# Chapter 3
# Biodiversity in Crisis and Our Daily Lives
## —Life on the Earth That Runs on to the Future—

## Section 1 Accelerating Loss of Biodiversity

According to the United Nations Millennium Ecosystem Assessment, the present rate of extinction of living organisms has reached 100 to 1,000 times higher than the rate of extinction in the past, and most indicators that show the status of ecosystem services (benefits people can obtain from ecosystems) are exhibiting a deteriorating trend. This section addresses the impact of biodiversity loss on our daily lives (decreases in products from agriculture, forestry and fisheries industries) and economic loss from declining ecosystem services, and then underscores the need to halt biodiversity loss and enhance biodiversity.

### Column What Is Biodiversity?

"Biodiversity," to put it plainly, is the state of "many living organisms existing by adapting to a variety of environments on the earth, from the abyssal ocean to uplands." This phrase contains the following three aspects. The existence of diverse types of ecosystems, such as forests, rivers, wetland, tidal flats, coral reefs and oceans, is described as "ecosystem biodiversity," while the existence of diverse kinds of living organisms in these ecosystems is called "species diversity" and the existence of various genetic variations in the same species, such as differences in body size, pattern or resistance to disease is termed "genetic diversity."

Let us explore these three aspects more deeply.

Ecosystem diversity means that there exist a variety of environments due to a variety of circulations on the earth. For example, there is the circulation of water in which precipitation that seeps into the ground evaporates through plants and forms clouds to cause rain. In the circulation of material, organic material that goes through consumers by the food chain ultimately returns to inorganic material by decomposers and producers again turn inorganic material into organic material. In the atmospheric circulation, carbon dioxide emitted in association with activities of living organisms on the earth, including human activities, is absorbed by forests that produce oxygen. These diverse circulations, for example, help form small units of specific ponds and forests, which combine to form larger units of basins, and several basins consist of units of archipelagoes and continents, which together constitute the earth, thus establishing various ecosystems on the earth in seamless manners. There exists no identical ecosystem on the earth. This is ecosystem diversity.

Species diversity indicates that there exists about 30 million species of various living organisms, including unknown ones, after living organisms have evolved to adapt to various environments on the earth. When kinds of living organisms are diverse, interactions between them are also diverse. There emerge a variety of direct and indirect interactions, from eating, being eaten, parasitizing other living organisms and providing habitats to competing for resources and decomposing dead living organisms. Looking at relationships of eating and being eaten, for example, while there is a manner of utilization in which some species feed on anything that is fit to eat, there is also the relationship based on strong mutual links where a certain insect eats only leaves of a certain plant. The diversity of species is thus based on the existence of various physical environments created by ecosystems, natural selection of species caused by a variety of interactions such relationships between living organisms and physical environments and relationships between living organisms, and genetic differences caused by evolution.

The significance of genetic diversity needs to be considered by keeping in mind that living organisms are the beings that try to survive, by maintaining life as individual organisms or by leaving next generations through procreation. A variety of living organisms we are currently seeing have been created through a long process of evolution. When there are genetic differences among individual living organisms and those differences influence their survival and procreation, which is exactly where evolution starts. Properties that make the survival easier, if only little, are carried forward to next generations. What properties make the survival easier depend on environments surrounding living organisms. Different properties evolve under different environments. In

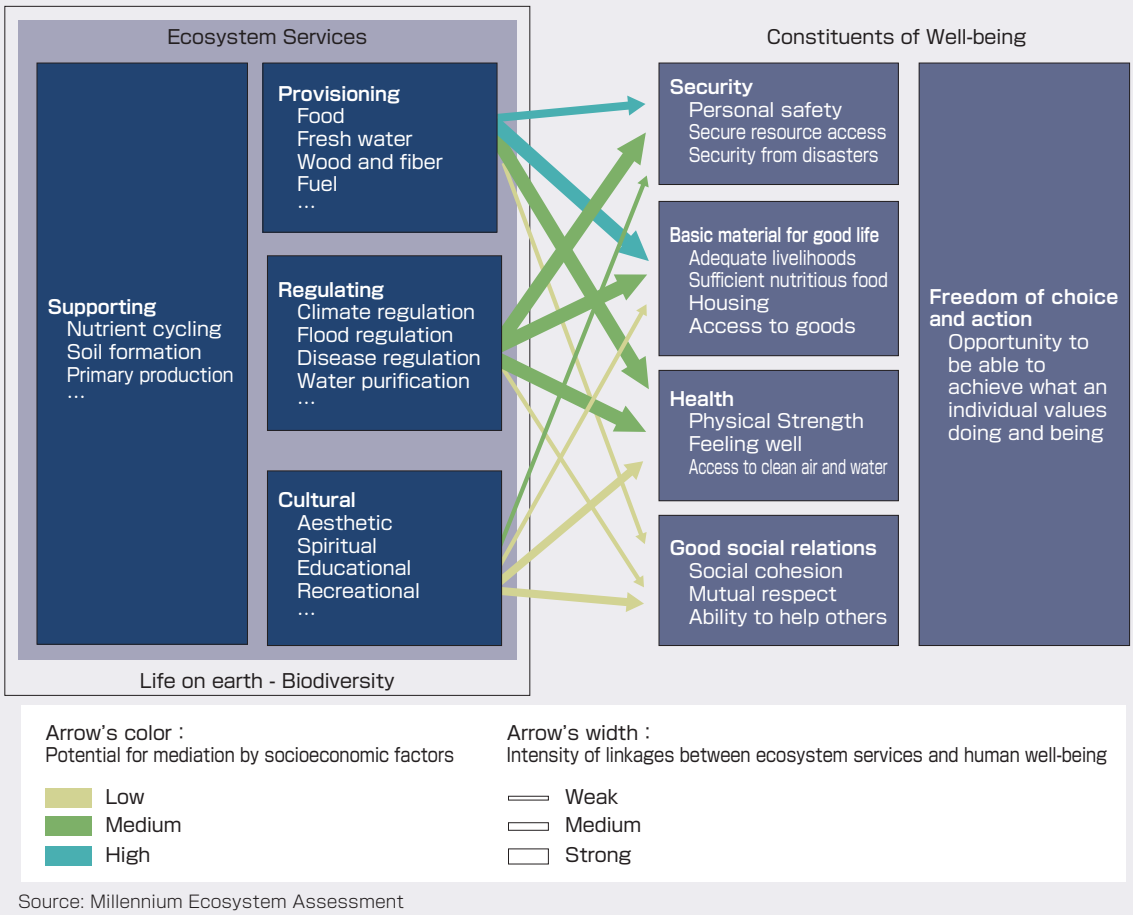
other words, genetic diversity (difference) that exists between living organisms (individuals) is the source of evolution. Biodiversity we have now can be described as the direct result of genetic diversity.

Then, what benefits are we, humans, getting from biodiversity? We find a variety of benefits of the diversity of ecosystems in that forests generate oxygen through photosynthesis and develop water sources, that rivers bring bountiful soil, that tidal flats purity contaminated water and that coral reefs provide many fish species with places of spawning, growth and feeding, bringing the richness of fish and shellfish. Humans have evolved and built civilization under these environments. Humans benefitted from species diversity as they found ones they could utilize from among various living organisms and created methods to produce grains, vegetables, livestock and other foods in large quantities that made it easier to secure food. Furthermore, genetic diversity, which supports the "existence of biodiversity" as a whole, must be recognized as indispensible for all living organisms on the earth, including humans.

Let us look at the benefits we humans are receiving from ecosystems in more specific terms. Ecosystems have inherent mechanisms to reproduce animals and plants, and humans obtain food, water, lumber, fuels and other things necessary for subsistence thanks to these mechanisms. Ecosystems also have the regulating function to stabilize the habitat environments for living organisms, such as easing of climate change and flooding, water purification, and control of diseases and destructive insects. Moreover, ecological elements are deeply related to our mentality and cultures. Examples include our sense of awe for nature, appreciation of sceneries as recreation, observation of animals and plants, and use of natural things as objects of paintings and haiku. These various benefits of ecosystems humans are receiving are called "ecosystem services" as a whole.

Where do we see the degradation of biodiversity and ecosystem services it underpins? In the first place, most of what we eat and drink comes from living organisms such as plants and animals, with the only exceptions of water and salt. We may directly make use of living organisms in nature or we may clear off living organisms in nature to grow grains and raise livestock useful for humans. Not a few living organisms have lost their habitats because of environmental contamination by humans. In tandem with the population growth and changing lifestyles, their burdens on the environment have kept increasing and grown too heavy. For example, the area of forests on the earth has been halved by human activities from the level prior to the spread of the impact of human

Linkages between Ecosystem Services and Human Well-being




Source: Millennium Ecosystem Assessment

activities, and the ratio of fish stocks being excessively utilized has kept growing. Thus, it is evident that human activities are burdening nature. This is clear from the results of analysis of changes in ecosystem services made in the third edition of the Global Biodiversity Outlook, published by the Secretariat of the Convention on Biological Diversity. Global trends concerning food show that while ecosystem services for grains, livestock and aquaculture are increasing, ecosystem services for fish catches and wild foods are decreasing (Figure 1-5-2). What we should not forget is that biodiversity and ecosystem services it underpins have been formed by a long history of evolution over approximately four billion years and they are not something humans can produce like manufactured products made at industrial plants, and thus cannot be restored to the original state easily once they are lost.

What can we do in order to maintain biodiversity and ecosystem services in good conditions and carry them over to future generations? Human activities are very significant in that they affect the environment, and we need to respond as society as a whole that depends on ecosystem services. For example, in manufacturing and construction industries dependent on biological resources, we need to switch processes of selection, processing and disposal of raw materials to sustainable ones that pay heed to biodiversity and manage ecosystem services as common assets of mankind through adequate payments for ecosystem services by various entities, including citizens. We should also do proactively what we can as individuals. People in the past lived with due heed to whether they could harvest crops or catch fish in the coming year. In the modern age when most people are not engaged in production activities, we rarely find ourselves in such scenes of directly paying heed to such things. However, we still must be able to feel that we are living with life bestowed upon us each day, set great store by and not waste food, and even in urban areas, notice the verdure and autumnal leaves of street trees, dandelions and the blossoming of cherry trees, and seasonal changes in the chirping of birds and insects. It is important to have these senses in everyday life and act on the basis of consciousness about "mottainai" wastefulness and a sense of gratitude for the blessing of life. We should be able to live nicely on the earth if we, as society as a whole and as individuals, pay due heed to biodiversity and proceed with efforts to maintain ecosystem services.

## 1 Fast-disappearing biodiversity on the earth

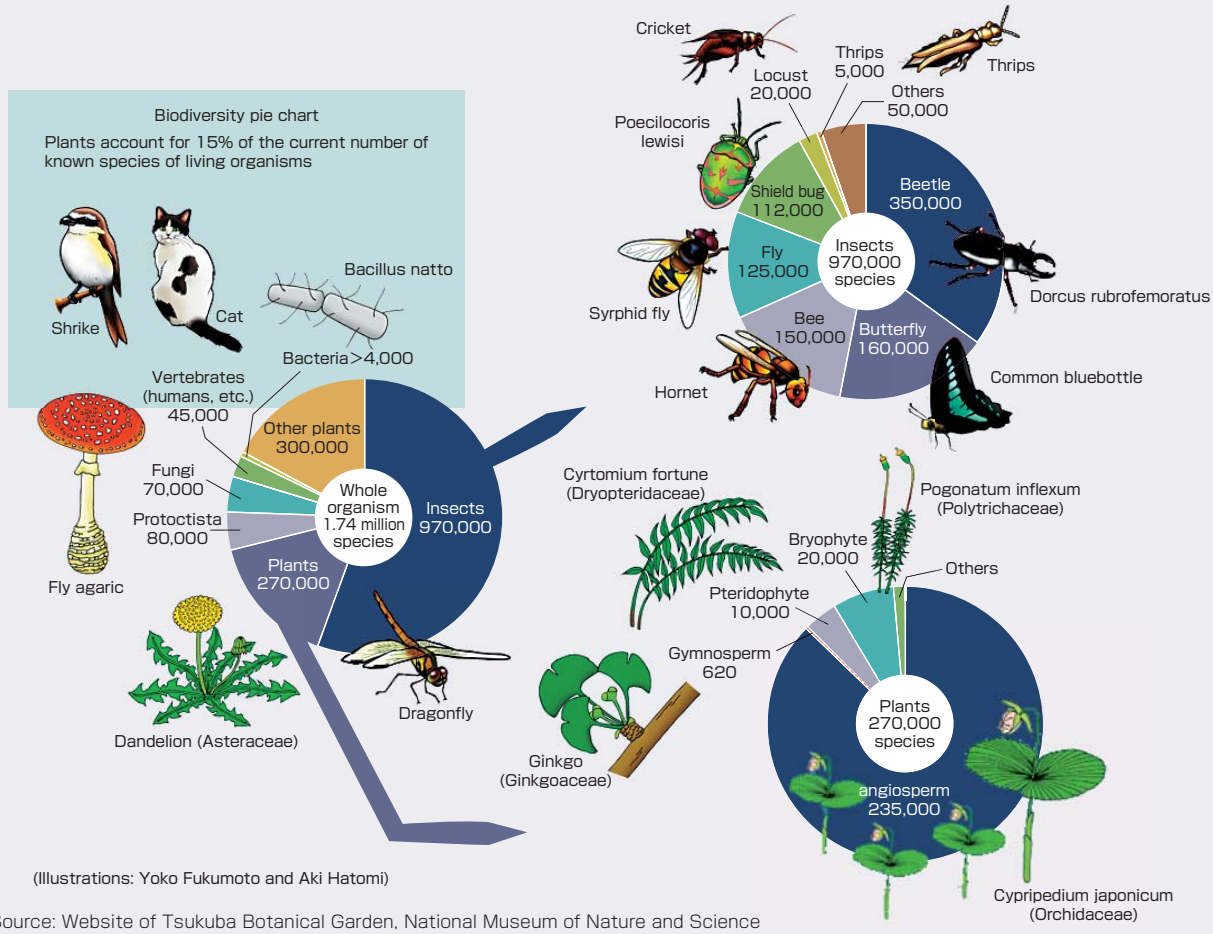
"Species" is the most fundamental unit in understanding biodiversity. Living organisms on the earth have adapted to a variety of environments in the history of evolution over approximately four billion years. As a result of this evolution, there are now multitudes of living organisms, estimated to amount to 30 million species, including unknown ones. Of them, the number of species we know of is about 1.75 million, only a fraction of the total (Figure 3-1-1). Since the birth of life, ecosystems on the earth that surround us are established on the basis of the long history of activities by living organisms on the earth. It is easy to imagine that it would require mind-boggling long years to restore ecosystems once they are lost. We know that biodiversity is essential for our subsistence given that oxygen that is essential for the subsistence of living organisms is generated by plants, agricultural products such as grains, vegetables and fruits are refined versions of wild plants and produced only because of the existence of biodiversity, and genetic biodiversity that can adapt to various environmental changes is necessary for species of living organisms to survive by avoiding extinctions caused by climate change or the spread of diseases.

Mass extinctions of living organisms are believed to have occurred five times on the earth in the past. These extinctions of species under natural conditions took several ten thousands to several hundred thousands of years to happen, averaging about 0.001 species a year. The problem is that current extinctions of living organisms being caused by human activities at an incommensurable speed compared with those in the past. Since 1975, about 40,000 species are said to be becoming extinct each year. Humans are indeed capable of extinguishing other living organisms before we know it (Figure 3-1-2).

According to the Red List of the International Union for Conservation of Nature (IUCN) announced in November 2009, out of a total of 47,662 species assessed, 17,285 species are listed as threatened, an increase of 363 species over the 2009 list (Figure 3-1-3). The biggest driver pushing these species towards extinction is the destruction of habitats, but the main drivers are varied, including hunting and picking, invasion by invasive alien species, and contamination of water and soil. IUCN found that of species assessed, 21% (5,490 species) of mammals, 30% (6,285 species) of amphibians, 12% (9,998 species) of birds, 28% (1,677 species) of reptiles, 32% (4,443 species) of fish, 70% (12,151 species) of plants and 35% (7,615 species) of invertebrates are at risk of extinction. This means that we are rapidly losing useful assets in the form of unknown genes of living organisms.

Overexploitation and poaching of living organisms have an impact on biodiversity, and we have the Washington Convention (the official name: the Convention on International Trade in Endangered Species of Wild Fauna and Flora) as an international agreement concerning trade in rare plants and animals. The Washington Convention is designed to protect certain

Figure3-1-1 The Number and Ratio of Known Species of Animals and Plants




(Illustrations: Yoko Fukumoto and Aki Hatomi)

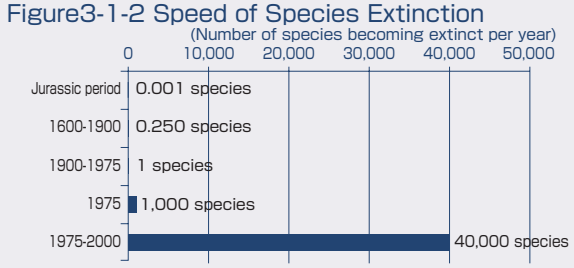
Source: Website of Tsukuba Botanical Garden, National Museum of Nature and Science

species of wild fauna and flora against overexploitation through international trade. The convention took effect in 1975, and Japan acceded to it in 1980. The number of parties to the convention increased from 18 in 1975 to 175 in February 2010 (Figure 3-1-4).

Degradation of biodiversity has become actually observable at various locations around the world. While nine subspecies of wild tigers are known, including Bengal tiger and Amur tiger, three subspecies have already become extinct (Photo 3-1-1). According to an investigation by the World Wide Fund for Nature (WWF), the population of tigers is estimated to have dwindled from 100,000 to about 3,400 to 5,100 in a period of 100 years to the 21st century. Main reasons behind the decline include poaching for beautiful furs and materials for Chinese medicine and habitat loss due to development of agricultural land.

In Japan, remarkable examples of biodiversity degradation include the decrease in coral cover degree in Okinawa, the changing dynamics of benthic fish and shellfish in Tokyo Bay, and the decrease in alpine plants due to feeding damage from deer in Oze. Coral reefs are exposed to a variety of stresses, including rising sea temperatures, a sharp increase in acanthasters, and the inflow of red soil and nutrient salt. An analysis of field surveys and aerial photos show that areas with high coral cover of 50% or over decreased to just about 18% in 2003 compared with the 1980 level (Figure 3-1-5).

Figure3-1-2 Speed of Species Extinction



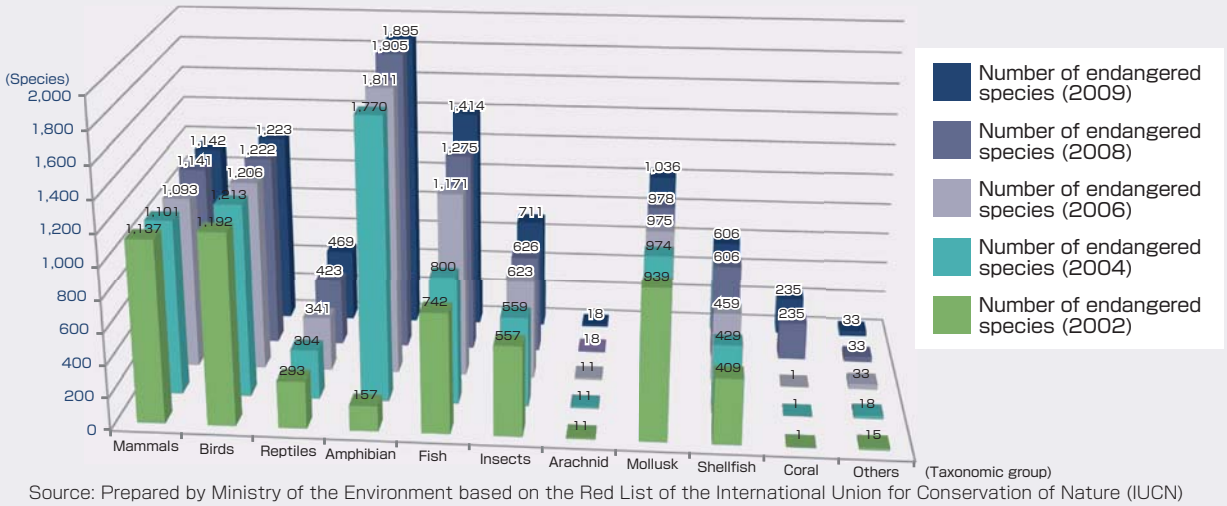

Source: Prepared by Ministry of the Environment based on Norman Myers, "The Sinking Ark: A New Look at the Problem of Disappearing Species" (1981)

In Tokyo Bay, the long-term monitoring of 20 fixed points in the inner bay area has been going on with the same method for over 30 years (from 1977 to present), resulting in the accumulation of valuable knowledge from a global viewpoint. The survey covers the population, weight and the number of species of benthic fish and shellfish communities as a whole in coastal sea areas heavily susceptible to human activities. The survey results show that both the population and weight tended to increase from the 1970s through the latter half of the 1980s due to water quality improvement in Tokyo Bay, the population and weight decreased sharply from the late 1980s to the 1990s. In the 2000s, while the population stayed at a low level, only the weight of fish species increased, with commonly observed species like squillas, marbled flounders and pennant coralfish

declining and large-size fish species growing, bringing about changes in biota (Figure 3-1-6). Causes of these developments are unknown, but some changes in the propagation environment, such as the emergence of hypoxic water masses and the shrinkage of shallow sea areas, have been assumed, and resources are unlikely to recover unless these problems are solved.

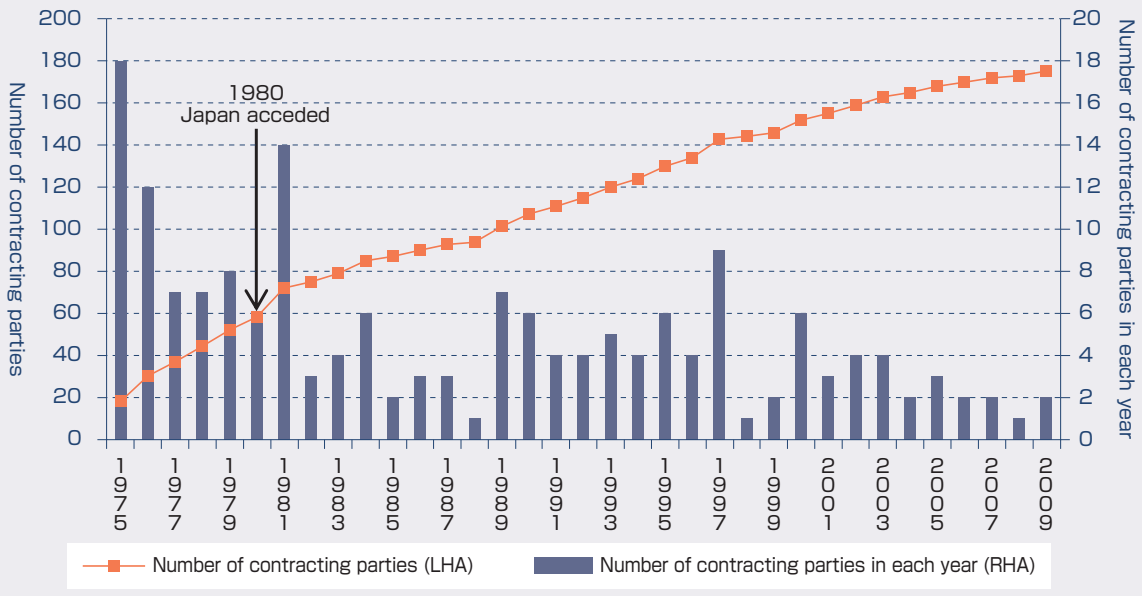
In Oze National Park that came into being in 2007, since the inhabitation of Sika deer was confirmed in the mid-1990s, vegetation in wetlands has been disrupted by feeding damage. The population survey estimates that 305 Sika deer will have been living in the park in 2020, 3.4 times the population 10 years ago, which may give an irreparable impact on the ecosystem that has never been influenced by Sika deer before. Aside from the possibility that the ecosystem in the national park that has been established over a long period of history may be destroyed, it is also feared likely that the landscape and the cultural value as the object of academic investigations might be damaged or the deteriorating landscape could lead to a decline in the number of visitors to the national park to cause an economic loss to the local community.

Figure3-1-3 Number of Threatened Animal Species in the World by Taxonomic Group




Source: Prepared by Ministry of the Environment based on the Red List of the International Union for Conservation of Nature (IUCN)

Figure3-1-4 Changes in the Number of Contracting Parties to the Washington Convention

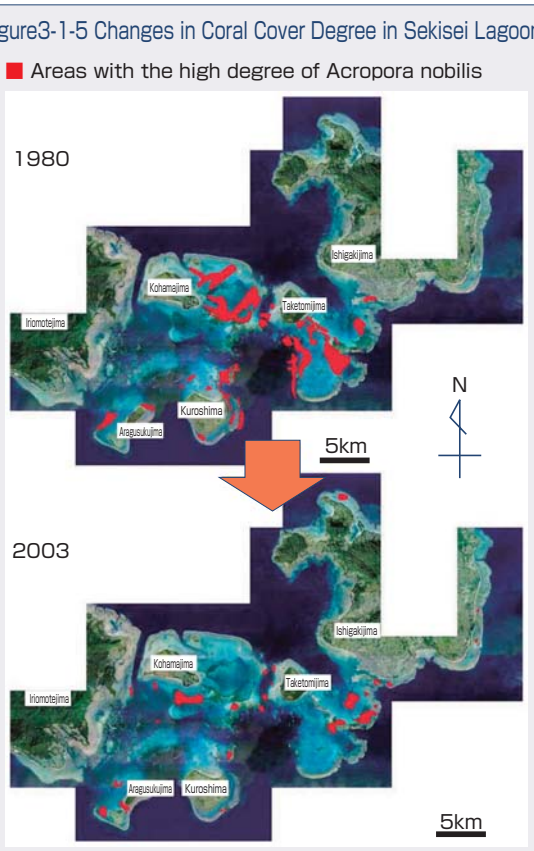



Source: Prepared by Ministry of the Environment based on the website of the Secretariat of the Washington Convention

Photo3-1-1 Bengal Tiger

Source: Hollingsworth, John and Karen/U.S. Fish and Wildlife Service (FWS)

Figure3-1-5 Changes in Coral Cover Degree in Sekisei Lagoon




Source: Ministry of the Environment

## 2 Linkages between biodiversity loss and our daily life

The U.N. Millennium Ecosystem Assessment carried out between 2001 and 2005 points out that large and irreversible change in biodiversity due to human activities has occurred in the past 50 years. It also points out that the degradation of ecosystem services would grow significantly worse during the first half of the 21st century and the risk of accelerating and irreversible changes could grow, concluding that coupled with the exacerbation of poverty, these problems, unless addressed, will substantially diminish the benefits that future generations obtain from ecosystems.

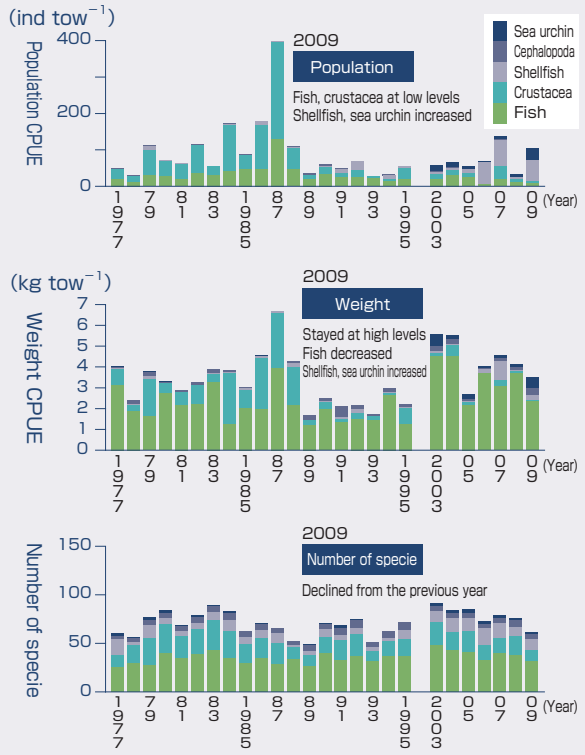
The main drivers for the degradation of biodiversity include the decrease in forests and overexploitation of biological resources and the burden on biodiversity from either of them is known to be continuing or even growing. The area of forests in the world stood at 4,077.28 million hectares in 1990, but decreased by 8.90 million hectares (0.22%) per year in 1990-2000 and by 7.30 million hectares (0.18%) per year in 2000-2005. While the rate of decrease slowed, the decrease was the net change after deducting the increase from forest planting, vegetation restoration and natural expansion of forests. The continuation of the loss of forest area amounting to as large as about 7.30 million hectares per year presents a major problem (Figures 3-1-7 3-1-8). It is apparent that the decrease in forest area is showing no sign of halting particularly in Africa and Latin America.

On the other hand, global demand for timber is projected to grow at an annual rate of just over 1% in coming years (Figure 3-1-9). While any sharp tightening of timber supply and demand is seen unlikely in the long term in view of the expanding area of highly productive planted forests, it is necessary to continue with efforts for sustainable forest management.

Fisheries production, meanwhile, increased over six times in the 50 years between 1950 and 2000, a rate of increase far greater than the population growth of about 2.4 times during the same period, with the rising proportion of overexploitation (Figures 3-1-10, 3-1-11).

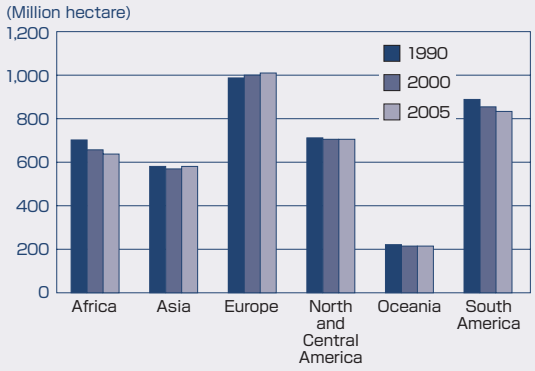
As fish and shellfish resources necessary in the future are estimated to keep growing, unless the exploitation of these resources is held within the scope of resource recovery, our everyday life will likely be affected sooner or later (Table 3-1-1). The Western and Central Pacific Fisheries Commission (WCPFC) in December 2009 decided not to increase the number of vessels and days of operation for fishing bluefin tuna in the Western and Central Pacific from the 2002-2004 level, beginning in 2010. In November 2009, a decision was also taken to reduce caches of bluefin tuna in the Atlantic Ocean. These decisions mark the start of medium- and long-term efforts to conserve resources.

## Figure3-1-6 Secular Change in Fish Catches (Population and Weight) and Number of Fish Species in Tokyo Bay



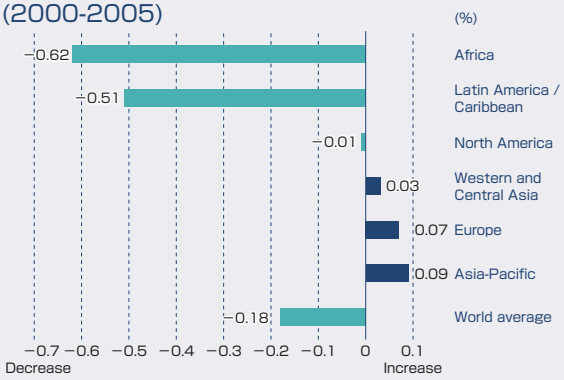

Source: Laboratory of Fisheries Biology, Department of Aquatic Bioscience, Graduate School of Agricultural and Life Sciences, University of Tokyo; National Institute for Environmental Studies

## Figure3-1-7 Trends in forest area by region 1990-2005



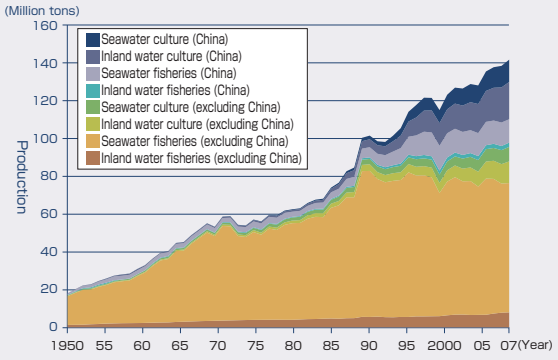

Source: Prepared by Ministry of the Environment based on FAO, "Global Forest Resources Assessment 2005"

## Figure3-1-8 Net Annual Change in Forest Area (2000-2005)



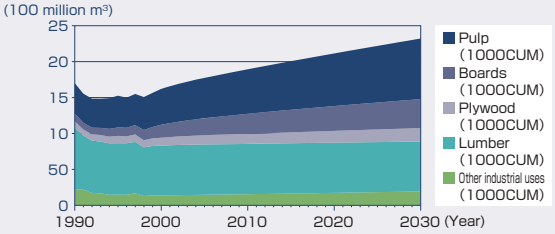

Source: Prepared by Ministry of the Environment based on FAO, "Global Forest Resources Assessment 2005"

## Figure3-1-10 Changes in Global Fisheries Production



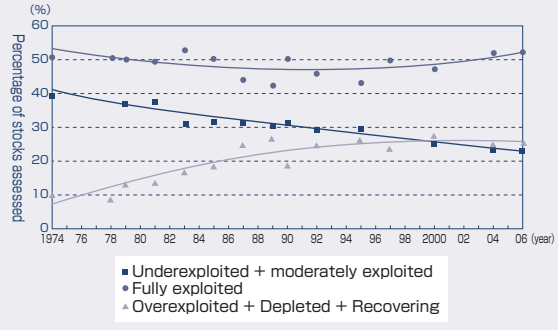

Note: Excludes marine plants, marine mammals and miscellaneous fishery products
Source: Prepared by Ministry of the Environment based on FAOSTAT database

## Figure3-1-9 Actual and Projected Industrial Roundwood Demand (World Total) by Use




Note 1: Estimates based on actual demand for 1961-1999
2: Model-based calculated figures for 2000 onward
Source: Forestry and Forest Products Research Institute, Selection of Study Results in FY 2006 (2007)

## Figure3-1-11 Global trends in the state of world marine stocks since 1974




Source: FAO, "The State of World Fisheries and Aquaculture 2006"

## Table3-1-1 Projected Future Demand for Fishery Products

| | Per-capita fish and shellfish consumption for food per year | World total demand A | World total production B | Demand - production A - B |
|---|---|---|---|---|
| 1999/2001 | 16.1kg | 133 million tons | 129 million tons | - 4 million tons |
| 2015 | 19.1kg | 183 million tons | 172 million tons | - 11 million tons |

Note: World total demand and world total production include nonfood fish and shellfish.
Source: Materials provided by the Fisheries Agency

## 3 Economic losses from the degradation of ecosystem services

Efforts have been made to capture the economic value of ecosystem services in order to objectively capture the impact of biodiversity loss on our livelihood. There are various types of ecosystem services. It is difficult to make an economic valuation of some of them because of the characteristics of their services. Table 3-1-2 shows some examples of the estimation of the economic value of ecosystem services made to the extent that they can be converted into monetary value.

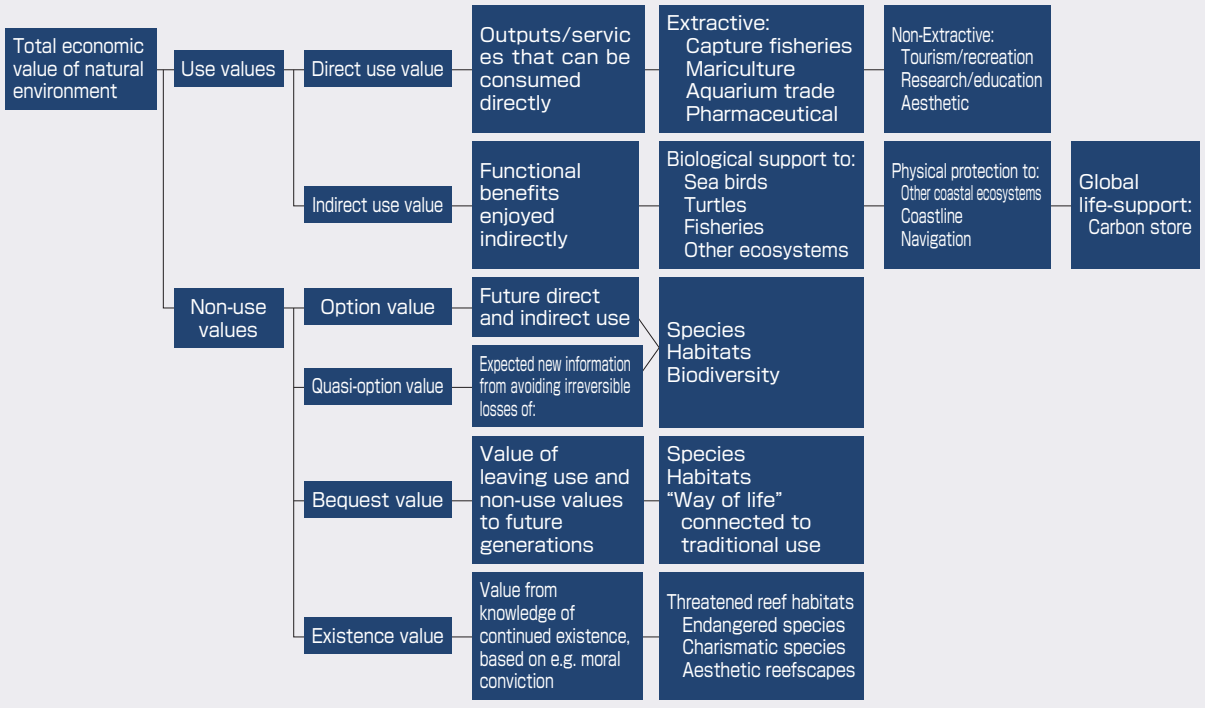
While active efforts are under way to capture the economic value of natural environment, there is no single identical natural environment subject to the economic valuation of ecosystem services. Since it is very difficult to evaluate ecosystem services by the use of a single yardstick, like pricing of carbon dioxide emissions in global warming countermeasures, full heed needs to be given to this in considering the economic valuation of ecosystem services.

One conceivable way of evaluating the economic value of natural environment is, given the diverse values of natural environment, to divide the economic value into use value and non-use value and subdivide them further into smaller categories. One example is the classification shown in Figure 3-1-12. But the evaluation needs to be

Table3-1-2 Examples of Monetary Value Assessed for Ecosystem Services

| Item | Monetary value of ecosystem services | Estimator |
|---|---|---|
| Global ecosystem services | About $33 trillion per year | Dr. Robert Costanza, University of Maryland, U.S., 1997, Nature (U.K. science magazine) |
| Function of pollinating insects | About ¥24 trillion per year | French National Institute for Agricultural Research (INRA), 2008, Ecological Economics (U.S. science magazine) |
| Rain forests | An annual average of about ¥540,000 per ha, about ¥982 trillion globally | International Union for the Conservation of Nature and Natural Resources (IUCN), 2009 |
| Degradation of forest ecosystem | An economic loss amounting to about ¥220-500 trillion expected by 2050 | The Economics of Ecosystems and Biodiversity (TEEB), An Interim Report, 2008 |
| Mangrove forest | Protection and planting of mangroves in Vietnam cost $1.1 million, but save annual expenditures on dike maintenance of $7.3 million | The Economics of Ecosystems and Biodiversity (TEEB), D1 (For Policy Makers), 2009 |
| Conservation of global protected areas | Costs about $45 billion annually, but the functions of nature (absorption of carbon dioxide, preservation of drinking water, flood prevention, etc.) are worth $5 trillion per year | The Economics of Ecosystems and Biodiversity (TEEB), D1 (For Policy Makers), 2009 |

Figure3-1-2 Total Economic Value of Natural Environment and Attributes of Economic Values to Coral Reefs




Source: Barton (1994)

made by keeping in mind that respective subdivided values contain the following two valuation axes:

(i) Natural science-based valuation: Investigate and show the state of nature and to what problems nature is exposed.

(ii) Social science-based valuation: Show the significance to humans and what values are offered to humans.

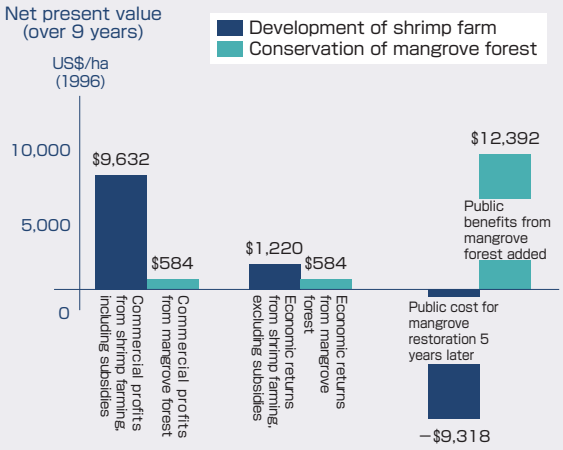
As methods to evaluate the value of natural environment by substituting it with things that already have market values, there are the output evaluation method, prevention expenditure method, damage cost method and alternative method, etc. However, the evaluation cannot be made unless there are substitutable market goods. The value that cannot be converted into monetary value has to be evaluated qualitatively. For example, as the landscape and the function of preserving ecosystems do not have substitutable market goods, they cannot be evaluated using the above-mentioned methods.

According to "The Economics of Ecosystems and Biodiversity (TEEB), D1 (For Policy Makers)", in a local development project, as commercial profits are often given priority and ecosystem services are underestimated, the act of development tends to be judged commercially feasible. When government subsidies are excluded and post-development restoration costs are taken into account, however, ecosystem services turn out to be larger than expected benefits from not undertaking the development project exceed benefits from development. For example, in a project to develop a shrimp farm by cutting down mangroves, the project most likely is assessed only from the aspect of economic gains to be obtained by a developer. When the economic effects of the shrimp farm and benefits from mangroves are compared, the former is judged considerably larger (the left-hand graphs in Figure 3-1-13). However, the shrimp farm development project is funded by government subsidies, and when this support factor is excluded, the economic effects of the development is reduced to about one-eighth (the middle graphs in Figure 3-1-13). Further, in addition to the profits to be gained by the developer, when the benefits of the development and mangrove conservation are compared, including public costs necessary to restore the functions of mangrove forests on the site of the shrimp farm five years later and public benefits from preserving mangrove forests, the benefits of conservation prove to be larger than the benefits of development (the right-hand graphs of Figure 3-1-13).

Meanwhile, efforts to economically evaluate ecosystem services are under way in Japan as well. For example, around Kabukurinuma (wetlands designated under the Ramsar Convention, in Osaki, Miyagi Prefecture), known as one of the largest destinations of anatine birds in Japan, the economic value of ecosystem services (maintaining the number of anatine birds coming to the wetlands at the current 70,000) protected by environmentally-sound farming around the wetlands has been analyzed. The analysis was made using the conjoint method, under which a survey is carried out by presenting multiple environment conservation measures to potential respondents and asking them to rank their desirability to evaluate the economic value. A nationwide questionnaire survey for a six-day period via the Internet drew a total of 3,257 responses (the response rate at 21.6%). The survey results put the willingness to pay at an average ¥1,007 per household per year, which is estimated to total ¥53.2 billion when extended to the total number of households of 52.88 million in Japan (as of March 2009) (based on "Policy Research on Environmental Economics," Associate Professor Managi and Professor Kuriyama).

As seen above, by translating the economic value of ecosystem services into monetary value, it becomes possible to compare the economic value of development and the economic value maintained through conservation as well as the costs involved in both.

Figure3-1-13 Relationship between Benefits from Shrimp Farm Development and Public Benefits of Mangrove Forest




Source: The Economics of Ecosystems and Biodiversity

## Column World of Mutualism between Corals and Crabs

A variety of living organisms, including crabs, shrimps, univalve shells and small fish, use the space between coral branches as their habitats. Based on research on the relationship between Pocillopora damicornis and Trapezia cymodoce, we introduce the mutualism (the relationship of harmonious coexistence that brings mutual benefits) between them in this column.

Trapezia cymodoce feeds on mucus made by corals. This is the advantage of living with corals. Corals, on the other hand, are protected by Trapezia cymodoce from acanthasters, their natural enemy. Scenes of Trapezia cymodoce beating off acanthasters that approached to eat corals by cutting off their ambulacral feet and grabbing and cutting their needles are observed. All of more than 10 types of Trapezia cymodoce confirmed to live in coral reefs in Okinawa behave like this.

On the other hand, what remains less well understood is cases where congeneric multiple species of Trapezia cymodoce live in the same coral colony, which is contrary to the principle that "species with the similar mode of life do not live in the same habitat." One tentative theory under study is: "The coexistence relationship between corals and Trapezia cymodoce is related to the existence of acanthasters. When acanthasters are around, many species of Trapezia cymodoce gather to protect corals. If acanthasters are not around, Trapezia cymodoce do not have to exert efforts to beat off acanthasters, so species of Trapezia cymodoce start fighting among them and only strong species survive. Then, individuals in the surviving species start fighting and a pair of a large-size male and female occupy the coral colony."

If the above phenomenon is unraveled, clues to the protection of corals from acanthasters may be obtained. Besides this example, there are a lot of unknowns about the mechanism of ecosystems. Destroying biodiversity that brings immeasurable benefits to us without elucidating these unknowns would be a great loss to all living organisms on the earth, including humans.

Multiple species of Trapezia cymodoce confirmed to live in the same coral colony

Photo: Professor Makoto Tsuchiya, Faculty of Science, University of the Ryukyus

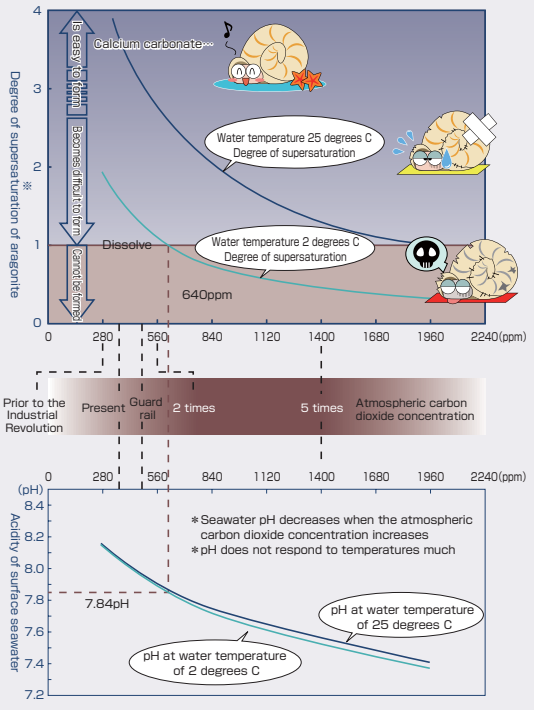
# Section 2 Biodiversity and Global Warming

According to the IPCC Fourth Assessment Report, the risk of species extinction is projected to increase with increase in global average temperature. Droughts and wildfire associated with climate change are also threatening food production and ecosystems, while the degradation on biodiversity such as decreasing forest area is accelerating global warming. Therefore, it is necessary to implement measures to conserve biodiversity and measures against global warming by linking them.

## 1 Impact of global warming on biodiversity

The IPCC Fourth Assessment Report states that annual average Arctic sea ice extent has shrunk by 2.7 [2.1 to 3.3] % per decade, with larger decreases in summer of 7.4 [5.0 to 9.8] % per decade (Numbers in square brackets indicate a 90% uncertainty interval around a best estimate). The U.S. Fish and Wildlife Service (FWS) estimates that sea ice changes as projected, two-thirds of the global population of polar bears will be lost by around the mid-21st century. The IPCC Fourth Assessment Report states that increases in sea surface temperature of about 1 to 3℃ are projected to result in more frequent coral bleaching events and

Figure3-2-1 Linkages between Acidity of Surface Seawater and Formation of Calcium Carbonate




※Aragonite: Calcite and aragonite are two types of calcium carbonate with different crystal forms. Living organisms that form shells with aragonite more significantly affected by ocean acidification include sea butterflies (planktonic conches) and corals.

Source: Center for Global Environmental Research, National Institute for Environmental Studies, "What We Should Know about Global Warming"
http://www.cger.nies.go.jp/ja/library/qa_index-j.html

widespread mortality, unless there is thermal adaptation or acclimatization by corals.

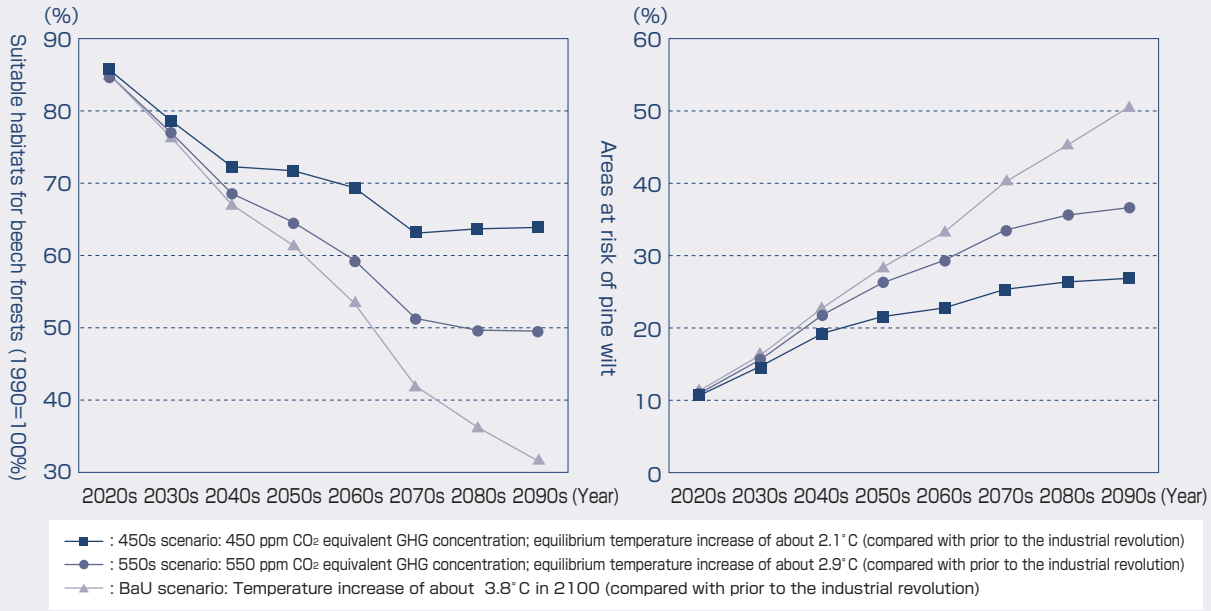
Further, there have been changes in oceans and forests, which are the vital foundations for the living organisms. Before the Industrial Revolution, when the atmospheric concentration of carbon dioxide was around 280ppm, the sea surface had a pH of 8.17. At present, when the carbon dioxide concentration has reached around 380ppm, the sea surface pH has already declined to around 8.06 (Figure 3-2-1). In oceans, there are many living organisms that have calcareous shells and skeletons. For examples, shellfish form shells for self-protection, while fish use calcium carbonate for ear stones that maintain their physical balance. Corals leave calcareous skeletons to nurture the next generation. However, when the carbon dioxide concentration in seawater rises with atmospheric carbon dioxide dissolving into seawater, acid ($H^+$) generated from carbon dioxide neutralizes carbonate ion ($CO_3^{2-}$), the material for calcium carbonate, reducing the carbonate ion concentration and making the production of calcium carbonate difficult. According to German Council of Science and Humanities, in order to avoid a critical impact on marine organisms that form calcareous shells, the decline in pH since the Industrial Revolution should not exceed 0.2. Meanwhile, in order to keep atmospheric temperature increases within two degrees C, the carbon dioxide concentration must be kept from exceeding 450ppm. If the carbon dioxide concentration is 450ppm, the decline in seawater pH would be around 0.17, barely below the 0.2 target to avoid a critical impact on marine organisms. Incidentally, both the atmospheric temperature rise target of 2 degrees C, above which climate change is likely to cause a major impact, and the pH decline target to avoid a critical impact on marine organisms have the same carbon dioxide concentration target of 450ppm.

A study on wildfires by the University of California, et al, and referenced by the IPCC Fourth Assessment Report found that since the 1970s, wildfire in the western United States increased in years when temperatures from spring to summer increased by about 2 degrees Celsius. Thus, large wildfires increased suddenly since the mid-1980s, and it has been reported that the frequency of wildfires is about four times and the forested area burned from 1987 to 2003 is 6.7 times the area from 1970 to 1986. In terms of the impact on ecosystems, the IPCC Fourth Assessment Report states that approximately 20-30% of plant and animal species assessed so far are likely to be at increased risk of extinction if increases in global average temperature exceed 1.5-2.5℃ .

Turning to the impact on ecosystems in Japan, "Comprehensive Assessment of Climate Change Impacts to Determine the Dangerous Level of Global Warming and Appropriate Stabilization Target of Atmospheric GHG (greenhouse gas) Concentration" (hereafter referred to as "Project for Comprehensive Projection of Climate Change Impacts" ), a strategic research and development area project financed by the Global Environment Research Fund of the Ministry of the Environment, projects a decrease in suitable habitats for beech forest an expansion of pine distribution areas at risk of pine wilt. It also projects that the impact and damage will likely decrease considerably if the greenhouse gas concentration is contained at the stringent stabilization target of 450ppm, but occurrence of a measure of damage cannot be avoided (Figure 3-2-2).

The degradation on biodiversity also affects global warming. The annual amount of carbon dioxide naturally absorbed by the earth is about 3.1 billion tons-C, of which terrestrial ecosystems (forests, grasslands and farmland, etc.) are estimated to absorb about 1.8 billion tons-C. As discussed in Section 1, the decline in forest area has not halted, with the capacity to absorb carbon dioxide decreasing gradually. Thus, the decline and degradation of forest ecosystems are likely to accelerate global warming. And if the atmospheric carbon dioxide concentration increases, the acidification of oceans that absorb 25% of global carbon dioxide emissions progresses further, threatening a serious impact on marine ecosystems.

Figure3-2-2 Ratio of Changes in Suitable Habitats for Beech Forests and Pine Distribution Areas at Risk of Pine Wilt Due to Global Warming




Source: Project Team for Comprehensive Projection of Climate Change Impacts, 2009

## 2 Conservation of biodiversity and global warming measures are inseparable

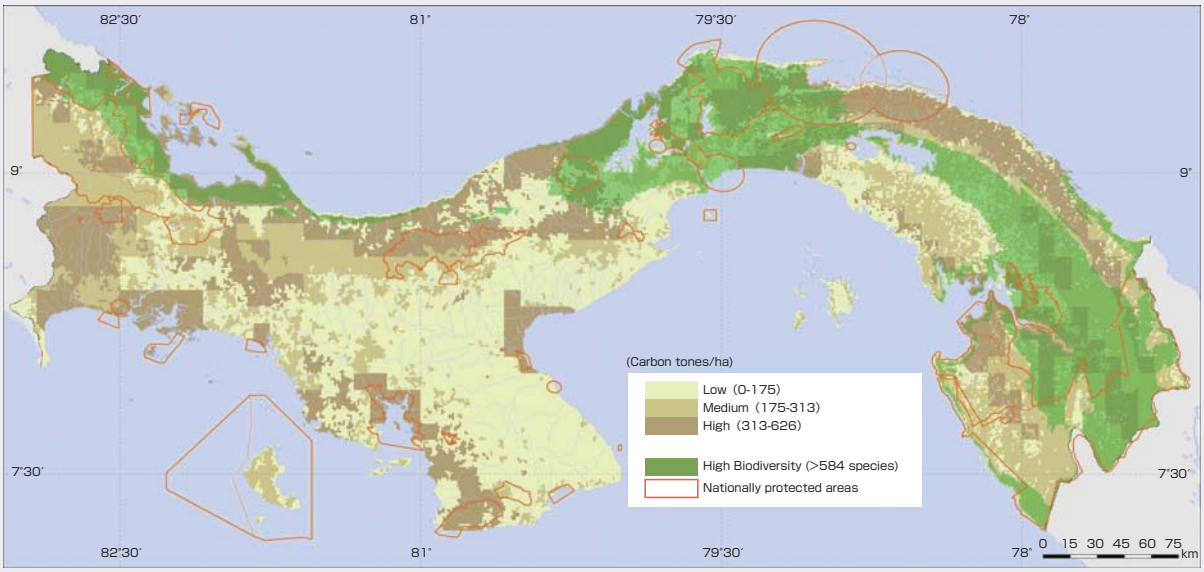
As seen above, biodiversity and global warming are closely connected and thus measures to deal with them should be more effective if they are mutually contributory. The "Stern Review: The Economics of Climate Change," which analyzes the economic impact of climate change, notes that "Curbing deforestation is a highly cost-effective way of reducing greenhouse gas emissions," and also leads to the conservation of biodiversity, etc.

About 20% of global greenhouse gas emissions are said to stem from the decrease and degradation of forests in developing countries. Under these circumstances, a mechanism to provide incentives to efforts to halt the decrease and degradation of forests in developing countries, called "REDD (reducing emissions from deforestation and forest degradation in developing countries)" is being considered under the Framework Convention on Climate Change (FCCC). Further, in recent years, the "REDD-plus" mechanism, which adds to REDD the ideas of forest conservation and sustainable forest management contributory to the conservation of biodiversity, is also being discussed. The Copenhagen Accord, adopted at the 15th session of the Conference of the Parties to the FCCC, held in Copenhagen, Denmark, in December 2009, incorporates the establishment of a mechanism for securing necessary financial resources for these efforts, including REDD Plus. In order to promote REDD effectively from both aspects of biodiversity conservation and global warming countermeasures, the World Conservation Monitoring Centre of the U.N. Environment Program (UNEP) has developed national maps for six tropical countries showing where areas of high carbon storage coincide with areas of biodiversity importance. Figure 3-2-3 illustrates the national map for Panama, where it is estimated that 20% of Panama's carbon emissions is stored in high carbon, high biodiversity areas. These efforts are believed to contribute to the objective identification of prioritized areas for REDD.

Furthermore, for example, the "Payment for Ecosystem Services (PES)," a method for maintaining ecosystem services, such as the cultivation of water source forests to secure water sources, can be expected to function as carbon sinks, if forests are adequately protected as a consequence. The following maps have been developed for Madagascar as an example. Colored areas in the left panel depicts the overlap between multiple ecosystem services in forest and wetlands, while red areas in the right panel indicates where payments would be suitable, after considering ecosystem services and payment costs (Figure 3-2-4).

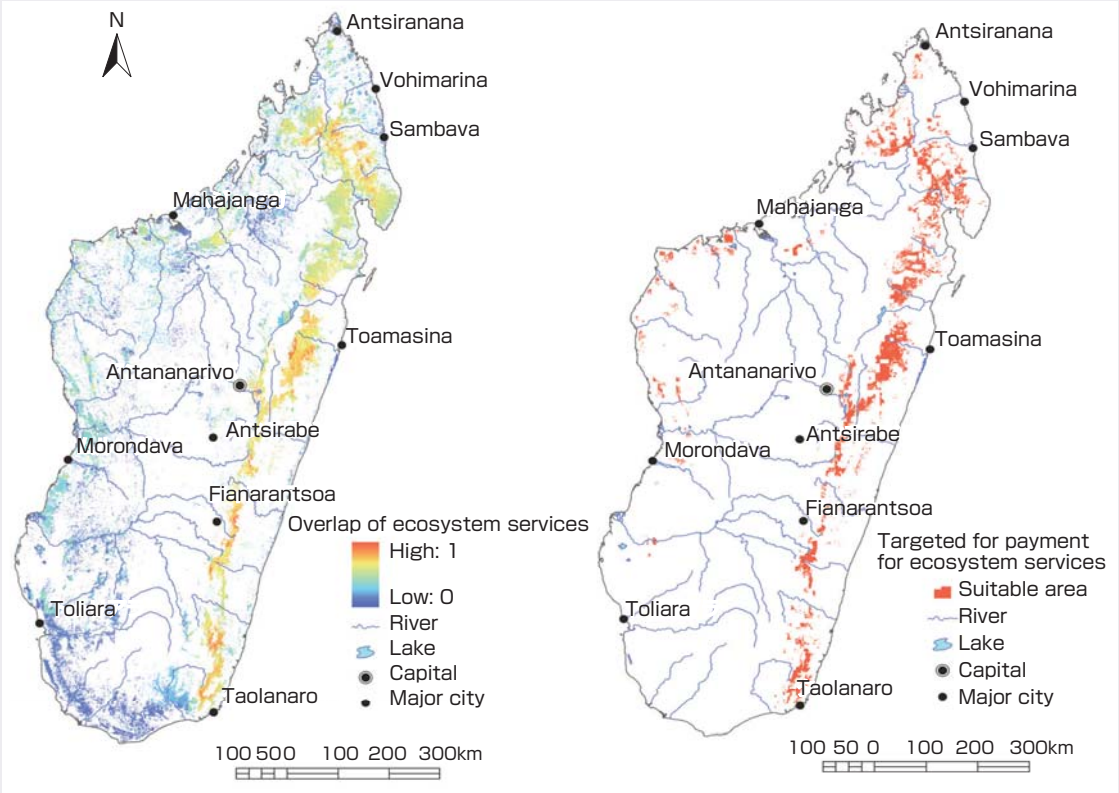
As seen above, since the conservation of biodiversity and global warming countermeasures mutually bring about synergetic effects and added value to the other, it can be considered more effective if efforts are made by linking both measures.

Figure3-2-3 An Example of National Maps Developed by the United Nations Environment Program's World Conservation Monitoring Centre (UNEP-WCMC) (Panama)




Source: Kapos et al. 2008

Figure3-2-4 Targeted Payments for Ecosystem Services in Madagascar




Source: Adapted from Wendland et al. 2009

# Section 3 Shift to Biodiversity-Friendly Socio-economy (Mainstreaming of Biodiversity)

In order to realize the coexistence of humans and nature and make a shift to a biodiversity-friendly socio-economy, it is necessary to incorporate the conservation and sustainable use of biodiversity into various social and economic activities on a global scale as well as at the level of civil life (mainstreaming of biodiversity).

Therefore, in this section, we shed light on the relationship between corporate activities and cities and

biodiversity, which has previously been thought to be not even remotely related, and also describe the need for a shift toward biodiversity-friendly lifestyles as well as excellent examples of various entities working for the mainstreaming of biodiversity.

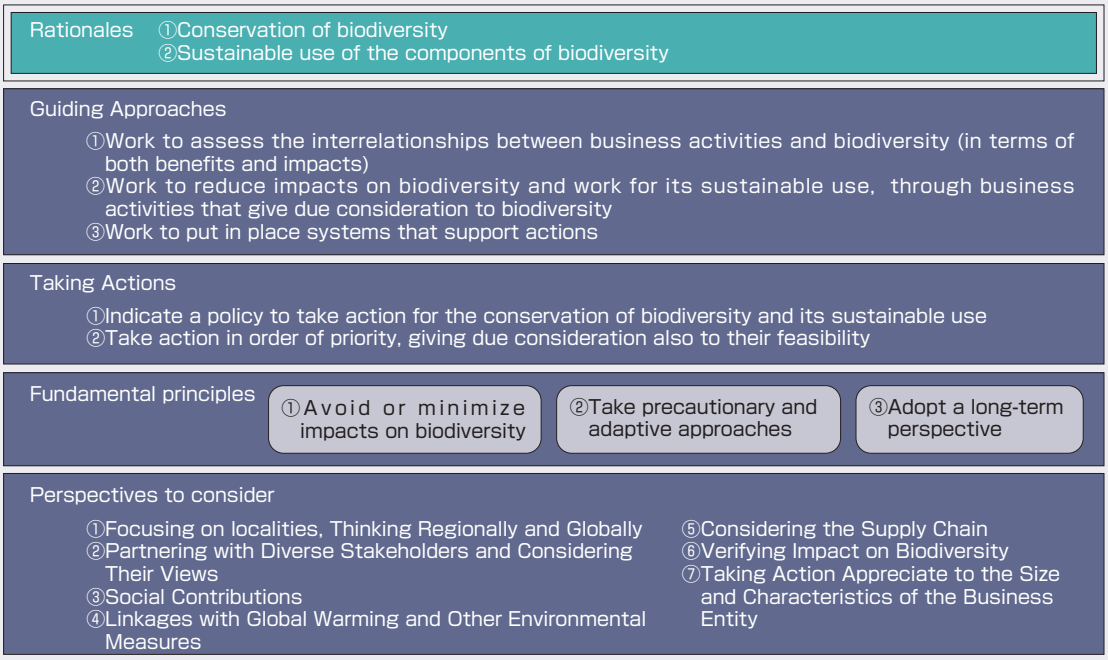
## 1 Biodiversity and businesses

International movements concerning biodiversity and businesses began with the adoption for the first time of a resolution regarding the importance of private-sector engagement at the eighth meeting of the Conference of the Parties to the Convention on Biological Diversity (COP8), held in Curitiba, Brazil, in March 2006. While noting that the private sector is arguably the least engaged of all stakeholders in the implementation of the Convention, the decision placed high expectations on contributions private-sector businesses can make, noting that (1) the daily activities of business and industry have major impacts on biodiversity, and encouraging business and industry to adopt and promote good practice could make a significant contribution to preventing the loss of biodiversity; (2) individual companies and industry associations can be highly influential on Governments and public opinion, and thus, they have the potential to spread the conservation and sustainable use of biodiversity; and (3) the private sector possesses biodiversity-relevant knowledge and technological resources, as well as more general management, research and communication skills, which, if mobilized, could facilitate practices for the conservation and sustainable use of biodiversity.

At the high-level ministerial segment of COP9 held in Bonn, Germany, in May 2008, a signing ceremony took place for the "Leadership Declaration" on the "Business and Biodiversity Initiative (B&B Initiative)," promoted by the German government, in order to further increase the engagement of private-sector businesses in the achievement of the objectives of the Convention on Biological Diversity (CBD). The declaration states that signatory companies acknowledge and support the Convention's three objectives, and commits them to analyze corporate activities with regard to their impacts on biodiversity. A total of 34 companies, including nine Japanese firms, participated in the signing ceremony. Further, G8 Environment Ministers Meetings in 2007, 2008 and 2009 addressed biodiversity as an important agenda item, underlining the need to strengthen policies to engage the industry sector and consider economic impacts associated with the loss of biodiversity.

In Japan, meanwhile, given the international developments discussed above, "The Third National Biodiversity Strategy," formulated in 2007, set forth the preparation of guidelines for guidance for voluntary actions by businesses. The Basic Act on Biodiversity (Act No. 58 of 2008) provides for obligations of business operators and citizens and also prescribes the promotion of biodiversity-friendly business operations as a national policy. Further, in August 2009, the Ministry of the Environment announced the "Guidelines for Private Sector Engagement in Biodiversity," which serves as guidance for voluntary actions by business operators for the conservation of biodiversity and its sustainable use. The guidelines provide for the philosophy, the direction and procedures of efforts and basic principles for business operators voluntarily taking actions friendly to biodiversity (Figure 3-3-1).

Figure3-3-1 Outline for Guidelines for Private Sector Engagement in Biodiversity




Note: Precautionary approaches/Preventive measures without delay, even in the absence of complete scientific evidence, in case where there may be large scale and irreversible impacts on biodiversity.
Adaptive approaches/Measures based on the ongoing monitoring of business activities and other factors, which are adjusted flexibly based on the monitoring results.
Source: Ministry of the Environment, "Guidelines for Private Sector Engagement in Biodiversity"

Photo3-3-1 Rain Forest Restoration Experimental Project on Borneo Island (Malaysian Territory)

Photo: Mitsubishi Corporation

Photo3-3-2 Mangrove Planting in Ranong, Thailand

Photo: Tokio Marine & Nichido Fire Insurance Co., Ltd.

Photo3-3-3 Tree Planting in Devastated Forests (East Java, Indonesia)

Photo: Sumitomo Forestry Co., Ltd.

Under these circumstances, the business community has embarked on initiatives of their own. In March 2009, Nippon Keidanren announced the "Declaration of Biodiversity by Nippon Keidanren," showing the determination to exert active efforts on biodiversity and providing guidelines for specific actions. In April 2008, the "Japan Business Initiative for Conservation and Sustainable Use of Biodiversity (JBIB)" was launched by Japanese companies for the purpose of learning about the conservation and sustainable use of biodiversity. As another example of various efforts initiated in the private sector, in April 2009, the Shiga Committee for Economic Development announced the "Shiga Business and Biodiversity Initiative for Lake Biwa," with the 10-point declaration statement, including "We practice conservation activities for one species at least, or at one habitat area."

There are also companies that have been undertaking activities that help conserve biodiversity as part of their main business operations or corporate social responsibility (CSR) activities since before the rise in the public awareness of efforts on biodiversity.

For example, a general trading house has been carrying out an experimental project in the Malaysian territory of Borneo Island to restore the rain forest ecosystem in the critical state to natural forests as much as possible at an early date. The project has been under way for 20 years since 1990, with the participation of company employees along with experts and people from local communities (Photo 3-3-1).

A nonlife insurance company achieved the condition of carbon neutral in FY 2007, offsetting carbon dioxide emissions from its domestic business offices by the use of natural energy and the carbon dioxide absorption and reduction effects of mangroves it planted. The planting of mangroves the company has been undertaking for a period of 10 years in partnership with nongovernment organizations (NGOs) has now covered a combined area of about 5,900 hectares in Indonesia, Thailand, the Philippines, Vietnam, Myanmar and Fiji Islands (Photo 3-3-2). The company has also launched a project to donate cash equivalent to two mangrove trees per insurance contract in which a policyholder agrees to read a contract renewal agreement on the website instead of a paper document.

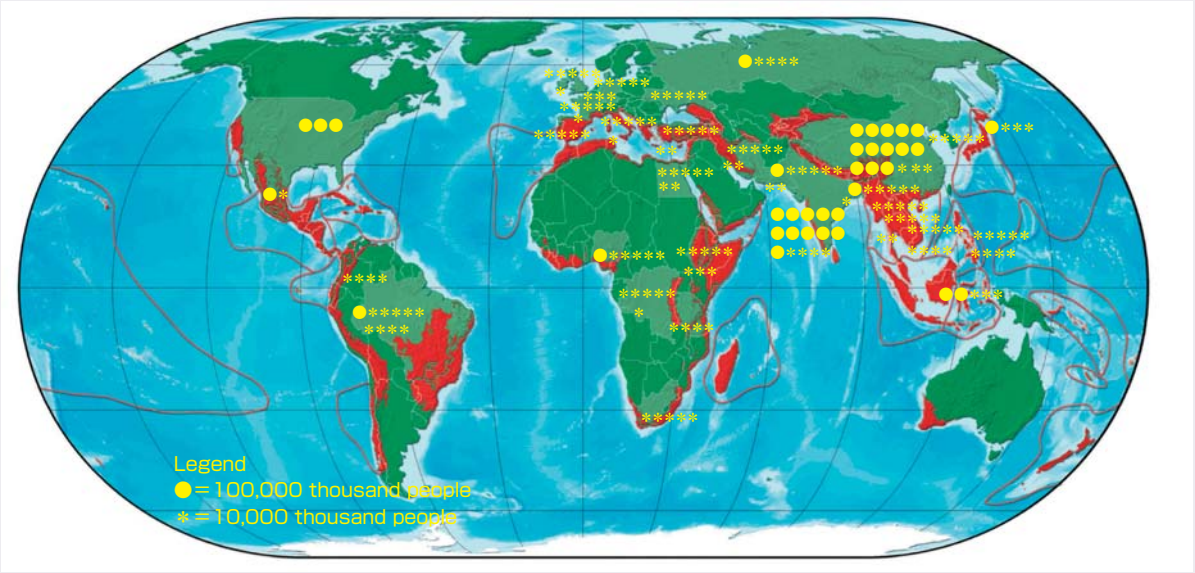
A forestry business company says while domestic forests it owns absorbed 116,000 tons of carbon dioxide in FY 2008, carbon dioxide fixed in lumber used for building wood houses it sold amounted to 210,000. This is a good example of a company contributing to the conservation of nature in its core business operations. The forestry industry contributes to the conservation of biodiversity as well as to the absorption of carbon dioxide. All forests the company owns have already been certified as adequately managed forests in 2006 by the Sustainable 'Green Ecosystem' Council (SGEC). Following the certification, the company has launched a survey to monitor the inhabitation and growth situation of animals and plants mainly in clear-cut areas. In response to deforestation of 1.90 million hectares per year in Indonesia, the company has decided plant trees in 300 hectares of protected forests within national parks and in 1,200 hectares of denuded forest lands outside protected forests (Photo 3-3-3).

As seen above, corporate activities friendly to biodiversity are becoming active both at home and abroad.

## 2 Cities and biodiversity

The term "biodiversity hotspots," first proposed by conservation biologist Norman Myers in 1988, indicates

Figure3-3-2 Hotspots and Populated Areas




Note: Populated areas = The world's top 30 populous countries (China, India, U.S., Indonesia, Brazil, Pakistan, Bangladesh, Nigeria, Russia, Japan, Mexico, Philippines, Vietnam, Germany, Egypt, Ethiopia, Turkey, Iran, Thailand, Congo, France, Britain, Italy, Myanmar, South Africa, Korea, Ukraine, Spain, Colombia and Tanzania)
Source: Prepared by Ministry of the Environment based on materials provided by Conservation International (www.conservation.or.jp)

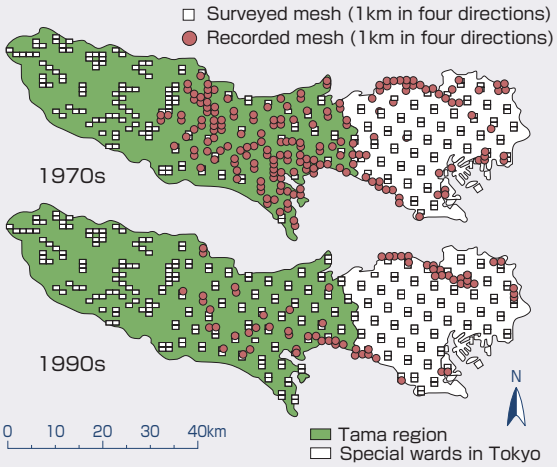
areas that have the high level of biodiversity with at least 1,500 indigenous species of vascular plants and yet at risk of destruction with 70% or more of natural vegetation damaged. A total of 34 areas are designated as hotspots globally, including Japan. The hotspots cover only 2.3% of the surface area of the earth, but include many densely populated areas, an indication of heavy development pressures (Figure 3-3-2).

At present, as seen in the Introductory Chapter, half of the world population lives in cities, in only 2.8% of the earth's land areas. Urban populations keep increasing, with two-thirds of the global population projected to be living in cities by 2050. Urban residents and economic activities consume 75% of resources being consumed by mankind, with a considerable degree of dependence of benefits from biodiversity in surrounding areas (ecosystem services). In fact, the food self-sufficiency rate by prefecture for FY 2007, announced by the Ministry of Agriculture, Forestry and Fisheries, is 1% for Tokyo, 2% for Osaka and 3% for Kanagawa, clearly showing the actual situation that big cities are producing little food to feed their residents.

However, the history of cities is widely varied and they have different backgrounds, including the mode of land utilization and the extent of urbanization as well as economic, social and cultural conditions. As the distribution of living organisms is either shrinking or expanding in accordance with the stage of urban development, as shown in Figure 3-3-3 and in Figure 5-1-5 in Part II, it is deemed necessary to build relationships with biodiversity suitable to respective cities.

In November 2009, the "Local Government Conference on Biodiversity 2009" was held in Nagoya, Aichi Prefecture, with the participation of 103 municipal governments in Japan, sponsored by Aichi Prefecture, Nagoya City and the Aichi-Nagoya COP10 CBD Promotion Committee. In preparation for the "City

Figure3-3-3 Changes in Skylark Distribution in Metropolitan Tokyo




Source: Prepared by Ministry of the Environment based on Tokyo Metropolitan Government, "Survey Report on the State of Procreation of Birds" and "Survey Report on Procreation of Birds"

Biodiversity Summit 2010" scheduled to be called to coincide with COP10, the conference participants discussed problems common to municipalities in Japan and exchanged information on their initiatives for the conservation of biodiversity. In a report on discussions at the conference, the participants confirmed the items that were deemed important when local authorities carry out policies and measures for the conservation and restoration of biodiversity in the future, including the comprehensive perspective of "biodiversity" and the wisdom of a system of circulation and coexistence with the environment.

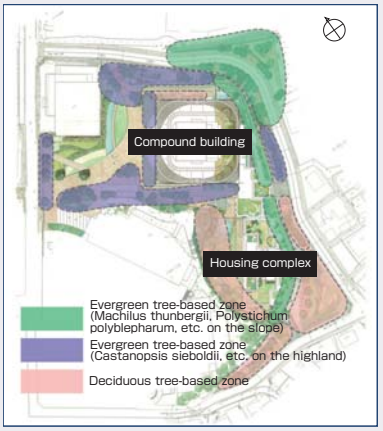
The cooperation among local governments has been extended globally. Already in 1990, officials from over 200 local governments of 43 countries gathered at the United Nations in New York City for the "World Congress of Local Governments for a Sustainable Future," and established the International Council for

Figure3-3-4 Efforts on Biodiversity in Redevelopment Project

Efforts on biodiversity in a redevelopment project in the Toranomon/Roppongi Disrict First Class City Urbanization Area

The project contributes to the conservation and recovery of biodiversity in the following points:

1. Green space based on native species and potential natural vegetation: Restore regional vegetation in the planned area
   ※Main native species: Castanopsis sieboldii, Machilus thunbergii, Quercus glauca Thunb, Styrax japonica, Benthamidia japonica, etc.
2. Large green spaces:
   Enhanced green effect and better connection with surrounding areas
3. Sterical green spaces with the high green coverage ratio:
   Contribute to improved habitats for living organisms
4. Special components of the environment:
   Consideration for components of the environment such as deadwood, tree hollows and fallen leaves




Source: Mori Building Co., Ltd.

Local Environmental Initiatives (ICLEI)." As of December 2009, over 1,100 local governments from 68 countries of the world participate in ICLEI. ICLEI is designed for cooperation among local governments on key themes such as prevention of climate change, comprehensive water management, conservation of biodiversity, building of sustainable local communities and sustainability management, and its activities are guided by the belief that measures developed by local governments are the highly cost-effective way to realize sustainability at the local, national and global level. COP9 held in Bonn, Germany, in 2008 adopted a decision on the promotion of engagement of cities and local authorities, the first of its kind, recognizing the importance of roles of cities and local governments under the Convention on Biological Diversity.

New attempts are under consideration in Japan concerning cities and biodiversity. The City of Nagoya is considering the introduction of a mechanism for conserving forests in suburban private land by administering the city planning system in exchange for the easing of the floor-space ratio for buildings in urban areas.

Among private-sector companies, for example, in open space planning for an urban redevelopment project, a developer launched an initiative to restore nature, the first of its kind in Japan, by paying full heed to native species and potential natural vegetation based on a survey of existing conditions and literature searching. This redevelopment project has been assigned the highest rating of AAA based on an objective quantitative evaluation by the Japan Habitat Evaluation and Certification Program (JHEP), a third-party organization (Figure 3-3-4). JHEP was introduced as a Japanese version of the Habitat Evaluation Procedures (HEP), a method for a quantitative assessment of the natural environment from the standpoint of wildlife habitat developed by the U.S. Department of the Interior in the 1980s. The HEP, noted for its high objectivity and reproducibility as well as for its excellence as an easy-to-understand consensus-building tool, is widely used for environment impact assessment and nature restoration projects in the United States. Separately, as of th end of March 2010, a total of 33 sites have been recognized as the excellent green space actively conserved and utilized by companies and other entities under "the Social and Environmental Green Evaluation System (SEGES)", helping to motivate and strengthen green conservation activities.

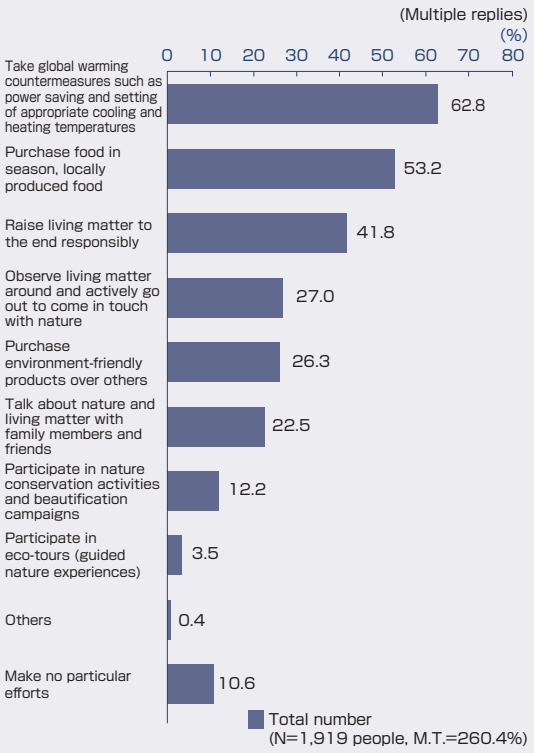
## 3 Lifestyles mindful of biodiversity

### (1) Consideration for biodiversity by choice of manufactured products and food

As discussed above, most of resources and materials essential for our clothing, food and housing are supplied as ecosystem services provided by ecosystems. In this subsection, we describe what we can as consumers. First of all, it is fundamentally necessary to obtain ecosystem services in a sustainable manner that does not disrupt the reproduction function of ecosystem services, as they are provided as renewable services in natural cycles. According to a public opinion survey conducted by the Cabinet Office in 2009, the ratio of people who cited "prioritized purchases of environment-friendly products" as efforts for biodiversity-friendly lifestyles stood at a low 26%, underscoring the need to promote the spread of products that pay due heed to biodiversity (Figure 3-3-5). Next, we introduce sustainable production initiatives and our choices as consumers regarding timber, fisheries resources and agricultural products.

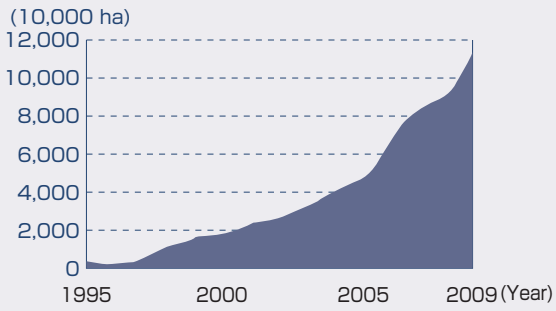
Japan's domestic demand for timber amounted to 77.97 million cubic meters in 2008, of which about 76% was met by imports. Timber is imported mainly from North America, Southeast Asia, Russia, Europe and Australia. In Indonesia, for example, about 1.90 million hectares (equivalent to the area of Shikoku) of forests are lost per year due to forest fires and illegal logging. One of things

## Figure3-3-5 Previous Efforts for Biodiversity-Friendly Livelihood




Source: Cabinet Office, "Public Opinion Survey on Environmental Issues"

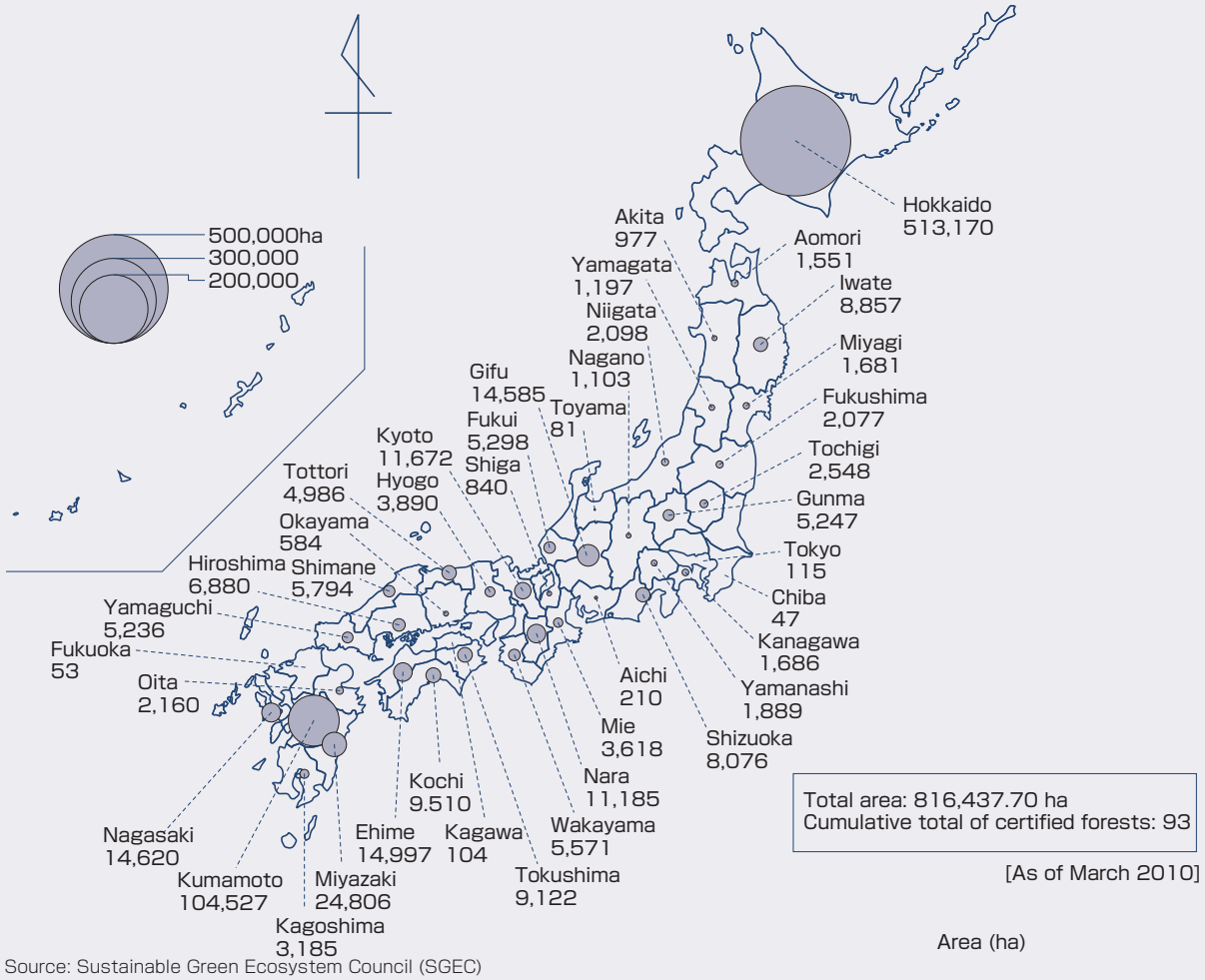
## Figure3-3-6 Global Area of FSC-Certified Forests




Source: Forest Stewardship Council (FSC) International Headquarters

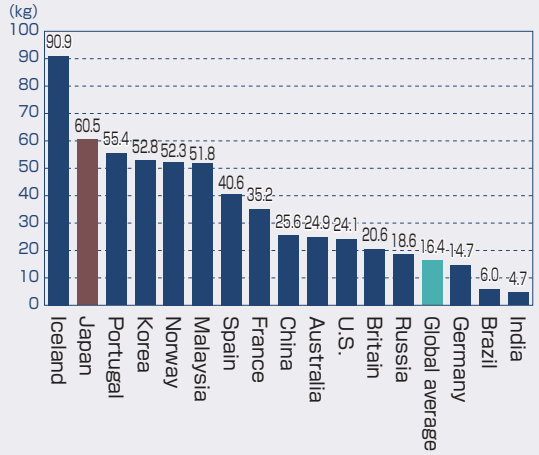
we can do as consumers to reduce illegal logging and maintain biodiversity in countries of origin is to purchase lumber and wood products certified for legitimacy and sustainability. Based on "the Act on Promoting Green Purchasing", the Japanese government since 2006 has been procuring lumber certified for legitimacy and sustainability. In order to promote sustainable forest management, the government has also presented at home and overseas guidelines for requirements of lumber and wood products whose use is to be promoted in Japan. Because of these initiatives, it is now possible to procure lumber and wood products certified for legitimacy and sustainability across the country. Consumers can contribute to the conservation of biodiversity and its

## Figure3-3-7 Distribution Map of Japan's SGEC-Certified Forests (By Prefecture)



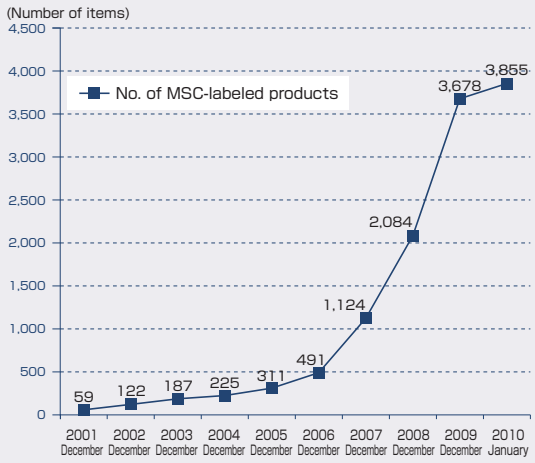

Source: Sustainable Green Ecosystem Council (SGEC)

Figure3-3-8 Per-Capita Annual Consumption of Fisheries Products in Major Countries (2005)



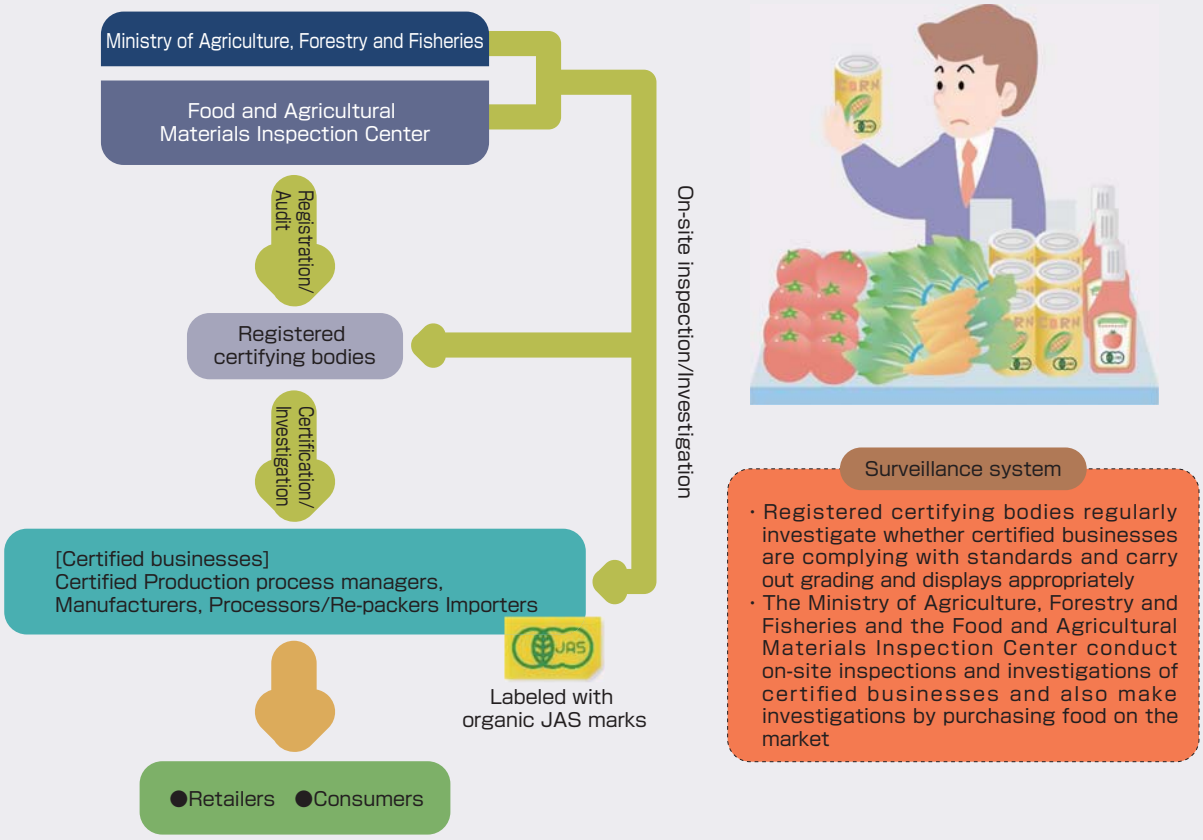

Source: Prepared by Ministry of the Environment based on FAOSTAT

Figure3-3-9 Trends in Number of MSC-Labeled Products




Source: Marine Stewardship Council (MSC) Japan Office

Figure3-3-10 Overview of the Organic Food Inspection and Certification System

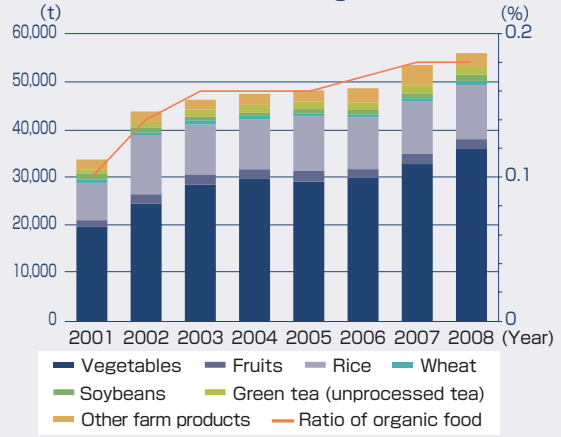



Source: Ministry of Agriculture, Forestry and Fisheries brochure, "Organic Food is Wonderful"

sustainable use by choosing certified products when they purchase products made from trees, such as furniture, stationery, miscellaneous goods used in daily livelihood and paper as well as lumber. A good reference in choosing lumber certified for legitimacy and sustainability is forest certification. Forest certification schemes are private sector-led systems in which third-party organizations certify appropriate forest management by looking into "whether forest managers are complying with laws and international agreements," "whether forests are rich forests offering habitats for many living organisms" and other matters, separately manage timber produced from certified forests for distribution with certification labels. Forest certification schemes include the Programme for the Endorsement of Forest Certification (PEFC), the Forest Stewardship Council (FSC) and the Sustainable Green Ecosystem Council (SGEC). Forest area certified by the FSC is growing globally (Figure 3-3-6), while domestic forests certified by SGEC increased to 93 forests, for a combined area of 816,438 hectares, as of March 2010 (Figure 3-3-7).

Per-capita consumption of fisheries products for

Figure3-3-11 Amount of Graded Organic Farm Products and the Ratio to Total Agricultural Produciton




Source: Prepared by Ministry of the Environment based on Ministry of Agriculture, Forestry and Fisheries, "FY 2008 Results of Grading Concerning Accredited Businesses"

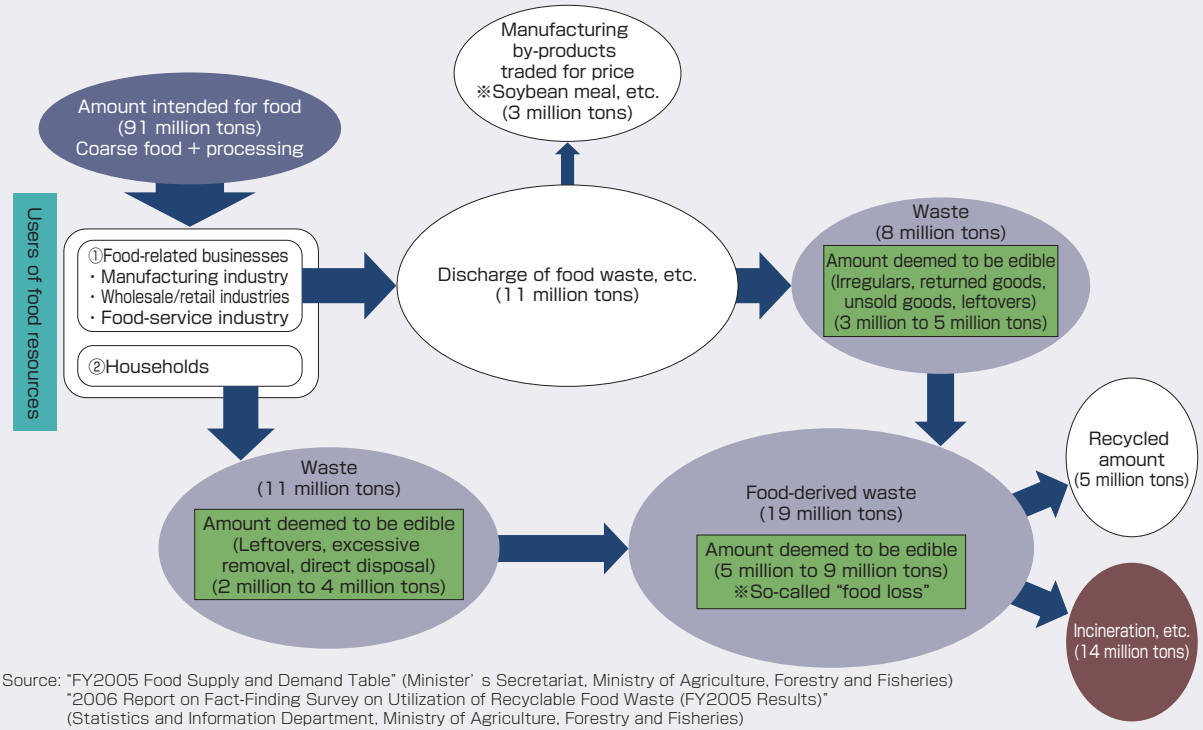
Japanese people is the third largest in the world and about four times the global average (Figure 3-3-8). In order to obtain rich fisheries resources in a stable manner, biodiversity that provides them needs to be conserved. Efforts to avoid the depletion of fisheries resources are necessary to carry out sustainable fisheries operations, by, among others, setting certain rules on catches, kinds of fish to be caught, fishing periods and fishing methods. Certification schemes for such fisheries operations include the Marine Stewardship Council (MSC) and the Marine Eco-Label Japan (MEL Japan). Products with MSC certification labels are seeing increasing sales globally, reaching a total of 3,855 items as of January 2010 (Figure 3-3-9). In Japan, about 170 items certified by the MSC are in the market as of June 2009.

In Japan, production of organic farm products is being carried out under unified rules based on the Act for Standardization and Proper Labeling of Agricultural and Forestry Products (Act No. 175 of 1950) enforced in April 2001. Under this system, accredited business operators can grade agricultural products satisfying JAS (Japan Agricultural Standards) standards for organic vegetables and put organic JAS marks on such products (Figure 3-3-10). Production standards for organic farm products, designed to maintain and improve the natural cyclical function of agriculture, call on producers to (1) prepare soil using compost and not to use, in principle, chemical fertilizers and agricultural chemicals (in over two years prior to seeding and planting and during cultivation) to give full play to the productivity of farmland driving from soil characteristics; (2) produce farm products in agricultural fields that adopt cultivation management methods that reduce burdens traceable to agricultural production on the environment as much as possible; and (3) not to use genetically engineered seedlings. Our purchases of farm products carrying organic JAS marks help promote agriculture with less environmental burdens such as impacts of agricultural chemicals on living organisms and conserve biodiversity. In fact, between 2001 and 2008, amounts of farm products graded under organic JAS standards increased about 1.7 times from 33,734 tons to 55,928 tons (Figure 3-3-11). As the ratio of farm products graded under organic JAS standards to total agricultural production still remains low, we are being called upon to make wise choices for the further spread of organic farm products.

## (2) Consideration for biodiversity through reduction of food waste

In Japan, about 19 million tons of food waste are

Figure3-3-12 Flow Chart of Generation of Food Waste



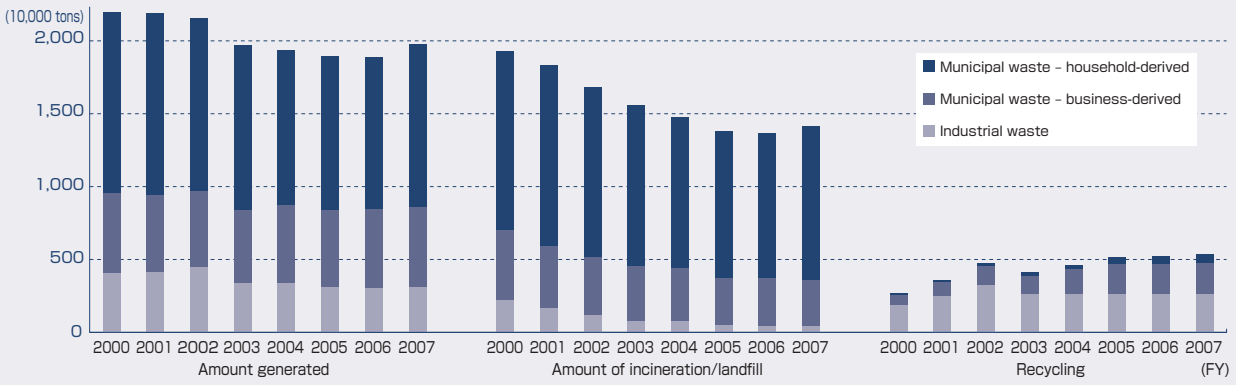

Source: "FY2005 Food Supply and Demand Table" (Minister's Secretariat, Ministry of Agriculture, Forestry and Fisheries)
"2006 Report on Fact-Finding Survey on Utilization of Recyclable Food Waste (FY2005 Results)" (Statistics and Information Department, Ministry of Agriculture, Forestry and Fisheries)
"FY2005 Statistical Survey on Food Loss" (Statistics and Information Department, Ministry of Agriculture, Forestry and Fisheries)
Prepared and estimated by Ministry of Agriculture, Forestry and Fisheries based on "Discharge and Disposal of Municipal Waste, Discharge and Disposal of Industrial Waste, etc." (Ministry of the Environment Estimates of FY2005 results)

discharged annually, of which food that can be eaten but is disposed of, or "food loss," is estimated to account for about 5 million to 9 million tons (Figure 3-3-12). Of food waste discharged by food-related business operators, an amount deemed to be disposed of by incineration or landfill has been on the steady decline year by year to stand at around 60% (Figure 3-3-13). On the other hand, only about 640,000 tons out of food waste discharged by general households is being recycled, with the remaining 94% being disposed of by either incineration or landfill (Table 3-2-4 of Part II).

According to the FAO, the undernourished population in 2009 is estimated to have reached as high as 1.02 billion people in the world, topping the one-billion mark for the first time ever. In Japan, food equivalent to an average 2,473 kilocalories per capital per day was supplied on a calorie basis in FY 2008 (Figure 3-3-14). For the entire population of Japan (127.69 million as of October 1, 2008), this translates into about 315,777 million kilocalories. The difference between the amount of calories supplied and the amount of calorie intake is understood to be a rough indication of food waste and leftovers. In Japan, this difference stood at 708 kilocalories per capital per day in FY 2007, which amounts to a daily food waste of 90,405 million kilocalories per day for the entire nation. If this amount is divided by 2,200 kilocalories per capita per day, which is believed to be the minimum daily calorie intake to keep an adult from undernourishment, we get the amount of nourishment for some 41.93 million people. When there are so many people in the world who cannot get enough food, we need to get food from ecosystem services across more effectively.

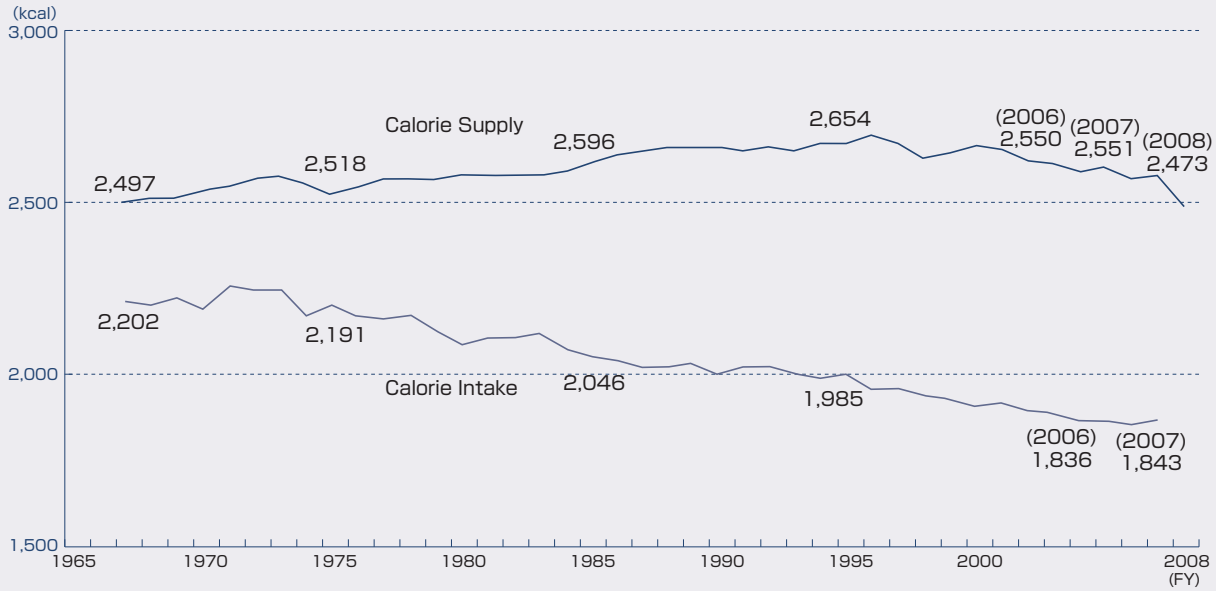
In recent years, "shokuiku (dietary education)" is being actively pursued, including the promotion of cooked rice for school lunch and use of locally produced farm

Figure3-3-13 Generation and Disposal of Food Waste (FY2000-FY2007)




Note: 1 Total may not add up due to rounding
2 The amount of food waste estimated by Ministry of the Environment based on "Discharge and Disposal of Municipal Waste, etc." (FY2007 results) and "Discharge and Disposal of Industrial Waste, etc." (FY 2007 results)
3 The amount of recycling of municipal waste derived from households was similarly estimated by Ministry of the Environment
4 The amounts of municipal waste derived from businesses and industrial waste (including breakdowns) were estimated based on Ministry of Agriculture, Forestry and Fisheries, "2008 Results of Fact-Finding Survey on Utilization of Recyclable Food Waste"
Source: Ministry of Agriculture, Forestry and Fisheries; Ministry of the Environment

Figure3-3-14 Changes in Calorie Supply (Food Supply and Demand Table) and Calorie Intake (National Health and Nutrition Survey)




Note: 1 excluded Alcoholic beverages
2 The difference between calorie supply and calorie intake should be regarded as a rough indicator of leftovers and waste because both calorie data are totally different in statistical survey methods and calorie calculation methods and cannot be compared simply.
Source: Ministry of Agriculture, Forestry and Fisheries, "Food Supply and Demand Table" ; Ministry of Health, Labour and Welfare, "National Health and Nutrition Survey"

products in school lunch. But the main purpose of shokuiku is to have children acquire the fundamental habits of "leaving no food uneaten" and "having a sense of gratitude." This is applicable to household efforts to reduce food waste. Among things individuals can do immediately are to understand the meanings of the use-by date and the expiration date and try to finish up food as food past the use-by date does not become inedible, avoid buying too much food by confirming kinds and amounts of food kept in a refrigerator before going shopping, and finish up purchased food in order by confirming the use-by and expiration dates.

## (3) Consideration for biodiversity in initiatives by businesses

Businesses have the important role of providing benefits of biodiversity widely to society through their products and services. In a public opinion survey conducted by the Cabinet Office in June 2009, 82% of respondents said they highly rate corporate activities paying heed to biodiversity. Operations of businesses are supported by attitudes of consumers and have to change in response to consumption behavior of each citizen. At the same time, businesses are expected to make their activities more biodiversity-friendly and encourage a shift in consumer lifestyles by offering products and services that pay greater heed to biodiversity.

Activities by businesses give an impact on biodiversity in various situations and also benefit from biodiversity. For example, food, wood, paper, fiber, fuel and water are essential for business activities. A variety of genes are useful for development of pharmaceutical products and cultivar improvement. Aside from the supply of material, stable climate and prevention of natural disasters such as landslides and floods are necessary for stable business activities. Furthermore, technological innovation is often inspired by forms and functions found in the natural world. This is called "bio-mimicry," meaning mimicry of living organisms, and one of the well-known examples is the design of the lead vehicle of Shinkansen bullet train shaped like the halcyon beak to reduce pneumatic resistance.

Meanwhile, development and utilization of iron ores and other mineral resources as well as oil and other fossil fuels affect biodiversity through land conversion and global warming. Disposal of waste, treatment of drainage water and construction of business offices and industrial plants may also affect biodiversity in their processes. Furthermore, we may get involved with biodiversity through investment in and loans to economic activities as well as social action programs.

As seen above, whether we are in agricultural, forestry and fisheries industries, construction industry and manufacturing industry or in retail industry, financial services industry and mass media, we affect biodiversity and rely on its benefits through utilization of biological resources, supply chain and investment and loans. Such benefits and impacts occur both at home and abroad. In particular, Japan bestowed with few natural resources depends on other countries for their supply, and we must not forget that our present livelihoods are underpinned by exploitation of ecosystem services overseas.

While efforts by businesses so far have rather centered on activities related to corporate social responsibility (CSR), from now on, it will become important for them to address biodiversity in their main business lines. As the direction of efforts by businesses, the Guidelines for Private Sector Engagement in Biodiversity state that businesses should (1) strive to grasp linkages between business operations and biodiversity (benefits and impacts); (2) strive for mitigation of impacts on biodiversity and sustainable utilization of biodiversity; (3) strive to enhance structures to promote efforts on biodiversity. Businesses' involvement with biodiversity is varied depending the category and size of their operations. It is important for each business operator to understand linkages between its business operations and biodiversity, and then proceed with efforts in order of priority while taking feasibility into account.

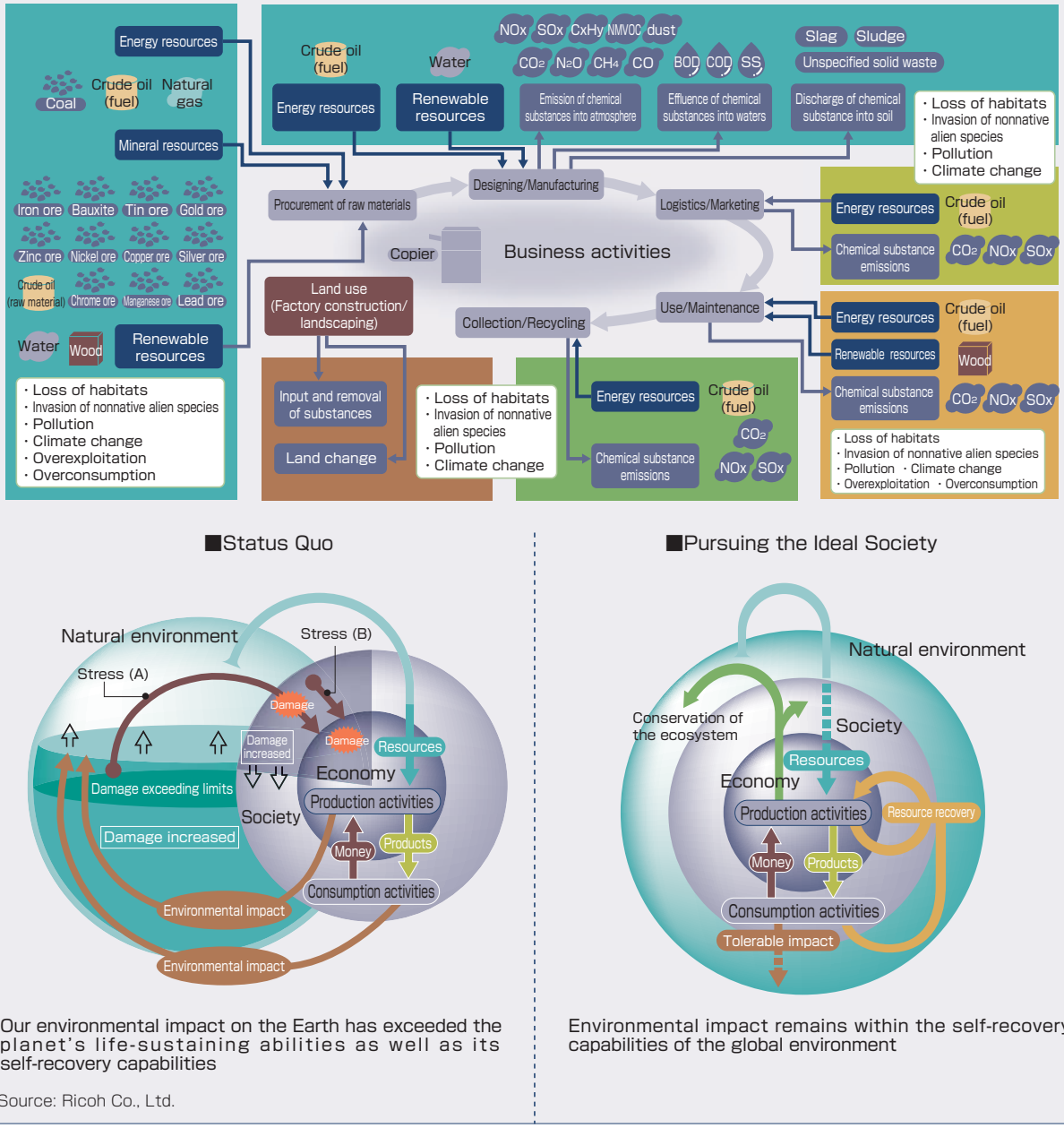
Businesses' efforts on biodiversity involve both risks and opportunities (Table 3-3-1). For example, while work to review the procurement of raw materials from the perspective of biodiversity may require additional costs, reduced risks related to the procurement of raw materials are expected to help stabilize business management. Japan depends on overseas for about 60% of food, about 80% of timber and almost all of mineral resources and

Table3-3-1 Examples of Risks and Opportunities in Business Activities

| Type | | Examples of risks and opportunities |
|---|---|---|
| Operational | risks | · Scarcity of raw material inputs or increased costs of procurement of material inputs, such as due to declines in living resources<br>· Reduced output or productivity, or disruption of business operations, due to declines in living resources availability |
| | opportunities | · Development of production processes that are less affected by scarcity of material inputs, by means of sustainable use or reduction in use of living resources<br>· Strengthening of the supply chain through the promotion of actions by suppliers |
| Regulatory /legal | risks | · Imposition of fines, suspension or rejection of licenses or permits, lawsuits, etc. due to legal violations related to biodiversity<br>· Cuts in quotas for living resources or imposition of new user fees |
| | opportunities | · Official approval received to expand operations thanks to consideration of biodiversity<br>· Development or sales of new products that comply with new regulations, etc. related to biodiversity |
| Reputational | risks | · Damage to brand or corporate image, and risk to social "license to operate" due to discovery of negative impacts on biodiversity |
| | opportunities | · Demonstration of consideration of biodiversity improves brand image, appeals to customers, and differentiates company from others in the industry<br>· Consideration of biodiversity helps to obtain the understanding of the local community or strengthen relationships with local residents and other stakeholders |
| Markets/ products | risks | · Loss of customers due to promotion of green procurement in public and private sectors<br>· Decline in market competitiveness of products or services due to lower environmental product quality |
| | opportunities | · Development of products and services that consider biodiversity, and new markets for certified products, etc.<br>· Development of new technology, products, etc. that promote conservation and sustainable use of biodiversity.<br>· Appeal to consumers who have high ethical sensitivity for environmentally concerned, corporation and products, etc. |
| Financing | risks | · Potential refusal of financing requests due to more rigorous lending criteria at financial institutions |
| | opportunities | · Appeal to investors who emphasize social responsibility |
| Internal | risks | · Decline in employees' morale |
| | opportunities | · Improved employees' morale |

Source: Ministry of the Environment, "Guidelines for Private Sector Engagement in Biodiversity"

Figure3-3-15 Map of Corporate Activities and Biodiversity




Our environmental impact on the Earth has exceeded the planet's life-sustaining abilities as well as its self-recovery capabilities

Environmental impact remains within the self-recovery capabilities of the global environment

Source: Ricoh Co., Ltd.

fossil fuels. In that sense, efforts on biodiversity are also important as a resources strategy.

As seen above, businesses' efforts on biodiversity in cooperation with various entities, including consumers, are necessary not only to accelerate movements of society as a whole toward realizing natural symbiosis society but also to carry on with their business operations in the future.

For example, an office equipment maker is striving to grasp the linkage with biodiversity in each stage of a whole range of business activities from the procurement of raw materials, designing/ manufacturing, logistics/ selling to use/maintenance and recovery/recycling and reduce burdens on biodiversity (Figure 3-3-15). This company has found that in the copier business, for example, the impact of business operations on biodiversity was the largest in the procurement of raw materials, such as paper and pulp and metallic resources and water resources used in production. Instead of linear business activities where it manufactures products by the input of resources and ultimately disposes of them into the environment, the company is pursuing business activities whose impacts remain within the self-recovery capabilities of the global environment (Figure 3-3-15).

A Japanese consumer electronics maker launched its efforts on biodiversity since October in 2008 by supporting the "Arctic Program," one of measures to protect the global environment being undertaken by the World Wildlife Fund (WWF). The WWF's project is designed to promote the understanding about the Arctic and manage ecosystems by the following four methods:

Communicating the global implications of Arctic climate change;

Ensuring the Arctic biosphere does not become a new source of atmospheric carbon;

Eliminating the additional pressures on the environment caused by unsustainable exploitative activities;

Establishing governance regimes to conserve the ecosystems and species of the Arctic for future generations.

The company has "coexistence with the global environment" as one of the guiding principles for its business operations, and contributing to "removal of threats of environmental destruction in the Arctic and conservation of the environment of the Arctic region that greatly impacts global warming" is consistent with the objectives of its business activities. The company's support is extended mainly in the form of financial assistance, and assistance of 470,000 euros is planned over a three-year period. The company and the WWF are cooperating in efforts on environmental analyses and surveys as well as on support for the continued well-being of Arctic ecosystems, including the polar bear.

## Column Food Bank Activities

In recent years, "food bank" activities are spreading. A food bank is a system under which it receives food and food materials that are deemed not good enough to go through regular distribution channels but have no food quality problems from food manufacturers and retailers, etc. and donates them to welfare facilities and other organizations in need of support free of charge, supported by many volunteers. The United States has a history of about 40 years of food bank activities (with 220 organizations involved across the country and 2 million tons of food handled annually), and there is also an international organization for food bank activities with the membership of 18 countries across the world. In Japan, Second Harvest Japan (a specified nonprofit corporation established in 2002 in Taito Ward, Tokyo) has the largest scale of food bank activities and is a member of the international organization. In 2008, it handled 8.5 million tons of food with the monetary equivalent of about ¥510 million, and companies that provide it with food are estimated to have been able to reduce food disposal expenses by about ¥92 million.

Supporting companies that provide food to Second Harvest Japan have reached a cumulative total of some 500 firms, and the circle of support is now widening, including cooperation of distribution companies, apparently as part of corporate CSR activities. Foods handled are wide-ranging, from staple food (rice, bread, noodles, etc.), supplementary dishes, articles of taste (sweets, beverages) and seasonings, perishable food, chilled and frozen food, instant food and food stocks in case of natural disasters. About a dozen food banks have been established in recent years, with their activities spreading from cities to rural area. Since the food bank mechanism is beneficial to both supporting companies and aid-receiving welfare facilities and other organizations, and also in light of the original objective of taking good care of food, it is hoped that food bank activities will spread further widely.

### Performance of Food Bank Activities

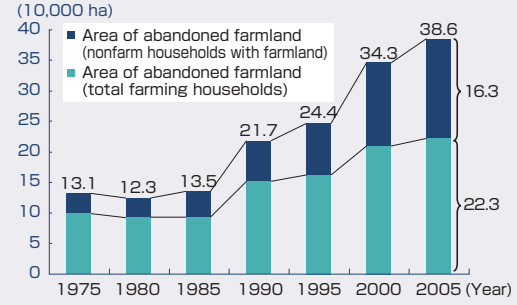
| Year | Amount handled (ton) | Welfare contributions (¥10,000) | Donation multiplier | Corporate contributions (¥10,000) |
|---|---|---|---|---|
| 2006 | 255 | 15,300 | 10.0 | 2,766 |
| 2007 | 370 | 22,200 | 8.0 | 3,900 |
| 2008 | 850 | 51,000 | 14.0 | 9,200 |
| 2009 | 560 | 33,000 | 11.4 | 5,600 |

Source: Second Harvest Japan Secretariat

## Column Utilization of Abandoned Farmland

As of FY 2005, there were about 390,000 hectares of abandoned farmland. Abandoned farmland is "farmland where no crops were grown at least in a past year with no clear intentions indicated for cultivation resumption over the coming few years." Abandoned farmland stood at 135,000 hectares in 1985, and increased nearly 2.5 times in the past 20 years. Amid expectations of tightening global food supply and demand in the medium and long-term, the objectives of recovering and utilizing abandoned farmland include the need to ensure the stable supply of food and the need to secure various functions including the preservation of national land, cultivation of water sources, prevention of disease and disease and pest damage and bird and animal damage, and conservation of biodiversity through appropriate management of hillside and mountainous areas.

### Changes in Area of Abandoned Farmland




Source: Ministry of Agriculture, Forestry and Fisheries, "Agroforestry Census"

## 4 Budding "Mainstreaming"

A variety of entities have already launched social and economic activities paying heed to biodiversity. In this subsection, we describe activities by local governments, companies and nongovernment organizations (NGOs), centering on activities chosen for the first outstanding performance awards of the "Japan Awards for Biodiversity," established by the Ministry of the Environment and the AEON Environmental Foundation in order to promote the conservation of biodiversity and its sustainable use.

### (1) Efforts by local governments

Prefectural governments and municipalities have been undertaking various efforts on the conservation of biodiversity, including preservation of nature parks and other protected areas, protection and management of wild birds and animals, protection of rare species of wild fauna and flora, conservation and revitalization of urban green areas and measures to deal with alien species. For example, regarding the protection of rare species of wild fauna and flora, all the prefectural governments have formulated the red data book and the red list by 2005, and 27 prefectural governments enacted ordinances on the protection of rare species of wild fauna and flora by FY 2009. Furthermore, a total of 30 prefectures introduced the forest environmental tax and similar tax systems for the purpose of conserving forests and water sources by FY2009, with specific efforts funded with these tax revenues.

In addition to these efforts, local governments are developing regional biodiversity strategies based on the Basic Act on Biodiversity, in order to proceed with the conservation of biodiversity and its sustainable use in accordance with natural and social characteristic of their regions. As of the end of March 2010, Saitama Prefecture, Chiba Prefecture, Aichi Prefecture, Shiga Prefecture, Hyogo Prefecture, Nagasaki Prefecture, Ngareyama City, Nagoya City and Takayama City have already formulated their regional biodiversity strategies, while many other local governments are considering the formulation of such strategies.

### (2) Corporate Initiatives

A construction company, in cooperation with organizations concerned, has expanded upon previous studies on ecological networks and developed a system to evaluate an impact of urban development projects on local ecosystems in an easy-to-understand manner, and is already applying the system to actual construction projects such as hospitals and business buildings. The company is also breeding Japanese honeybees, a native species, as a sentinel species of the urban environment for the collection and analysis of data on their flight paths and distances and honey source plants, and is making use of such data for biodiversity-friendly cities.

A housing maker, in order to allow for sustainable wood use, in collaboration with timber suppliers and NGOs, developed in 2007 "timber procurement guidelines" with 10 procurement policies from the broad perspectives of not only legitimacy of procured timber but also biodiversity conservation, livelihoods of residents in logging areas and revitalization of the domestic forestry industry. The company classifies timber into four categories by a sum of evaluation points for each procurement policy, and strives to increase the percentage of timber produced with due heed given to biodiversity. These efforts bring benefits to timber suppliers as well in that they can independently change timber procured in accordance with objective standards.

A shinkin bank (credit association) has offered the "time deposit for considering biodiversity" in order to help enhance the interest in COP10 to be held in Nagoya City, Aichi Prefecture, its business area, and deepen understanding about biodiversity. Bank employees met personally with over 20,000 customers and engaged in activities to mutually deepen the interest and understanding about the importance of biodiversity and COP10. The shinkin bank sold out the time deposit product two months earlier than originally scheduled, contracted ¥3,076 million in 4,164 accounts (about 3,400 depositors), with 0.01% of the deposited amount donated to the Aichi-Nagoya COP10 CBD Promotion Committee.

A detergent maker is purchasing land for the restoration of rain forests and engaged in activities to preserve Borneo elephants driven out of their habitats by donating 1% of sales of coconut detergents to the Malaysian government-sanctioned "Borneo Conservation Trust." Aside from financial assistance, the company is also organizing Borneo eco-tours for consumers as part of diffusion and educational activities to enhance environmental conservation awareness. These efforts have drawn massive consumer support.

### (3) Efforts by NGOs, etc.

The Shiretoko Nature Foundation has been conducting long-term monitoring and biological surveys and genetic diversity surveys on brown bears, Yezo sika deer, marine mammals, white-tailed sea eagles and other large animals living in the Shiretoko Peninsula, the world natural heritage site. Through environmental education and experience-based education programs making use of such research results, the Foundation is also engaged in activities to communicate the importance of nature and biodiversity in Shiretoko to local residents and visitors. Furthermore, commissioned by Shari Town and Rausu Town, its founders, the Foundation is contributing to the conservation of local biodiversity through continuous efforts, including the protection and management of brown bears and other wild animals and the "Shiretoko 100 $m^2$ Forest Trust," one of pioneering national trust movements in Japan.

Since its establishment in 2001, the Research Institute of Agriculture and Nature, a specified nonprofit corporation, has developed an index of 5,470 species of animals and plants in rice paddies and a list of surveys on the distribution of their habitats, based on the belief that "ordinary insects," not destructive inspects or helpful insects, form the rice field environment, and submitted them to relevant research institutions. The institute is also trying to make 230 species each of animals and plants into indicator species to evaluate biodiversity in

rice fields. Further, the institute carried out a research and analysis of organism species in rice paddies and dikes under pesticide-free production, developed agricultural technology by utilizing its research and analysis results, publicly proposing it evaluation methods. It is spreading these research results to farmers, nature protection organizations and people related to environmental education.

### (4) Cooperative efforts by companies and NGOs

The Asaza Fund, a specified nonprofit corporation, has revived Yatsuda, a reservoir for Kasumigaura Lake, and since 2008, has been producing Japanese sake using brewer's rice produced in revived Yatsuda with the cooperation of a local sake brewery. The Fund is hugely successful in selling its sake through the cooperation with local sake retailers and it is using part of sales for the revival of Yatsuda. Efforts to restore the Yatsuda reservoir are under way in a broad area around the lake in collaboration with other companies and volunteer groups.

In Toyooka City, Hyogo Prefecture, in order to secure biodiversity-rich rice fields where white storks that have returned to the wild feed, JA Tajima, White Stork Shicchi Net, the municipal government of Toyooka, the Toyooka Agricultural Improvement and Diffusion Center of Hyogo Prefecture and others are cooperating to promote "white stork-nurturing farming method" to produce safe and secure rice and nurture a variety of living organisms at the same time by reducing the use of agricultural chemicals or with no agricultural chemicals. They are also carrying out surveys on living organisms in rice paddies by developing a method of survey farming household can conduct on their own and by cooperating citizens and consumers. Part of proceeds from the sale of "white stork-nurturing rice" planted under the above-mentioned farming method is donated to the "Toyooka White Stork Fund" to be used to improve habitats for white storks, including feeding grounds. The price is about 50% higher than ordinary rice for rice produced with no agricultural chemicals used and about 20% higher for rice with reduced use of agricultural chemicals. Since sales have been robust despite high prices, however, farming households producing these types of rice are increasing year after year. Sales of the 2008 crop amounted to 520 tons (produced in about 200 hectares of rice paddies) for about ¥170 million.

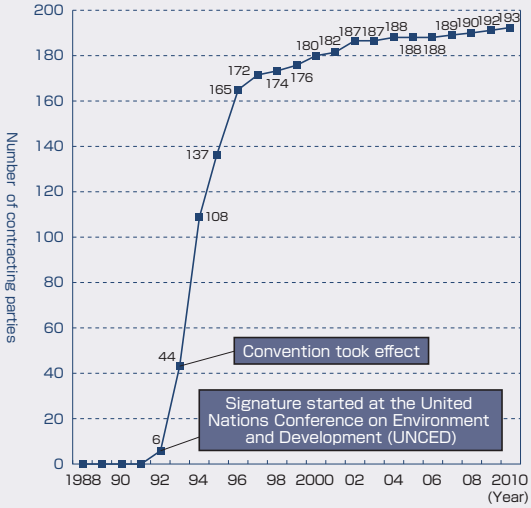
## Section 4 10th Meeting of the Conference of the Parties to the Convention on Biological Diversity (COP10) That Determines the Direction of Life on the Earth

In order to maintain the sound foundation for existence of mankind, not only global warming countermeasures but also the conservation of biodiversity and its sustainable use are essential. Therefore, given the experience of failure to achieve the 2010 Biodiversity Target, the international community is getting into action to set a new target for years beyond 2010. Japan, as the host country of COP10, will make the meeting successful and promote efforts for sustainable exploitation of ecosystem services.

### 1 The international community at a major turning point

"The Economics of Ecosystems and Biodiversity (TEEB)" released at the high-level ministerial segment of COP9 in 2008 in its preface noted that "we are still learning the 'nature of value,' as we broaden our concept of 'capital' to encompass human capital, social capital

Figure3-4-1 Changes in Number of Contracting Parties to the Convention on Biological Diversity




Source: Prepared by Ministry of the Environment based on the website of the Secretariat of the Convention on Biological Diversity Secretariat

Figure3-4-2 Developments and Trends of International Efforts

| | |
|---|---|
| 1993 | Convention on Biological Diversity entered into force<br>(Three main objectives)<br>・The conservation of biological diversity<br>・The sustainable use of the components of biological diversity<br>・The fair and equitable sharing of the benefits arising out of the utilization of genetic resources |
| 2002 (COP6) | Adoption of the Convention on Biological Diversity Strategic Plan<br>2010 Target: Achieve a significant reduction of the current rate of biodiversity loss by the year 2010 |
| 2006 (COP8) | Release of the second edition of Global Biodiversity Outlook (GBO2)<br>Loss of biodiversity still continuing |
| 2007 | The G8 Environment Ministers Meeting held in Germany addressed biodiversity as a major agenda for the first time |
| 2008 (COP9) | Decision to hold CBD COP10 in Nagoya City, Aichi Prefecture |
| 2010 (COP10) | Release of the third edition of Global Biodiversity Outlook (GBO3)<br>Failed to achieve the 2010 Target |

Source: Ministry of the Environment

and natural capital. By recognizing and by seeking to grow or conserve these other 'capitals' we are working our way towards sustainability." Human capital is priced by payments of compensation for labor and social capital is priced by payments for services provided, but as for natural capital, most ecosystem services are used free of charge have not been priced, though only a small portion of ecosystem services are being traded with prices. The absence of pricing is believed to be one of the fundamental causes of the loss of biodiversity and degradation of ecosystems. TEEB points out that removal of this fundamental cause is necessary for sustainable use of ecosystem services.

Signing of the Convention on Biological Diversity began at the U.N. Conference on Environment and Development (Earth Summit) held in Rio de Janeiro, Brazil, in 1992, along with the Framework Convention on Climate Change. Thus, these two conventions are often called the twin conventions. At present, 192 countries and the European Union have acceded to the Convention on Biological Diversity and 191 countries and the European Union have acceded to the Framework Convention on Climate Change. This means almost all countries on the earth participate in the two conventions, demonstrating the extent of international interest in them. The contracting parties to the Convention on Biological Diversity are required to formulate national biodiversity strategies, and at present, a total of 170 countries have formulated their national strategies (Figure 3-4-1). As seen by these figures, countries sharing the sense of crisis about the loss of biodiversity are growing, and it is hoped that countermeasures taken by each country and coordinated international efforts will make further progress going forward.

Since the Convention on Biological Diversity took effect in 1993, efforts by the international community have made headway as summarized in Figure 3-4-2. COP6 of the Convention on Biological Diversity, held in The Hague, the Netherlands, in 2002 with the theme of "from dialogue to action," adopted the "Convention on Biological Diversity Strategic Plan," including the "2010 Target" to "to achieve by 2010 a significant reduction of the current rate of biodiversity loss" . The "third edition of Global Biodiversity Outlook (GBO3)" released by the Convention Secretariat in May 2010 in order to assess the achievement status of the 2010 Target showed that nine out of 15 indicators depicting the state of biodiversity has declined (Figure 1-5-2), and said the 2010 Target "has not been met" and the loss of biodiversity is continuing.

The sense of crisis is mounting that unless the degradation of biodiversity halts, we could face a serious situation with ecosystem services greatly damaged. On the other hand, the scientific capturing and assessment of biodiversity still remain insufficient, underscoring the need to globally push forward with the establishment of assessment methods and improvement of biodiversity monitoring systems.

## 2 2010 and Significance of CBD COP10

COP10 to be held in 2010 is set to assess the 2010 Target and discuss a new global target for biodiversity beyond 2010, or "Post-2010 Target" (Figure 3-4-3).

The U.N. General Assembly in 2006 decided to designate 2010 as the International Year of Biodiversity (IYB). The Secretariat of the Convention on Biological Diversity is to serve an organ responsible for the International Year of Biodiversity (IYB), and the Secretariat is urging contracting parties to increase the awareness of the three major objectives of the Convention on Biological Diversity ((1) the conservation of biological diversity; (2) the sustainable use of the components of biological diversity; (3) the fair and equitable sharing of the benefits arising out of the utilization of genetic resources) and the 2010 Target achievement, and also hold ceremonies to mark the International Year of Biodiversity by setting up national commissions. Under the IYB logo (Figure 3-4-4) and the slogan, "Biodiversity is life. Biodiversity is our life.," decided by the Secretariat, a variety of activities are set to take place around the world in 2010. Furthermore, in September 2010, a summit-class high-level meeting on biodiversity is scheduled to take place at the U.N. General Assembly. In a year that is to become a major milestone globally, an international conference that will set the course of the future direction of global biodiversity will take place in Japan.

Also on the agenda of COP10 are important issues aside from the Post-2010 targets. One of them is an international regime for access and benefit-sharing of genetic resources (ABS), on which discussions are to be completed by COP10. The Convention on Biological Diversity acknowledges states' sovereign rights to exploit natural resources within their jurisdiction and the fair and equitable sharing of the benefits arising out of

Figure 3-4-3 Major Themes to Be Discussed at COP10

- Assessment of the 2010 Target and adoption of the next target beyond 2010 (the post-2010 target)
- Completion of an International Regime on Access and Benefit-sharing (ABS) of genetic resources.
- Sustainable use of biodiversity; protected areas; businesses and biodiversity; public relations, diffusion and edification; the International Year of Biodiversity (IYB), etc.

Source: Ministry of the Environment

Figure 3-4-4 International Year of Diversity Logo

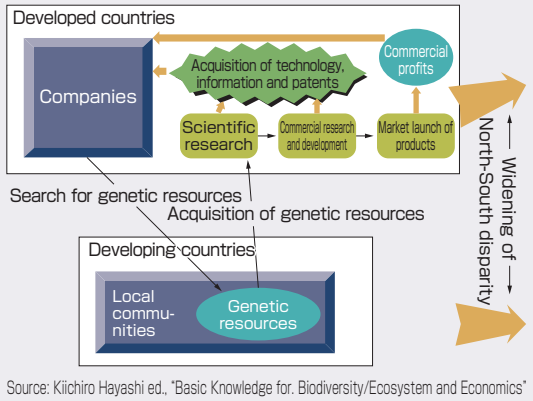

Source: Secretariat of the Convention on Biological Diversity

the utilization of genetic resources is designated as the third objective of the Convention. ABS is designed to develop a mechanism under which users of genetic resources have smooth access to genetic resources of provider countries and at the same time users distribute the benefits gained from genetic resources to provider countries in a fair and equitable manner that the benefits arising out of the utilization of genetic resources contribute to the conservation of biodiversity and its sustainable use.

It is important that an international regime for ABS will become a mechanism that ensures smooth access to genetic resources, contributes to human well-being through pharmaceutical products, etc. developed from genetic resources, and also contributes to global promotion of biodiversity conservation through the appropriate distribution of the benefits gained (Figure 3-4-5). Considerations by countries concerned are currently under way under the Convention on Biological Diversity, and Japan, as the host of COP10, is being called upon to take the initiative for progress in negotiations.

Other chief agenda include sustainable use of biodiversity; protected areas; businesses and biodiversity; public relations, diffusion and edification; and the International Year of Biodiversity (IYB), etc. COP10 will prove an important forum to set the course for an international framework and efforts corresponding to the three major objectives of the Convention on Biological Diversity.

Figure3-4-5 Relationship between Developed and Developing Countries Concerning Use of Genetic Resources before Adoption of the Convention on Biological Diversity




Source: Kiichiro Hayashi ed., "Basic Knowledge for. Biodiversity/Ecosystem and Economics"

## 3 Japan's responsibility as the COP10 host

### (1) International contributions based on Japan's experiences

COP10 is a very important conference to discuss the direction of global biodiversity going forward. Japan, as its host, needs not only to make COP10 a successful event but also to produce fruitful results from the conference by, among others, making proposals based on its own experiences. In relation to the post-2010 targets, the agenda of paramount importance at COP10, it has

Figure3-4-6 Japanese Proposal Concerning Post-2010 Targets of the Convention on Biological Diversity

**Mid/long-term target (2050)**

Enhancing the harmony between human being and nature all around the world, to improve the state of diversity from the current level as well as to sustainably increase the benefits of ecosystem services human being receives.

**Short-term targets (2020)**

To have the following actions taken by 2020, so as to halt biodiversity loss:
①To conduct full observations and analyses on the state of biodiversity as global scale and on scientific justification. To make ecosystem services respected in every aspect of human society.
②To expand activities for biodiversity conservation, to promote practical methods for sustainable use of biodiversity extending to future generations and to establish mechanisms for reducing adverse effects of human activities on biodiversity.
③To mainstream biodiversity by ensuring the participation of various stakeholders and new steps to be taken by various stakeholders.

**Sub-targets**

(1) Sub-targets to address indirect and broad-based drivers for biodiversity loss
Sub-target 1: To invite the wider participation of various stakeholders in the conservation and sustainable use of biodiversity
Sub-target 2: To establish mechanism to ensure harmonized approaches between ecosystem conservation and other human activities such as development and poverty alleviation
(2) Sub-targets to address direct and specific drivers for biodiversity loss
Sub-target 3: To increase the ratio of production that is managed in sustainable manner in agriculture, forestry, fisheries and other activities which utilize biological resources
Sub-target 4: To take urgent measures against threats to biodiversity
(3) Sub-targets to improve status of biodiversity itself
Sub-target 5: To promote the activities to conserve biological species and expand the areas to conserve ecosystems
(4) Sub-targets to ensure the benefits of biodiversity for human being
Sub-target 6: To establish the mechanism to sustainably benefit from the ecosystem services and to ensure its contribution to human well-being
(5) Sub-targets to address the effective achievement of above mentioned sub-targets
Sub-target 7: To prepare systems to encourage more facilitated ABS (Access and Benefit Sharing) and protection of traditional knowledge
Sub-target 8: To conduct full observations and analyses on the state of biodiversity and ecosystems at global scale and scientific justification so that they are well perceived and understood by general public
Sub-target 9: To provide financial and human resources as well as increase scientific and technical capacity in order to achieve the conservation and sustainable use of biodiversity

Source: Ministry of the Environment

been pointed out about the 2010 Target that the target itself is abstract and lacks clarity and that since there are no methods available to make an objective and numerical evaluation, it was difficult to obtain the understanding for taking emergency measures with a sense of crisis to achieve the target. Given these circumstances, measures taken to cope with development, climate change, deforestation and overfishing that lead to biodiversity loss were not sufficient. The decision at COP9 in 2008 called for the post-2010 targets to "include ambitious but realistic, and measurable short term targets" by 2020 and medium- and long-term targets by 2050, and also to be "short, focused and action-oriented." Given these developments, Japan in January 2010 submitted "Post-2010 targets (Proposal by Japan)" to the CBD Secretariat (Figure 3-4-6). The Japanese proposal put forward the mid/long-term target for enhancing the harmony between human being and nature and improve the state of biodiversity from the current level by 2050 (Vision) and the short-term targets for actions taken by 2020 to halt biodiversity loss (Mission). Japan proposes nine sub-targets under the short-term targets, and presents a total of 34 specific means for achievement under them, with many concrete examples and numerical indicators where possible. The CBD Secretariat will draft post-2010 targets on the basis of proposals from Japan and other countries for final discussions at COP10. Based on the Japanese proposal, the government will contribute to the forthcoming discussions so as to help improve post-2010 targets.

As discussed later in this paper, in relation to "sustainable use of biodiversity," a topic to be addressed at COP10, Japan intends to propose the "Satoyama Initiative," carrying the name satoyama, or Japan's woodland near populated areas utilized in a sustainable manner for the promotion of sustainable utilization and management of natural resources.

## (2) Reflection of international developments in and acceleration of domestic measures

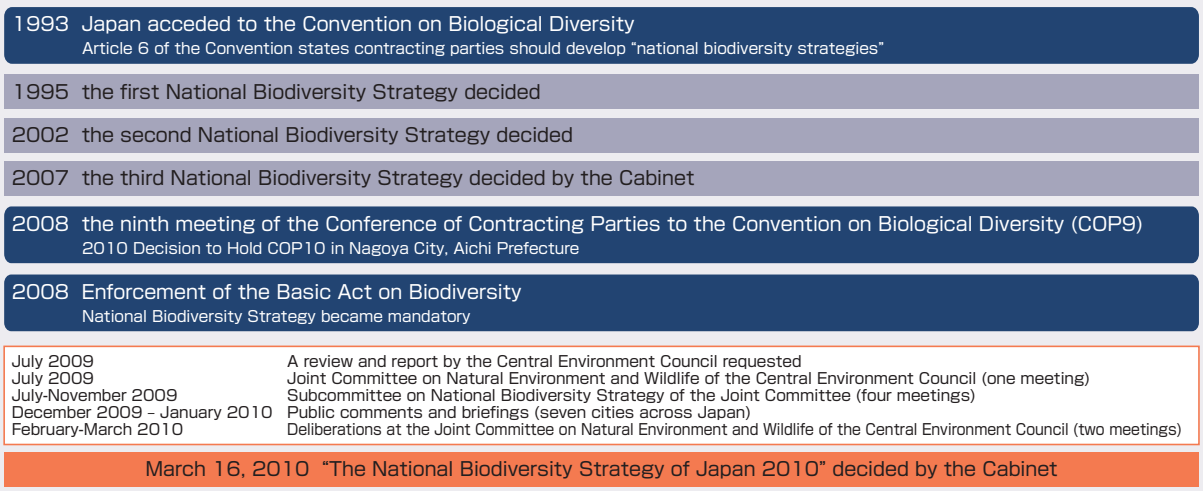
Based on the Convention on Biological Diversity, the Japanese government has so far formulated the three National Biodiversity Strategies in 1995, 2002 and 2007. Subsequently, the Basic Act on Biodiversity, domestic legislation enforced in June 2008, requires the government to formulate the national biodiversity strategy. Further in March 2010, the government formulated the National Biodiversity Strategy of Japan 2010, the first national strategy for biodiversity under the Basic Act on Biodiversity (Figures 3-4-7, 3-4-8).

This National Biodiversity Strategy of Japan 2010 added issues which should be achieved with government's view at COP10 including Japanese perspective of proposal for post-2010 targets to the Secretariat of the Convention on Biological Diversity in January 2010.

The National Biodiversity Strategy of Japan 2010 broadly consists of two parts. Part 1 may be called the core body of the strategy, which, after ascertaining the perception of the current situation such as what biodiversity is and its importance, covers the challenges of four crises affecting biodiversity in Japan and depicts four basic strategies that broadly set the direction for prioritized policy measures that should be taken by around FY 2012. In the Third National Biodiversity Strategy formulated in 2007, as the long-term perspective of time required for the recovery of natural ecosystems in implementing these four basic strategies, the grand-design was included as a common vision from the perspective of biodiversity looking ahead 100 years from now. With the Japanese proposal for post-2010 targets included, Part 1 of the latest National Biodiversity has set the course for pressing forward with biodiversity strategies broadly in phases and over the long term by FY 2012, 2020, 2050 and 2110 (Figure 3-4-9).

Part 2 lists a variety of measures systematically as specific action plans for realizing the strategy. The number of specific measures with the names of responsible government ministries and agencies increased from about 660 in the Third National Biodiversity Strategy to about 720, while the number of numerical indicators rose from 34 to 35. Japan will promote domestic and international measures toward COP10 by steadily implementing these policy measures incorporated in the National Biodiversity Strategy of Japan 2010.

Figure3-4-7 Formulation Process of the National Biodiversity Strategy




Source: Ministry of the Environment

Figure3-4-8 Outline of the National Biodiversity Strategy of Japan 2010

Decided by the Cabinet on March 16, 2010

**Part 1: Strategy**

**What is biodiversity? - three kinds of biodiversity -**

**Ecosystems diversity**
Tidal flats, coral reefs, forests, grassland, wetland, rivers, etc.



**Species diversity (among species)**
Estimated number of organism species on the earth 5 million to 30 million species



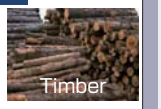
**(Genetic) Diversity within species**
Many different patterns for Japanese littleneck shells

**【Importance】 Biodiversity supporting life and livelihood**

**Basis for existence of all life on the earth**
- Supply of oxygen
- Stable climate, etc.

**Source of useful value**
- Food, timber
- Genetic resources
- Biomimicry※, etc.

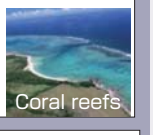
※ Imitating or taking cues from forms and functions of living organisms to develop technology, etc.




**Source of enriching culture**
- Local dishes
- Festivals, local folk songs, etc.

**Basis for safety and security**
- Prevention of natural disasters, etc.

Example) Coral reefs mitigate waves and erosion damage




**【Challenges】 Crisis of biodiversity**

**First crisis**
Ecosystem destruction by human activities
Reduction/extinction of species


**Second crisis**
Impact on satochi-satoyama due to inadequate management by humans


**Third crisis**
Ecosystem disturbances by invasive species


**Crisis caused by global warming**
Extinction of many species and ecosystem destruction

Example: IPPC Fourth Assessment Report
If the average global temperature rises by 1.5-2.5 degrees C…

20-30% of species of fauna and flora on the earth may see the risk of extinction increase

**【Targets】**

**Mid/long-term target (by 2050)**
- Enhance the harmony between human being and nature broadly at the national and regional level
- Improve the state of biodiversity from the current level
- Sustainably increase the benefits of ecosystem services

**Short-term targets (by 2020)**
Take the following actions by 2020 to halt biodiversity loss:
- Conduct full observations and analyses on the state of biodiversity and expand activities for biodiversity conservation
- Establish mechanisms for reducing adverse effect of human activities on biodiversity
- Promote practical methods in our daily life for sustainable use of biodiversity

**【Long-term perspective】 Grand-design, targeting 100 years ahead**

Present the national grand-design from the perspective of biodiversity as a "100-year plan" for recovery of ecosystems of national land over a period of 100 years
Deep-mountain natural areas; rural areas; urban areas; river/wetland areas; coastal areas; oceanic areas; and small island areas

**【Four Basic Strategies】**

I Mainstreaming biodiversity in our daily life
Mainstreaming biodiversity in our daily life; promoting and supporting the measures at local level, etc.

II Rebuilding sound relationship between human being and nature
Enriching the measures to conserve rare wild fauna and flora; promoting the integrated measures of natural symbiosis, material-recycling, and low-carbon society

III Securing linkages among forests, countryside, rivers and the sea

Ⅳ Success of CBD COP10; promotion of Satoyama Initiative; strengthening of scientific base; enhancing the science-policy interface; introduction of economic perspective; and assistance to developing countries, etc.

**Part 2: Action Plan**

- About 720 specific measures
- About 35 numerical indicators

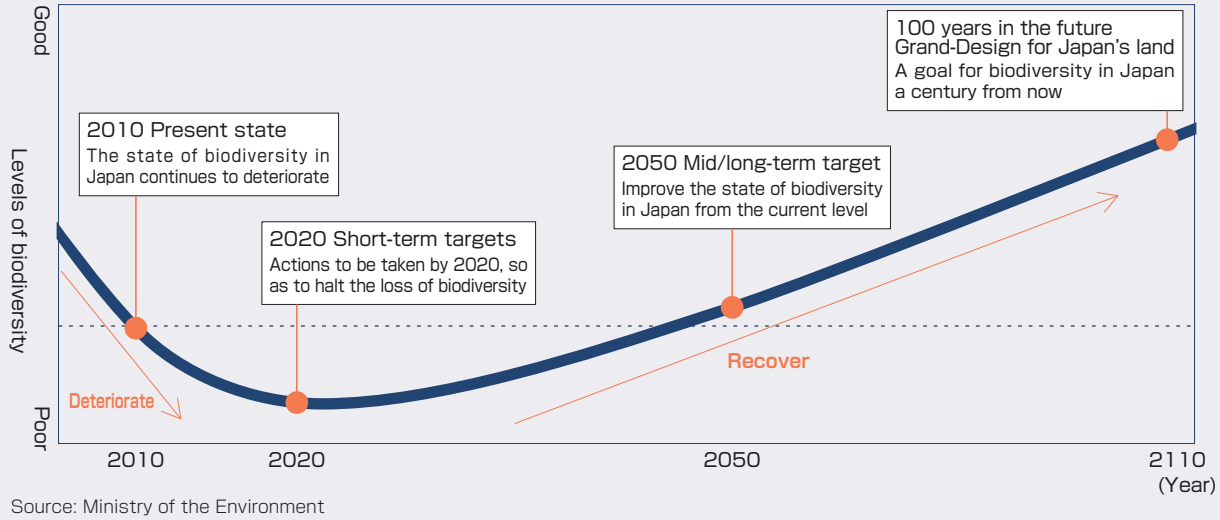
Source: Ministry of the Environment

After COP10, the government plans to review the National Biodiversity Strategy of Japan 2010 by reflecting discussions about post-2010 targets at COP10.

## (3) Participation and cooperation of the national and local governments, private sector, citizens and all other stakeholders

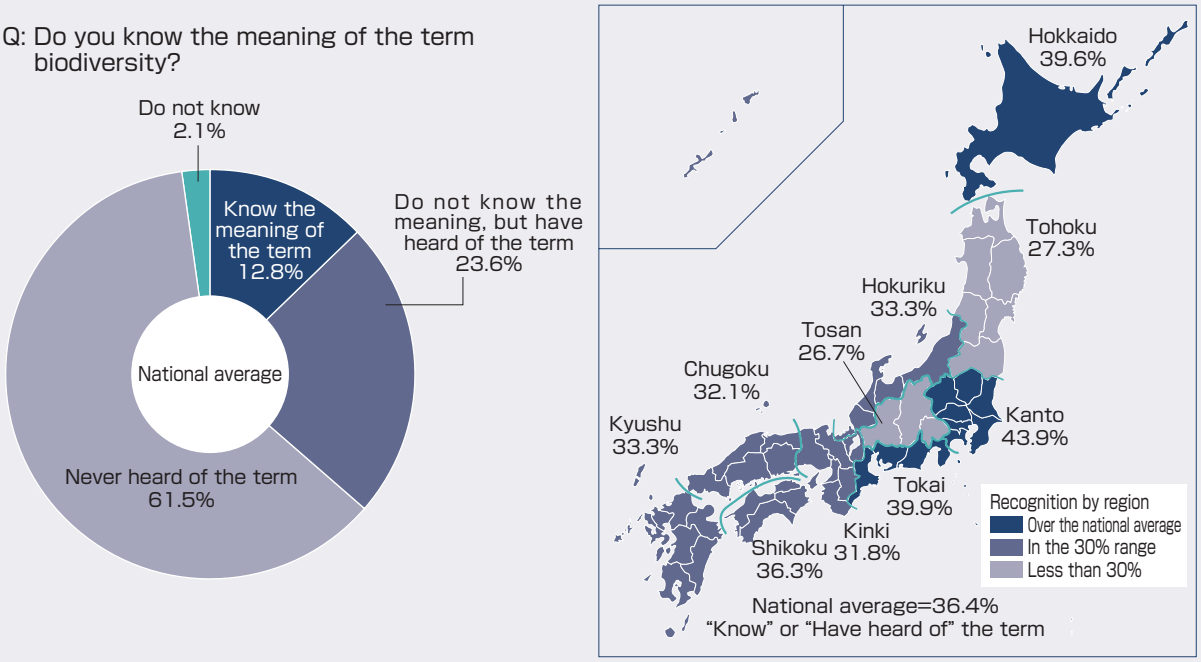
As stated in one of the four basic strategies of the National Biodiversity Strategy of Japan 2010, "Mainstreaming biodiversity in our daily life," in order to carry forward the rich national land with blessings bestowed by nature, it is necessary to consider and stay mindful of biodiversity not only in our daily life but also as society as a whole. To this end, it is necessary to call upon a variety of stakeholders to promote efforts commensurate with their respective positions to realize the "mainstreaming of biodiversity in society" where the importance of biodiversity conservation is shared by local

Figure3-4-9 How biodiversity should recover in Japan




Source: Ministry of the Environment

Figure3-4-10 Recognition of the Term "Biodiversity"




Source: Prepared by Ministry of the Environment based on the Cabinet Office, "Public Opinion Survey on Environment Issues"

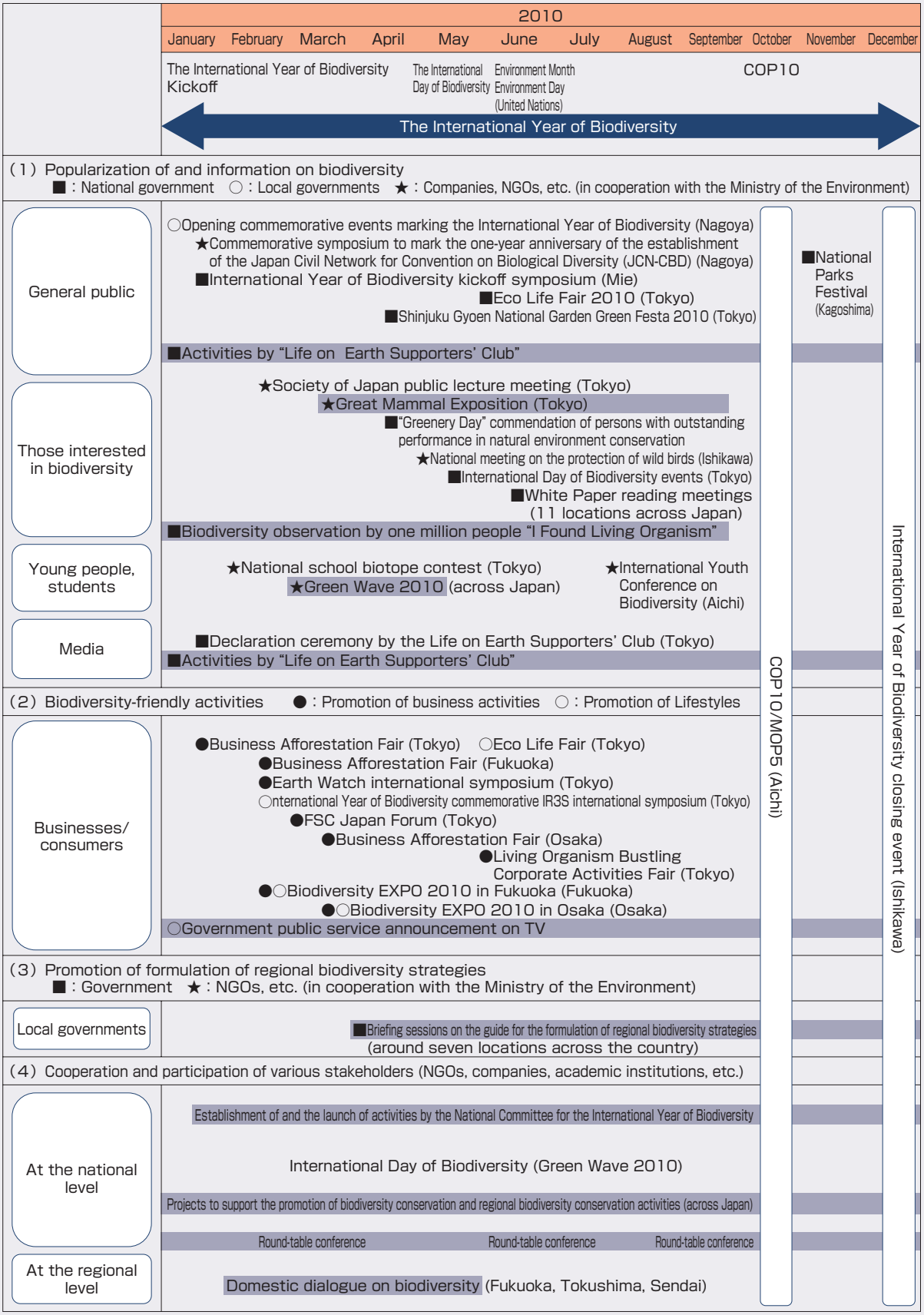
governments, businesses and individual citizens, etc. as the common sense and is reflected in behaviors of respective stakeholders. In Section 3, we introduced examples of forward-thinking efforts by a variety of stakeholders. In order to encourage the participation and cooperation of these various stakeholders and support their independent efforts, the government is undertaking various initiatives, including the publication of the guide to the formulation of regional biodiversity strategies, "Guidelines for Private Sector Engagement in Biodiversity" and projects to support regional biodiversity conservation activities.

## (4) An opportunity to have biodiversity conservation take firm root in everyday life, not a transient fad

Biodiversity that brings a myriad of benefits is indispensable for human kind. On the other hand, most of social and economic activities by humans, including their daily life, are imposing heavy burdens on biodiversity. Reducing burdens on biodiversity require efforts in everyday life and social and economic activities, just as with the problem of global warming.

To that end, it is important that many people understand and recognize the term biodiversity and its meaning as well as the fact that their daily life and social and economic activities are imposing burdens on

## Figure3-4-11 Mainstreaming Biodiversity in Our Daily Life




Note 1 Only major events to be undertaken by or through cooperation with the Ministry of the Environment are listed (as of February 2010)
Note 2 The shaded areas indicate the duration of events

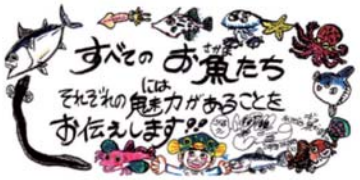
Source: Ministry of the Environment

## Column For all the life on Earth –“Life on Earth Supporters’ Club”

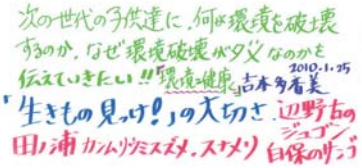
Our livelihood cannot go on without the blessings of biodiversity. But the term biodiversity remains as not widely recognized and we cannot say the understanding about biodiversity has made much progress. Under these circumstances, the Ministry of the Environment launched the “Life on Earth Supporters’ Club” consisting of prominent figures in November 2008, asking them to seize on a variety of occasions to send out messages regarding biodiversity to a broad array of Japanese people.

In this column, we introduce “My Action Declaration” of these members of the “Life on the Earth Supporters’ Club” speaking of their own intended actions for biodiversity conservation.

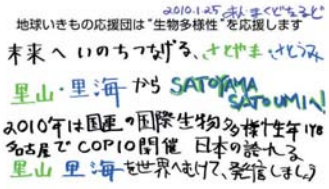
Sakana-kun, Visiting associate professor at Tokyo University of Marine Science and Technology/Fish life coordinator



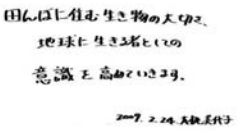

Takami Yoshimoto
Actress



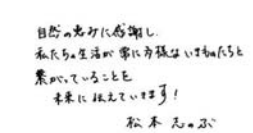

Anne McDonald
Essayist




Miyoko Oomomo
Talent/newscaster

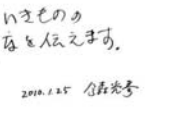



Shinobu Matsumoto
Freelance announcer

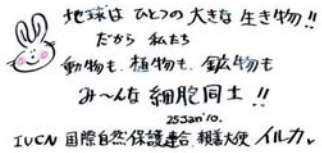



Tomoto Nakajima
Actress

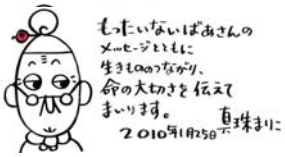

Mitsuhiko Imamori
Photographer



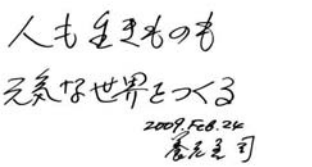

Iruka
Singer/song writer



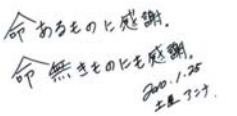

Mariko Shinju
Illustrator



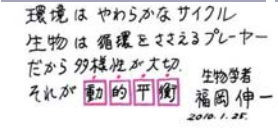

Takeshi Yoro
Biologist/University of Tokyo professor emeritus



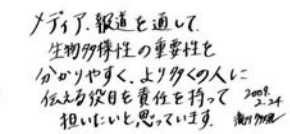

Anna Tsuchiya
Actress/model/singer



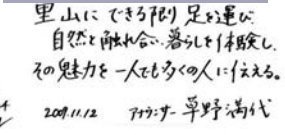

Shinichi Fukuoka
Biologist



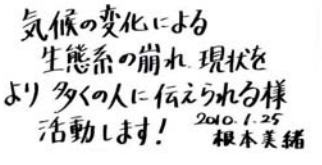

Christel Takigawa
Freelance newscaster



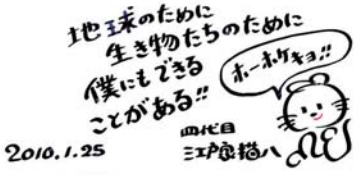

Mitsuyo Kusano
Freelance announcer



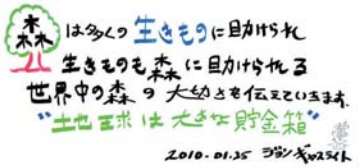

Mio Nemoto
Freelance announcer/certified weather forecaster




Nekohachi Edoya
Rakugo performer




John Gathright
Doctor of agriculture/talent/columnist/ecologist/space produce




(Random order, honorific titles dispensed with)

biodiversity and then act accordingly to mitigate burdens on biodiversity in their daily life. A public opinion survey conducted by the Cabinet Office in 2009 found that the recognition of the term biodiversity (the ratio of respondents who said they "have heard of it" or "know the meaning of it") was a relatively low 36.4%. The rate of recognition was a little higher than 30.2% in a similar survey conducted by the Ministry of the Environment five years ago in 2004, but we need to continue to strive to increase the recognition of the term (Figure 3-4-10).

COP10 will be the first massive-scale international conference on biodiversity to be held in Japan. Since the third conference of the contracting parties to the Framework Convention on Climate Change was held in Kyoto in 1997, the recognition and efforts to cope with global warming issues at home have made great strides. COP10 of the Convention on Biological Diversity will also provide a great opportunity to enhance the recognition of biodiversity and to promote the mainstreaming of biodiversity in our society.

The Ministry of the Environment established the National Committee for IYB in January 2010. The government will consider commemorative events and activities at the "Committee on Life on Earth," created under the National Committee and consisting of scholars, business leaders, media people, cultural figures and NGO representatives (Figure 3-4-11). Based on the Committee's deliberation, we will establish "individual project teams" for implementing a variety of individual projects such as commemorative events to mark the International Year of Biodiversity and the International Day of Biodiversity. In order to promote the mainstreaming of biodiversity more efficiently, we will also register organizations carrying out related projects voluntarily and organizations supporting and cooperating with related activities as "Life on Earth Supporters" to a create more broad-based campaign.

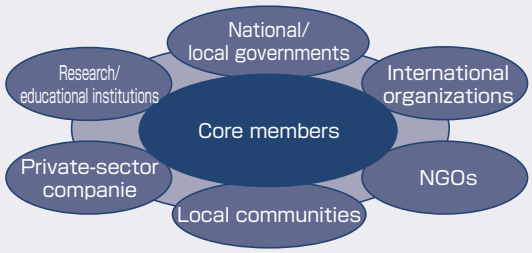
## 4 Wisdom and Spirit of Natural Symbiosis Spreading to the World

For the conservation of biodiversity, the role of secondary nature formed and maintained through human activities such as agriculture and forestry operations over long years is as important nature maintained in its protozoa (protist) shape. However, this secondary form of nature, together with ecosystem services that can be derived from it, is under threat to its sustainability or has already been lost in some areas, due to a string of events in recent years, including urbanization, industrial development, sharp changes in rural populations and the aging of society. These areas exist across the world. These areas, including muyong, uma and payoh in the Philippines, mauel in Korea, dehesa in Spain, terroirs in France, chitemene in Malawi and Zambia, and satochi-satoyama (community-based forest areas and the surrounding countryside) in Japan, have varied characteristics depending on regional climate, geological formation, cultures and socioeconomic and other conditions. In order to proceed with the conservation of biodiversity and its sustainable use, it is important to realize a society of natural symbiosis by taking measures corresponding to their respective regional characteristics while recognizing the value of secondary nature and sharing the importance of seeking to maintain and conserve it on a global scale.

More specifically, effective ways to do this include the global sharing and mutual analyses of methods of sustainable use and management of biological resources in respective regions, capacity-building of relevant parties through cooperation among local governments, international institutions and NGOs, and implementation of bilateral and multilateral official development assistance (ODA) projects, in accordance with the existing principles of the conservation of biodiversity and its sustainable use. Japan has proposed this approach as the Satoyama Initiative. Seizing the occasion to host COP10, Japan plans to promote this approach by calling for stronger international cooperation and increased efforts, including the launch of the partnership with the participation of various stakeholders (Figure 3-4-12).

At home, meanwhile, Japan is exerting the following efforts as part of projects to promote the Satoyama Initiative:

Figure3-4-12 Composition Image of International Satoyama Partnership(tentative name)




Source: Ministry of the Environment

Figure3-4-13 COP10 Logo

Life in harmony, into the future
COP10/MOP5 Aichi-Nagoya 2010

Source: Ministry of the Environment

(1) Investigations and analyses of and sending out information on satochi-satoyama that is making distinguishing efforts;
(2) Trials and social experiments on new measures to utilize satoyama for environmental education and eco-tourism as well as use of biomass;
(3) Building of rules and frameworks for a variety of stakeholders to sustainably mange and utilize satoyama as shared resources;
(4) Formulation of "action plans for satochi-satoyama conservation and utilization" to encourage people's understanding of and interest in satochi-satoyama and carry out conservation and utilization activities across Japan as national movements.

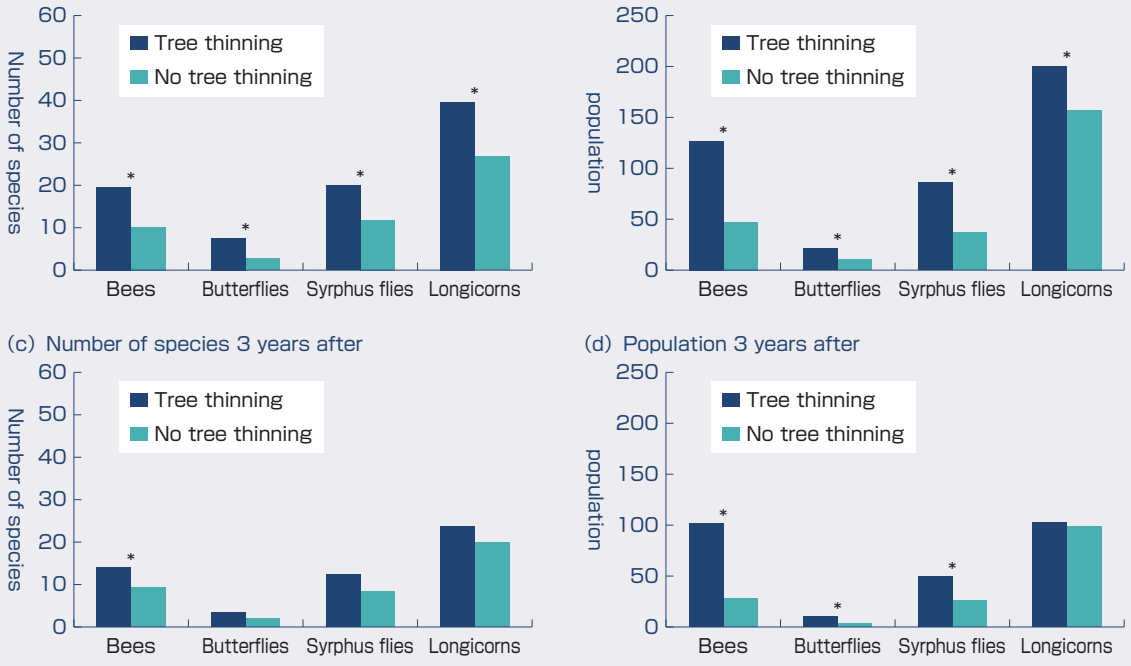
Historically, in Japan, people had the way of living to seek the coexistence with nature in a relatively limited livelihood sphere, as exemplified by the concept of "shiri-shiho" (several miles around you) for the procurement of food and other daily necessities. Today, in order to solve various issues confronting human being, including but not limited to biodiversity as well as climate change and 3Rs (reduce, reuse and recycle), the question we are faced with is how we should live in the closed world of the earth. One of possible solutions is the way of living in harmony with local nature, as exemplified in satochi-satoyama in Japan. However, it is not easy for Japanese people to alter today's convenient way of livelihood and we also need to have the global perspective to go beyond the bounds of Japan. One of approaches for realizing a sound material-cycle society is the "re-styling, or shift to lifestyles and business styles based on 3Rs. Realization of the natural symbiosis society requires the "re-styling" corresponding to today's social and economic conditions.

The COP10 logo was designed as an origami image (Figure 3-4-13). Origami symbolizes the wisdom and culture of Japan. By placing humans at the center, the logo symbolizes the coexistence of human being and a variety of living organisms. And the combination of the human adult and the child expresses the wish to carry forward rich biodiversity to future generations. In

## Column Relationship of Management of Satoyama and Biodiversity

According to a study of the Forestry and Forest Products Research Institute looking into whether tree thinning, one of satoyama management methods, actually contribute to the conservation and enhancement of biodiversity, the comparison between Japanese cedar artificial forests thinned by about half in the number of trees and about one-third in wood cubic volume and forests with no tree thinning found that the number of species of bees, butterflies, syrphus flies and longicorns was larger in thinned forests than forests without thinning and the populations of insects were also larger in thinned forests for all species one year after tree thinning. While the differences between two forests tended to disappear three years after tree thinning, the study clearly shows that thinning of artificial forests, as a method of satoyama management, has altered the composition of plant species in forest floors and in the short run, increased the number of insect species and their populations, thus enhancing biodiversity of forests.

Species of Insects and Population Collected 1 Year and 3 Years after Tree Thinning



considering the global environment going forward, including biodiversity, the idea of enhancing the harmonious coexistence with nature around the world is important, as proposed by Japan as the mid/long-term target of post-2010 biodiversity targets. To that end, Japan will widely send out messages on the Satoyama Initiative at COP10 carrying this logo and use COP10 as a catalyst to redouble efforts in Japan.

## Conclusion

Ahead of COP10 to be held in Japan in October, in Chapter 3, we discussed Japan's responsibility as the host country of COP10 and underscored the need for a shift to the socio-economy that is friendly to biodiversity. Biodiversity provides the wide-ranging benefits to human being on a scale far greater than we usually think. On the other hand, this precious biodiversity is disappearing rapidly on a global scale, making difficult for human being to sustainably receive those benefits from ecosystem services in the future. Further, it is becoming known now that the benefits to be obtained by conserving ecosystems are greater than costs required to restore once-lost ecosystems. It is important to proceed with development actions and utilization of natural resources after making an accurate cost-effect analysis.

Japan is giving a major impact on global biodiversity from its dependence on overseas for the bulk of natural resources, and thus it is necessary for Japan to take the initiative in making a shift to a biodiversity-friendly socio-economy, from corporate activities to our individual lifestyles, for the conservation and sustainable use of biodiversity, that is the basis for existence of human being. COP10, which is to consider global targets for biodiversity beyond 2010, is an important conference that can influence of the future of global biodiversity. As the host country of this conference, Japan needs to play a leadership role to realize the greater harmony between human being and nature on a global scale by globally spreading the Satoyama Initiative for sustainable use and management of natural resources.