

**JICA Biodiversity Finance Impact Tool (Biodiversity-FIT)
Guidance on Biodiversity Mainstreaming**

**Part II
Sector-Specific Guidance for Biodiversity
Mainstreaming**

Environmental Management Sector

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1. Importance of Biodiversity in the Environmental Management Sector

1.1 Relationship between Ecosystem Services and Environmental Management

The environmental management sector benefits significantly from ecosystem services through a wide range of activities, including waste management, the protection of water and air quality, and soil remediation. For example, natural processes such as waste decomposition and purification, the natural self-purification of water and air, soil water retention and filtration functions, the mitigation of floods and landslides, and the moderation of urban heat island effects all form the foundation of effective environmental management.

Conversely, when environmental management is inadequate, factors such as improper waste treatment and landfilling, the discharge of untreated wastewater or emissions, and soil contamination can undermine the capacity of ecosystems to provide essential services. This can in turn lead to a range of negative socio-economic impacts, including increased flooding and soil erosion, the generation of odors, noise, and dust, the loss of biodiversity, and the deterioration of living environments for local residents.

In this context, environmental management projects are increasingly expected to adopt nature-positive approaches that maximize the benefits derived from ecosystem services while promoting the conservation and restoration of natural capital. Examples include incorporating ecosystem considerations into the siting of landfills and wastewater treatment facilities, the creation of green spaces and biotopes, the promotion of a circular economy, and community-based environmental education and monitoring. These initiatives contribute not only to reducing environmental pressures, but also to maintaining and enhancing ecosystem services, strengthening community resilience, and advancing progress toward the SDGs. In this way, the environmental management sector can be regarded as a key sector that addresses complex challenges such as climate change, urbanization, and population growth, while leading the transition toward a nature-positive society.

1.2 Ecosystem Services through Environmental Management and Local Communities

Biodiversity in the environmental management sector is closely intertwined with local communities and cultures through a wide range of activities, including waste management, wastewater treatment, air and water quality management, and greening initiatives. Local natural environments and ecosystem services, such as water purification, air purification, soil retention, and the provision of urban green spaces, support the foundations of safe and hygienic living conditions for residents. At the same time, traditional knowledge and practices related to resource circulation and living in harmony with nature, such as household composting of organic waste, rainwater harvesting, and the conservation of local green spaces, contribute to strengthening community ties, fostering environmental awareness, and building the foundations for contemporary circular societies and sustainable environmental management. In this way, integrating biodiversity considerations into

environmental management not only supports sustainable environmental practices but also reinforces local livelihoods and cultural values, making it a key element in advancing both sustainable environmental management and resilient, community-centered development.

1.3 Global and Domestic Initiatives toward Nature Positive Approach in the Environmental Management Sector

In the Kunming–Montreal Global Biodiversity Framework (GBF) adopted in 2022, achieving nature-positive outcomes defined as halting and reversing biodiversity loss by 2030 was set as a global objective. International organizations such as UNEP, IUCN, and the World Bank are promoting policy integration and practical approaches based on Nature-based Solutions (NbS) in the environmental management sector¹. These approaches include incorporating ecosystem considerations into the siting of waste treatment and wastewater treatment facilities, introducing green infrastructure, conserving and restoring wetlands and forests, improving water and air quality through the use of natural purification functions, and advancing a circular economy. In addition, the Taskforce on Nature-related Financial Disclosures (TNFD) is driving changes in corporate decision-making and financial flows including those involving environmental management businesses through the disclosure of nature-related risks and opportunities².

In response to these initiatives, multilateral development banks (MDBs) revised the Common Principles for Tracking Nature Finance in November 2025 and introduced a new “Common Nature Finance Taxonomy³”. This taxonomy classifies investments and projects that contribute to nature-positive outcomes into four categories: (a) restoration and conservation of biodiversity or ecosystem services; (b) reduction of the direct drivers of biodiversity or ecosystem services loss; (c) integration of nature-based solutions across economic sectors; and; and (d) design and implementation of policy, tools or other sectoral instruments enabling (a) to (c). The taxonomy standardizes eligible activities across seven sectors⁴, including the transportation sector (such as ports, waterways, maritime shipping, and linear infrastructure), and is positioned as a framework to enhance the consistency and transparency of nature finance. Furthermore, the International Capital

¹ IUCN (2020). “Guidance for using the IUCN Global Standard for Nature-based Solutions”.

<https://iucn.org/resources/publication/iucn-global-standard-nature-based-solutions-first-edition>

World Bank (2021). “A Catalogue of Nature-based Solutions for Urban Resilience”.

<https://documents.worldbank.org/en/publication/documents-reports/documentdetail/502101636360985715>

² TNFD (2023). “Recommendations of the Taskforce on Nature-related Financial Disclosures”.

<https://tnfd.global/publications/recommendations/>

³ World Bank (2025). “MDB Common Nature Finance Taxonomy”.

<https://www.worldbank.org/en/topic/environment/publication/mdb-common-nature-finance-taxonomy>

⁴ 1. Forestry, agriculture, fisheries, and aquaculture, 2. Mining and energy, 3. Transportation, 4. Waste management, water, and sanitation, 5. Industry, trade, and services, 6. Financial sector, and 7. Cross-cutting themes (Renewable Natural Resources Asset Management, Urban Development and Disaster Risk Management, Green Buildings)

Market Association (ICMA) published “Sustainable Bonds for Nature: A Practitioner’s Guide⁵” in June 2025, providing practical guidance for the issuance of sustainable bonds targeting projects that contribute to biodiversity and natural capital. These initiatives reflect the expanding scale of nature-related investment in international capital markets, including investments in urban and regional development.

Domestically, the “Annual Report on the Environment, the Sound Material-Cycle Society and Biodiversity in Japan (2023)”, formulated by the Ministry of the Environment, Japan, articulates a vision for the simultaneous achievement of net-zero GHG emissions, a circular economy, and a nature-positive. Within this framework, strengthening biodiversity conservation and resource circulation in the environmental management sector is emphasized through initiatives such as waste management, wastewater treatment, the introduction of green infrastructure, the utilization of renewable energy, and the promotion of environmental education and community participation. Furthermore, the “Sixth Basic Environment Plan” and the “Fundamental Plan for Establishing a Sound Material-Cycle Society” (both formulated in 2024) clearly position the promotion of international cooperation and technical assistance to developing countries as key policy priorities. Based on these plans, the Ministry of the Environment, local governments, private sector entities, and academic institutions are working collaboratively to advance environmental management practices and facilitate technology transfer both domestically and internationally. Japan has accumulated world-leading expertise in areas such as waste management, wastewater treatment, the development of circular economy systems, and community-based environmental initiatives. By leveraging this knowledge and experience, Japan is actively contributing to international cooperation aimed at enhancing environmental management and supporting the transition toward sustainable and nature-positive societies worldwide.

Based on the JICA Global Agenda with 20 Strategies for Global Development, JICA promotes environmental management initiatives centered on practical support for reducing local environmental risks, the promotion of a circular economy and resource circulation, and environmental improvement through community participation. Through these efforts, JICA contributes to the achievement of the SDGs, particularly Goals 6, 11, 12, 13, and 17. The environmental management sector plays a critical role in addressing complex and interlinked challenges such as climate change, urbanization, and population growth, while simultaneously leading the transition toward a nature-positive society.

Furthermore, projects for which biodiversity mainstreaming in development operations has been examined using this guidance and for which contributions to biodiversity are confirmed will be

⁵ International Capital Market Association (2025). “Sustainable Bond for Nature: A Practitioner’s Guide”. <https://www.icmagroup.org/assets/documents/Sustainable-finance/2025-updates/Sustainable-Bonds-for-Nature-A-Practitioners-Guide-June-2025.pdf>

reported to the OECD-DAC under the Rio Marker for Biodiversity⁶, and will also be communicated externally.

2. Major Challenges and Potentials of Biodiversity in the Environmental Management

2.1 Impacts of Ecosystem Services on Environmental Management Projects (Dependencies)

The Millennium Ecosystem Assessment (MA) and the Economics of Ecosystems and Biodiversity (TEEB) classify ecosystem services into four categories: provisioning services, regulating services, habitat (supporting) services, and cultural services. In environmental management projects, regulating services such as air and water purification, waste decomposition, climate regulation, and disaster risk reduction, and cultural services, including sanitation and landscape quality, public health and well-being, and environmental education, play particularly important roles.

When ecosystem services are degraded, inappropriate waste treatment or disposal and declines in wastewater treatment performance can pose serious risks to the outcomes of environmental management projects and to local living environments. Such degradation may result in the spread of odors and hazardous substances, deterioration of water and air quality, increased risks of infectious diseases, landscape degradation, and adverse health impacts on residents. In addition, climate change and advancing urbanization are giving rise to new challenges, including increased pressure on waste and wastewater treatment facilities, heightened disaster risks, and declining levels of sanitation and safety within local communities.

Conversely, environmental management projects that incorporate the conservation and restoration of natural environments present opportunities to deliver multiple co-benefits through the maintenance and enhancement of ecosystem services. These benefits include reduced disaster risks, improved adaptive capacity to climate change, enhanced public health, and strengthened community resilience. The introduction of green infrastructure, community-based environmental improvement activities, and the promotion of a circular economy contribute to sustainable environmental management by strengthening regulating and cultural services. Furthermore, the establishment of local environmental management bodies and coordination platforms can facilitate consensus-building among stakeholders and contribute to improvements in sanitation, safety, and

⁶ Since 2002, projects that contribute to at least one of the three objectives of the Convention on Biological Diversity (CBD)—namely, (i) the conservation of biological diversity, (ii) the sustainable use of its components (ecosystems, species, or genetic resources), and/or (iii) the fair and equitable sharing of the benefits arising from the utilization of genetic resources—have been reported as the Rio Marker for Biodiversity in the OECD-DAC Creditor Reporting System (CRS) statistics.

The criteria for assigning the Rio Marker “Biodiversity” under the OECD-DAC are set out in the following official guidance documents:

[https://one.oecd.org/document/DCD/DAC/STAT\(2018\)26/FINAL/en/pdf](https://one.oecd.org/document/DCD/DAC/STAT(2018)26/FINAL/en/pdf)

health at the community level.

As environmental management projects are highly dependent on ecosystem services, promoting project design and implementation based on a comprehensive assessment of both the risks and opportunities associated with ecosystem services is essential for achieving sustainable environmental management.

2.2 Impacts of Environmental Management Projects on Ecosystems (Impacts)

Environmental management projects can have negative impacts on ecosystem services when waste is improperly treated or disposed of, when landfills are inadequately managed, when wastewater is discharged without proper treatment, or when excessive land modification occurs. Such practices can lead to the deterioration of water and air quality, loss of biodiversity, soil contamination, landscape degradation, and adverse health impacts on local residents, resulting in the decline of regulating and cultural services. In addition, increases in waste generation and wastewater volumes associated with urbanization and population growth can place pressure on existing infrastructure, heighten disaster risks, and undermine sanitation and safety within local communities.

At the same time, there are cases in which environmental management projects contribute to the maintenance and enhancement of ecosystem services and lead to nature-positive outcomes. For example, appropriate waste management and the promotion of recycling, the upgrading of wastewater treatment facilities, the introduction of green infrastructure, and community-based environmental improvement activities can improve water and air quality, support biodiversity recovery, reduce disaster risks, enhance public health, and improve the local landscape, thereby strengthening regulating and cultural services. Furthermore, the promotion of a circular economy and the enhancement of environmental education can raise environmental awareness and foster the adoption of sustainable lifestyles within local communities.

As such, environmental management projects can generate both negative and positive impacts on ecosystem services. It is therefore essential to accurately assess risks and opportunities during the planning and implementation stages and to maximize contributions toward a nature-positive society.

3. Mainstreaming Biodiversity in Practice (Environmental Management Sector)

Biodiversity mainstreaming in development projects refers to the integration and practical application of perspectives on natural capital and biodiversity throughout all stages of a project, including planning, implementation, monitoring, and evaluation. This chapter introduces a practical approach to biodiversity mainstreaming in the environmental management sector through the following five steps. An overview of the entire process is provided in Part I, “5. Mainstreaming Biodiversity in Practice (Overview).”

3.1 Step 1: Identification of Interfaces between Project Activities and Natural Capital and Ecosystem Services, and Preliminary Consideration of Response Measures

Project activities in the environmental management sector benefit from a wide range of ecosystem services derived from natural capital, while at the same time exerting various impacts on natural capital and ecosystems. These dependencies and impacts are closely linked to the biodiversity of the project area and therefore require appropriate understanding and responses.

In this first step, the project identifies how the planned project activities depend on ecosystem services and how they affect natural capital and ecosystems (i.e., the project’s interfaces with ecosystem services). To this end, the department responsible for the project uses the Sector-specific Ecosystem Impact Matrix to examine the degree of dependency on and impact on ecosystem services associated with the project. This matrix is developed with reference to assessments under ENCORE (Exploring Natural Capital Opportunities, Risks and Exposure)⁷ and evaluates the degree of interaction between project activities and ecosystem services, provisioning services, regulating services, habitat (supporting) services, and cultural services, using a five-level scale (see Figure 1). In addition, by referring to the List of Response Measures to Ecosystem Impacts (see Figure 2), an initial examination is conducted of potential response measures that may be considered based on the identified points of interaction.

Activities in each Sector and Sub-sectors		Touchpoints with Ecosystem Services																											
		Provisioning Services							Regulating Services													Habitat Services			Cultural Services				
		Water	Food	Medicine	Genetic Material	Climate Regulation	Water Regulation	Regulation of Air Quality	Emission Prevention	Soil Quality (including and excluding)	Water Purification	Air Pollution	Waste Remediation	Atmosphere Noise and Light	Biological Control	Pollination	Provision of Habitats and Ecosystems	Maintenance of Genetic Diversity	Cultural Activities and Opportunities	Preservation of Natural Landscapes	Scientific and Historical Values								
Environmental Management Sector	Environmental Management Sub-sectors	Provisioning Services	Regulating Services	Habitat Services	Cultural Services	Material recycling	Sanitation activities and other solid waste management	Collection of solid waste	Processing and disposal of solid waste	Provisioning Services	Regulating Services	Habitat Services	Cultural Services	Material recycling	Sanitation activities and other solid waste management	Collection of solid waste	Processing and disposal of solid waste	Provisioning Services	Regulating Services	Habitat Services	Cultural Services	Material recycling	Sanitation activities and other solid waste management	Collection of solid waste	Processing and disposal of solid waste	Provisioning Services	Regulating Services	Habitat Services	Cultural Services

Source: Prepared by JICA based on data provided by ENCORE

Figure 1 Sector-specific Ecosystem Impact Matrix (Illustrative Image)

⁷ ENCORE is a natural capital assessment tool jointly developed by UNEP and other partners (<https://encore.naturalcapital.finance>). As ENCORE is based on industry classifications designed primarily for corporate and economic activities, it should be noted that the specific activities of JICA projects may not be fully covered.

In the List of Response Measures, the main response measures to the anticipated ecosystem impacts are organized for each activity in the environmental management sector shown in Table 1, and are summarized in the areas highlighted by the red boxes in Figure 2.

Table 1 List of Activities Organizing Response Measures to Ecosystem Impacts in the Environmental Management Sector

No.	Sub sector	Activities
1	Improvement of waste management and promotion of a sound material-cycle society	Establishment of Collection, Transportation, and Final Disposal Systems for General Waste
		Development of collection and transport vehicles and disposal site equipment
		Improvement of final disposal site
		Reduction and mid-stream management of wastes (separation, composting, etc.)
		Strategy to Promote Circular Economy through Waste Reduction and Recycling
2	Promotion of healthy environment through appropriate environmental regulations and pollution control measures	Development of Sewage and sludge management facilities
		Operation of Wastewater treatment plants
		Improvement of water quality and urban environments
		Promotion of air quality improvement measures

Source: Prepared by JICA

No.	Environmental Management: Sub-sectors	Activity Group	Activities and Countermeasures	Affected ecosystem services (Based on TEEB)	Effects of activities and countermeasures (Risk avoidance / response, and opportunity enhancement)
1	Improvement of waste management and promotion of a sound material-cycle society	Establishment of Collection, Transportation, and Final Disposal Systems for General Waste	Measures to Prevent Animal Intrusion at Waste Collection Points (Use of Lidded Containers, Nets, Shortening Collection Times, etc.)	Habitat and nursery service (habitat and nursery maintenance)	- Suppress ecosystem impacts by preventing changes in wildlife feeding behavior and avoiding intrusion into human living areas.
			Prevention of roadkill through the adjustment of garbage collection and transport times, optimization of route design, and implementation of safe driving practices	Habitat and nursery service (habitat and nursery maintenance) Regulating service (attenuation of noise and light)	- Reduce wildlife collision risks and minimize disturbance to ecological processes such as foraging, movement, and reproduction by avoiding wildlife activity periods and areas. - Conserve biodiversity by reducing wildlife collision risks caused by transport trucks.
			Introduction of low hazard vehicles (Higher fuel efficiency vehicles, EVs, CNG vehicles, etc.)	Regulating service (climate regulation, air filtration, attenuation of noise and light) Provisional service (food, material, medical, and amenity resources)	- Reduce fossil-fuel consumption, GHG emissions, and air pollutants from vehicle operation through transition to low-emission vehicles. - Reduce air-pollutant emissions and noise where diesel and gasoline vehicles are replaced.
			Adjustment of waste facility delivery times, taking the activity hours of nearby wildlife into account	Habitat and nursery service (habitat and nursery maintenance) Regulating service (attenuation of noise and light)	- Conserve habitats by minimizing disturbance to ecological processes through avoidance of wildlife activity periods and areas.
			Selection of disposal sites with consideration for natural ecosystems (avoidance of groundwater recharge areas, forests, and wetlands, etc.)	Provisional service (water supply) Foundational service (water flow regulation, water purification, regional disaster mitigation, soil quality regulation) Habitat and nursery service (habitat and nursery maintenance)	- Secure animal habitats, ecological corridors, and natural capital. - Avoid flood-prone and high-risk locations.
Improvement of final disposal site	Proper installation of waterproofing sheets and leachate treatment facilities	Regulating service (water purification) Habitat and nursery service (habitat and nursery maintenance)	- Conserve aquatic ecosystems by preventing groundwater and river contamination. - Reduce health and living environment risks to residents.		

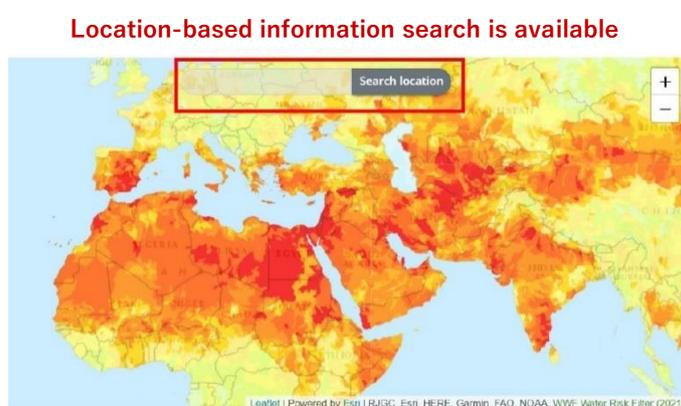
Source: prepared by JICA

Figure 2 List of Response Measures to Ecosystem Impacts (Illustrative Image)

3.2 Step 2 : Identification of Ecosystem Impacts (Dependencies and Impacts)

By utilizing external tools such as the Biodiversity Risk Filter (BRF) provided by WWF⁸ (see Figure 3), this step geographically assesses the degree of dependency on and impact on ecosystem services at the points of interaction identified in Step 1. This step is conducted during the implementation stages of the preparatory survey or the detailed planning survey.

The BRF is a tool that builds on sector-level dependency and impact assessments developed under ENCORE, while integrating region-specific biodiversity conditions, such as the distribution of protected areas, tree cover loss, and habitats of threatened species, based on 33 indicators. Through this approach, the BRF enables a spatial understanding of biodiversity risks associated with project sites and target areas, thereby allowing for more refined risk assessments and the consideration of appropriate response measures.



Source: WWF Biodiversity Risk Filter (WWF)

Figure 3 Example of an Ecosystem Risk Heat Map Generated by the WWF Biodiversity Risk

3.3 Step 3 : Examination of Response Measures to Ecosystem Impacts

During the implementation stages of the preparatory survey and the detailed planning survey, it is expected that appropriate response measures will be considered based on the points of interaction (dependencies and impacts) between project activities and ecosystem services, with the aim of minimizing risks while also linking them to opportunities. As described above, the environmental management sector is highly dependent on ecosystems and, at the same time, has significant potential to exert impacts on them; therefore, the consideration of response measures represents a critical step that directly influences the sustainability of projects.

Response measures are expected not only to mitigate risks, but also to incorporate a nature-

⁸ WWF Biodiversity Risk Filter is an online tool provided by WWF that spatially visualizes biodiversity risks in a given area. <https://riskfilter.org/biodiversity/home>

positive perspective by generating benefits for environmental restoration and local communities. In considering response measures, reference should be made to the annexed “List of Response Measures to Ecosystem Impacts,” from which activities that are highly feasible and expected to deliver effective outcomes should be selected. The list provides illustrative examples of response measures, organized by types of activities in the environmental management sector, aimed at reducing ecosystem-related risks and enhancing opportunities. An illustrative image of the list is shown in the figure below, where the areas highlighted by red boxes indicate examples of response measures to ecosystem impacts.

Activities within each sector		Selected Countermeasures against Ecosystem Impacts and their Classification under Common Nature Finance Taxonomy		Proposed Evaluation Indicator		Relevant Ecosystem Services and Effects of Response Measures		Contribution to GBF Targets			
No.	Environmental Management Sub-sector	Activity Group	Activities and Countermeasures	1. Countermeasures and Restoration / 2. NBS A. Polluted and Degraded		Proposed Evaluation Metrics		Affected ecosystem services (Based on NBS)	Effects of activities and countermeasures (Link activities / responses, and opportunity enhancements)	Contribution to GBF targets	Sustainability Impact
				Region (Activities and Objectives)	Process (Short-term Outcomes)	State (Mid- to long-term Outcomes)	Socio-indicators				
1	Environmental Management Sub-sector	Establishment of Collection, Transportation, and Final Disposal System for General Waste	Measures to Prevent Annual Increase in Waste Collection Points (Use of Colored Containers, Bags, Shredding Collection Tents, etc.)	Number of annual collection points (before and after countermeasures)	Reduction in waste volume	Reduction in waste volume (before and after countermeasures)	Waste management (habitat and ecosystem integrity)	Waste management (habitat and ecosystem integrity)	Support ecosystem impacts by preventing changes in wildlife feeding behavior and avoiding intrusion into human living areas.	1. Species genetic diversity, and average human-wildlife conflicts	○
			Prevention of overflow through the equipment of garbage collection and transport bins, optimization of route design, and implementation of shift working practices	Number of overflow incidents	Reduction in overflow incidents	Reduction in overflow incidents (before and after countermeasures)	Waste management (habitat and ecosystem integrity)	Waste management (habitat and ecosystem integrity)	Reduce wildlife collision risks and remove disturbance to ecological processes such as feeding, movement, and reproduction by avoiding wildlife activity periods and areas.	2. Species genetic diversity, and average human-wildlife conflicts	○
			Introduction of low-carbon vehicles (High-torque efficiency vehicles, EVs, CHV vehicles, etc.)	Number of low-carbon vehicles	Reduction in CO2 emissions	Reduction in CO2 emissions (before and after countermeasures)	Air pollution index	Air pollution index	Reduce local air pollution, carbon emissions, and air pollution from vehicle operation through promotion to low-carbon vehicles.	3. Air quality, particulate matter, and pesticide leaching (3.1. Air quality, particulate matter, and pesticide leaching)	○
			Adjustment of waste facility delivery times, taking the activity hours of nearby wildlife into account	Number of wildlife collisions	Reduction in wildlife collisions	Reduction in wildlife collisions (before and after countermeasures)	Wildlife management (habitat and ecosystem integrity)	Wildlife management (habitat and ecosystem integrity)	Reduce wildlife collision risks and avoid disturbance to ecological processes through avoidance of wildlife activity periods and areas.	4. Species genetic diversity, and average human-wildlife conflicts	○
			Selection of disposal sites with consideration for natural ecosystems (avoidance of groundwater recharge areas, forests, and wetlands, etc.)	Number of environmental assessment conducted for site selection	Completion of environmental assessment	Completion of environmental assessment (before and after countermeasures)	Water management (habitat and ecosystem integrity)	Water management (habitat and ecosystem integrity)	Prevent ground-water pollution and avoid disturbance to ecological processes through avoidance of wildlife activity periods and areas.	5. Habitat design and effective management, 4. Species genetic diversity, and average human-wildlife conflicts, 3. Air quality, particulate matter, and pesticide leaching	○
			Proper installation of waterproof sheets and technical measures (facilities, etc.)	Number of waterproof sheets installed	Reduction in groundwater pollution	Reduction in groundwater pollution (before and after countermeasures)	Water management (habitat and ecosystem integrity)	Water management (habitat and ecosystem integrity)	Prevent ground-water pollution and avoid disturbance to ecological processes through avoidance of wildlife activity periods and areas.	6. Species genetic diversity, and average human-wildlife conflicts	○
			Reduction of methane and hydrogen sulfide emissions, methane gas recovery (CO2-free Economy Approach)	Number of methane gas recovery facilities	Reduction in methane gas emissions	Reduction in methane gas emissions (before and after countermeasures)	Regulating services (climate regulation)	Regulating services (climate regulation)	Mitigate climate change through greenhouse gas reductions.	7. Air quality, particulate matter, and pesticide leaching (7.1. Air quality, particulate matter, and pesticide leaching)	○
			Development of proper burial practices in disposal sites (To reduce impacts on surrounding ecosystems)	Number of proper burial practices implemented	Reduction in soil contamination	Reduction in soil contamination (before and after countermeasures)	Soil quality	Soil quality	Reduce ecosystem disturbance and habitat impacts by supporting food and food webs.	8. Species genetic diversity, and average human-wildlife conflicts	○
			Establishment of ecosystem buffer zones through the greening of areas surrounding the facility	Number of ecosystem buffer zones established	Reduction in ecosystem disturbance	Reduction in ecosystem disturbance (before and after countermeasures)	Regulating services (water regulation, climate regulation, and pest and disease regulation)	Regulating services (water regulation, climate regulation, and pest and disease regulation)	Reduce ecosystem disturbance and habitat impacts by supporting food and food webs.	9. Species genetic diversity, and average human-wildlife conflicts, 11. Involvement, maintenance, and enhancement of natural habitats, 12. Ecosystem resilience and recovery	○

Source: prepared by JICA

Figure 4 List of Response Measures to Ecosystem Impacts and Related Information (Illustrative Image)

3.4 Step 4 : Setting Effects Indicators

During the implementation stage of the preparatory survey or the detailed planning survey, and following the examination of response measures in Step 3, effects indicators are considered in parallel in order to understand what results the proposed measures will deliver in terms of ecosystem conservation and restoration, as well as risk reduction. Two types of indicators are examined: “ecosystem indicators”, which measure the effectiveness of response measures from the perspective of the health and sustainability of the natural environment and ecosystem services; and “socioeconomic indicators”, which measure outcomes from the perspective of local communities’ quality of life, culture, social inclusion, and resilience.

In considering these indicators, it is recommended to refer to the indicator examples compiled for each response measure in the accompanying reference material, “List of Response Measures to Ecosystem Impacts,” while selecting indicators for which data collection is feasible, taking into

account the specific characteristics of the project, as well as the local natural, social, cultural, and regional contexts. The list presents illustrative examples of “ecosystem indicators”⁹ and “socioeconomic indicators” that have been organized with reference to the MDB Guidance.

Ecosystem Indicators

- **Characteristics:** Indicators that measure the health and sustainability of natural capital and ecosystem services, based on international frameworks such as IPBES and TNFD
- **Examples:** Vegetation cover area, ecosystem network connectivity indices (e.g., proximity and connectivity of ecological corridors), water quality of nearby inland water bodies, greenhouse gas (GHG) emissions, etc.

Socioeconomic Indicators

- **Characteristics:** Indicators that measure local communities’ quality of life, well-being, inclusiveness, and resilience, from the perspectives of JICA’s concept of Human Security and the Sustainable Development Goals (SDGs).
- **Examples:** Levels of satisfaction with the living environment among nearby residents; number of complaints related to littering, waste scattering, and damage caused by nuisance wildlife (e.g., animals and birds); fuel costs associated with waste collection and transportation; number of health-related complaints or reported health impacts among residents; amount of renewable energy generated, etc.

These indicators not only enable the quantitative demonstration of project outcomes, but also serve as an evidence base for internationally reporting progress toward nature-positive outcomes.

3.5 Step 5 : Examination of Monitoring Methods

During the preparatory survey or detailed planning survey stage, a monitoring framework should be developed based on the effect indicators established in Step 4. This framework enables the continuous tracking and evaluation of changes in ecosystems and local communities that occur following project implementation.

Examples of major monitoring methods:

- Fixed-point observation: e.g., regular monitoring of green space area, biodiversity indices, water quality, and vegetation.
- Participatory monitoring: e.g., community-based recording of species and local environmental activities, as well as surveys on residents’ satisfaction with their living

⁹ The MDB Guidance refers to “Financing Nature: A Practitioner’s Guide to Results Metrics Selection (Inter-American Development Bank, November 2025)”, which classifies and defines indicators into three categories: Response, Pressure, and State.

environment and access to safe drinking water.

- Use of remote sensing and GIS: e.g., assessment of land-use change and the status of ecological networks.
- Regular review meetings: e.g., progress reviews and issue-sharing among local governments, community members, and relevant organizations.

Examples of implementation arrangements:

- The project formulation department develops the monitoring plan and implements it in collaboration with local governments, research institutions, NGOs, and other relevant organizations.
- The project formulation department encourages active participation of local residents and local organizations to establish a community-based monitoring framework.
- Monitoring results are utilized for verifying project effectiveness, providing feedback for subsequent planning, and disseminating information both domestically and internationally.