOF	229.700 km ² (13 locations)	600 km ²	Coastal wetlands

* Among the seven areas designated by city mayors or *do* governors as wetlands protected areas, the Songdo mud flat is a coastal wetland protected area (6.1km²).

Action plan 3-①-②	Reinforcing the management of protected areas	ME, MOF, KFS
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□ **Key points**

A. [Joint] Improving the management system considering the characteristics of protected areas

- **(KFS)** Improve the management system of protected areas and conduct the Management Effectiveness Evaluation (MEE).
 - Upgrade the management system of protected areas such as forest genetic resources reserves (2019 – 2020).
 - Establish and operate an information system for the systematic management of information on forest protection zones (from 2019).
 - Apply management plans through assessments of forest genetic resources reserves on a regular basis.
 - Expand the MEE on forest genetic resources reserves: 128 sites (31%, 2017) → 318 sites (100% of national forests, 2022)
- **(KFS)** Reinforce the management system of the Baekdudaegan protection zone.
 - Expand the designation of the protected areas for the Baekdudaegan to 300,000 ha by 2025 and promote the effective management of the Baekdudaegan protection zone.
 - Improve the management system of the Baekdudaegan protection zone and revise the Baekdudaegan Protection Act.
- **(MOF)** Establish an assessment system for the management of marine protected areas and the health of coastal wetland ecosystems.
 - Develop a basic plan for each designation marine protected area.
 - Promote registration of a Ramsar wetland site and certification as a wetland city.
 - Develop an ecological rating map for mud flats including the introduction of a mud flat health rating system based on the information on the current conditions of coastal wetlands (2018 – 2019).
 - Determine the mud flat ecological rating for each region in order to set the target for each mud flat (create ecosystem health index) (from 2020).
- **(ME)** Promote survey and assessment projects for the designation and management of protected areas by

type (2019 – 2023).

- Conduct detailed surveys on specific areas/themes (i.e. ecology, landscape, islands).
- Obtain basic data on ecosystems through surveys of the topography, vegetation, flora and fauna of areas with outstanding ecological environments such as ecological and scenery conservation areas, coastal dunes, uninhabited islands, specified islands and Dokdo Island.
 - Carry out detail surveys on specific areas (i.e. Baekdudaegan and the DMZ).
- Acquire basic data on ecosystems through surveys of topography, vegetation, flora and fauna of the Baekdudaegan protection zone and the entire DMZ area.
- (ME) Conduct a survey of national park habitats (marine habitats) and coastal wetlands, and classify types.
 - Shift the paradigm of the management system for marine national parks from the two-dimensional (sea surface) to three-dimensional (space) approach, which includes underwater areas.
 - Acquire basic data for the systematic and scientific management of marine resources based on habitats and map habitat information by taxon through ecological surveys.
 - Establish a biological and environmental database for coastal wetlands in national parks and prioritize management by grading.
- (ME) Provide support for private land in protected areas.
 - Promote projects to support private land in protected areas by purchasing such land and creating prestigious towns.

B. [Joint] Build an integrated management system for protected areas

- (ME) Form and operate a consultative body of agencies related to protected areas.
 - Develop and confirm the Implementation Plan for Expansion of Protected Areas and Improvement of Management (roadmap) (ME, MOF, CHA, KFS, MOLIT and other related departments; January 21, 2016) to operate a consultative body for the promotion and expansion of integrated, cross-ministry policies for protected areas.
 - Review the current data on unregistered protected areas for each department and discuss possible ways to expand protected areas (1-2 times per year).
- (ME) Establish comprehensive development plans for protected areas.
 - Establish development plans for each protected area under which local economies, culture and nature can co-exist in harmony.
 - Promote the design and development of village landscapes so that local landscapes blend with culture.
 - Establish a development plan to revitalize local economies based on specialized ecosystem services in each protected area.
 - Establish an active management system for the sustainable use of ecosystem services and organize a consultative body of stakeholders in the area.

Target 2. Achieving ecosystem restoration

□ **Current status and needs**

- It is important to maintain and improve biodiversity and ecosystem services through ecological restoration in order to improve the adaptability of ecosystems to changing environments as damage reduces biodiversity and ecosystem services.
- Policies and systems for the restoration of ecosystems are being carried out around the world in an effort to restore the degraded functions of ecosystems.
- The target corresponds to Aichi Target 15 on “restoring ecosystems and enhancing their resilience.”

Action plan 3-2-①	Laying the foundation for ecosystem restoration	ME, MOF, RDA, KFS
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□ **Key points**

A. [Joint] Building the foundation for managing the restoration of the natural environment

- (ME) Lay the foundation for promoting natural environment restoration (2020).
 - Survey the current status of the degradation of the natural environment, implement restoration projects based on priorities, build the foundation for promoting pan-governmental restoration projects across various ecosystems, and plan new restoration projects.
- (ME) Help draw up urban ecological status maps.
 - Support the creation and utilization of urban ecological status maps pursuant to the mandatory obligation to create urban ecological status maps (by 2021) and require urban areas to develop maps

step by step depending on the size of the city.

Classification	By 2018	By 2019	By 2021	Note
City size	Special city, metropolitan city, metropolitan autonomous city, special self-governing province	City areas with a population of over 300,000	All city areas	Voluntary in <i>gun</i> areas

- **(MOF)** Establish and implement a management plan for marine ecological axes.
 - Establish the foundation for the conservation and management of marine ecological axes to facilitate the integrated management of marine ecosystems and biodiversity and to maintain the connectivity of ecological structures and functions (2020).
 - Determine the scope of marine ecological axes, improve systems, set up restoration plans, strengthen cooperation and develop promotional strategies.
 - Improve the Conservation and Management of Marine Ecosystems Act (by 2019), and establish and implement the Basic Plan for the Conservation and Management of Marine Ecosystems (2019 – 2028).
- **(MOF)** Enact laws on the sustainable management and restoration of mud flats.
 - Establish the foundation for the restoration of contaminated and degraded mud flats and the protection of marine habitats for the sustainable use of mud flats (ongoing consultation with relevant agencies).
- **(RDA)** Standardize plant (horticulture) resources and establish the institutional foundation for ecological restoration.
 - Cultivate horticultural crops for ecological restoration and develop standardization technologies.
- **(KFS)** Enhance and systematize the concept of forest restoration.
 - Integrate various concepts of restoration, for example, in terms of topography, vegetation and ecology, and systematize restoration methods by reflecting field characteristics.
 - Prepare a detailed manual on the selection of restoration sites, design and construction.
 - Establish the institutional foundation for improving the performance of forest restoration projects by establishing the Basic Plan for Forest Restoration and revising the work process guideline for forest restoration.

Action plan 3-2-2	Restoring habitats	ME, MOF, RDA, KFS
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□ **Key points**

A. [Joint] Restoring degraded habitats

- **(KFS)** Restore major damaged forests on the Korean Peninsula.
 - Promote the ecological restoration of damaged areas that have high conservation value including Baekdudaegan and the DMZ, and connect and restore the mountain ranges of Baekdudaegan.
 - Restoration plans for Baekdudaegan and DMZ areas: 315 ha (2017) → 411 ha (2022)
 - Connection and restoration plans for forest ecological axes: 5 locations (2017) → 11 locations (2022)
 - Restore forests in the downhill race site at Mt. Gariwangsan as well as islands and coastal areas (from 2019).
 - Promote ecological restoration on islands and in coastal areas: 1 ha (2017) → 8 ha (2023)
- **(MOF)** Carry out restoration projects in the main habitats of marine species.
 - Conduct mud flat ecosystem restoration projects (2 or 3 locations per year), release natural enemies to eliminate organisms that cause whitening events, and transplant marine plants (sea grasses) every year (Dokdo Island, from 2019).
- **(RDA)** Develop planting technologies in urban regeneration areas (2019 – 2021).
 - Establish a database based on surveys of urban regeneration plants.
 - Create an index for the ecosystem services of agricultural resources in urban regeneration areas.
- **(ME)** Promote restoration projects for the core ecological axes of the Korean Peninsula, and restore habitats for marine species in national parks.
 - Restore the core ecological axes of the Baekdudaegan (ridges (*jeongmaek*)) National Parks, islands and coastal areas.

- Promote a comprehensive mid- to long-term plan (2017 – 2026) for restoration projects (a total of 288 locations, 16% restoration).
- Strengthen ecological connectivity through the restoration of ecological axes (e.g. coastal wetlands, sand dunes, ports, harbors) in national parks, islands and coastal areas damaged by coastal development or excessive use.
- Carry out projects for the propagation and recovery of sea horse species and coral polyps that are internationally endangered by operating the Marine Life Center at the Dadohaejaesang National Park.
 - Restore 10 sites, including artificial structures in intertidal zones, in 2017.
 - Target the restoration of 15 sites, including artificial structures in abandoned aquaculture farms and coastal sand dunes, by 2022

Target 3. Protecting endangered and endemic species

□ Current status and needs

- There has been a dramatic increase in the threat of extinction caused by human activities in addition to extinctions caused by natural processes. Proactive efforts are required to deter such threats.
- Against this backdrop, it is necessary to conserve endemic species and understand the long-term trends of biodiversity in the ROK by acquiring basic knowledge of the species inhabiting the country.
- The target corresponds to Aichi Target 12 on “managing endangered species.”

Action plan 3-3-1	Conserving and recovering endangered species	ME, KFS
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□ Key points

A. [KFS] Promote efforts for *in situ* and *ex situ* conservation of forest biological resources

- *In situ* conservation focusing on the indigenous habitats of rare species
 - Monitor habitats of rare species, expand protection facilities, and increase the designation of rare species habitats as forest genetic resources reserves.
- Facilitate proactive conservation activities such as building *in situ* safety zones, restoring populations and proliferating useful forest insect resources.
- Secure rare plant seeds, increase the amount of seeds stored in seed vaults, and develop germplasm regeneration technologies.
- Develop alternative habitats for endangered coniferous species and establish *ex situ* conservation forests, propagate populations for *in situ* reintroduction, expand arboretums of different climates and vegetation, and expand the designation of agencies for managing forest bio-resources.

B. [ME] Promote endangered species conservation projects

- Ensure well-balanced connections and restoration in endangered wildlife habitats.
 - Strengthen the conservation of habitats through preliminary evaluations and improvements.
 - Assess endangered species’ vulnerability to climate change and prepare conservation measures.
 - Reinforce the health of habitats such as mountain ranges, rivers and wetlands, and restore their functions.
 - Expand village species recovery projects and enhance the participation of local communities and residents.
- Recover 25 endangered species by 2027.
 - Select 25* priority targets among 64 recovery target species.

Classification	Recovery Target Species (64)
Mammals (7)	<i>Ursus thibetanus ussuricus</i> , <i>Naemorhedus caudatus</i> , <i>Vulpes vulpes peculiosa</i> , <i>Moschus moschiferus</i> Linnaeus, <i>Cervus nippon hortulorum</i> , <i>Mustela nivalis</i> Linnaeus, <i>Lutra lutra</i>
Birds (5)	<i>Platalea minor</i> Temminck & Schlegel, <i>Ciconia boyciana</i> Swinhoe, <i>Nipponia nippon</i> , <i>Columba rupestris</i> Pallas, <i>Larus saundersi</i>
Amphibians and reptiles (6)	<i>Sibynophis chinensis</i> , <i>Hyla suweonensis</i> Kuramoto, <i>Mauremys reevesii</i> , <i>Pelophylax chosonicus</i> , <i>Elaphe schrenckii</i> , <i>Kaloula borealis</i>
Fish (7)	<i>Microphysogobio rapidus</i> , <i>Microphysogobio koreensis</i> , <i>Kichulchoia brevifasciata</i> , <i>Acheilognathus somjinensis</i> , <i>Gobiobotia nakdongensis</i> , <i>Acheilognathus majusculus</i> , <i>Rhodeus pseudosericeus</i>

Insects (13)	<i>Chrysochroa coreana</i> , <i>Hipparchia Autonoe</i> , <i>Callipogon relictus</i> , <i>Gymnopleurus mopsus</i> , <i>Nannophya pygmaea</i> , <i>Cicindela anchoralis</i> , <i>Libellula Angelina</i> , <i>Haplotropis brunneriana</i> , <i>Cybister chinensis</i> , <i>Mellicta ambigua</i> , <i>Argynnis nerippe</i> , <i>Leptalina unicolor</i> , <i>Sinia divina</i>
Invertebrates (11)	<i>Charonia sauliae</i> , <i>Pseudohelice subquadrata</i> , <i>Koreanohadra koreana</i> , <i>Lamprotula coreana</i> , <i>Chasmagnathus convexus</i> , <i>Dendronephthya suensoni</i> , <i>Clithon retropictus</i> , <i>Ellobium chinense</i> , <i>Sesarmops intermedius</i> , <i>Dendronephthya putteri</i> Kükenthal, <i>Uca lactea</i>
Terrestrial plants (15)	<i>Sedirea japonica</i> , <i>Euchresta japonica</i> , <i>Cypripedium guttatum</i> , <i>Leontopodium hallaisanense</i> , <i>Lychnis kiusiana</i> , <i>Pterygopleurum neurophyllum</i> , <i>Calanthe aristulifera</i> , <i>Pedicularis hallaisanensis</i> *, <i>Nymphaea minima</i> , <i>Kirengeshoma koreana</i> , <i>Iris koreana</i> , <i>Ceratopteris thalictroides</i> , <i>Mankyua chejuense</i> , <i>Metanartheceum luteo-viride</i>

In bold text: priority recovery targets (25 species) / Recovery targets are subject to change depending on recovery conditions.

- Prepare recovery guidelines by taxon and set up recovery plans for each species.
- Strengthen the species conservation function in cooperation with habitat conservation agencies.
- Establish a new control tower (i.e. Research Center for Endangered Species) for endangered species conservation policies.
- Develop technologies for the propagation and recovery of endangered wildlife.
 - Secure individuals of original wildlife populations, develop and disseminate propagation and recovery technologies, and evaluate and support recovery projects.
 - Lay out a phased plan to introduce endangered species (by 2020).
- Promote projects for the propagation and recovery of species in habitats such as national parks.
 - Conduct a survey on 52 endangered wild plants in national parks and promote their propagation and recovery (by 2022).

Action plan 3-3-2	Establishing systems to manage endangered species	ME, MOF
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Key points

A. [ME] Enhancing the management and protection of endangered species

- Conduct surveys and research on wildlife diseases and strengthen the response and management system.
 - Open and operate the National Wildlife Health Research Center, establish the Second Basic Plan for Wildlife Disease Management (2021 – 2025), and develop and implement AI countermeasures for wild birds.
- Bolster the wildlife rescue and treatment system.
 - Increase wildlife rescue and management centers (17 centers by 2020, national project), and establish a system to boost their operational efficiency and expertise.
- Operate wildlife rescue and treatment centers in national parks.
 - Rescue 236 individuals of 43 species and release 51 individuals (2017), engage in rescue and treatment activities inside and outside of national parks, and operate recovery, rescue and management efforts in main hubs (northern, southern districts).
- Carry out surveys of the nationwide distribution of endangered wildlife, strengthen habitat protection, and establish an integrated platform for a genetic resources database.

B. [MOF] Strengthening the management of marine life

- Step up the management of marine organisms under protection.
 - Conduct a survey of habitat conditions and risk factors (from 2019).
 - Designate areas for protecting marine organisms and promote eco-tourism based on regional hubs (5 locations by 2020).
 - Designate and manage *ex situ* conservatories and rescue and treatment centers (ongoing).
- Minimize marine animal bycatch.
 - Understand the current status of marine animals (*cetacean*, *pinnipeds*, *chelonias mydas*) bycatch by fishing gears used by season and the fishery industry.
 - Develop fishing gear that enables the escape of marine animals caught by accident to prevent bycatch of green turtles and marine mammals, and develop equipment such as signaling devices (from 2021).

Action plan	Strengthening the management of internationally endangered species	ME, MOF
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3-3-3	(CITES)	
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Key points

A. [ME] Enhancing the management of internationally endangered species

(ME) Reinforce scientific management capabilities for globally endangered species (CITES species).

- Continue to provide support for systematic improvements to ensure the implementation of national laws in the ROK concerning internationally endangered species and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).
- Promote the improvement of national laws concerning globally endangered species and related systems to increase the capacity to implement the CITES.
 - Review the scope of the endangered species transfer report and seek systematic improvements in import/export permission.
- Accumulate information for the scientific management and practice of the identification and import/export of internationally endangered species, and expand public services by publishing guidebooks and develop guidelines (from 2022).
 - Promote the expansion of information services regarding CITES species (currently 24,000 species → 36,000 species by 2022), operate DNA barcode information search services (from 2019), and develop and publish guidelines on the import and export of CITES at least once a year.
- Conduct a scientific review of CITES species regarding import approval, registration of breeding facilities and authorization for artificial propagation.
 - Review completed for 832 cases in 2017 and 134 cases in 2018 (as of May 31).
- Support for and participation in CITES-related international conferences and understanding international trends
- o **(MOF)** Strengthen scientific management capabilities for globally endangered marine life species (CITES species) and develop assessment and management techniques for the conservation of nationally protected species and species of concern.
- o **(ME)** Develop assessment and management techniques for the conservation of nationally protected species and species of concern.
 - Evaluate the conservation status of freshwater life according to international standards (IUCN).
 - Reselect candidate groups for endangered species according to the IUCN standards on habitat conditions and breeding information of vulnerable freshwater species, and prepare a IUCN conservation status assessment report on freshwater species.

B. [ME] Create a CITES shelter

- o Implement international conventions through the establishment of shelters for internationally endangered species and make efforts to secure biological resources with high economic potential.
 - Pursue national projects related to animal welfare in a prompt manner to deal with the increasing illegal breeding of internationally endangered species through smuggling and trafficking. Animals at risk of extinction due to illegal trade and other reasons should be protected under the international convention (CITES).
 - Prevent the penetration of malicious infectious diseases from overseas via smuggled animals and secure various biological resources.
 - Shelter size/budget information: 2,690m² (animal breeding room, quarantine/inspection room, disinfection room, etc.) / KRW 6 billion

Classification	Quarantine facility	Breeding facility	Treatment/autopsy facility
Area (m ²)	350	1,760	- (existing facility)
Classification	Support and other facilities	Business administration	Total
Area (m ²)	350	230	2,690

Action plan 3-3-4	Conducting species surveys, research and monitoring	ME, MOF, RDA
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Key points

A. [Joint] Analyzing the current status of indigenous biota of the Korean Peninsula and compiling the National Species List of Korea

- **(ME)** Expand the National Species List by accelerating explorations of indigenous species.
 - Compile the National Species List of Korea consisting of 60,000 species by 2023 by enhancing research on indigenous species centering on unexplored and uncharted fields.
 - Secure empirical taxonomic data* on the endemic species of the Korean Peninsula (55 species by 2023).
 - * Literature, external morphology, microstructure, gene sequence data, etc.
 - ※ Conduct joint research with neighboring Asian countries (Japan and China).
 - Prepare drafts for 1,790 species and publish 52 biology journals in Korean and English in three years.
 - Draw up drafts for biology journals on 16,000 indigenous species by the end of the fifth stage (2020).
 - **(MOF)** Increase the National Marine Species List by accelerating explorations of marine species.
 - Expand the National Marine Species List by focusing on specific sea areas (e.g. the East Sea islands of Ieodo, Baengnyeongdo and Jeodo; northern fishing areas) and uncharted fields.
 - Secure empirical taxonomic data on marine endemic species on the Korean Peninsula.
- B. [ME] Conducting research on the distribution of endangered wildlife and the IUCN Red List**
- Promote research on the nationwide distribution of endangered wildlife.
 - Conduct annual surveys on a total of 301 species (41 species per year, 169 species for a phased survey)
 - Provide statistics and other data for the public on the website of the endangered wildlife information network (www.redlist.go.kr) on a continuous basis.
 - Continuously conduct assessments and grading of the extinction risk of indigenous species in the ROK (from 2019).
 - Register with the IUCN through an assessment of the endemic species of the Korean Peninsula.
 - Publish the Korean Red List (2011 – 2014, National Institute of Biological Resources) and a revised edition (2019 – 2022).
 - Develop national statistics for the Korea Red List Index (by 2023).
- C. [Joint] Promoting research on national biological resources and species**
- **(ME)** Strengthen research and management of biological resources in freshwater ecosystems.
 - Research unexplored taxa in freshwater environments and new/unrecorded freshwater species in specific habitats (300 species per year).
 - Discover 600 new/unrecorded species by 2017. → Discover 2,100 species by 2023.
 - Expand the acquisition of biological specimens as a criteria for national sovereignty over biological resources (138,000 specimens by 2017 → 42,000 specimens by 2023).
 - **(MOF)** Boost efforts directed to surveys, discovery, research and management of marine biological resources in marine ecosystems.
 - Conduct surveys of undiscovered taxa and new/unrecorded marine species in specific sea areas.
 - **(ME)** Carry out research on ecological roles and functions of insectivorous bats.
 - Conduct research on the ecological roles and functions of insectivorous bats, which contribute to the improvement of biodiversity by controlling the population of insects in habitats (e.g. forests, wetlands, rivers, urban areas).
 - **(ME)** Carry out research on the biodiversity of the endophytic fungi that coexist with coniferous trees.
 - Conduct monitoring of endophytic fungi* in *Abies koreana* and develop techniques using endophytic fungi to reduce the deterioration of coniferous trees.
 - * A type of fungi that can be used to supply nutrients to plants and to manage and restore coniferous forests
 - **(ME)** Carry out research on the distribution and characteristics of major endangered species in marine national parks.
 - Conduct an analysis of habitat environment and range of movement in an effort to recover endangered species in marine national parks and use the results in designating and evaluating target areas for conservation/restoration.
- D. [RDA] Predicting and monitoring the risk of extinction of genetic resources in crops and domesticated animals**
- Predict the risk of extinction of genetic resources in the ROK's domesticated animals and prepare countermeasures.

- Develop indicators for estimating the risk of extinction and conduct monitoring.
 - Subjects for monitoring of extinction risk: DAD-IS domestically nurtured varieties (once a year)
- Predict the risk of extinction of genetic resources of indigenous crops and prepare countermeasures.
 - Establish an indicator system for predicting the risk of extinction and conduct monitoring.

Target 4. Promoting genetic diversity

□ Current status and needs

- The genetic diversity of cultivated species and wild species, along with socially, economically and culturally valuable species, is decreasing. This calls for genetic diversity to be maintained and improved.
- Continuing efforts are required not only for the *ex situ* preservation of cultivated species for future use but also for the conservation of the genetic diversity of cultivated species grown *in situ*.
- The target corresponds to Aichi Target 13 on “maintaining genetic diversity.”

Action plan 3-4-①	Developing technologies for conservation and utilization	MSIT, RDA
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□ Key points

A. [MSIT] *Ex situ* conservation of microbial resources that are difficult to preserve, and development of restoration techniques

- Develop and apply the protocols for safe long-term preservation of obligate anaerobic microorganisms (2018).
- Provide tailored and safe long-term conservation of microorganisms that are difficult to preserve consistently, and develop the protocols for restoration.

B. [RDA] Securing useful plant genetic resources from home and abroad and developing preservation technologies

- Nationally register domestic and foreign useful resources for food security and industrialization (targeting 3,000 resources).
 - Hold a deliberative council on the registration of agricultural bio-resources as part of the national registration of genetic resources (4 times per year).
- Introduce and collect useful genetic resources through closer cooperation with international organizations and other related institutes.
 - 1,000 resources including miscellaneous grain crops (ICRISAT)¹, pulse crops (Kenya), fruit trees (Georgia), vegetables (Russia) (2018).
- Develop safe preservation technologies for trophozoite/recalcitrant seeds
 - Develop cryopreservation technologies for different crops: fruit trees such as citrus fruits (2018), vegetables such as strawberries (2019 – 2021)
 - Promote cryopreservation
 - * 1,500 resources from 6 crops including garlic (2018) → Expand to trophozoites (2022).

C. [RDA] Conduct diversity assessment to improve the use of genetic resources of domesticated animals

- Assess the diversity of livestock genetic resources using biometric information.
- Assess the diversity of livestock genetic resources using information on physical appearance.
 - Diversity assessment: 4 animals (i.e. cow, pig, chicken, goat) (2018) → 6 animals (deer and duck added) (2023)

¹ ICRISAT: International Crops Research Institute for the Semi-Arid Tropics

Action plan 3-4-②	Establishing an institutional basis to improve genetic diversity	MSIT, MOHW, ME
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Key points

A. [Joint] Expanding the securement of genetic resources

- (MSIT) Operate research resources centers, and encourage the research resources centers and their resources to meet the international requirements.
 - Research resource centers aim to consistently secure, conserve and distribute substances obtained from humans, animals, plants, microorganisms and biological/chemical reagents.
 - Prioritize investments by 2020 in the development of highly valued research materials, such as those related to infectious diseases, microorganisms or biological models.
 - Focus on attending international meetings and developing new international standards, in order to prepare for a global bio-resource war along with the introduction of the Nagoya Protocol.
 - Scheduled to end in February 2019
- (MOHW) Operate the National Culture Collection for Pathogens (NCCP).
 - Implement the Act on the Promotion of Collection, Management, and Utilization of Pathogen Resources.
 - Expand the collection and distribution of pathogen resources (nationally isolated pathogen collection of over 1,650 strains).
 - Expand cooperation with domestic and international resource centers.
 - Pathogen resource exchange with the Deutsche Sammlung von Mikroorganismen und Zellkulturen GmbH (DSMZ)
 - Aim for the targeted securing of 2,228 strains from 499 species of pathogen resources for disclosure/distribution and 10,000 strains for distribution (by 2023).

B. [MOHW] Implementing the Act on the Promotion of Collection, Management, and Utilization of Pathogen Resources

- Help operate pathogen culture collections by field.
 - 2 fields (culture collections for medical fungi or virus pathogens)
- Operate 3 culture collections for pathogens by field, promote the safe management of pathogen resources, and conduct research on the current status of pathogen resources (2018).
- Expand the operation of culture collections for pathogens by field to seven locations (by 2022), promote the safe management of pathogen resources, and conduct research on the current status of pathogen resources (2022).

C. [ME] Promoting the operation of the Freshwater Bio-resources Culture Collection

- Collect cultures and ensure stable preservation of useful freshwater bio-resources (i.e. freshwater algae, microorganisms) as the basis for promoting the bio industry.
 - Preserve a total of 11,000 strains of freshwater resources by 2023 (including 3,000 strains collected between 2015 and 2017).

Description	Total	2019	2020	2021	2022	2023
Cultures collected	7,600	1,400	1,400	1,600	1,600	1,600

- Develop technologies for mass culture of freshwater bio-resources with potential for commercialization.
- Operate an efficient cryopreservation system for the medium- to long-term conservation and management of freshwater bio-resources.
 - Develop source technologies for the cryopreservation of freshwater algae (patent application in December 2017)

Action plan 3-4-③	Conducting genetic research on biological resources	MSIT, ME, MOF, RDA, KFS
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Key points

A. [Joint] Developing a genetic resource database

- (MSIT) Secure DNA from reference specimens of natural history collections.

- Create DNA barcodes to accurately classify and identify acquired DNA.
- Apply DNA barcodes to biological systematics and genetic biodiversity studies.
 - 2,910 DNA specimens as of today → 6,000 DNA specimens by 2023.
- **(MSIT)** Provide refined information on biodiversity.
 - Provide status and trend analysis of global and national biodiversity.
 - Propose a draft amendment of the characteristic-based standards for inter-ministerial information sharing of biological research materials (provisional).
 - Refine biodiversity-related information provided by the Korean Bio-resource Information System (KOBIS).
 - Connect the Korean Natural History Research Information System (NARIS) and the Korean Bio-resource Information System (KOBIS) for real-time information sharing.
- **(RDA)** Evaluate the useful traits of agricultural genetic resources and strengthen the utilization of information.
 - Survey the basic traits of agricultural genetic resources.
 - Assess the disease-resistance and natural disaster-resistance capacity of agricultural genetic resources.
 - Assess the properties of the nutritive and functional components of agricultural genetic resources.
 - Build big data from property assessments of agricultural genetic resources and provide information.
 - Promote the standardization of criteria for property assessments and build a new database (2018 – 2020): 30 crops including green onion.
 - * Crops subject to standardization (cumulative): 90 crops (2017) → 95 crops (2018) → 125 crops (2020)
 - Build big data including history, assessments and genetic information and provide such information (by 2022).
- **(KFS)** Build an Integrated Archive for Forest Biological Diversity.
 - Establish an integrated information archive for the forest species of the Korean Peninsula (ongoing).
 - Promote the informatization of biological specimens according to international standards and set up a global sharing mechanism.
 - * Accumulate specimens and relevant information according to the TDWG-proposed standards.
 - Establish an Online Flora and facilitate linkage to the World Flora Online (WFO).
 - * Support the achievement of GSPC Target 1, “an online flora of all known plants.”
 - Develop an integrated classification system for forest insect resources and provide related services.
 - Secure insect barcode sequences by major functional group and accumulate relevant information.
 - Utilize insect barcode sequences based on the Barcode Blitz and taxonomic information.
 - * Accumulate genetic resource information to identify biological resources owned by the country: 1,000 cases
- **(KFS)** Promote the assessment and conservation of forest genetic resources.
 - Assess the genetic diversity of forest genetic resources and enhance *in situ* conservation technologies.
 - Build big data on genetic information to develop assessment techniques for forest genetic resources and conduct an assessment of genetic characteristics.
 - * Evaluate regional adaptation characteristics through the development of high-density DNA markers based on genetic information and gene mapping: 5 species of tree, 90 markers (2017) → 15 species of tree, 450 markers (2022)
 - Facilitate *in situ* conservation based on genetic diversity assessments and enhance management techniques for forest genetic resource protection zones.
 - Restore genetic diversity through reintroduction.
- **(MOF)** Update the National Marine Species List of Korea.
 - Reflect new and unrecorded species obtained through research projects such as surveys of marine bio-resources, and update the status of species held by institutions such as deposit conservation centers.
 - Update the status of additionally obtained species following the verification of unreported resources with the help of literature and experts.
- **(MOF)** Pursue the standardization of marine bio-resource information and establish an integrated database.
- **(MOF)** Establish genetic information on the protected marine species and endemic species of the ROK.

- Acquire genetic information by species, update taxonomic information, and exchange and analyze genetic information between globally protected species and species inhabiting the ROK.
- **(ME)** Conduct research on the genetic diversity of major biological resources.
 - Identify the status of the genetic diversity of endangered species, endemic species and species with high economic value, and conduct a pilot study for regular monitoring.
 - Complete an analysis of 202 cases by 2018. → 356 species to be analyzed between 2019 and 2026 (32 cases/year).
 - Develop molecular markers to identify the origin of major indigenous species and classify the group.
 - Identify all genetic components, structures and properties of species and utilize the results to discover useful genes for conservation and sustainable use.
- **(ME)** Carry out research on the DNA barcodes of major biological resources and prepare phylogenetic trees.
 - Number of species with DNA barcode information obtained [cumulative]: 8,581 species (2018) → 10,400 species to be analyzed (by 2023)
- **(ME)** Expand the conservation of genetic resources.
 - Expand the securement of various wildlife genetic resources to improve genetic diversity.
 - Wildlife genetic resources secured (170,000 resources in 2018 → 300,000 resources in 2023, cumulative)

Strategy 4. Benefit-sharing and sustainable use of biodiversity

Widely sharing the benefits of biodiversity and ecosystem services

Overview

I Aichi Target – D

Enhance the benefits to all from biodiversity and ecosystem services

I Relevance to the Sustainable Development Goals (SDGs)

Ensure the conservation, restoration and sustainable use of biodiversity and ecosystem services and pursue international agreements for access to and the utilization of genetic resources

The foundation for an institutional system is laid out to provide ecosystem services in such a way that all citizens can share the benefits of biodiversity and ecosystem services and restore the ecosystem. Furthermore, international agreements are implemented for the fair and equitable sharing of benefits arising from the utilization of genetic resources.

Indicators and references

I Policy and legislative activities

Achievements include the initiation of legislation to enhance and provide compensation for ecosystem services and to develop a comprehensive ecosystem restoration policy.

I Local eco-tourism revenues

Revenues from 4 successful ecotourism model areas including Inje's Eco-village, Gochang's Dolmen Park-Ungok Wetland, Shinan's Yeongsando Myeongpum Village and Jeju's Dongbaekdongsan Wetland

I Cases of information sharing through the ABSCH (Access and Benefit-Sharing Clearing-House)

The number of cases in which information has been published throughout the ABSCH in accordance with the Nagoya Protocol and decisions taken by the Conference of the Parties serving as the meeting of the Parties to the Protocol.

I Share of sustainably grown produce

Proportion of agricultural produce certified as eco-friendly (i.e. organic produce, pesticide-free produce, low-pesticide produce) out of the total agricultural produce supplied

Target 1. Laying the foundation for ecosystem services

□ Current status and needs

- All ecosystems provide ecosystem services and contribute to human well-being.
- The systems that help identify ecosystems particularly significant to human well-being and protect and restore ecosystem services contribute to biodiversity and human well-being.
- The target corresponds to Aichi Target 14 on “protecting ecosystems and essential services.”

Action plan 4-1-1	Building the foundation for ecosystem services assessments	ME, MOF, KFS
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□ Key points

B. [ME] Creating a legal framework for ecosystem services

- Establish a foundation for policymaking through the creation of a legal framework for ecosystem services.
 - Prepare a framework act to enhance the consistency and rationality of policies related to ecosystem services.
 - Amend existing laws to implement relevant policies to ensure scientific, systematic surveys and assessments of ecosystem services and payment for ecosystem services (PES).
 - Revise the Act on the Conservation and Use of Biological Diversity (2019) and draw up guidelines for the assessment of ecosystem services (2021).

C. [Joint] Establishing an assessment system considering the characteristics of ecosystems

- (KFS) Establish an assessment system to evaluate forest ecosystem services.
 - Develop assessment standards to evaluate forest ecosystem services by 2021.
 - Prepare valuation standards by discovering and selecting key forest ecosystem services as well as

- improving the functional assessment indicators.
- Systemize and map the value of forest ecosystem services at the national level by developing an assessment model for key local forest ecosystem services (i.e. model forest).
- Build an institutional foundation to reflect the value evaluated according to the assessment standards for forest ecosystem services in the protection and utilization of forests.
- **(MOF)** Set up a marine spatial plan for all sea areas.
 - Introduce the “plan first, use later” system (existing system: use sea areas on a first-come, first-served basis) for the entire jurisdictional sea areas (e.g. coasts, EEZs).
 - Draft the Marine Spatial Planning and Management Act and conduct spatial planning for different sea areas*.
 - * Southern coast (2018 – 2019) → Western coast (2019 – 2020) → Eastern coast (2021)
- **(ME)** Create an assessment system for national ecosystem services.
 - Select indicators to assess ecosystem services for different ecosystem types and develop standards for valuation.
 - Systemize and map the value of ecosystem services by developing assessment models for ecosystem services at the national and local levels.
 - Lay the institutional foundation to realize the sustainable use of natural resources based on assessments of national and local ecosystem services.

Action plan 4-1-2	Providing public ecosystem services	MCST, ME, MOF, KFS
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□ **Key points**

A. [Joint] Mapping ecosystem services

- **(MOF)** Develop technology for ecosystem-based marine spatial analysis and utilization.
 - Develop technology for the assessment of marine ecosystem services and their cumulative impacts (by 2021).
 - Develop an integrated spatial analysis information system and integrated mapping technology (by 2021).
- **(ME)** Support well-balanced national spatial planning based on quantitative assessments of ecosystem services.
 - Create an ecosystem service assessment map (including at the local government level) and verify its accuracy.
 - Prepare local government maps for the measurement of ecosystem services (20 maps by 2023) and link them to existing maps such as biotope maps.
 - Use the newly created maps as standards for environmental impact assessments, the calculation of the Ecosystem Conservation Cooperation Charge and the valuation of biodiversity management contracts (by 2023).
 - Conduct research on economic valuation of ecosystem services for the creation of a new ecosystem service account (by 2023).

B. [Joint] Providing expanded cultural services

<Leisure and eco-tourism services>

- **(MCST)** Make use of tourism resources based on ecological themes.
 - Develop the ROK’s representative eco-tourism destinations by tapping into the country’s unique ecological resources (e.g. wetlands, habitats for migratory birds, DMZ).
 - Enhance program capacity by taking a humanistic storytelling approach and operating an assessment system.
 - Improve tourism capacity through projects to upgrade the existing tourism infrastructure with the aim of preventing damage to ecological resources, and install convenience facilities.
 - ※ Create about ten eco-tourism destinations every year by utilizing tourism resources based on ecological themes (by 2023).
- **(MCST)** Refurbish old tourist facilities by applying cultural content.
 - Renovate existing tourist destinations that retain tourism resources but have lost their attraction due to aged facilities and/or a lack of sophisticated cultural content by strengthening and integrating cultural content.
 - Make full use of the assets (e.g. history, cultural facilities, hands-on experience facilities) of existing facilities and of the areas near the sites in need of revitalization to create content, designs, storytelling

and programs tailored to local conditions.

※ Renovate about 4 aged tourist facilities every year (until 2023).

- **(ME)** Expand and support eco-tourism.
 - Expand the designation of eco-tourism areas and enhance eco-tourism programs to improve tourist satisfaction, thereby creating a virtuous circle of boosting local economies and ensuring the conservation of ecosystems.
 - (Expand eco-tourism areas) Increase the number of eco-tourism areas designated by the ME from the current level of 26 to 35 by 2022.
 - (Enhance eco-tourism) Offer area-specific customized consulting services for planning and operating eco-tourism areas and provide training to local residents to foster eco-tourism directors.
 - (Conduct promotion and ensure ecological welfare) Engage in intensified promotion activities in spring and fall, hold an eco-tourism festival and provide vulnerable groups with opportunities to experience eco-tours free of charge.
- **(MOF)** Develop and support islands for marine eco-tourism.
 - Expand the designation of uninhabited and small islands as eco-tourism islands, improve eco-tourism programs and improve tourist satisfaction, thereby creating a virtuous circle of boosting local economies and ensuring the conservation of marine ecosystems.
 - ※ 164 islands have potential to be transformed into eco-tourism islands out of the total 2,876 uninhabited islands.

<Health and recreational services>

- **(MCST)** Make eco-friendly hiking trails a brand for tourism.
 - Strengthen software for the creation of hiking course tour content to boost the use of hiking trails.
 - ※ Develop and operate permanent programs to turn tourist attractions into content (e.g. branding of Haeparang Trail) (by 2023).
 - Lay out a course called the Korea Dulle-gil by surveying the existing hiking trails on the outskirts of the Korean Peninsula, and turn the course into tour content.
 - ※ A total of 4,500 km (expected): 770 km along the eastern coast, 1,700 km along the southern coast, 1,600 km along the western coast, 430 km along the Pyeonghwa-Nuri Trail.
 - ※ Make Korea Dulle-gil tourism content (by 2021) and turn ultra-long range hiking trail into a brand (by 2023).
 - (Korea Mobility-Durunubi) Map-based integrated service including course information on leisure tours, nearby travel information (504 hiking trails and 44 cycle paths across the country)
 - * Leisure tours: Human-powered activities such as hiking, cycling, canoeing and kayaking
 - ※ Provide people and local governments with the GPS-based public data about hiking trails and cycle paths and offer tourism platform services (from 2019).
- **(KFS)** Expand forest healing facilities and create forest recreational spaces.
 - Provide various forest healing services by expanding forest healing infrastructure (20 locations), develop healing forests (31 locations) considering their accessibility and healing environments and establish the National Jideokgwon Forest Healing Center (1 location) for long-term healing stays based on oriental medicine.
 - Expand forest recreational infrastructure such as recreational forests to meet various demands for recreation.
 - * Create 26 recreational forests, 4 eco-culture experience complexes, 1 forest therapy venue and 1 forest campsite.
- **(ME)** Create urban ecological resting places.
 - Restore in an ecologically friendly manner illegally cultivated land, bare ground and other damaged spaces in an idle or abandoned state in urban areas and their surroundings, connect the ecological axis with cities, and build nature gardens called Jayeonmadang (4 locations).
 - Expand ecological spaces, which are insufficient in urban living zones, and increase the number of ecological playgrounds that can serve as venues for play and hands-on experiences for children and as places for rest and community services for residents (17 locations).
 - Strengthen the ecological function of urban artificial green areas and establish small ecosystems on the rooftops of public buildings that are structurally safe and appropriate to serve as an ecological stepping stone (4 locations).

Target 2. Promoting the sustainable use of ecological resources

Action plan 4-2-①	Finding growth engines with the use of biological resources	ME
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□ Key points

- (ME) Create new scientific value for biological resources.
 - Verify the basic biological usefulness of indigenous biological resources including Korean relatives of transboundary biological resources or species that are utilized overseas (374 species in 2017 → 1,200 species in 2023 in cumulative terms).
 - Isolate eco-friendly biological resources as part of efforts to reduce environmental pollution through, for example, environmental bioremediation of hazardous materials.
 - ※ Discover drought-resistant herbs in Mongolia (10 species by 2020) and conduct joint research on the restoration of grassland as a means of reducing yellow dust in the ROK.
 - ※ Explore heavy metal-resistant microorganisms and indigenous plants that can reduce heavy metal pollution from the exhausted mining areas of Gangwon-do Province.
 - Search for functionally effective materials, including toxic materials, originating from indigenous species and eco-friendly active materials for biological protection.
 - ※ Effective nematicidal materials, materials suppressing plant diseases such as Brown shot hole disease on flowering cherry trees, etc.
 - Find and maintain genomic information of wildlife resources with proven usefulness.
 - ※ 20 species in 2017 → 80 species by 2023 in cumulative terms
 - Establish a foundation for providing information by linking information from usefulness analyses to the biodiversity of the Korean Peninsula.
 - ※ Provide basic data to support research on the selection of species requiring out-of-the-country transportation permits.
 - Build a foundation for reducing alien fish species by securing sterilization technology for fish species that disturb the ecosystem.
 - ※ Applying technology secured through model fish (*Oryzias latipes*) to invasive fish (e.g. *Lepomis macrochirus*).

Action plan 4-2-②	Developing biomimicry technology	ME
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□ Key points

- (ME) Push ahead with new R&D on biomimicry technology to realize a blue economy.
 - Lay out a roadmap for the development of innovative technology with a view to converting into blue economy (March 2018).
 - Set up a plan for new R&D to develop biomimicry technology* and other technologies aimed at discovering and utilizing indigenous species to replace imported biological resources (from March 2018).
 - * Sustainable innovative technology that enables growth while purifying the environment and preventing environmental damage by imitating and applying the structure and function of nature
 - Continue to carry out research on innovative biological resources technology and expand transfer of main accomplishments to the private sector.
 - Hold an ecology-engineering convergence forum and conclude MOUs for technological and policy cooperation with related organizations such as the National Institute of Ecology and the Jeollanam-do Provincial Government (second half of 2018).

Target 3. Implementing the Nagoya Protocol

□ Current status and needs

- The fair and equitable sharing of the benefits arising out of the utilization of genetic resources is one of the objectives of the Convention on Biological Diversity. Against this backdrop, research on the discovery and utilization of genetic resources is being actively conducted for the benefit of all people.
- Polices need to be established and implemented in response to the terms of the Convention stipulated in the

- Nagoya Protocol in order to share benefits arising from the utilization of genetic resources.
- The target corresponds to Aichi Target 16 on the “implementation and operation of the Nagoya Protocol.”

Action plan 4-3-1	Building the groundwork for national implementation of the Nagoya Protocol	MSIT, MOTIE, ME, MOF, RDA, KFS
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□ **Key points**

A. [ME] Operating the Nagoya Protocol system

- Respond effectively to the Nagoya Protocol and strengthen cooperation for research on foreign biological materials.
 - Officially establish and operate a Genetic Resources Information Center which collects, manages, monitors and provides to industries the Nagoya Protocol related information (March 2018).
 - Expand bilateral agreements related to biological and genetic resources at the national level.
- Manage information on genetic resources.
 - Promote the operation of the Council and the Working Groups involving ministries related to the Act on Access to and Utilization of Genetic Resources and Benefit-Sharing*.
 - *(Council) Composed of Director General of the Nature Conservation Bureau, ME (Chairman) and public servants (third – fourth grade) from 9 central administrative agencies (established in September 2017). The Working Group consisting of affiliated organizations is in operation (2019 – 2023).
 - Analyze agendas for the Conference of the Parties serving as the meeting of the Parties to the Nagoya Protocol and establish plans to respond to the agendas.
- Conduct research to select biological resources requiring out-of-the-country transportation permits.
 - Continue to operate a system to select biological resources requiring out-of-the-country transportation permits in order to strengthen the right of the nation to retain genetic resources with high ecological and economic value (from 2002).
 - Designate 4,813 indigenous species including invertebrates, plants and fungi (as of December 2017).
 - ※ The ROK can expect to designate about 1,000 additional species as candidate species for biological resources requiring out-of-the-country transportation permits. This is based on the results of research carried out between 2015 and 2017.
 - Select additional species to raise the number to 6,500 by continuously assessing the ecological and economic value of all indigenous species (by 2023).
 - Conduct research on how to improve the system in order to enhance the effect of controlling out-of-the-country transportation of biological resources and take necessary action based on the research results.
 - Set up (2019) and implement (2020) a plan to revise the out-of-the-country transportation permit procedure for biological resources in order to ensure access to genetic resources and the sharing of benefits.
 - Explore the possibility of establishing an ex-post management system for out-of-the-country transportation of biological resources (by 2022).

B. [MOTIE] Promoting international cooperation to secure biological resources under the ABS regime

- Promote international cooperation to secure foreign biological resources.
 - Facilitate international cooperation with megadiverse countries in Asia (e.g. Bhutan).
 - Secure foreign biological resources, conduct analyses of biological resources and search for useful materials.

C. [Joint] Establishing a system to implement the Nagoya Protocol by sector

- **(MSIT)** Respond to the implementation of the Nagoya Protocol.
 - Amend the Act on the Acquisition, Management, and Utilization of Biological Research Resources for the implementation of the Nagoya Protocol.
 - Establish and operate an inter-ministerial information sharing system for biological research materials.
 - Organize (July 2011) and operate the Korea Biological Resources Centers Alliance (KBRCA) (13 meetings as of today).
 - Establish (2010) and operate the Korea Bio-resource Information System (KOBIS) in accordance with Article 11(2)1 of the Act on the Acquisition, Management, and Utilization of Biological Research Resources.
 - ※ Bio-resource information is being shared among the MSIT, MAFRA, ME and MOF. The MOHW is expected to join the linkage system (2018).

- **(RDA)** Develop a domestic system to implement ABS for the genetic resources of domesticated animals.
 - Establish an ABS implementation system for the genetic resources of domesticated animals that is compliant with international standards.
- **(MOF)** Analyze agendas of international regulations related to the Nagoya Protocol and prepare national response strategies.
 - Analyze agendas by participating as a Party to the ABS in international meetings such as the third Meeting of the Parties (MOP3) and support the preparation of national response strategies.
 - Support the establishment of national strategies to fulfill the obligation to provide information on access, utilization and benefit-sharing by examining other countries' legislation related to ABS implementation and conducting relevant monitoring activities.
- **(KFS)** Promote the forest bio-industry.
 - Collect, conserve and evaluate resources for sustainable use and establish a database (from 2019).
 - Implement R&D to seek forest bio-resource materials (from 2017).
 - Establish a pilot area for the utilization of bio-forestry materials as resources in order to increase resource supply.

Action plan 4-3-2	Providing support for private implementation of the Nagoya Protocol	MSIT, MOTIE, ME, MOF
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□ **Key points**

A. [Joint] Providing support for awareness-raising of the Nagoya Protocol in the private sector

- **(MOTIE)** Lay the foundation for supporting industries subject to international agreements on the ABS.
 - Define the role of MOTIE as a national checkpoint.
 - Strengthen support for the bio industry under the ABS regime (promote the procedure for using foreign resources linked to the integrated reporting service of the ME and provide relevant support).
 - Provide consultation services to related industries with respect to the Nagoya Protocol and the Act on Access to and Utilization of Genetic Resources and Benefit-Sharing (examine laws and systems of the main countries, identify the best ABS practices and provide consulting services concerning benefit-sharing and dispute cases).
- **(MSIT)** Strengthen efforts to enhance researchers' awareness of the Nagoya Protocol.
 - Provide information on the Nagoya Protocol through the ABS Center of the Korea Research Institute of Bioscience & Biotechnology (KRIBB), which operates an ABS help-desk for researchers.
 - Host international conferences and seminars to raise awareness of the Nagoya Protocol.
 - Publish and distribute handbooks for researchers such as an ABS Guide or an ABS Brief.
- **(ME)** Raise domestic industries' awareness and expand support for capacity-building.
 - Create a help desk to enhance understanding of the Nagoya Protocol and to support capacity-building, provide customized consulting for corporations, hold an ABS forum in the ROK, publish newsletters, etc. (2019 – 2023).
 - ※ Diversify promotional channels including radio advertisements, national electronic display boards, and electronic display boards at main transport centers across the country.
 - Develop strategies for responding to overseas companies and develop plans to support Korean industries by examining and analyzing other countries' industry support policies (2018 – 2019).
 - Analyze and provide related laws and access procedures and standards of major countries providing biological materials* (2019 – 2023).
 - * Analyze regulations of major countries providing genetic resources and publish the Nagoya Protocol Capacity-building Guidelines by each stakeholder group (e.g. government, industry)
 - Develop and distribute materials for the bio industry to respond to the Nagoya Protocol at the working level and operate educational programs.
 - Develop and operate educational programs to implement the Act on Access to and Utilization of Genetic Resources and Benefit-Sharing, including procedures of access to domestic and overseas genetic resources and benefit-sharing, and to support capacity-building among industry, academia and research institutes (2019 – 2023).
- **(MOF)** Operate the ABS Information Center for Marine Bioresources,
 - Provide information on access to, utilization and benefit-sharing of genetic resources by operating the ABS Information Center for Marine Bioresources.
 - Provide consultations on access to and utilization of domestic marine biological resources following the adoption of the ABS implementation laws, provide country-specific ABS information and data on domestic and overseas ABS trends.

- ※ Act on Access to and Utilization of Genetic Resources and Benefit-Sharing; Act on Securing, Management, Use, Etc. of Marine and Fisheries Bio-resources

Target 4. Advancing sustainability in agriculture, forestry and fisheries

□ Current status and needs

- Sustainable production contributes to the conservation of biodiversity and the enhancement of ecosystem services through supply management.
- Eco-friendly agriculture, forestry and fisheries reduce the discharge of pollutants that impact ecosystems, while contributing to the enhancement of biodiversity by providing various habitats for species.
- The target corresponds to Aichi Target 6 on “sustainable management of marine biological resources” and Aichi Target 7 on “sustainable agriculture, fishery and forestry.”

Action plan 4-4-①	Encouraging sustainable agriculture	MAFRA, ME, RDA
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□ Key points

A. [MAFRA] Encouraging eco-friendly agriculture by expanding the foundation for low-input production

- Increase the direct payment rate for eco-friendly agriculture to promote the spread of eco-friendly farms.
- Scale up the production base by increasing the number of eco-friendly agricultural districts (100 districts from 2017 – 2022).
- Expand research centers to develop and disseminate low-input farming techniques specialized for each area.
* Establish 10 eco-friendly research centers (2008 – 2018, 9 centers established and 1 center under construction).

B. [MAFRA] Expanding channels to distribute eco-friendly produce and create new added value

- Secure and expand various sales channels such as eco-friendly public meal services, direct transactions, home shopping and online shopping.
- Provide incentives for the practice of value consumption to conserve the environment, for example, through linkage to the green card system.
- Promote logistics centers for green produce and expand distribution organizations at the regional level in areas of production.
Scaling up and systemization of distribution (1 location in 2017 → 4 locations in 2018 → 9 locations in 2022)
- Create new added value through the expansion of the eco-friendly processing industry and the promotion of exports.

C. [MAFRA] Enhancing the environmental and ecological conservation function of eco-friendly agriculture

- Expand the application of the concept of eco-friendly agriculture to maintaining and enhancing the health of soil and ecosystems.
- Boost promotions to and education for consumers focusing on the environmental conservation function of eco-friendly agriculture.

D. [ME] Building the foundation for the conservation management of paddy wetlands

- Encourage eco-friendly farming in paddy wetlands and improve the biodiversity management contract system to secure habitats (2019).
- Promote research projects to identify measures for the conservation management of paddy wetlands and prepare such measures through collaboration among relevant ministries (2021).

E. [RDA] Conducting research on the production and supply system for organic seeds to practice organic farming

- Develop technology to disinfect seeds of leafy vegetables, root vegetables and fruit vegetables by utilizing organic farming materials and physical methods.
※ Select natural materials to disinfect organic seeds and develop utilization technology.
- Develop technology to produce organic seeds, for example, by selecting major disease and pest-resistant

varieties for different crops, analyze their functionality, and establish the seed gathering system.

※ Publish the standard operating procedures (SOP) for disinfecting organic seeds.

F. [RDA] Developing site-tailored organic farming technology

- Develop comprehensive management technology for diseases and pests by utilizing cultivation methods, biological methods and organic farming materials in order to address the issues occurring in organic farmland.

※ Select main organic materials for disease and pest control for different crops and develop their utilization technology, and develop technology for the management of organic farmland vegetation by attracting or repelling pests as well as protecting natural enemies.

- Establish an organic resource utilization system for organic cultivation.
 - Calculate the optimum input amount of organic resources such as rye and hairy vetch by crop.
 - ※ Provide recommendations for fertilizer amount for different crops and organic resources.

G. [RDA] Ensuring conservation of genetic resources of domesticated animals through duplication and separation

- Present safe conservation methods through duplication and separation of varieties with high industrial usability and establish a mechanism for sustainable use.

Action plan 4-4-②	Expanding sustainable forestry	KFS
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□ **Key points**

A. [KFS] Expanding ecological forestry by promoting forestation based on 6 forest functions

- Promote forestation based on each forest function to ensure the optimization of various functions and boost economic and public value of forest resources.
 - Establish a mid- to long-term plan, the Five-year Four-stage Forestation Plan (2019 – 2023) and carry out effective projects.
 - Strengthen ecological functions by applying forest management technology specialized to each function.

B. [KFS] Developing site-customized sustainable forestry technology

- Develop forestry technology customized to each area.
 - Seek forestry varieties, cultivation techniques and biological disease and pest control methods suitable for each area.
 - ※ Develop vegetation management techniques by attracting or repelling pests as well as protecting natural enemies.

Action plan 4-4-③	Sustainable use of fishery resources	MOF
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□ **Key points**

A. [MOF] Conducting projects to create fishery resources

- Create sea forests to restore the coastal ecosystem.
 - (Period/target) 2009 – 2030 / Forming a total of 54,000 ha of sea forests by 2030 with 3,000 ha per year (100% financed by the central government).
 - ※ 4-year project (1 year for creation and 3 years for management)
 - (Project description) Survey of the status of bleaching, creation of sea forests, development of technology for the creation, protection and conservation of natural seaweed beds; survey of effectiveness
 - (Current status) 15,251 ha has been created as of 2017 / 20 new locations (3,108 ha) in 2018*.
 - * 9 locations in East Sea, 1 location in West Sea, 4 locations in South Sea, 6 locations in Jeju Island
 - (Budget) KRW 34.7 billion (2016) → KRW 35.2 billion (2017) → 35.1 billion (2018)
- Create sea forests based on the survey of the status of bleaching and analysis of its causes (ongoing).
- Build coastal marine ranches to increase fishery resources and boost fishermen's income.

- (Period/target) 2006 – 2022 / Creating 50 marine ranches (50% financed by the central government, 50% financed by the local government)
 - ※ 5-year project for each ranch / A total of KRW 5 billion of investment with 1 billion per year (50% financed by the central government, 50% financed by the local government)
- (Project description) Creation of fisheries, resource recruitment, improvement of habitat environment, survey of effectiveness, etc.
- (Current status) 45 locations as of 2017 (30 locations completed, 15 under construction) / 20 locations in 2018 (15 under construction, 5 new locations*)
 - *New locations: Pohang, Seogwipo, Wando, Gochang, Ansan
- Increase fishermen's income and promote local economy through positive effects such as increasing fish catch and useful biomass in the established locations.
- Maintain seeds of marine organisms to systematize the release management for strategic varieties.
 - Release 108.57 million fish (10,160 *Oncorhynchus keta* and 697 others) between 2011 and 2018 / KRW 25 billion
- Facilitate the recovery of fishery resources by creating spawning grounds and habitats for specialized species for different sea areas.
 - *Amphioctopus fangsiao*, *Octopus dofleini*, *Thamnaconus modestus*, *Apostichopus japonicas*, *Liparis tanakae*, *Octopus minor* (2015 onwards, KRW 16.8 billion)

B. [MOF] Strengthening strategies for the recovery and management of fishery resources

- Enhance the method of setting and operating the Total Allowable Catch (TAC).
 - Improve the TAC allocation method which tends to encourage competitive fishing (shifting to individual quota), thereby preventing excessive catch.
 - Increase the number of fish species subject to the TAC and participating fishery businesses.
 - * Further apply the TAC system until 2022 to decreasing species such as *Trichiurus lepturus* and *Larimichthys polyactis* and strengthen the resource management system by increasing the number of fishery resource examiners.

Strategy 5. Laying the groundwork for implementation

Knowledge management and capacity building

Overview

I Aichi Target – E

Enhance implementation through participatory planning, knowledge management and capacity building.

I Relevance to the Sustainable Development Goals (SDGs)

Boost international collaboration and strengthen the means of implementation for sustainable development.

Adequate support is provided to complement various partnerships and mobilize financial resources that will enhance the ROK's capacity to take part in international collaboration and implement technology, knowledge and plans related to biodiversity.

Indicators and references

I Share of biodiversity-related ODA projects

Proportion of the budget appropriated for biodiversity-related ODA projects to the total ODA budget

I Number of data records accumulated in the NIBR traditional knowledge database

The number of data records both oral and written accumulated in the traditional knowledge database under the Progress of the Traditional Knowledge Project and the Medium-Term to Long-Term Plan of the National Institute of Biological Resources (NIBR)

I Number of biodiversity research projects

The number of research projects on biodiversity counted by the National Science & Technology Information Service (NTIS)

Target 1. Strengthening international collaboration

□ Current status and needs

- It is necessary to seek collaboration with countries that have advanced technologies and rich biodiversity and to pursue cooperation between the ROK and the DPRK. This is part of cooperation on knowledge and technology with respect to biodiversity conservation and expansion and of promoting the conservation and utilization of a variety of biological resources.
- The target corresponds to Aichi Target 19 on “enhancing, sharing and applying knowledge.”

Action plan 5-①-①	Building and implementing international cooperation systems	MSIT, MOFA, MAFRA, MOTIE, ME, MOF, RDA, KFS
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□ Key points

A. [MSIT] Strengthening the implementation of international collaboration on biodiversity

- Establish collaborative research networks with international biodiversity organizations and other relevant institutions and carry out national obligations.
 - Operate the Korean Biodiversity Information Facility (KBIF) under the Global Biodiversity Information Facility (GBIF).
 - Register in the national biodiversity resources database and link it to the GBIF data portal.
 - Lay the foundation for a research collaboration network with overseas science centers and museums of natural history.
- KBIF's plans for main project in 2018
 - Build domestic and overseas collaboration networks relating to biodiversity information.
 - Conduct surveys and research on biodiversity and publish scientific journals.
 - Operate the Korean Natural History Research Information System (NARIS) and establish a relevant database.
- Expand KBIF projects.
 - Scale up the Korean Biodiversity Consortium network (add 1 institution/year).
 - Enhance the linkage of data across ministries and step up registration of GBIF portal data (add 1 million

- data records/year).
 - Form a ROK-Mongolia cooperation network for joint research.
 - Collect basic data through a ROK-Mongolia joint survey.
 - Provide training to foster experts specialized in Mongolian natural history resources.
 - Publish a technical book on Mongolian natural resources.
 - ※ The ROK-Mongolia collaboration network has been in operation since 2006.
- B. [MAFRA] Paying contributions for sustainable conservation of crops related to food and agriculture**
 - Pay contributions as a member state of the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) (from 2011).
- C. [RDA] Reinforcing collaboration to secure diversity of overseas agricultural genetic resources**
 - With Georgia, conduct joint collection and research on the utilization of plant genetic resources (2015 – 2019).
 - With Russia, conduct joint collection and research on plant genetic resources (from 1996).
 - Introduce genetic resources of miscellaneous grain crops held by the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) in response to climate change and assess their characteristics (2017 – 2019).
 - Carry out joint surveys and collection of resources originating from Kenya (2017 – 2019).
 - Secure the diversity of useful overseas resources (2020 – 2025).
- D. [KFS] Bolstering collaborative projects on forest biodiversity through international organizations and agreements**
 - Step up activities to implement the Forest Ecosystem Restoration Initiative (FERI) of the CBD.
 - Hold workshops in collaboration with international organizations and related groups with the aim of transferring technologies to developing countries and building capacity to develop policies.
 - Contribute to the achievement of the Aichi Biodiversity Targets and the Sustainable Development Goals by selecting recipient countries, developing an action plan for their ecosystem restoration and executing direct projects.
 - Establish and operate a website to share information on projects and their outcomes.
 - Expand the implementation of the Forest and Landscape Restoration Mechanism (FLRM) projects in cooperation with the Food and Agriculture Organization (FAO).
 - Choose the recipient developing countries, set up action plans and implement them on site.
 - ※ Current recipient countries: Guatemala, Rwanda, Peru, Uganda, Lebanon, the Philippines, Cambodia
 - Raise awareness of forest and landscape restoration through the FAO and share and promote best practices.
- E. [MOTIE] Invigorating international cooperation on the safety management of living modified organisms (LMOs)**
 - Execute the Korea Biosafety Capacity Building Initiative in an effective manner.
 - Propose and implement an initiative aimed at securing the effectiveness of biosafety and capacity building in developing countries (USD 4 million, 2015 – 2020) with momentum from the seventh meeting of the Parties to the Cartagena Protocol on Biosafety (October 2014, Pyeongchang).
 - Provide financial support and perform relevant work for the ROK-led capacity building projects such as LMO Safety Management Education, which include training on risk assessment for developing countries as well as the Biosafety Clearing House (BCH) Capacity Building Program.
 - Finance projects led by the CBD Secretariat: LMO Risk Assessment Training and Capacity Building for the Detection and Identification of LMOs.
 - Boost international collaboration on biosafety in Asia centered on the national Biosafety Clearing House (BCH).
 - Strengthen international collaboration in Asia with respect to living modified organisms through various efforts such as the operation of the ABF (Asia BCH Family) portal initiated by national agencies responsible for the BCH.
- F. [Joint] Participating in multilateral initiatives on biodiversity and responding to related issues**
 - **(MOFA)** Take part in multilateral initiatives on biodiversity including the International Union for Conservation of Nature (IUCN), the Ramsar Convention on Wetlands, the Convention on Biological Diversity (CBD), and the Convention on International Trade in Endangered Species of Wild Fauna and Flora

- (CITES), and respond to relevant diplomatic issues.
- **(MOF)** Participate in multilateral initiatives on biodiversity including the Convention on Biological Diversity (CBD) and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

G. [MOFA] Participating in multilateral initiatives on marine and forest protection and responding to related issues

- Take part in multilateral initiatives on marine protection including the North-East Asian Subregional Programme for Environmental Cooperation (NEASPEC) and the Yellow Sea Large Marine Ecosystem (YSLME) and respond to relevant diplomatic issues.
- Participate in multilateral initiatives on forest protection including the United Nations Convention to Combat Desertification (UNCCD) and respond to relevant diplomatic issues.

H. [ME] Conducting joint research on overseas biological resources and establishing a collaborative system

- (Strengthen cooperative relationships) Respond to the Nagoya Protocol, build close relationships with providers of biological resources and lay the groundwork for benefit-sharing.
 - Provide comprehensive information on biodiversity to resource-providing countries whose research base for biological resources is limited by donating illustrated books on biodiversity (by 2023).
 - ※ Illustrated books: Biodiversity of Cambodia: Fishes in Tonle Sap Great Lake (2018), Birds of Tanzania (2019), Medicinal Plants of Vietnam (2020), Plants of Kosrae (2020), Medicinal Plants of Tanzania (2020), Orchids of Cambodia (2021)
 - Offer training to the civil servants of megadiverse but infrastructure-deficient countries who are responsible for the management of biological resources.
 - ※ 20 trainees from 9 countries per year (a total of 192 participants by 2023)
- (Expand international collaboration) Consider increasing the number of partner countries to provide various biomaterials to the bio industry (December 2018).
- (Secure useful resources) Support domestic industries by surveying and identifying useful overseas resources that are used as materials in the bio industry, by providing information on proven-effective useful resources and by offering the foundation for securing useful resources.
 - Discover overseas biological resources through joint research in Southeast Asian countries including Cambodia, Laos and Myanmar (February – March 2018, National Institute of Biological Resources (NIBR)).
 - ※ Hold a ROK-Myanmar deputy ministers' meeting to strengthen the collaboration network for biological resources and survey and discover biological resources in the Himalayan region (February 2018).
 - Designate target species to obtain by seeking related information, including patents and papers, on useful biological resources that are being utilized locally in partner countries
 - ※ Number of useful biological resources to be obtained: 796 species (2017 – 2018) → 800 species (2019 – 2020)
 - ※ Preferentially obtaining species requested by industries for their practical utilization by identifying demand among industry-academia-research consultative groups on biological resources
 - Verify the usefulness of the biological resources obtained, offer related information to the bio industry, and build the foundation to obtain materials.
 - ※ Publish and distribute to industries a yearly handbook by seeking information on patents of materials that have been legally acquired from partner countries and that have undergone analyses of their efficacy, and by collecting information on utilization by indigenous peoples (published and distributed the Overseas Useful Biological Resources I, II and III).

Action plan 5-①-②	Providing overseas support for biodiversity	ME, MOF
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□ Key points

A. [ME] Carrying out biological resources informatization projects for megadiverse countries (developing countries)

- Establish the foundation for acquiring and sharing information on overseas biological resources by providing support to developing countries that lack a strong informatization base with respect to the national biological resources information systems and infrastructure.

- (Project description) Intensify international collaboration by providing support with respect to the national biological resources information systems and infrastructure of developing countries that lack a strong base of informatization.
 - ※ Build a cooperative system for information with overseas institutions (2019) → Support informatization centering on Southeast Asia (2020 – 2021) → Expand to other regions (2022)
- Help acquire and use useful overseas resources by establishing the foundation to obtain and share information on overseas biological resources.

B. [MOF] Executing the CBD-SOI capacity building education project

- Fostering education leaders in the conservation of marine organisms for the ministries of SOI partnership countries and implementing practical training projects mainly for site directors from developing countries (by 2020)

Action plan 5-①-③	Building a cooperation system between the ROK and the DPRK	ME
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□ **Key points**

A. [ME] Securing ROK-DPRK communication and cooperation channels in the natural environment and laying the groundwork for mutual cooperation

- Establish an information system on biodiversity on the Korean Peninsula by supporting research on natural resources in the DPRK including research on the changes in ecosystems and biodiversity of the DPRK’s biosphere reserves (2019).
- Promote the designation of the Demilitarized Zone (DMZ), with its value to biodiversity conservation, as a biosphere reserve (2019).
 - ※ Designate the DMZ area in Gangwon-do Province as a biosphere reserve.
- Conduct ROK-DPRK environmental cooperative projects based on the New Economic Map of the Korean Peninsula (Ministry of Unification).
 - Designate the DMZ area and Mt. Geumgangsan as key districts for ecological and environmental resources, protect rare animals including *Nipponia Nippon*, and boost ROK-DPRK cooperation on biological resources to seek materials that can replace imports.

B. [ME] Establishing a system for joint surveys and cooperation on ecological and environmental resources to build a network of protected areas along the Baekdudaegan ecological axes that connect ecosystems in the ROK and the DPRK

- Prepare a ROK-DPRK joint survey to discover ecological and environmental resources on Mt. Geumgangsan.
 - Conduct a joint survey on the main ecological and environmental resources in Mt. Geumgangsan, a core ecological axis connecting the ROK and the DPRK, including fauna and flora, topography and history.
 - ※ At the moment, Mt. Geumgangsan is introduced primarily in terms of cultural assets and landscape, which does not put much emphasis on raising its ecosystem value.

Target 2. Preserving and utilizing traditional knowledge

□ **Current status and needs**

- Respecting and utilizing traditional knowledge helps fulfill international obligations with respect to the effective participation of local communities. This is because people and local communities have traditionally relied on biological resources, and because traditional knowledge contributes to the conservation and sustainable use of biodiversity.
- At the moment, it is difficult to define what traditional knowledge is, so it is urgent to discover traditional knowledge through literature. To go a step further, the traditional knowledge discovered needs to be applied and utilized in agriculture, forestry and fisheries.
- The target corresponds to Aichi Target 18 on “protecting traditional knowledge.”

Action plan 5-2-①	Finding traditional knowledge and building a database	MSIT, ME, MOF, RDA, KFS
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□ **Key points**

A. **[Joint] Discovering traditional knowledge in various sectors and accumulating data**

- **(MSIT)** Develop a system to analyze old literature and secure original texts.
 - Launch a web service on the East Asian traditional medical texts (2016).
 - Secure information on the 100 major old books of the East Asian medical science tradition, and open and build the relevant database (by 2023).
- **(RDA)** Explore traditional knowledge of agriculture and rural areas and establish a management system.
 - Conduct research on refining the classification system for traditional knowledge of agriculture and rural areas and on the application of traditional knowledge.
 - ※ Refine the Korean Traditional Knowledge Resource Classification (kTKRC) (by December 2018)
 - Pursue the national standardization of kTKRC (by 2020)
 - Search for the origins of traditional knowledge resources such as old literature, develop guidelines on the establishment of the database and carry out pilot applications.
 - ※ Develop guidelines on the establishment of the traditional knowledge database and conduct pilot applications (November 2019) → Establish the database and initiate relevant service (by 2023)
 - Establish a sustainable conservation and management system for traditional knowledge related to agriculture and rural areas.
- **(KFS)** Seek traditional forest knowledge (TFK)²⁾ based on the classification system (5 categories, 33 items of tangible knowledge, 29 of intangible knowledge).
 - ※ Propose ways to use TFK by identifying its uniqueness through comparison studies, especially for Baekdudaegan mountain villages.
 - Carry out a project to discover traditional forest knowledge from encyclopedic works in old literature.
 - ※ Establish rights to TFK and utilize TFK as FORESTory³⁾ resources.
- **(MOF)** Conduct field survey of traditional knowledge related to oceans and fisheries and provide public services.
 - Conduct surveys and interviews on inhabited islands, in fishing villages and in traditional markets across the country.
 - Provide public services through the Marine Bio-Resources Information System (MBRIS).
 - Make available the information that can be disclosed such as literature information and public traditional knowledge.
- **(ME)** Explore and discover traditional knowledge on the utilization of indigenous biological resources.
 - Survey traditional knowledge in three national parks in Jeollanam-do Province (Dadohaehaesang National Park, Wolchulsan National Park, Mudeungsan National Park) and traditional villages in Jeolla-do Province (eco-villages, clan villages, etc.) that have outstanding biodiversity or that are likely to retain unique traditional knowledge.
 - ※ Complete the survey of orally transmitted traditional knowledge associated with biological resources in 22 national parks of the ROK by 2020.
 - Extract old names of biological resources specified in old literature (e.g. medical and agricultural books, encyclopediae), identify, apply the current taxonomy, conduct a survey of biological knowledge (old names, shapes, ecology and uses) and carry out a detailed analysis of the utilization of knowledge.
 - ※ Complete the survey of biological knowledge found in the 55 major works of old literature by 2020.
 - Informatization by developing a database of traditional knowledge related to the utilization of biological resources found in both orally transmitted traditions and old literature. Provide a browsing service for traditional knowledge handed down through old literature.
 - ※ Provide search-based species information service for traditional knowledge in 2020.

²⁾ TFK: Traditional Forest Knowledge

³⁾ FORESTory: Storylines to discover, share and disseminate the history, memories and stories of traditional forest knowledge centering on forest cultural assets

Action plan 5-2-2	Utilizing traditional knowledge	ME, MOF, RDA, KFS
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□ **Key points**

A. [Joint] Expanding research on biological resources to enhance the utilization of traditional knowledge

- **(ME)** Conduct research on useful microorganisms among traditional freshwater species and carry out research on the development of technology to utilize them in industries through systematic management (10 cases by 2023).
 - ※ Develop application technologies by collecting information from orally transmitted traditions or old literature and establishing formulations.
- **(ME)** Carry out research on the functionality, effectiveness and biological activities of new materials derived from freshwater biological resources with high added value (30 cases by 2023).
 - ※ New materials derived from freshwater biological resources: Materials with maximum functionality generated from freshwater biological resources with the help of technologies such as fermentation and bioconversion
- **(ME)** Create high value-added industries utilizing functional materials derived from freshwater biological resources and convergence technologies (1 case in 2017 to 3 cases by 2023).
 - Lay the groundwork for creating opportunities for new projects and commercialization by implementing projects to develop functional products based on traditional knowledge.
 - ※ Analyze the links between and the level of traditional knowledge-related projects and seek measures for collaboration with relevant companies.
- **(MOF)** Extract natural materials from marine species based on traditional knowledge.
 - Establish the foundation for applied research including basic surveys of biological activities and distribution (5 species per year).

B. [RDA] Utilizing traditional knowledge of agriculture and rural areas and building the foundation for value creation

- Conduct research on the promotion of local marketing for the agricultural industry with the use of traditional knowledge.
 - Carry out research on the utilization of local marketing for traditional resources such as local products and native species.
 - Conduct research on access and benefit-sharing of traditional knowledge related to agricultural bio-resources.
 - Pursue research on the distribution of traditional knowledge and its utilization in the agricultural industry.
- Conduct research on the creation of new value from traditional knowledge of agriculture and rural areas.
 - Conduct research on the valuation and practical utilization of traditional knowledge of agriculture and rural areas.
 - Carry out research on the dissemination of the value of traditional knowledge and relevant support strategies.

C. [KFS] Develop measures to restore, manage and utilize traditional village forest

- Discover and restore traditional village forest on a continuous basis.
 - Prioritize villages with concerns about damage or disconnection or where residents actively participate in discovery and restoration efforts. ※ Restore 149 locations (by 2020).
 - Restore village forests as forests with unique characteristics considering their traditional functions such as landscape/feng shui, environmental control, culture/religion, recreation/tourism and nature/ecosystem.
 - ※ Designate a traditional village forest with a high value in terms of history, culture, legend and indigenous as a forest cultural asset.
- Establish a traditional village forest database and expand its utilization.
 - Build a database including information on old big trees for the systematic management of traditional village forests.
 - Identify ways to expand the utilization of traditional village forest that will enable residents' direct participation and promote cultural succession including local festivals, linking to adjacent tourist attractions and forest guide programs.

Target 3. Fostering scientific knowledge and advancing policy cooperation

□ Current status and needs

- Sufficient information is required for effective decision making to conserve biodiversity, detect threats and ensure sustainable use. In fact, many countries face difficulties in achieving their goals because of a lack of information.
- Encouraging the research and development of new technologies on biodiversity and facilitating monitoring activities will expedite the attainment of other targets, thereby contributing to the implementation of related strategies and plans.
- The target corresponds to Aichi Target 19 on “enhancing, sharing and applying knowledge.”

Action plan 5-3-①	Conducting basic surveys of natural environment	ME, MOF
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□ Key points

A. [ME] Revamping the system for survey projects on the natural environment

- Refurbish the system for survey projects in order to improve the efficiency of natural environment surveys conducted by 5 institutions including the National Institute of Biological Resources (NIBR) and the National Institute of Environmental Research (NIER) (from 2019).
 - Perform long-term ecological monitoring utilizing ICT technologies and citizen science and develop plans and prepare guidelines for the Fifth National Natural Environment Survey (2019 – 2023) (from 2019).
 - Streamline similar or overlapping projects, improve field surveys that rely on external surveyors, and build an integrated system to enhance the application of survey results.
 - Lay the groundwork for improving the natural environment policy system, for example, by establishing taxonomies by type of ecosystem and resource and by developing an ecosystem service assessment system that uses standardized survey and assessment techniques.

B. [ME] Standardizing the ecosystem monitoring system

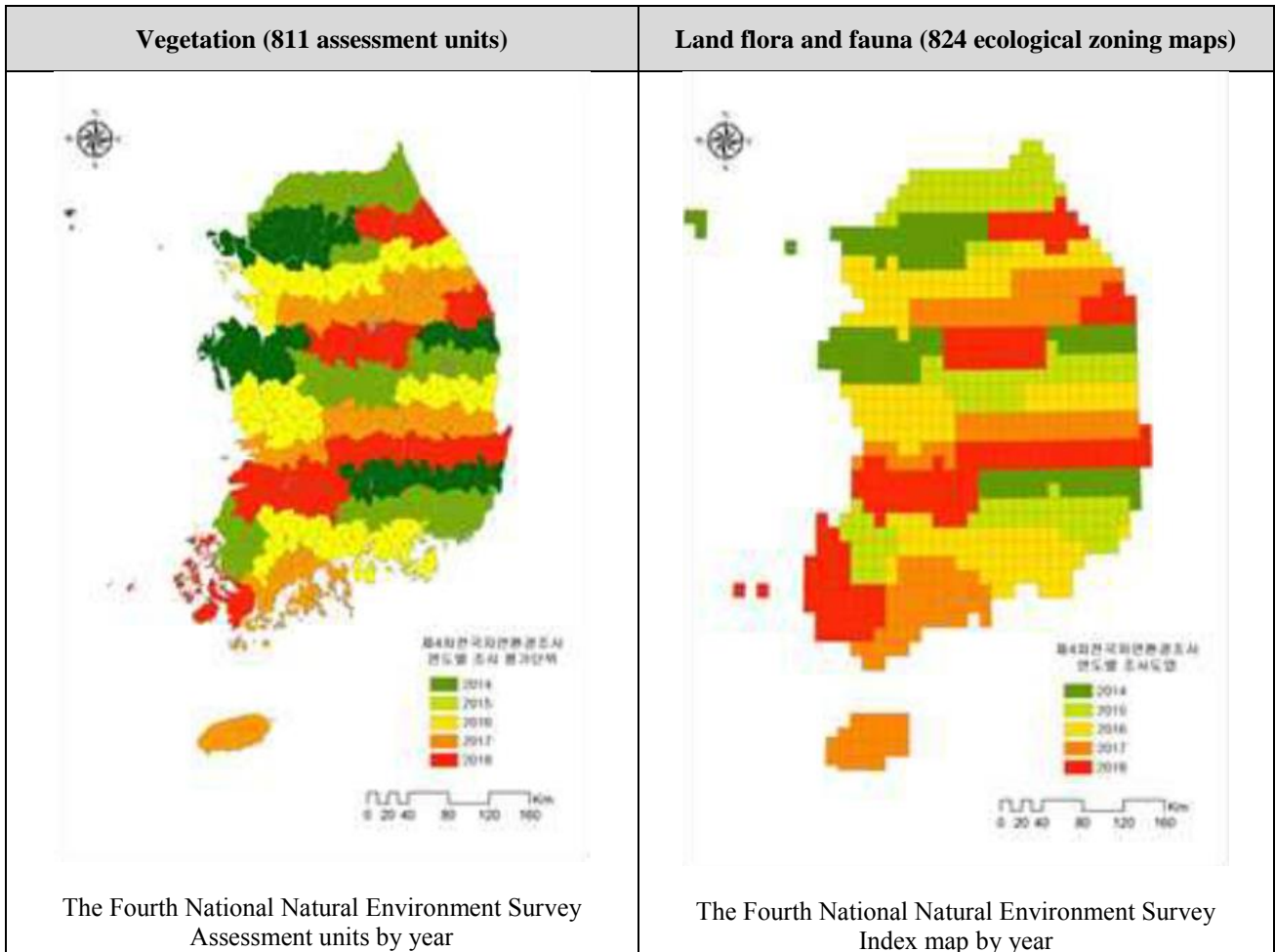
- Establish an integrated ecosystem monitoring system among affiliated research institutes under the ME.
 - Build a standardized monitoring system and database applicable to basic surveys carried out by each research institute.
 - Increase efficiency in the utilization of survey data and avoid redundant surveys through the integrated management of basic survey data by function and type of ecosystem.
 - Lay the foundation for understanding and responding to the changes in national ecosystems by providing basic data for research on interactions within and between ecosystems.
- Develop an ecosystem monitoring network among ministries at the national level.
 - Establish a consistent monitoring system and database.
 - Build a network connecting the basic ecosystem survey systems of different ministries including the ME, the KFS and the RDA.
 - Share basic survey data through the basic monitoring network, improve the efficiency of utilization, and avoid redundant survey efforts among ministries.
 - Increase the utilization of basic survey data at the policy level through assessments and valuations of ecosystem services at the national level and understanding the interactions between ecosystem services.

C. [Joint] Conducting a basic survey of each ecosystem

- **(MOF)** Implement a comprehensive survey of national marine ecosystems.
 - Conduct monitoring 1 to 4 times on tidal flats, coasts and aquatic ecosystems as well as seabirds across marine areas in the ROK and establish a database.
 - (Tidal flats) Sedimentary environment, large zoobenthos, seabirds, halophytes
 - (Estuary, upwelling) Marine environment, zooplanktons, phytoplanktons, large zoobenthos, ichthyoplanktons
 - (Aquatic) Marine algae, benthic invertebrates, fish, coral communities
 - ※ Set targets for a comprehensive survey based on the results of monitoring conducted by 2022 (current target is to build the database with 60,000 data entries annually).
- **(ME)** The Fifth National Natural Environment Survey (2019 – 2023)
 - Identify the physical environment of biodiversity and ecosystems by conducting surveys of main geomorphological landscapes, vegetation, and flora and fauna distributed across the country.




※ Legal basis: Article 30, Paragraph 1 of the Natural Environment Conservation Act (Investigation of Natural Environment): Investigate the natural environment of the nation every 5 years.

- Divide the country into 824 ecological zoning maps (1:25,000 topographic map), then split 1 map into 9 grids, and conduct a survey for each field following the order specified in the Fourth National Natural Environment Survey.
- Conduct surveys of topography, vegetation, flora, insects, birds, mammals, amphibians, reptiles, benthic macroinvertebrates and fish.
- Carry out a survey of vegetation by dividing the country into 811 assessment units taking into account the continuity of vegetation communities, topography and the current status of land use.



Year	2019	2020	2021	2022	2023	Total
Ecological zoning maps (ea.)	160	165	170	169	160	824
Assessment units	160	165	165	165	156	811

- Shift from surveys centered on the status of species distribution to surveys aimed at evaluating and assessing the status of habitats and the health of ecosystems in accordance with the reorganized system of the Fifth National Natural Environment Survey.

First – fourth (1986 – 2018)	Fifth (2019 – 2023)	Sixth (2024 - 2028)
		
Distribution of species	Distribution of species and status of habitats	Survey and assessment on the health of ecosystems

- Enhance the reliability of information for ecological zoning maps by collecting more precise survey results through the expanded application of GIS/RS, drones and unmanned sensor cameras.
- Adopt more sophisticated survey techniques through intensive R&D and improve the utilization of survey results. This should include cause analyses for ecosystem changes and comprehensive analyses for the preparation of alternatives.
- **(ME)** Conduct surveys, assessments and monitoring of biodiversity in national parks.
 - Obtain habitat data, including biological data, on 4 or 5 parks every year.
 - ※ Identify the status of environmental factors affecting wildlife habitats, such as habitat structure and weather, for different habitat types.
 - Identify the status of factors affecting habitats, prepare park policies for the conservation of habitats and establish the foundation for a conservation and management response system.
 - Update the status of habitats in parks and strengthen the monitoring system to ensure a prompt policy response.
 - Identify changes in habitat data with respect to the conservation of communities of endangered species and the reduction of the damage caused by hazardous species.
 - Introduce an information system in response to adverse impacts such as damage and disturbances to habitats.
 - Improve the conservation and management system for habitats by enhancing the information system to enable the transfer and sharing of information in an accurate and timely manner.

Action plan 5-3-②	Strengthening the research base	ME
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□ **Key points**

A. [ME] Establishing and operating the national biodiversity clearing-house mechanism

- Share information with 60 agencies under 6 ministries including the MSIT, the ME and MAFRA.
 - Sharing about 11.74 million pieces of biodiversity data (2017) including that related to biological and genetic resources (about 11.53 million), genetic information (about 30,000) and species information (about 180,000) (2017).
 - ※ National biodiversity statistics: <http://www.kbr.go.kr>
 - Refine and optimize the linkage of national biodiversity information (2017).
- Ensure the comprehensive management of biodiversity and biological resources information held by domestic and overseas institutions and the private sector.
 - Provide the Global Biodiversity Information Facility (GBIF) with biodiversity information (from 2018).
 - Enhance the comprehensive management of biodiversity information linked to relevant ministries, local governments and the private sector, and strengthen the linkage of information (from 2018).

B. [ME] Operating projects to foster biodiversity experts

- The Act on the Conservation and Use of Biological Diversity taking effect in 2012 and the full implementation of the Nagoya Protocol necessitate the nurturing of experts in biodiversity and biological resources in order to strengthen the nation's sovereignty over biological resources.
 - ※ The passing of the Act on Access to and Utilization of Genetic Resources and Benefit-Sharing

(January 2017), the ratification of the Nagoya Protocol (May 2017) and the ROK's accession to the Nagoya Protocol (August 17, 2017) call for the ROK to enhance its national sovereignty over biological resources.

- Establish sustainable research infrastructure in the field of biodiversity and biological resources by nurturing local experts for undiscovered taxa.
- Strengthen government policies and encourage industries to help nurture international experts with the capacity to respond to the CBD and the Nagoya Protocol.
- Operate the following 2 projects to foster experts specialized in biodiversity (since 2012).

Project name	No. of trainees	Journals & dissertations published	No. employed	No. of degrees obtained	Others
Fostering Experts for Undiscovered Taxa (2012 – 2017)	70	96	39	55	6 academic conferences, 108 overseas training sessions
Fostering Experts in Biodiversity and Economics (2014 – 2017)	70	24	15	22	62 reports

- Continue to carry out the 2 aforementioned projects: Fostering Experts for Undiscovered Taxa and Fostering Experts in Biodiversity and Economics (from 2018).
 - Foster experts in the taxonomy of domestically undiscovered taxa including insects, invertebrates and microorganisms (e.g. algae, eumycetes) (45 experts per year).
 - ※ Pursue expert-fostering projects in 4 fields that involve numerous undiscovered indigenous taxa including insects, invertebrates (non-insects), microorganisms and integrated taxa.
 - ※ Prioritize the nurturing of experts in morphological taxonomy with considerations for the characteristics of each taxon.
 - Nurture CBD experts and conduct relevant joint research.
 - ※ Identify projects that can respond to the national biodiversity strategies and through which policy proposals can be made by referring to the decisions of the Conference of the Parties to the CBD and the Aichi Biodiversity Targets (2011 – 2020), and conduct joint research for each project selected.
 - Operate the Global Capacity Building Academy for Biodiversity (from 2019).
 - ※ Plan and operate programs to nurture experts on international conventions on biodiversity.
 - Prepare a separate system to foster experts on sustainable future (from 2019).

C. [ME] Establishing new nature and ecology research institutes by zone

- Build research facilities in the fields of nature and ecology with the aim of studying biological resources and maintaining and managing biological specimens.
 - Establish biological resource institutes connected to the National Institute of Biological Resources (NIBR) in each zone by considering the distribution of biological resources and topographic characteristics.
 - Secure national sovereignty over the ROK's biological resources and support the country's bio industry as an active response to the utilization of indigenous species as resources and to competition for national biological resource sovereignty.
- Build the Honam National Institute of Biological Resources (by 2019).
 - Honam National Institute of Biological Resources: an institute designed to investigate, discover and study indigenous biological resources in the Honam area and its islands and coasts (rare and unrecorded species continually being discovered).
 - The institute is expected to develop technologies to conserve and utilize biological resources in islands and coasts, to support practical utilization and industrialization, and to help raise awareness of biological resources in the Honam area and foster human resources.

Action plan 5-3-3	Citizen science	ME, MOF
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□ **Key points**

A. [ME] Expanding the utilization of citizen science monitoring

- Conduct monitoring on climate-sensitive biological indicator species (CBIS) with public participation.
 - Revise the National Climate-sensitive Biological Indicator Species, which contains species that people can easily observe and recognize in their daily lives (100 species and 30 candidate species in 2017).
 - Enhance the participation of the general public and civic organizations (about 150 citizens from 22 organizations participated in 2018).
 - Help local governments (Seoul, Busan, Incheon) to operate the BioBlitz (provide experts from 2014).
 - Secure monitoring data including the CBIS based on public participation (citizens from civic organizations or clubs).
 - Encourage the active participation of the general public for the conservation of their respective regions' biodiversity and promote public awareness (5 events per year including workshops, 2019 – 2023).
 - Obtain data efficiently by providing customized monitoring guidelines and regular education for the general public (7,000 times per year, 2019 to 2023)
 - Encourage the participation of local citizens in BioBlitz, run by local governments, and raise public awareness of biodiversity (Busan (May 2018), Seoul (June 2018), Incheon (September 2018), 2019 – 2023; experts and support provided every year).
 - Perform long-term ecological monitoring utilizing citizen science and develop plans and prepare guidelines for the National Natural Environment Survey (from 2019).
- Expand governance for public participation in biodiversity efforts.
 - Promote communities by supporting the establishment of the citizen scientist information system and the provision of relevant services.
 - Establish a comprehensive management and utilization system by entering information suitable for users (general users, students and experts) and employing differentiated management tools.
 - Provide cloud-based information services for the informatization of privately-held biological resources including those held by the general public, universities and research institutes, and for the comprehensive management of biological resources.
 - ※ Service providing a standardized system and infrastructure for the systematic management and informatization of privately-held biological resources that have not been managed well due to a lack of an informatization base.
 - Support the linkage of privately-held biological resources information to the national biodiversity clearing-house mechanism.
- Boost participation of the private sector (citizens) in surveys on wetlands.
 - Create and operate a pool of wetland survey experts from the private sector and set up plans to carry out surveys of the private sector (2019).
 - ※ Mobilize the experience and knowledge of private-sector human resources such as those from private sector organizations and experts, and engage them in conducting surveys on wetlands for different regions and establish conservation and management measures.
 - Conduct a pilot version of a wetlands survey using experts from the private sector (2020), and select and utilize the best practices of wetlands surveys performed by private-sector experts (2020).
 - Develop guidelines for wetlands surveys to be conducted by science and technology experts to encourage the conducting and use of wetlands surveys (2019).
 - Make available online and offline the results of surveys performed by science and technology experts, develop the two-way application of wetlands surveys and conduct trial runs (2020).

B. [MOF] Improving the citizen monitoring system for coastal wetland protected areas

- Strengthen the function of citizens in monitoring the conservation and management of marine ecosystems, and enhance its linkage to policies.
 - Promote the mandatory participation of local residents and tidal flat ecology guides in conservation and management tasks.
 - Develop and operate capacity building programs to nurture experts on the operation of citizen monitoring in each region (area).
- Practice comprehensive management for the operation of citizen monitoring.
 - Select citizen monitoring staff; ensure a single, consistent operating system, and promote comprehensive management at the Sea Ecology Information Center (ecosea.go.kr) by establishing a database of basic data such as reports.

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