3 BIODIVERSITY AND ECOSYSTEM SERVICES

In March 2016, the government published Japan Biodiversity Outlook 2, the results of an assessment of biodiversity and ecosystem services in Japan over the past 50 years.

Overview of biodiversity

The assessment found that biodiversity in Japan continues to be in a state of long-term decline. The four major drivers indicated were: 1) development and other human activities; 2) the reduction in use/management of nature; 3) invasive alien species, chemical substances, and other things introduced by humans; and 4) global climate change. Examples of each of these drivers of the decline in biodiversity include the following.

The first driver is the result of continued habitat alteration of the Japanese ecosystem, including forests, farmlands, wetlands, and tidal flats, due to development during the period of high economic growth, with around 40% of tidal flats having disappeared. River crossing structures are affecting the continuity between upstream and downstream, and between rivers and oceans, and deterioration of the continuity of rivers may be obstructing the movement of animals going upstream. Furthermore, development and exploitation were indicated as drivers of extinction for the 26 species so far confirmed extinct in Japan. In the case of the second driver, there has been a loss of Satochi-Satoyama, the secondary natural environment formed through human intervention in nature, such as farmland and grassland. For example, the loss of secondary grassland is indicated as a driver of the dramatic loss of grassland birds and butterflies. With regards to the third driver, the effects of alien species are a concern, for example, as indicated by the increase in agricultural damage caused by raccoons. With regard to the fourth driver, cases have been reported of disruption of phenological synchronism relationship between biological cycle events and seasonal variation, such as mismatches in timing between the flowering of alpine plants and the appearance of the bumblebees that pollinate them. Also, average coral coverage around the Okinawa Main Island is reported to have decreased to 7.5% due to factors such as rising ocean temperatures.

Results of Biodiversity Assessment

			Long-term trend of impact		Degree of impact and current trend
			Between 50 and 20 years ago	From 20 years ago to present	
Drivers of Biodiversity Loss	First Crisis	Development, alternation of ecosystems	↑	↖	
		Eutrophication	↖	↖	
		Loss of endangered species	↑	↖	
	Second Crisis	Reduced and management of Satochi-Satoyama	↖	↖	
		Reduced direct use of wildlife	↖	←	
		Loss of endangered species	↖	↖	
	Third Crisis	Invasion and establishment of alien species	↖	↖	
		Chemical substances	↖	↖	
		Loss of endangered species	↖	↖	
	Fourth Crisis	Climate change	←	↖	
		Loss of endangered species	?	?	?

Note: Descriptions of the terms used in the table are as follows:

- First Crisis is the impact on biodiversity caused by development, exploitation and other human activities, including habitat alternation, direct use, and water pollution.
- Second Crisis is the impact caused by decline in human intervention in nature, including reduced use/management of Satochi-Satoyama.
- Third Crisis is the crisis brought by alien species, chemical substances, and other consequences of modern lifestyles and human activities.
- Fourth Crisis is the impact due to climate and other environmental changes including global warming, increased occurrence of strong typhoons, change in precipitation patterns, decreased fisheries catch, and ocean acidification.

Legend

Drivers			
Degree of impact during assessment period		Long-term and current trend of impact	
Weak	○	Decreasing	↖
Medium	●	Same	←
Strong	●	Increasing	↖
Very strong	●	Increasing rapidly	↑

Notes: Graphic symbols may not represent all of the multiple factors related to the indicators in question.

Arrows circled by dotted lines indicate that information is insufficient to make accurate assessments.

Overview of ecosystem services

Many of the provisioning services in Japan were assessed as being in decline, particularly with agricultural and fisheries products and timber, which are seeing major declines compared to historical levels.

Both the supply and demand sides contribute to the decline of provisioning services, with the former responsible for the deterioration of resources through overuse, habitat destruction and other factors, and the latter responsible for underuse of resources as a result of change in lifestyle and increased dependence on imported food and resources.

One of the causes of underuse is Japan's exceptionally heavy dependence on imported food and resources. Decreased domestic production of food and resources leads to an increase of abandoned farmland. The number of workers in the agricultural/forestry/fisheries industries is falling due to a shift in economic structure and resulting population flow from rural to urban areas, which could result in the loss of traditional knowledge and skills necessary to harness the bounties of nature.

Soil erosion control and other regulating services of artificial forests are sometimes compromised due to lack of management. In addition, reduced human activities in Satochi-Satoyama are creating conflicts with wild animals, thereby increasing disservices to humans, including attacks by bears.

Inter-regional food diversity is gradually being lost throughout Japan along with landscape diversity that creates a colorful mosaic of different vegetation and ecosystems. This fact suggests the loss of cultural services as well, which are rooted in each locality and its natural environment.

Interaction with nature has positive effects on our physical and mental well-being. While urbanization has deprived children of opportunities to interact with nature on a daily basis, many people are still interested in nature and are increasingly looking for ways to reconnect with rural communities and get back into nature through eco-tourism, etc.

Results of Ecosystem Services Assessment

		Assessment Result		
		Between 50 and 20 years ago	From 20 years ago to present	Overuse or underuse*
Provisioning services	Agricultural crops	→	↘	▼★
	Non-timber forest products	↗	↘	▼☆
	Seafood	↗	↘	▲★
	Freshwater	–	→	▲☆
	Timber	↘	→	▼★
	Raw materials	↘	↘	▼★
Regulating services	Climate	–	↘	–
	Air quality	–	→	–
	Water	–	↘	–
	Soil	→	–	–
	Disaster mitigation	↗	→	–
	Biological control	–	↘	–
Cultural services	Religion / festivals	↓	↘	–
	Education	↘	→	–
	Landscape	–	↘	–
	Traditional arts & crafts	↘	↘	–
	Tourism / recreation	↗	↘	–
Dis-service	Damage caused by wild animals	–	↗	–

Validity of the questionnaire assessment was examined by taking into account the results of expert questionnaire surveys conducted as part of JBO2.

Note: Descriptions of the terms used in the table are as follows:

- Provisioning services are services that provide food, fuel, timber, fiber, medicine, water and other important resources for human living brought by agriculture, forestry, and fisheries.
- Regulating services are services that modulate the environment, such as climate alleviation, flood mitigation, and water purification by forests.
- Cultural services are services that provide spiritual fulfillment, aesthetic enjoyment, religious/social foundation, recreational opportunities, etc.

Legend

	Quantitative trend in services received	
	Results of quantitative assessment	Where data is insufficient
Increasing	↑	↑
Slightly increasing	↗	↗
Same	→	→
Slightly decreasing	↘	↘
Decreasing	↓	↓

Overuse	▲
Underuse	▼
based on data	★
based on questionnaire	☆

Notes: Graphic symbols may not represent all of the multiple factors related to the indicators in question.
Arrows circled by dotted lines indicate that information is insufficient to make accurate assessments.