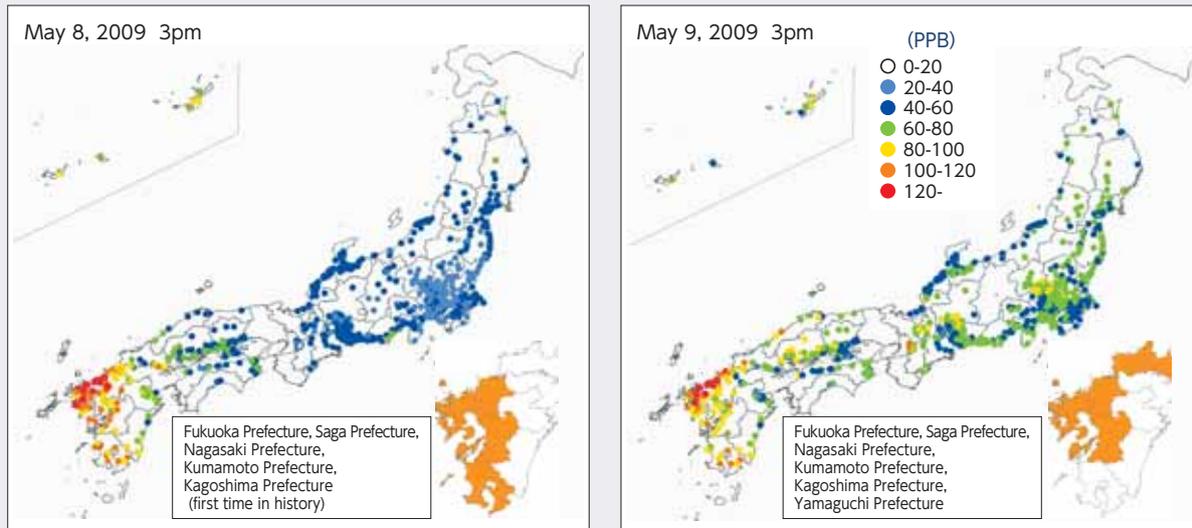




Figure 2-2-21 State of Photochemical Oxidant Warnings Issued



Source: Ministry of the Environment's Atmospheric Environmental Regional Observation System

Section 3 Wisdom in Order to Take over the Earth to Future Generations

The loss of biodiversity caused by changes in our society and economy affects the interaction between organisms on the Earth as well as our everyday and traditional lifestyle. What are necessary for taking over our life and culture across generation, and for

preservation and sustainable use of biodiversity?

In this section we will focus on “wisdom” and consider how to achieve a sustainable society which reflects the geographical and climates conditions in regions.

1. Wisdom in Our Everyday Life

Here we try to get the hints of the wisdom from our everyday life through clothing, cooking and housing.

(1) Wisdom in Life Cycle of Japanese Traditional Clothing

Japanese traditional clothing “Kimono” is made from linear parts of cloth. A piece of rolled cloth called a “*tan-mono*”, that is about 12 meters in length and 36 centimeters wide (for clothes of a woman who is 160cm tall), is cut into several liner parts and then sewed them flatly together. Kimono is “incomplete”, in a sense, at the product stage because they acquire a function as clothes when it is “wrapped and fitted” to fit one’s body shape who wears it, while western clothing is made “completely” by sewing parts of cloth together three-dimensionally at the product stage (Figure 2-3-1).

Because of this style of Japanese traditional clothing, it is relatively easy to return it from clothes (“Kimono” state) to rolled cloth (its original “*tan-mono*” state). In addition, silk, which is one of the materials used in the fabric of Japanese traditional clothing, is a very strong fiber that silkworms produce within their bodies. If managed appropriately, it can use over an extremely long time, and rolled clothes can be retailored to fit one’s body shape and preferences.

Kimono that was tailored in a parent’s generation can be retailored to fit preferences and body shape, and then passed on to a child’s generation and in some cases even carefully passed on to a grandchild’s generation. After that, when the clothes finally can no longer, it can be reused as house hold uses such as children’s dolls and wallets. This important resource from living organisms can be used to the end with none to waste.

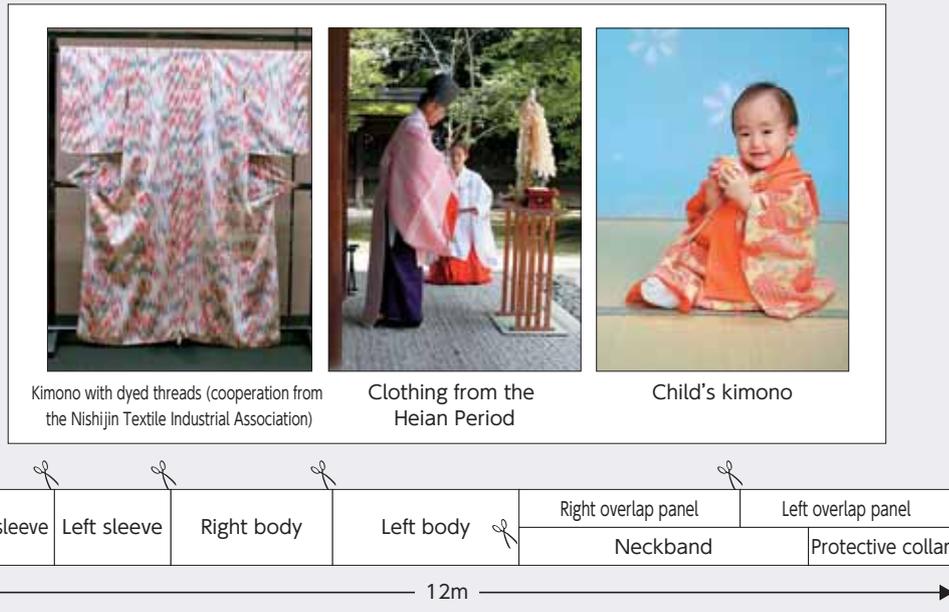
This recycling system of Kimono was general in the Edo Period. Clothes were so expensive that people needed to continue to wear as long as possible. This was a spirit to use the value and role of the products to the end. This is summarized in a word “*mottainai*” (means “what a waste!”), and this spirit is one of important wisdom in our everyday life for the sustainable use of resources.

(2) Local Production for Local Consumption and Seasonal Production for Seasonal Consumption: Wisdom for Controlling Consumption

Next we will discuss the wisdom for sustainable use of resources, focusing on Japan’s dining table.

Agriculture, forest, and fishery products are important products that are derived from the ecosystem services that are based on biodiversity. We have obtained,

Figure 2-3-1 Examples of Kimono and an Example of Cutting a *Tanmono*



Source: Ministry of the Environment

Ingredients and Dishes from Throughout the Year



cooked, and eaten foods that reflect the geographical and climate background. We not only eat food in order to get nutrients but also to enjoy our everyday lives through meals that use ingredients available from the ocean or mountains in each season. Japanese people enjoy butterbur sprout and bamboo shoots in the spring, bonito in the summer, chestnuts and persimmons in the fall, and wild boar meat and mountain vegetables and mushrooms that have been preserved in salt or by drying in the winter.

In each region of Japan there are many varieties of vegetables that reflect the climate of the region and that are familiar to the people living there, since the people have produced them in that region for a long time. For example, there are 41 varieties of traditional vegetables from Kyoto, such as Kintoki carrots and Kujo green onions, and 14 varieties of traditional vegetables from Aizu, Fukushima Prefecture, such as Aizu Kogiku squash.

“Local Production for Local Consumption and Seasonal Production for Seasonal Consumption” is an effort for encouraging consumption of crops in the regions where the crops are harvested. In recent years these efforts have been drawing attention from the aspects of consumption efficiency and food security. If crops are transported to distant places and consumed far from the places of production, more energy is needed for such style of consumption than the style of consuming without transportation. Consuming local products in the places of production, the distance for transportation of

the crops will become shorter and the amount of energy use for transportation can shorten consumption energy. By production of vegetables that are adjusted to the climate, consumption required for production can shorten consumption energy. There are also advantages for consumers, because they can feel comfortable due to such so-called “agriculture with a visible face” since crops are produced nearby.

Production and consumption of food that are adjusted to the climate will enable us to achieve high energy efficiency required for mass transportation, reduce the impacts on the environment and enjoy the seasonal change and comfortable everyday life.

(3) Efforts for Creating Residential Spaces that Reflects Climate Conditions

Kenko Yoshida, who was a Japanese monk and author in 13th to 14th century, wrote in the 55th essay of his work entitled “Tsurezuregusa (Essays in Idleness)”, “A house should be built, considering the summer condition. In winter one can live anywhere.” While this expression may be a bit of an exaggeration, it was an important perspective to build a well-ventilated and cool home in order to escape the humidity and hot air of the summer at that time, when there were no air conditioners.

Since in modern buildings people artificially control room temperature by air conditioners, constructing entire



buildings tend to be highly insulated and air-tight, and to maintain a pleasant living space while at the same time conserving energy.

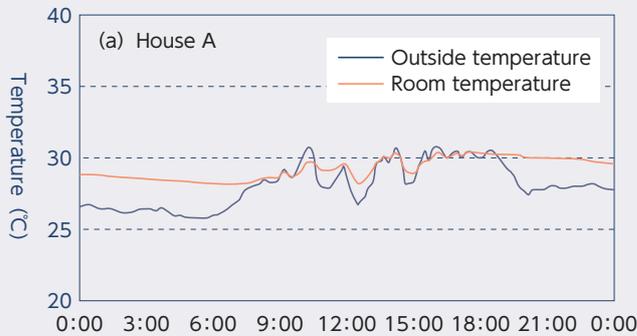
On the other hand, this direction of modern design is not necessarily appropriate for all regions of Japan. For example, in Okinawa, which has subtropical weather, buildings made of reinforced concrete after World War II, which is strong against damage from typhoons and termites. People rely on artificial cooling by air conditioners to deal with the heat and humidity, but the increased air-tightness of buildings causes indoor mold. For that reason, it becomes problem whether that was truly a pleasant living environment and whether it was an efficient design in terms of energy conservation.

Here is a study for comparing ventilation of the traditional houses and modern houses in Okinawa. Because traditional Okinawa houses have an open and

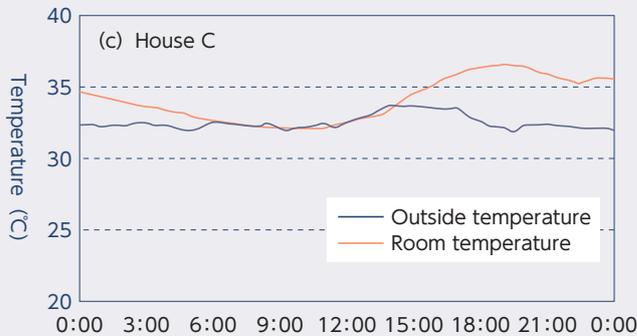
well-ventilated structure, changes in room temperature tend to quickly respond to changes in outdoor temperature. On the other hand, houses made of reinforced concrete shift at almost the same temperature as the outside temperature during the day, but then room temperature suddenly rises from late afternoon until around 7pm and goes back down to about the same level as outside temperature from evening until daybreak. The difference of temperature between inside and outside of houses is higher in houses made of reinforced concrete than it is in traditional houses. Residences made of reinforced concrete are easy to be heated up (Figure 2-3-2).

In Okinawa, this function of well-ventilated traditional houses is reevaluated. In recent years, well-ventilated Piloti architecture and passive cooling systems that do not rely on air conditioners are drawing attention as residences made of reinforced concrete not only to

Figure 2-3-2 Changes in Room Temperature in Okinawa Buildings and Outside Temperature



Examples of changes in temperature and room temperature (Photograph of traditional house provided by NPO Takidhun.)



Examples of changes in temperature and room temperature (House made of reinforced concrete)

(*) All measurements were made of houses when air conditioners were not being used. The graph is an example of data from one day during the measuring period when the weather was good. Photographs are not of the actual houses subject to the study. They are examples of a traditional house and a concrete house in Okinawa.

Source: Study on actual environmental conscious and healthy houses fit for climate and living environment in subtropical Okinawa
Junichiro Tsutsumi, Tetsuya Ando



Nago City Hall, which was designed with the aim of not relying on large-scale air conditioning (Photograph provided by Nago City.)

prevent damages from typhoons, but also to achieve high energy efficiency.

Our traditional life style reflects the geographical and climate background, which is unique in region to region. People achieve the traditional wisdom in this regional background. The modern lifestyle of mass production, mass distribution, and mass consumption that was rapidly achieved after World War II is not necessarily suited to

the geographical and climate conditions of each region, and it cannot be denied that this modern lifestyle impacts on the environment and causes the loss of traditional uniqueness. There is probably a great possibility that wisdom in traditional life style will be of use in order to reconsider our modern lifestyle and achieve the sustainable society.

2. Wisdom Within Regional Communities

(1) Life style in Satoyama Communities and Biodiversity

In Japan, over many years there has been a spread of secondary nature areas, which people in many ways maintain through agriculture and fisheries, such as farming land, plantation forests and secondary forests, irrigation ponds and canals, grasslands, and settlements. Those kinds of nature areas are referred to as satochi-satoyama, and since long ago we have been using the natural resources around us as the resources necessary for everyday life.

While living in satochi-satoyama, Japanese people have not consumed all of natural resources, but have instead continued to use them sustainably. For example, cultivation of rice (wet-paddy rice), which is Japan’s most important crop, is suited to Japan’s climate, which has a lot of rain throughout the year. It can be considered a sustainable and highly productive farming method, since it has withstood over 1,000 years of continuous cultivation. In addition, secondary forests including Sawtooth Oak, Quercus, and Japanese Red Pine are managed by logging in a cycle of approximately 10 to 20 years. Satochi-satoyama varied across Japan. They form ecosystems and scenery that are unique to each region.

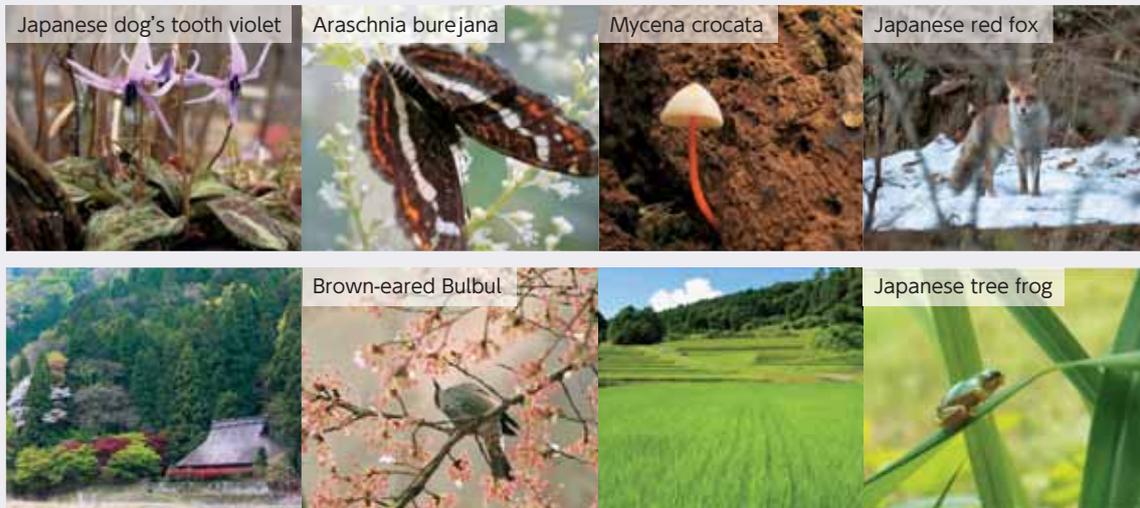
(2) Sustainable Use of Hunting Resources and Traditional Wisdom

The wisdom in everyday life reflects the interaction between people and nature, and thought to be rooted in regional communities as culture and traditional techniques. Life in the Matagi community, which is group of traditional hunters with techniques and an organization for capturing large animals, can be given as an example of people who have sustainably used natural resources within the capacity of the natural environment and nature’s ability to restore it. They have taken passes on the traditions and culture of their region.

Records of the history of use of game resources in Japan date back a long time. The Nihon Shoki, which was written in the year 600s, has descriptions of deer hunting in which deer were shot down from atop a horse, as well as descriptions of restriction of dangerous hunting methods such as pitfalls and fall traps. In the 1500s, records can be seen that indicate that Matagi communities had formed, mainly in areas between mountains in the Tohoku region.

People who lived in Matagi communities did not hunt all year round. They led their everyday lives by dividing activities into agriculture in the summer and hunting in the winter (Figure 2-3-3). The best game for the Matagi were large animals such as Asiatic black bears and it was life-risking work in the winter. So they abstained from hunting any more than they needed by strict command-

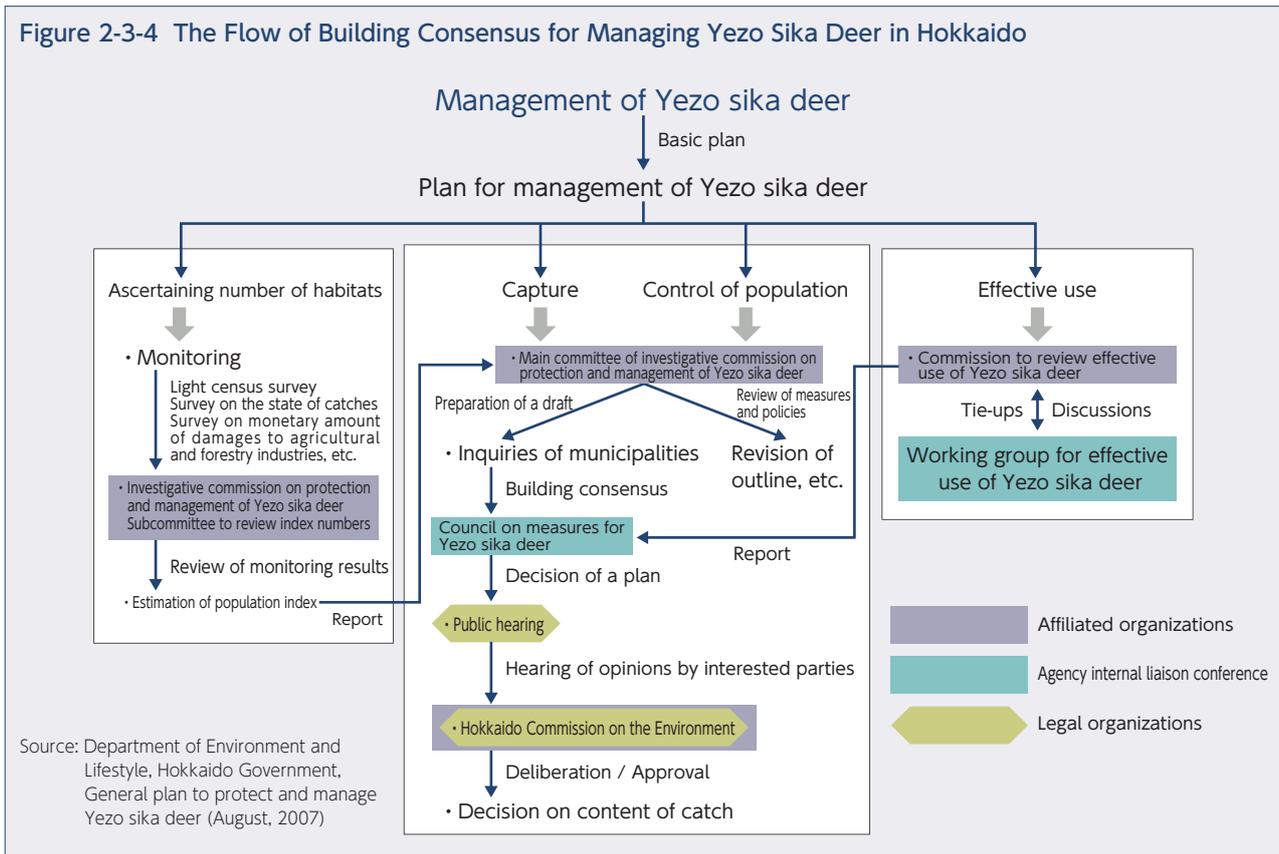
Satoyama and various forms of wildlife that inhabit satoyama



Living organisms from all four seasons can be seen near satoyama.

Source: Ministry of the Environment

Figure 2-3-4 The Flow of Building Consensus for Managing Yezo Sika Deer in Hokkaido



Meanwhile, the number of people in the forestry and agricultural industries, who directly interact with nature in the places closest to mountains and forests, has been declining every year. The number of households involved in forestry declined by approximately 20 percent from the 1980s to the 2000s, and the number of households involved in agriculture declined by approximately half. The number of hunters, who have direct interaction with wildlife through the hunting activity of capturing wild birds and mammals, has also gone from a peak of approximately 500,000 people in the 1970s to less than half that at present.

Such decreases in human approaches toward forests and decreases in the number of people who manage forests are significantly affecting biodiversity. Increases in wild birds and animals such as deer and wild boar in recent years are a considerable example of this, and damage to the agriculture, forestry and natural vegetation due to strong pressure are occurring at high levels (Figure 2-3-6).

Cooperation with stakeholders who live in regions is an essential component when preserving biodiversity. For that reason, the question of how to develop the human resource to manage biodiversity is an extremely important.

3. Toward Sustainable Use of Biodiversity

(1) Fundamental Viewpoints for Achieving Sustainable Use of Biodiversity

It is possible to get a variety of hints from the wisdom in everyday life which reflects the geographical and climate condition of each region, because it is full of suggestions for achieving a sustainable society. It is necessary for the world to take action for achieving sustainable use of natural resources with the traditional wisdom which interacts to scientific knowledge, considering the international movement in order to achieve Earth's sustainable environment and essential elements which should be given equally for all people. These wisdom and knowledge should be shared among people who actually take actions.

Here we will give fundamental viewpoints about methods of evaluation based on scientific knowledge and of management that uses economical methods toward

achieving sustainable use of natural resources.

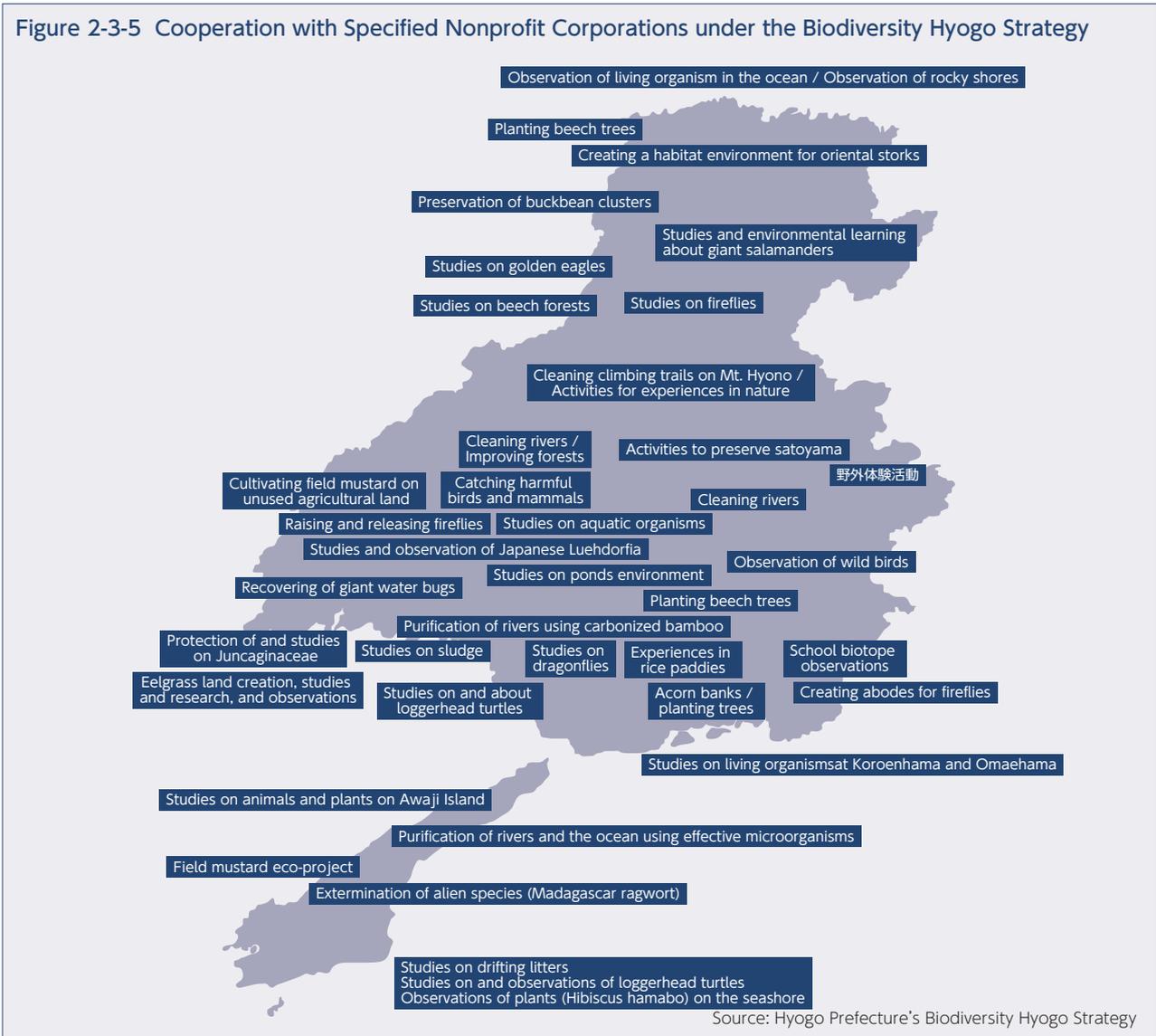
(2) The method of Evaluation Based on Scientific Knowledge

Although there is not enough scientific knowledge about ecosystems, efforts are taken to evaluate the state of ecosystems and the biodiversity loss, using the knowledge available at present. As examples of international efforts, the "Millennium Ecosystem Assessment (MA)" was conducted from 2001 until 2005, in which over 1,000 specialists participated on suggestion by the United Nations. The "Global Biodiversity Outlook (GBO)" was conducted three times (in 2001, 2006, and 2010) by the Convention on Biological Diversity Secretariat.

In Japan, "JBO: Japan Biodiversity Outlook" was published by the Committee on Comprehensive



Figure 2-3-5 Cooperation with Specified Nonprofit Corporations under the Biodiversity Hyogo Strategy



Assessment of Biodiversity set up by the Ministry of the Environment in 2010. JBO assesses the biodiversity of Japan over the past 50 years (Table 2-3-1). We will look at the results in detail in Chapter 3.

Efforts based on scientific knowledge are being made in relation to forest resources. In order to assess the progress in sustainable forest management, since 1994, the Montreal Process has been conducted, with participation by 12 major countries that have temperate and boreal forests, such as Japan, Canada, and China. In this process, criteria and indicators are set in order to preserve forests and manage them sustainably. Based on this, in October 2009, the Forestry Agency published the “Montreal Process Second Report by Country,” which assesses the state of Japan’s forests and forest management according to 7 criteria and 54 indicators.

Japan’s fishery resources are also well assessed. Studies of the fishery are being conducted in order to estimate how rich fishery resources, to calculate biologically total allowable catch of fish to analyze information on catches by fishing boats and measurement of catches at fishing ports, and to survey samples. Data available from studies is used as a scientific basis for setting total allowable catch (TAC) and is necessary for management of fishery resources.

Figure 2-3-6 Decline in People's Involvement with Forests and Increase in Damage Caused by Mammals

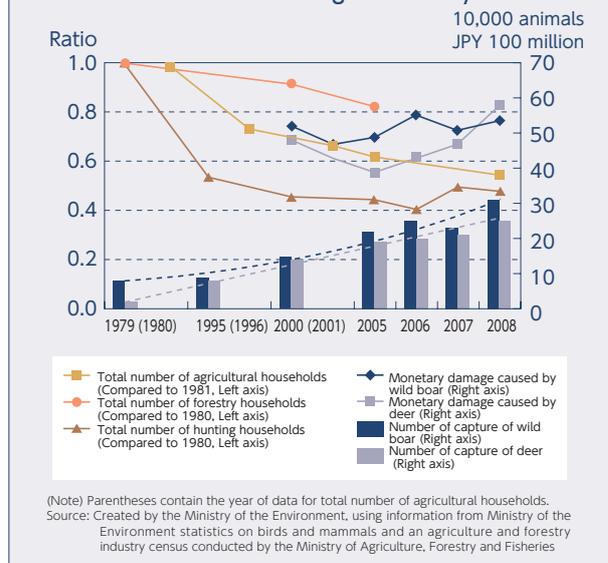


Table 2-3-1 Main conclusions of Japan Biodiversity Outlook (JBO)

Ecosystems that show a considerable loss of biodiversity	The degree of loss of biodiversity has been especially large in inland water systems, marine and systems, and island systems. The trend towards biodiversity loss continues up to now
Drivers of loss of biodiversity	① As for the "crisis caused by human activities, especially development (First Crisis)," although the speed at which loss of biodiversity attributable to this crisis has eased somewhat, effects from past development will still continue from now on. ② As for the "crisis caused by reduction of human activities (Second Crisis)," that crisis is now intensifying. ③ As part of the "crisis caused by species brought in by humans (Third Crisis)," the effects of invasive alien species are particularly prominent. ④ As for the "crisis caused by climate change," there are concerns about some fragile ecosystems, particularly alpine flora and coral reefs.
State of responses	Although various response have been taken to address loss of biodiversity and these responses have been effective to a certain degree. But given the major socioeconomic changes that indirectly drive biodiversity loss. These responses have not been sufficiently effective.
Direction of future responses	Because regional uniqueness in biodiversity is important, it will be important for various measures that include the constituents to be taken amid social and economic activities (make biodiversity mainstream).

Source: Ministry of the Environment

Table 2-3-2 Scientific and Quantitative Assessment of Biodiversity, and Examples of Economic Means of Preservation Measures and Policies

Field of measures and policies	Main examples	Overview	
Quantitative assessment of biodiversity	Millennium biodiversity assessment	Large-scale comprehensive assessment of biodiversity that was carried out from 2001 to 2005 with participation of 1,360 specialists from 95 countries, based on a call by the United Nations	
	Ecological footprint	Quantitative assessment of environmental impact, based on the values found by comparing the Earth environment's intrinsic production abilities and the amount of human consumption, and calculating an ideal land area referred to as a "global hectare."	
	TEEB: The Economics of Ecosystems and Biodiversity	Analysis conducted mainly by United Nations Environment Planning (UNEP) concerning the economic value of biodiversity, and costs due to loss and preservation of biodiversity	
Conservation of biodiversity and sustainable use using market mechanisms	Economic incentives	Payment for ecosystem services (PES)	Parties receiving the benefits of ecosystem services pay compensation costs to parties managing resources.
		Taxation	Taxes are applied to actions that affect biodiversity.
		Subsidies	Subsidaries are paid for actions that contribute to preservation of biodiversity, or subsidiaries that have a negative affect on preservation of biodiversity are eliminated.
		Trading of rights	Rights for using the environment are assigned as certificates, and environmental problems are solved by negotiations among parties making transactions in the market.
	Certification system	Certification is given to raw materials from living organisms are appropriately considered in terms of the ecosystem of the source, biodiversity, regional society, and the people who live there, and a unified certification mark is displayed so that consumers will know of the certification.	
	Mitigation	In order to reduce negative effects on biodiversity that are caused by development projects, efforts are made to avoid portions or all of such projects, minimize project scale, and consider correction or reduction of the natural environment that incurs such effects. Rather than compensation measures, priority consideration is given to avoidance and reduction of the effects themselves.	
Biodiversity offset	For negative effects caused by development projects, appropriate reduction measures are implemented. By taking compensation actions to target negative effects that remain even after such measures are taken, the quality and quantity of biodiversity as a whole is maintained in the same state. Bankers that are expert organizations on restoration and creation for conservation (compensatory mitigation banks) receive fixed amounts of credit and accurately restore and create on behalf of parties conducting development projects. This mechanism by which it is deemed that parties conducting development projects have taken compensation measures is referred to as mitigation banking.		

Source: Created by the Ministry of the Environment, using information from "Fundamental Knowledge about Biodiversity, Ecosystems, and the Economy," "Research on Measures and Policies for the FY2010 Environment Economy (Research on Measure and Policy Options that Aim for Sustainable Use of Ecosystem Services by Internalizing Economic Value)," etc.

(3) Measures for Conserving Biodiversity that Have Been Included in Society and the Economy

In recent years, policy option tools for decision making have been proposed in order to reduce deterioration of biodiversity and loss of ecosystem services, and to mainstream biodiversity into all kinds of decision-making. Some specific examples are methods of internalizing the economic value of biodiversity and ecosystem services in the market mechanism.

Article 11 of the Convention on Biological Diversity

states that, "Each Contracting Party shall, as far as possible and as appropriate, adopt economically and socially sound measures that act as incentives for the conservation and sustainable use of components of biological diversity." Countries around the world and international organizations are taking efforts for preserving biodiversity and achieving sustainable use by using market mechanisms. Quantitative assessment of biodiversity is to be important for promoting preservation of biodiversity and sustainable use with these market mechanisms.

As examples of quantitative assessment of biodiversity, the ecological footprint assesses the human impacts on



the environment, and “The Economics of Ecosystems and Biodiversity(TEEB)” assesses the economic value of biodiversity and costs due to loss of biodiversity. In addition, as a means of preserving biodiversity and

achieving sustainable use with market mechanisms, there are several examples. Tax systems and subsidies are mechanisms to internalize the external economic impacts on biodiversity in the market through economic

Column

Wisdom in Managing Groves Biodiversity in a City Areas (Kyoto)

The City of Kyoto has many traditional temples and shrines since it is a city with a long history of over 1,200 years. Various large and small green areas, such as Kyoto Gyoen (Kyoto Imperial palace park), are preserved, although it is a large city with a population of over 1.4 million people. In particular, within the grounds of temples and shrines, there are groves that have existed since long ago without being cut down. In the groves, the large-diameter trees, understory vegetation grow and various wild animals inhabit. In the 63-hectare expanse of Kyoto Gyoen, goshawks are observed even though the park is located in the middle of the city.

The grove of Shimo-gamo Jinja Shrine is called “Tadasu Forest,” which is an approximately 12-hectare, and is a forest that has been known since long ago, appearing in “The Pillow Book”(written in 10th century). Citizens are familiar with the forest, and many people come to and enjoy traditional events such as the Aoi Festival, which is one of Kyoto’s three biggest festivals. Even when there are no

events, as many as 1,000 to 1,200 people come per day. Within the grove, the brown hawk owl use the hollows that are formed in the large-diameter trees and breed there. This “Tadasu Forest” is registered as a world cultural heritage as part of Shimo-gamo Jinja Shrine and is carefully managed.

The wisdom for managing groves of shrines and temple in Kyoto, which have been carefully preserved since ancient times, is adjust to the restoration and management of modern city parks. In 1996 a restored green space called the “Forest of Life” was installed in Umekoji Park, which was built on the site of an old National Railway freight train shunting yard. The state of vegetation in “Tadasu Forest” is adopted as the target for restoration and management to achieve not only the functions of an ordinary city park but also Kyoto’s original ecosystem. In the process of restoration specialists from various fields such as landscape architecture, botany, and zoology are involved.

The way of management of this green space is



Shimogamo Jinja Shrine



Young brown hawk owls that built a nest in Tadasu Forest



Photographs: Ministry of the Environment
 Source: From the Umekoji Park map by the Kyoto City Greenery Association

unique. Monitoring is conducted almost entirely by city resident volunteers independently under the guidance of specialists. The vegetation monitoring has been conducted almost every month since 1998, and detailed data about changes has been compiled. Further, under a key theme of “management in moderation,” this management allows natural succession by holding back on trimming of underbrush. The number of people who enter the green space can be kept appropriately because the gate is in a garden called “Suzaku Garden” that charges entrance fee.

The income plays a role in management of the green space.

As a result of these efforts and ingenuity, 364 species of plants are identified in 2009, while 74 species was identified when the green space opened. In addition, goshawks are observed within the park in recent years.

It can be said that various types of green areas have been well conserved with the wisdom of traditional and modern management methods in the City of Kyoto.

incentives., Certification systems are to designate regions that are appropriately working to preserve biodiversity. Biodiversity offset is an appropriate reduction measure which are implemented by taking actions the quality and

quantity of biodiversity and maintaining in the same state for negative effects caused by development projects, (Table 2-3-2).

Summary

In Chapter 1 we saw that the Earth’s environmental problems continue to be one of the most serious risks and threats to the humans as well as to the future generations. In Chapter 2 we considered the current situation of the biodiversity, which provides the benefits that support our lives, and human wisdom for preventing loss of biodiversity and preserving it.

The Earth’s resources are limited. It is our wisdom and duty for us to achieve sustainable use of natural resources, formulate social rules, and take action so that we can use

limited resources sustainably and share them with future generations.

What kind of rules should be formulated and what kinds of actions are necessary, in order to use the benefits available from the Earth sustainably and fulfill our duty to future generations? In the next chapters we will discuss the latest international movements for achieving sustainable use and conservation of biodiversity, and actions on a global scale that utilize Japan’s technologies.