

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

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

Fisheries and Aquaculture Sector

January 2026

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1. Importance of Biodiversity in the Fisheries and Aquaculture Sector

1.1 Relationship between Ecosystem Services and Fisheries and Aquaculture

There is growing recognition of the need to reassess the relationship between fisheries/aquaculture and ecosystems. The functions provided by marine, coastal, and inland water ecosystems, such as the provision of fishery resources, water purification, climate regulation, and coastal protection, are increasingly understood not merely as natural benefits, but as foundational elements underpinning economic activities. These ecosystem services depend on the health and integrity of ecosystems as natural capital and are now being positioned as fundamental premises for policy design and project formulation, given their direct linkage to the sustainability of fisheries and the stability of fishers' livelihoods.

At the same time, the vulnerability of the fisheries and aquaculture sector to environmental change has become increasingly evident. Climate change induced sea surface temperature rise and ocean acidification are altering the distribution of fishery resources and ecosystem structures, leading to greater variability in catches and heightened management risks. In addition, development pressures in coastal areas and changes in land use are accelerating the degradation of critical ecosystems, giving rise to challenges such as the deterioration of water quality regulation functions and the loss of spawning and nursery grounds. These trends highlight the high sensitivity of fisheries to changes in the natural environment and underscore the need for risk assessments in project design that explicitly account for relationships with ecosystems.

Under these circumstances, achieving the sustainable development of fisheries and aquaculture requires the adoption of a nature-positive approach that seeks coexistence with nature through the conservation and restoration of ecosystems. Efforts that maximize the benefits of ecosystem services while minimizing environmental pressures not only contribute to the stable supply of fishery resources and enhanced regional resilience, but also represent a strategic direction for increasing the overall value of fisheries-related projects. Through the conservation and sustainable use of natural capital, the fisheries sector is expected to play a central role in future policy formulation and project implementation as a field that can present a model for sustainable economic activity.

1.2 Linkages with Local Communities and Culture

The natural environment in the fisheries and aquaculture sector is not limited to serving as fishing grounds or sources of resources; it is deeply intertwined with local social structures and livelihoods. Relationships with the sea and rivers shape the spatial configuration of communities and patterns of economic activity, while fisheries-based lifestyles and resource-use practices are reflected in local institutions and mechanisms for cooperation. These relationships with nature function as a foundation that supports local identity and social cohesion, and represent a key element illustrating

the interdependence between ecosystems and human society.

The fisheries and aquaculture sector has developed in close connection with traditional knowledge and social practices within local communities. In the management of fisheries resources and the use of aquatic environments, knowledge and techniques passed down across generations serve not only as means of livelihood but also as the basis for cooperation and mutual support. The maintenance of healthy ecosystems is fundamental to ensuring stable fisheries activities and to enhancing the quality of life and economic self-reliance of local residents. Positioned at the interface between the natural environment and social structures, the fisheries and aquaculture sector contributes to the sustainability of local welfare and economies.

Coastal and inland water ecosystems also contribute to enhancing the well-being of local communities. Stable income derived from fisheries, a sense of psychological fulfillment gained through close interaction with nature, and the promotion of social inclusion through community-based cooperation all serve to strengthen local resilience and support the development of a sustainable society. In the planning, implementation, and evaluation of fisheries and aquaculture projects, accurately understanding relationships with ecosystems and incorporating perspectives that include communities and people is essential to achieving truly sustainable regional development.

1.3 Global and Domestic Initiatives toward Nature Positive Approach in the Fisheries and Aquaculture 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. Against this backdrop, in the fisheries and aquaculture sector, the degradation of ecosystem services in marine, coastal, and inland water ecosystems is increasingly recognized as a driver of instability in fisheries resources and heightened vulnerability of local communities, underscoring the need for project development premised on the conservation and restoration of natural capital. At the international level, IPBES, UNEP, IUCN, FAO, and the World Bank are promoting policy integration and practical approaches based on Nature-based Solutions (NbS), such as coastal ecosystem conservation, the utilization of blue carbon, and the co-management of fisheries resources¹. In addition, the Taskforce on Nature-related Financial Disclosures (TNFD) is driving changes in corporate decision-making and financial flows including those involving

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>
FAO (2021). “Nature-based Solutions in Agriculture, Sustainable Management and Conservation of Land, Water and Biodiversity”. <https://openknowledge.fao.org/server/api/core/bitstreams/c9aa3745-ab2b-41bd-a3ba-c8ea3ef4582b/content>

agricultural 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 Forestry, agriculture, fisheries, and aquaculture sector (such as forestry, crops, livestock, fisheries and aquaculture), and is positioned as a framework to enhance the consistency and transparency of nature finance. Furthermore, the International Capital 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, priority is placed on promoting sustainable agriculture, forestry and fisheries, the sustainable use of fisheries resources, the creation of a rich natural environment, and decarbonization, as key elements for advancing an integrated transition toward sustainability. Furthermore, the “Transition Strategies toward Nature Positive Economy (2025)” aims to achieve both the enhancement of natural capital value and the sustainability of business activities in the fisheries and aquaculture sector. In particular, institutional frameworks are being developed for marine spatial modeling using Earth observation satellites and environmental DNA (eDNA) monitoring, quantitative assessment of fisheries resources, and certification schemes for “Nationally Certified Sustainably Managed Natural Sites”⁶. In addition, the Ministry of Agriculture,

² TNFD. Additional Sector Guidance: Aquaculture (2024), Fishing (2025), Water utilities and services (2025) https://tnfd.global/tnfd-publications/?_sft_framework-categories=additional-guidance-by-sector

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)

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>

⁶ Nationally Certified Sustainably Managed Natural Sites refer to areas certified by the Ministry of the

Forestry and Fisheries, Japan is promoting the utilization of blue carbon, the decarbonization of fisheries, and the conservation of coastal ecosystems through initiatives such as the “MIDORI Strategy for Sustainable Food Systems (2021)”⁷. The Ministry of Land, Infrastructure, Transport and Tourism is also advancing the introduction of green infrastructure and ecosystem networks in port and fishing port development⁸, and these initiatives are being linked with the expansion of certification schemes and nature finance, as well as the adoption of landscape approaches through collaboration between the private sector and local communities.

Based on the JICA Global Agenda with 20 Strategies for Global Development, JICA is also promoting integrated project design in the fisheries sector that combines climate change mitigation and adaptation measures with biodiversity conservation. Through initiatives such as the sustainable use of fisheries resources, conservation of coastal ecosystems, and community-based co-management of fisheries with the participation of local residents, these efforts contribute to the achievement of the SDGs, in particular Goals 14, 13, and 15.

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 reported to the OECD-DAC under the Rio Marker for Biodiversity⁹, and will also be communicated externally.

2. Main Challenges and Potentials of Biodiversity in the Fisheries and Aquaculture Sector

2.1 Impacts of Ecosystem Services on Fisheries and Aquaculture Projects (Dependencies)

The loss of ecosystem services in the fisheries and aquaculture sector increases environmental vulnerability in coastal and inland water areas and has serious implications for the sustainability of

Environment, Japan where biodiversity conservation is achieved through private-sector initiatives, including company-managed forests, satoyama landscapes, and urban green spaces. These sites form part of Japan’s efforts to achieve the 30by30 target—to conserve at least 30 percent of land and sea areas by 2030—and are registered internationally as Other Effective Area-based Conservation Measures (OECMs), which contribute to biodiversity conservation outside formally designated protected areas.

⁷ Ministry of Agriculture, Forestry and Fisheries (2021). “Green Food System Strategy”.

<https://www.maff.go.jp/j/kanbo/kankyo/seisaku/midori/attach/pdf/index-10.pdf>

⁸ Ministry of Land, Infrastructure, Transport and Tourism (MLIT) (2023). “Green Infrastructure Promotion Strategy 2023”. <https://www.mlit.go.jp/report/press/content/001629422.pdf>

⁹ 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)

fisheries resources and the livelihoods of local communities. 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 the fisheries and aquaculture sector, provisioning services (such as fisheries resources including fish, shellfish, and seaweed) and regulating services (such as water purification, climate regulation, and coastal protection) play particularly important roles.

The degradation of coastal ecosystems, including mangroves, tidal flats, and coral reefs, leads to the loss of spawning grounds and nursery habitats for juvenile fish, deterioration of water quality, and increased coastal erosion, resulting in declines in fisheries resources and instability in catches. In addition, rising sea surface temperatures and ocean acidification due to climate change are increasing risks to fisheries management and food security through shifts in the distribution of fisheries resources and disruptions to ecosystems. The decline of cultural services can also lead to the loss of fishing village cultures and traditional fishing practices, adversely affecting local identity and social cohesion.

On the other hand, fisheries policies and measures that incorporate the conservation and restoration of coastal and inland water ecosystems can generate multiple benefits, including the recovery of fisheries resources, improvements in water quality, reduction of disaster risks, and enhanced regional resilience. Strengthening regulating services contributes to improved adaptive capacity to climate change and greater stability in fisheries activities, while the enhancement of cultural services supports the creation of tourism resources and the revitalization of fishing communities. These outcomes represent co-benefits in the fisheries sector and create opportunities to enhance the overall value of projects and interventions.

As described above, given the high degree of dependence of the fisheries sector on ecosystem services, promoting project design and operation based on a comprehensive assessment of both the risks and opportunities arising from ecosystem services is essential to achieving sustainable fisheries.

2.2 Impacts of Fisheries and Aquaculture Projects on Ecosystems (Impacts)

Projects related to the fisheries and aquaculture sector may modify natural environments through fishing activities, aquaculture operations, and the development of related infrastructure, thereby exerting diverse impacts on ecosystem services. IPBES recommends strengthening institutional mechanisms for the prior assessment of resource use, as well as for the avoidance and mitigation of negative impacts. Practices such as overfishing, bottom trawling, coastal land reclamation, and the overcrowding of aquaculture facilities can lead to habitat loss, water quality degradation, and fragmentation of ecosystem networks. In addition, the introduction of invasive species, inadequate feed and wastewater management, and the leakage of plastic waste can impair regulating and

habitat-supporting ecosystem services, thereby increasing the vulnerability of marine and inland aquatic environments.

Conversely, fisheries management approaches based on sustainable resource use, environmentally responsible aquaculture, the conservation and restoration of coastal ecosystems, and the promotion of the blue economy can contribute to ecosystem recovery. These efforts are considered to strengthen regulating and cultural ecosystem services, while enhancing local resilience and improving the quality of life of fishers and coastal communities. Initiatives promoted by JICA (including co-management-based fisheries, inland aquaculture guidelines, and SATREPS projects) represent practical examples of balancing natural capital conservation with sustainable fisheries through active community participation.

As outlined above, fisheries- and aquaculture projects entail both negative and positive impacts on ecosystem services. It is therefore essential to appropriately assess risks and opportunities during the planning and implementation stages of projects, and to maximize their contribution to a nature-positive society.

3. Mainstreaming Biodiversity in Practice (Fisheries and Aquaculture 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 fisheries and aquaculture 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 fisheries and aquaculture 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

NO.	Sub Sector	Activities
	fisheries resources	
3	Sustainable aquaculture	Construction and operation of aquaculture facilities Feeding and feed management
4	Development of fisheries value chains	Enhancement of cold chain (icemaking and refrigeration systems) Improvement of added values and market access (transportation fleet, containers, and logistics systems, etc.)

Source: Prepared by JICA

No.	Fisheries and Aquaculture Sub-sector	Activity Group	Activities and Countermeasures	Affected ecosystem services (Based on TEEB)	Effects of activities and countermeasures (Risk avoidance / response, and opportunity enhancement)
1	Development of Fisheries Infrastructures	Construction and development of fishing port facilities	Reduction of ecological impacts through the installation of habitat-friendly structures like submerged breakwaters	Regulating service (climate regulation, water purification, regional disaster mitigation) Habitat and nursery service (habitat and nursery maintenance) Provisional service (food, material, medical, and amenity resources)	- Create and expand coastal ecosystems by developing depth zones and stable seabed substrates suitable for seaweed and seagrass growth. - Secure food supply sources by creating favorable environments for the growth of commercially valuable aquatic species. - Enhance water-quality purification and mitigate waves and currents through algae and filter-feeding organisms. - Achieve carbon sequestration.
			Introduction of habitat-friendly structures on seawalls and breakwaters (reef blocks, porous structures, etc.)	Regulating service (climate regulation, water purification, regional disaster mitigation) Habitat and nursery service (habitat and nursery maintenance) Provisional service (food, material, medical, and amenity resources)	- Create and expand habitat foundations for seaweed beds, sessile organisms, and fish. - Enhance water-quality purification and mitigate waves and currents through algae and filter-feeding organisms. - Secure food supply sources by creating favorable environments for the growth of commercially valuable aquatic species. - Achieve carbon sequestration.
			Restoration and conservation of seaweed beds, tidal flats, and mangroves to enhance buffering functions and to create, conserve, or restore spawning and nursery grounds.	Provisional service (food, material, medical, and amenity resources) Regulating service (climate regulation, water purification, regional disaster mitigation) Habitat and nursery service (habitat and nursery maintenance)	- Enhance coastal protection, increase carbon sequestration, and restore coastal biodiversity by integrating blue infrastructure (seaweed beds, tidal flats, mangroves) with breakwaters to reduce storm surges and wave heights. - Improve fisheries resources by improving juvenile survival and propagation by restoring and conserving seaweed beds, tidal flats, and mangroves.
			Effective reuse of dredged sediment and recycled materials (use in tidal flat reclamation, beach nourishment, land restoration, habitat creation, use of industrial byproducts, etc.) ③Circular economy approach.	Habitat and nursery service (habitat and nursery maintenance)	- Stabilize coastal geography and restore habitats by restoring sediment circulation. - Mitigate waves, storm surges, and coastal erosions.
		Construction and operation of seafood processing and distribution facilities	Management of turbidity, noise, light pollution, and sedimentation during construction and dredging to reduce habitat disturbance (with environmental monitoring). Implementation of water-saving facilities and water recycling systems.	Habitat and nursery service (habitat and nursery maintenance) Regulating service (water purification, attenuation of noise and light) Provisional service (water supply) Regulating service (water flow regulation)	- Minimize direct disturbances and impacts on marine ecosystems by controlling turbidity, sedimentation, noise, vibration, and light pollution during construction. - Mitigate impacts on the water cycle by reducing water withdrawal through water saving and reuse systems. - Reduce eutrophication and risks of red-tide in nearby waters by decreasing discharge volumes of treated wastewater. - Reduce operational costs (water intake and wastewater treatment) through water reuse.

Source: prepared by JICA

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

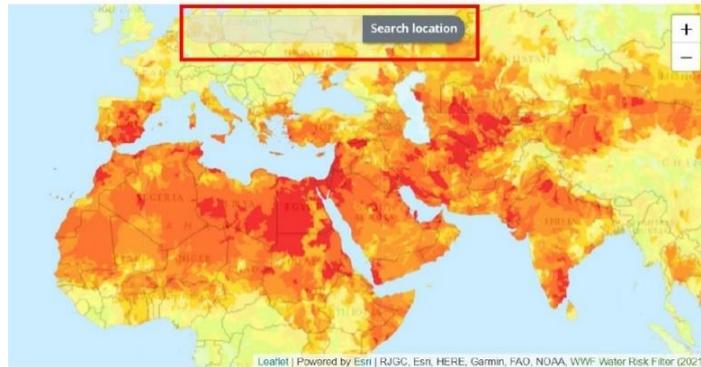
3.2 Step 2: Identification of Ecosystem Impacts (Dependencies and Impacts)

By utilizing external tools such as the Biodiversity Risk Filter (BRF) provided by WWF¹¹ (see Figure 3), this step geographically assesses the degree of dependency on and impact on ecosystem services identified in Step 1 at their points of interaction. This step is conducted during the implementation stage 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 the 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.

¹¹ 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>

Location-based information search is available



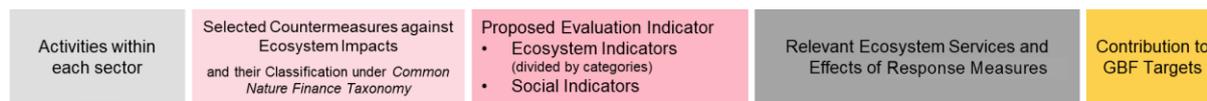
Source: WWF Biodiversity Risk Filter (WWF)

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

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 identified based on the points of interaction (dependencies and impacts) between project activities and ecosystem services, with the aim of minimizing risks while also converting them into opportunities. As described above, the fisheries and aquaculture sector is highly dependent on ecosystems and, at the same time, has the potential to exert significant impacts on them; therefore, the identification of response measures represents a critical step that directly influences the sustainability of projects.

Response measures should not only mitigate risks, but also incorporate a nature-positive perspective by generating benefits for ecosystem 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 both highly feasible and expected to deliver tangible effects should be selected. The list provides illustrative examples of response measures, organized by types of activities in the fisheries and aquaculture 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.



No.	Relative and Absolute Subsector	Activity Group	Activities and Countermeasures	NDC Category (1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 1.10, 1.11, 1.12, 1.13, 1.14, 1.15, 1.16, 1.17, 1.18, 1.19, 1.20)	Proposed Evaluation Metrics				Affected ecosystem services (based on TNFD)	Effects of activities and countermeasures (Use evidence / response and opportunity references)	Contribution to GBF targets	Countermeasure type				
					Response (Outcome and Outcome)	Pressure (Input and Input/Outcome)	State (Risk and Risk Outcome)	Social Indicators				Ecosystem Dependence	Ecosystem Impact			
1	Relative and Absolute Subsector	Construction and Development of Buildings	Reduction of ecological impacts through the installation of habitat-friendly features for sub-segment buildings	3	Reduction of habitat-friendly features for sub-segment buildings											
			Installation of habitat-friendly structures on roofs and balconies (e.g., green roofs, etc.)	3	Installation of habitat-friendly structures on roofs and balconies (e.g., green roofs, etc.)	Installation of habitat-friendly structures on roofs and balconies (e.g., green roofs, etc.)	Installation of habitat-friendly structures on roofs and balconies (e.g., green roofs, etc.)	Installation of habitat-friendly structures on roofs and balconies (e.g., green roofs, etc.)	Installation of habitat-friendly structures on roofs and balconies (e.g., green roofs, etc.)	Installation of habitat-friendly structures on roofs and balconies (e.g., green roofs, etc.)	Installation of habitat-friendly structures on roofs and balconies (e.g., green roofs, etc.)	Installation of habitat-friendly structures on roofs and balconies (e.g., green roofs, etc.)	Installation of habitat-friendly structures on roofs and balconies (e.g., green roofs, etc.)	Installation of habitat-friendly structures on roofs and balconies (e.g., green roofs, etc.)	Installation of habitat-friendly structures on roofs and balconies (e.g., green roofs, etc.)	
			Installation and conservation of green roofs, terraces, and balconies to enhance building functions and to create corridors or habitat corridors for biodiversity	10-3	Installation and conservation of green roofs, terraces, and balconies to enhance building functions and to create corridors or habitat corridors for biodiversity	Installation and conservation of green roofs, terraces, and balconies to enhance building functions and to create corridors or habitat corridors for biodiversity	Installation and conservation of green roofs, terraces, and balconies to enhance building functions and to create corridors or habitat corridors for biodiversity	Installation and conservation of green roofs, terraces, and balconies to enhance building functions and to create corridors or habitat corridors for biodiversity	Installation and conservation of green roofs, terraces, and balconies to enhance building functions and to create corridors or habitat corridors for biodiversity	Installation and conservation of green roofs, terraces, and balconies to enhance building functions and to create corridors or habitat corridors for biodiversity	Installation and conservation of green roofs, terraces, and balconies to enhance building functions and to create corridors or habitat corridors for biodiversity	Installation and conservation of green roofs, terraces, and balconies to enhance building functions and to create corridors or habitat corridors for biodiversity	Installation and conservation of green roofs, terraces, and balconies to enhance building functions and to create corridors or habitat corridors for biodiversity	Installation and conservation of green roofs, terraces, and balconies to enhance building functions and to create corridors or habitat corridors for biodiversity	Installation and conservation of green roofs, terraces, and balconies to enhance building functions and to create corridors or habitat corridors for biodiversity	Installation and conservation of green roofs, terraces, and balconies to enhance building functions and to create corridors or habitat corridors for biodiversity
			Retention and management of green roofs, terraces, and balconies to enhance building functions and to create corridors or habitat corridors for biodiversity	3	Retention and management of green roofs, terraces, and balconies to enhance building functions and to create corridors or habitat corridors for biodiversity	Retention and management of green roofs, terraces, and balconies to enhance building functions and to create corridors or habitat corridors for biodiversity	Retention and management of green roofs, terraces, and balconies to enhance building functions and to create corridors or habitat corridors for biodiversity	Retention and management of green roofs, terraces, and balconies to enhance building functions and to create corridors or habitat corridors for biodiversity	Retention and management of green roofs, terraces, and balconies to enhance building functions and to create corridors or habitat corridors for biodiversity	Retention and management of green roofs, terraces, and balconies to enhance building functions and to create corridors or habitat corridors for biodiversity	Retention and management of green roofs, terraces, and balconies to enhance building functions and to create corridors or habitat corridors for biodiversity	Retention and management of green roofs, terraces, and balconies to enhance building functions and to create corridors or habitat corridors for biodiversity	Retention and management of green roofs, terraces, and balconies to enhance building functions and to create corridors or habitat corridors for biodiversity	Retention and management of green roofs, terraces, and balconies to enhance building functions and to create corridors or habitat corridors for biodiversity	Retention and management of green roofs, terraces, and balconies to enhance building functions and to create corridors or habitat corridors for biodiversity	Retention and management of green roofs, terraces, and balconies to enhance building functions and to create corridors or habitat corridors for biodiversity
			Retention and management of green roofs, terraces, and balconies to enhance building functions and to create corridors or habitat corridors for biodiversity	3	Retention and management of green roofs, terraces, and balconies to enhance building functions and to create corridors or habitat corridors for biodiversity	Retention and management of green roofs, terraces, and balconies to enhance building functions and to create corridors or habitat corridors for biodiversity	Retention and management of green roofs, terraces, and balconies to enhance building functions and to create corridors or habitat corridors for biodiversity	Retention and management of green roofs, terraces, and balconies to enhance building functions and to create corridors or habitat corridors for biodiversity	Retention and management of green roofs, terraces, and balconies to enhance building functions and to create corridors or habitat corridors for biodiversity	Retention and management of green roofs, terraces, and balconies to enhance building functions and to create corridors or habitat corridors for biodiversity	Retention and management of green roofs, terraces, and balconies to enhance building functions and to create corridors or habitat corridors for biodiversity	Retention and management of green roofs, terraces, and balconies to enhance building functions and to create corridors or habitat corridors for biodiversity	Retention and management of green roofs, terraces, and balconies to enhance building functions and to create corridors or habitat corridors for biodiversity	Retention and management of green roofs, terraces, and balconies to enhance building functions and to create corridors or habitat corridors for biodiversity	Retention and management of green roofs, terraces, and balconies to enhance building functions and to create corridors or habitat corridors for biodiversity	Retention and management of green roofs, terraces, and balconies to enhance building functions and to create corridors or habitat corridors for biodiversity
		Development of Marine Infrastructure	Installation of water-saving facilities and water recycling systems	3	Installation of water-saving facilities and water recycling systems	Installation of water-saving facilities and water recycling systems	Installation of water-saving facilities and water recycling systems	Installation of water-saving facilities and water recycling systems	Installation of water-saving facilities and water recycling systems	Installation of water-saving facilities and water recycling systems	Installation of water-saving facilities and water recycling systems	Installation of water-saving facilities and water recycling systems	Installation of water-saving facilities and water recycling systems	Installation of water-saving facilities and water recycling systems	Installation of water-saving facilities and water recycling systems	
			Installing and upgrading existing sewage treatment plants	3	Installing and upgrading existing sewage treatment plants											
			Installing and upgrading existing sewage treatment plants	3	Installing and upgrading existing sewage treatment plants											
			Installing and upgrading existing sewage treatment plants	3	Installing and upgrading existing sewage treatment plants											
			Installing and upgrading existing sewage treatment plants	3	Installing and upgrading existing sewage treatment plants											

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 services 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”¹² 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

¹² 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.

- **Examples:** biodiversity indices (e.g. species richness and ecosystem diversity), reproductive status of target species, coverage of attached algae (periphyton), volume of effluent and water quality, and water reuse rate.

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:** economic losses and number of incidents caused by high waves and tsunamis, reductions in water treatment costs, fish catch volumes, feed-related costs, organic waste treatment costs, reduction rate of chemical use, equipment operational efficiency and costs, adoption rate of recycled materials, satisfaction levels of port users and visitors, and reductions in energy costs.

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:

- Participatory monitoring: e.g. community-based recording of native species or wildlife by farmers, and the use of traditional knowledge.
- Use of remote sensing and GIS: e.g. identification and analysis of changes in marine area use and urban ecological networks.
- Regular review meetings: e.g. progress review and issue-sharing among local governments, community members, and relevant institutions.

Examples of implementation arrangements:

- The project formulation department develops the monitoring plan and implements it in collaboration with local governments, research institutions, and NGOs.
- The project formulation department encourages active participation of local residents and farmers to establish a community-based monitoring framework.
- Monitoring results are expected to be utilized for project evaluation, feedback into subsequent planning, and international reporting on nature-positive initiatives through the Sustainability Promotion Office.