State of Japan's Forests and Forest Management

— 2nd Country Report of Japan to the Montreal Process —

October, 2009

Forestry Agency,Japan

This report was prepared by the Forestry Agency, Japan to provide information on the state of its forests and forest management in accordance with the Criteria and Indicators of the Montreal Process.

Montreal process:
an international initiative formed in 1994 to develop and apply criteria and indicators for the conservation and sustainable management of temperate and boreal forests. Participating countries are Argentina, Australia, Canada, Chile, China, Japan, Republic of Korea, Mexico, New Zealand, Russia, Uruguay and United States of America, whose forests together account for 80% of the temperate and boreal forests and 50% of the world's forests.

Criteria:
aspects of forests and forest management to be addressed in assessing the sustainability of forest management

Indicators:
items on which measurements and information are collected to describe the state of forest and forest management along the criteria

FOREWORD

At the Earth Summit held in Brazil in 1992, participating countries agreed on the pursuit of sustainable forest management. In order to monitor its progress, countries also agreed on developing criteria and indicators as one of the actions to be taken. Following this agreement, twelve major temperate and boreal forest countries, including Japan, have participated in the Montréal Process to develop and implement criteria and indicators since 1994.

The Forestry Agency of Japan has actively contributed to developing and implementing criteria and indicators utilizing its wealth of expertise on forests and forestry since the inauguration of the Montréal Process. Moreover, the Forestry Agency has undertaken the Liaison Office of the Montréal Process since January, 2007, hosted meetings to revise criteria and indicators and prepare the Overview Reports, thereby has willingly coordinated and consolidated the opinion of member countries. I am highly honored that these efforts are well acknowledged by the member countries.

The Working Group of the Montréal Process agreed at its meeting in 2008, on preparing the second country reports which report on the state of forests and forest management of each member country along the agreed upon criteria and indicators. It is my great pleasure that the second country report of Japan, which has been prepared by the Forestry Agency with the cooperation of relevant institutions including the Forestry and Forest Products Research Institute and the Ministry of the Environment, is now ready to be presented on the occasion of XIII World

Forestry Congress held in Argentina in October this year. I deeply appreciate all the organizations involved for their cooperation.

This Second Country Report contains new information on the forest ecosystem types and the state of forest fragmentation based on the result of the survey newly implemented by the Forestry Agency and so on. It is my honest hope that this report will widely acquaint the world with the state of forests and forest management of Japan and contribute to the efforts of countries and international organizations to promote sustainable forest management.

Taisuke SHIMADA
Director General
Forestry Agency, Japan
October 2009

ACKNOWLEDGEMENTS

This report is a result of the efforts of many people and organizations, whose contributions are briefly described and acknowledged, as follows:

Members of the core team set up in the Forestry Agency were Takeshi Goto, Counsellor for International Forest Resource Analysis, Yuichi Sato, Policy Advisor, Shigeru Takahara, member of the Planning Division, and Akimi Yamada, member of the International Forestry Cooperation Office, who were engaged in a series of works, including collection, processing and illustration of the data and information, drafting of the report and consultations, coordination with relevant organizations, and printing and binding of the report.

Members of the relevant divisions and offices of the Forestry Agency, Japan assisted the core team by providing useful recommendations and advices, as well as necessary data and information.

Members of the Forestry and Forest Products Research Institute (FFPRI) and the Ministry Environment, Japan also provided necessary data and information and useful advices.

Members of the International Forestry Cooperation Office provided the core team with valuable support in processing and illustration of the data and information and printing and binding of the report under the supervision of Kunio Shimizu, Director for International Forestry Cooperation.

All these contributions are deeply appreciated and highly recognized as a clear indication of the intention of pursuing sustainable management of Japan's forests.

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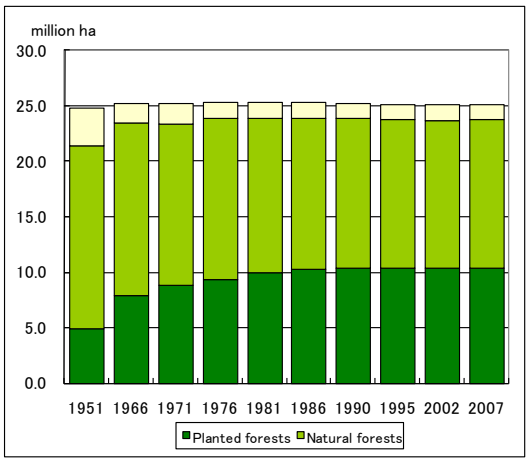
OVERVIEW

Outlook of Japan's Forests, Forestry and Wood Industry

Features of Forests

Forests cover approximately 25 million hectares, occupying about two-third of the total land area of Japan. Such high coverage of forests has been maintained for more than a half century. The sustained efforts for forest conservation and restoration, coupled by the warm and wet climate and steep terrains hindering the conversion of forestland into other uses, have contributed to such stable forest cover. The growing stock of Japan's forests, meanwhile, has constantly increasing, particularly in the plantation forests. The current volume of the growing stock of Japan's forests is approximately 44 billion cubic meters, which is more than twice as much as in 1950's.

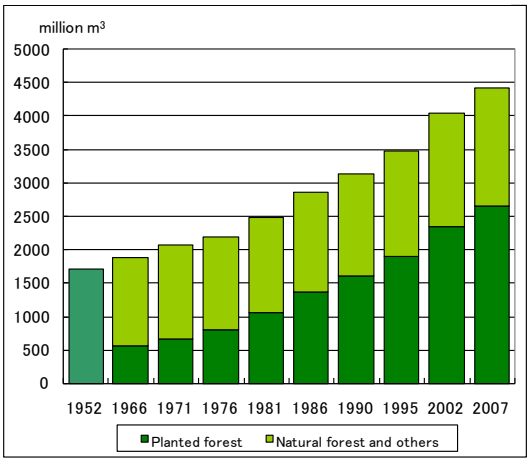
Figure1: Change in forest area of Japan



Sources: Forestry Agency. State of Forest Resources, Ministry of Agriculture, Forestry and Fisheries

See pages 4.

Figure 2: Change in growing stock of Japan



Sources: Forestry Agency. State of Forest Resources, Ministry of Agriculture, Forestry and Fisheries

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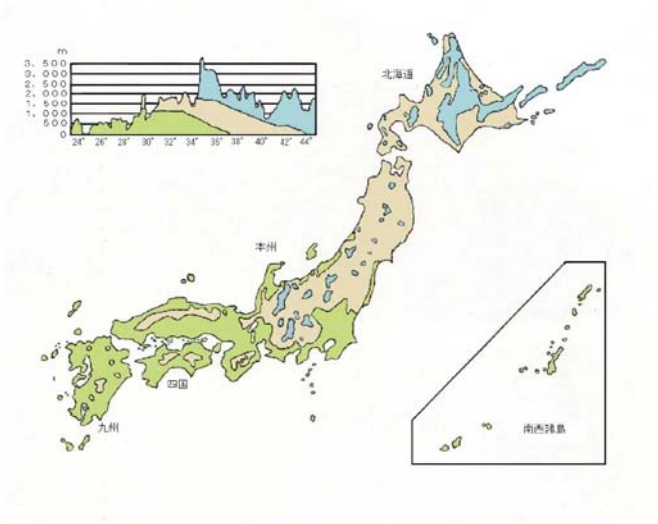
On the Islands of Japan stretching over 3,000 kilometers from north

to south, boreal, temperate and some sub-tropical forests are distributed. Affected by the diversified natural setting, such as the distinct summer and winter monsoons and intricate geographical and geological features, as well as the human intervention, a broad range of forest ecosystem types and species are found throughout the country. Most of the 200 species of terrestrial mammals and over 40 percent of the 8,100 species of ferns and seed plants known in Japan are regarded as forest associated.

Figure 3: Distribution of forest types in Japan



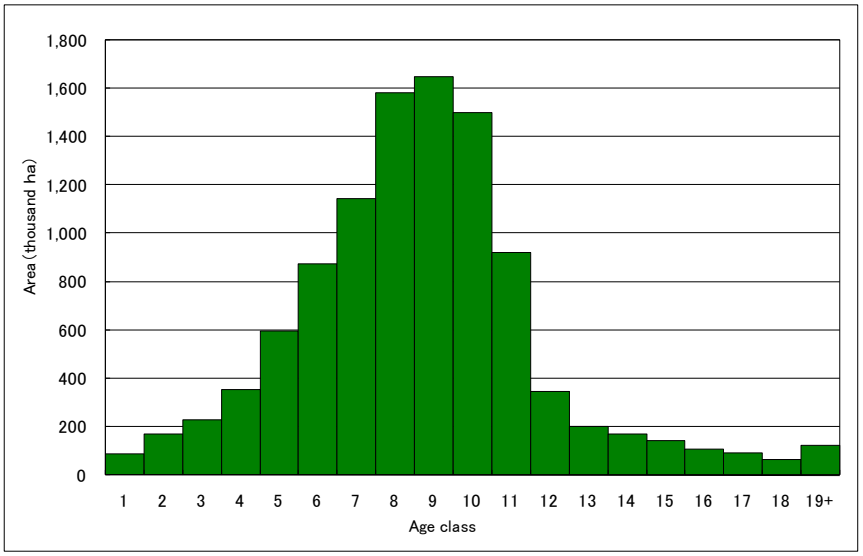
Legend	Vegetation type
	Boreal forests
	Cool temperate forests
	Warm temperate and sub-tropical forests

Sources: Forestry and Forest Products Research Institute

Approximately 53 percent of forests in Japan are classified as natural forests, 41 percent are planted forests and the remaining 5 percent are the forest land without trees, such as logged over forests and alpine and boulder areas, and bamboo forests. Some natural forests distributed in remote areas maintain unique native forest ecosystems and fauna and flora. Other natural forests have been normally affected by

human activities, such as fuel wood production, commercial logging and enrichment plantation. The majority of the planted forests were established during the late 1950's to the early 1970's when the wood consumption was increasing under the rapidly growing economy. Over 60% of the planted forests are younger than 45 years as a result, and still in need of care such as thinning.

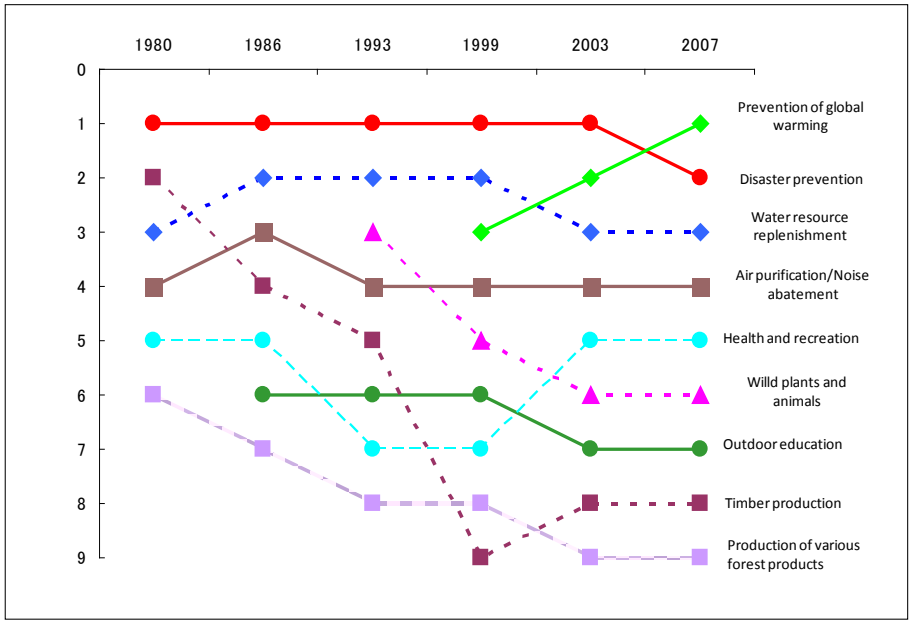
Figure 4: Distribution of age classes of planted forests of Japan



Sources: Forestry Agency. State of Forest Resources
See pages 34.

Healthy and vital forests provide us with a wide range of socioeconomic and environmental benefits. Besides the delivery of wood and non-wood forest products, the environmental benefits from forests, such as soil and water conservation, have been well recognized by the people of Japan. The growing concern about the global environment issues in recent years has further raised the public awareness of the multiple and crucial roles of forests in securing our well-being. Among those roles, carbon sequestration function of forests is particularly attracting higher attention. As a consequence, proper maintenance and sustainable use of planted forests, as well as the conservation of natural forests, is gaining the public support.

Figure 5: Change in Japanese People's Expectation to forest roles



Sources: Cabinet Office

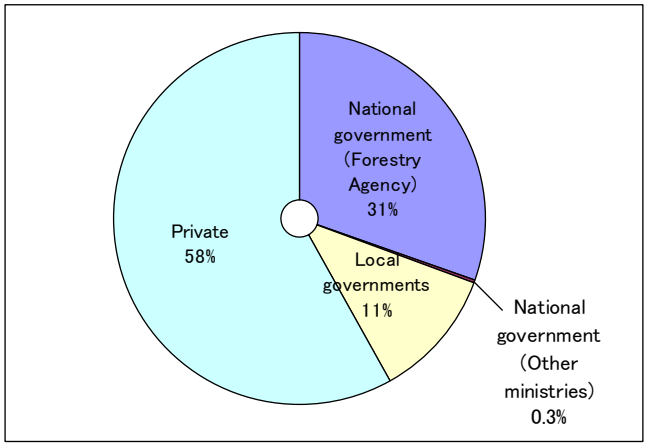
See pages 105.

Before thinning **After thinning**

State of Forestry and Wood Industry

In Japan, approximately 42 percent of forests are publicly owned and 58 percent are privately owned. About 85 percent of the publicly owned forests belong to the national government, and the remaining 15 percent belong to the local public entities, including prefectural and municipal governments and district properties. The majority of the owners of the privately owned forests, on the other hand, are households. Among 920 thousand households, which own more than 1 hectare of forests, 57 percent own less than 3 hectares of forests and only 11 percent own more than 10 hectares of forests. Such small-scale ownership pattern of the privately owned forests, coupled by the generally steep terrains, hinders efficient forest operations and active forest management.

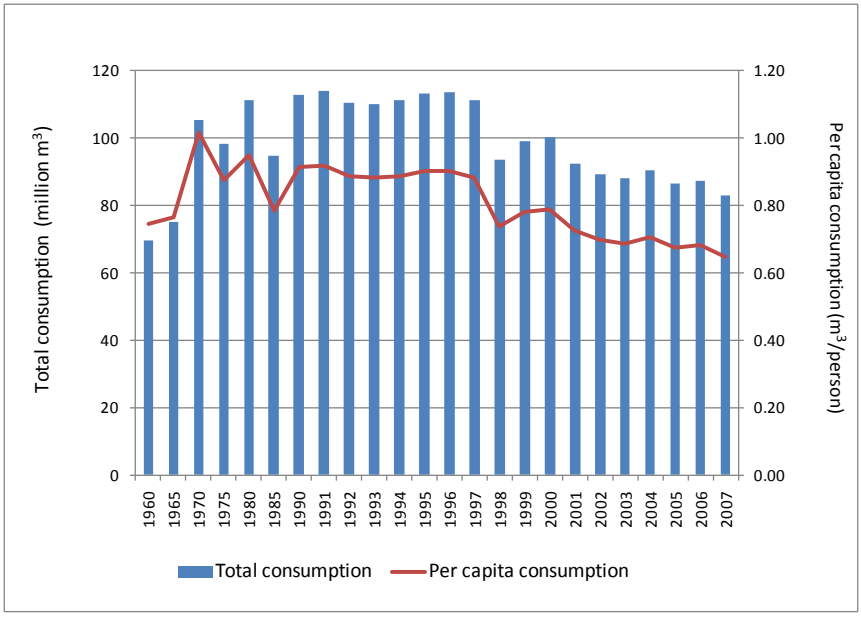
Figure 6: Share of forest ownership in Japan



Sources: Forestry Agency. State of Forest Resources
See pages 6.

Japan's wood consumption in recent years hovers below 90 million cubic meters per annum in round wood. The largest category of wood use is pulp and wood chips, which occupies over 40% of the total consumption, followed by sawn timber and plywood. The current level of wood production in Japan, on the other hand, is around 19 million cubic meters, which covers only a little over 20% of the total consumption. The balance is filled up by the imported round wood and wood products. From the global viewpoint, 7% of the internationally traded industrial round wood is imported to Japan.

Figure 7: Change in wood consumption in Japan

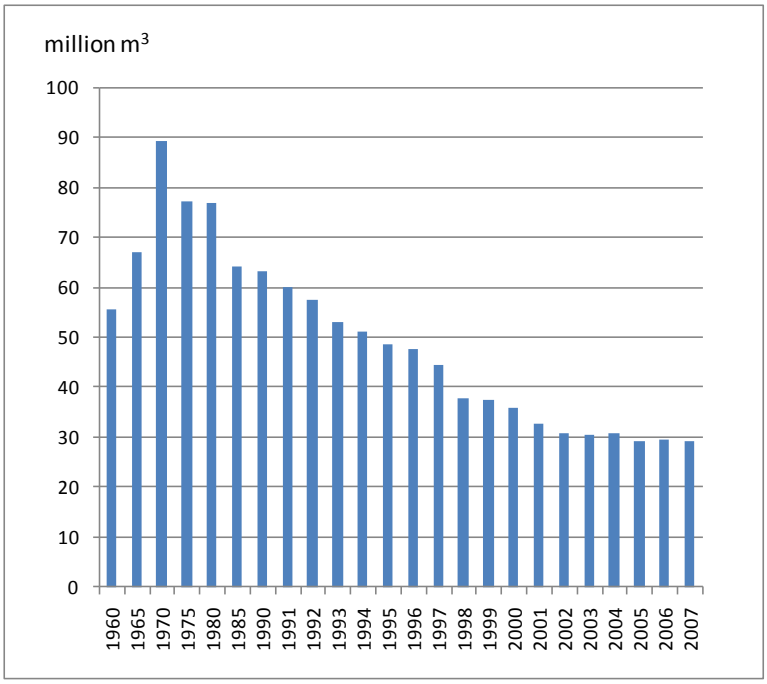


Sources: Forestry Agency, Ministry of Internal Affairs and Communication. National Census etc.

See pages 73.

Wood production in Japan has constantly declined since the 1960's in competition with the imported wood and other building materials. The use of domestically produced wood, including small diameter logs from the thinning of planted forests, however, is now regaining the attention of the wood processing industry of Japan. Such change is attributed to the increasing concern for the stable supply of imported round wood, as well as the increasing growing stock of planted forests and the improving wood processing technologies. The challenge ahead is to ensure the stable supply of wood through the collective management of smallholders' forests and the efficient forest operations while maintaining the sustainability of resource base and the environmental functions of forests.

Figure 8: Change in wood production in Japan



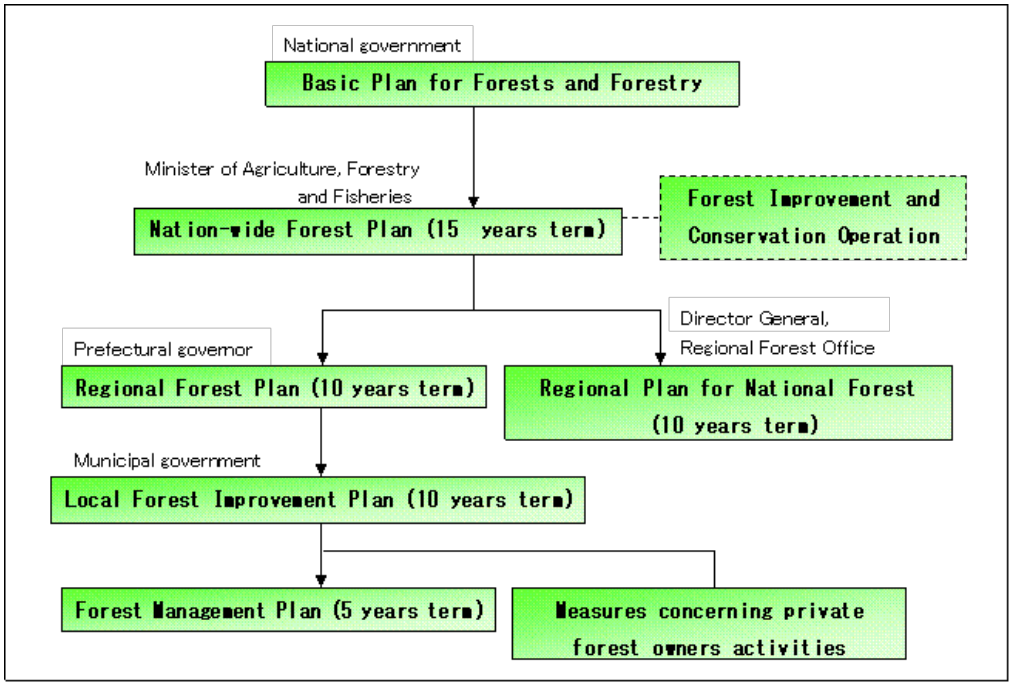
Sources: Forestry Agency, Ministry of Internal Affairs and communication, Ministry of Economy, Trade and Industry

See pages 67.

Framework of Forest Administration

The principles of the management of Japan' forests are laid down by the Forests and Forestry Basic Act which was fully renovated in 2003 reflecting the international trends toward the sustainable forest management. The Act provides that the primary objective of the forest management is to sustain the multiple benefits from forests and defines, to this end, a range of policy measures to be implemented for the improvement and conservation of forests and the development of forestry and wood industry. In accordance with the Basic Act, Basic Plan for Forests and Forestry has been periodically formulated to identify Japan's national strategy containing long-term goals and approaches.

Figure 9: Structure of forest planning system of Japan

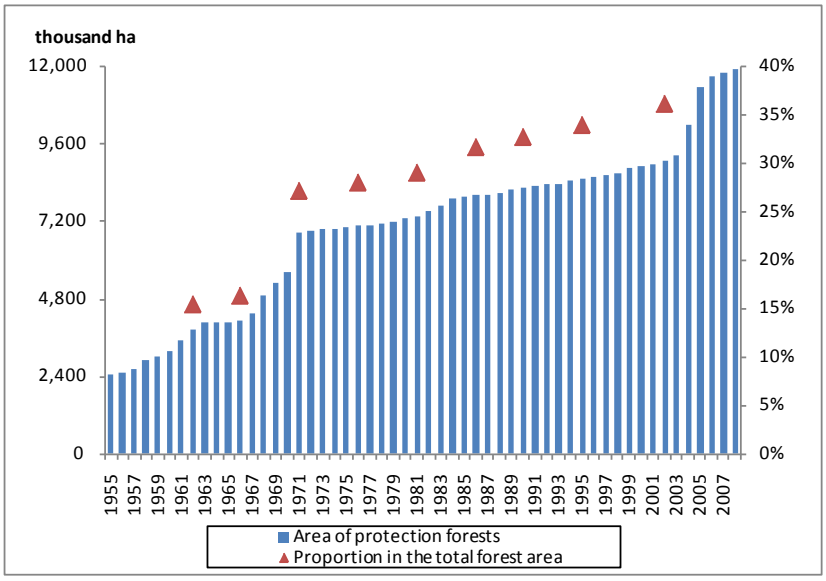


Sources: Forestry Agency
See pages 110.

In order to implement a variety of policy measures, institutional frameworks, such as those for the forest planning and forest conservation, are provided by the Forest Act. Forest management plans are formulated at national, district and municipal levels by the respective government bodies and at the management unit level by the individual forest owners,

as well, to ensure the sustainability of the resource base and the multiple functions of forests. The protected forests are designated by the Minister for Agriculture, Forestry and Fisheries or the governor of prefectures for a variety of conservation needs, such as soil and water conservation and recreational opportunities. Activities, such as logging operations and earthworks, are restricted in the protected forests depending on the purpose and the required level of conservation.

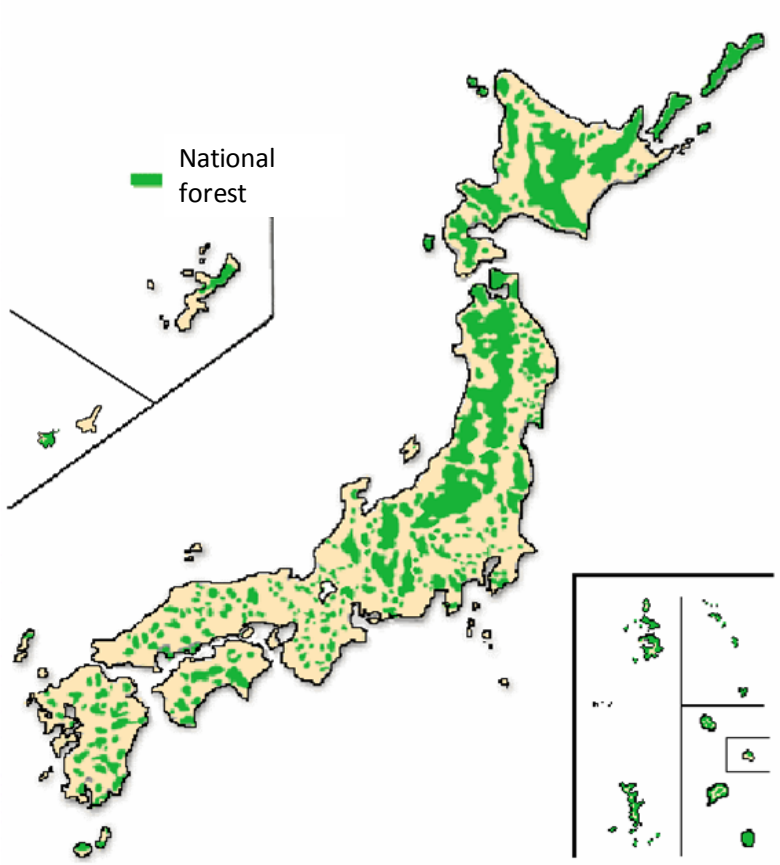
Figure 10: Change in area of protected forests of Japan



Sources: Forestry Agency

The instruction and assistance to the private forest owners and wood industry is carried out by both the national government, namely the Forestry Agency, and the prefectural and municipal governments in a coordinated manner. The management of national forests, on the other hand, is directly conducted by the Forestry Agency, under which local offices, including seven Regional Forest Offices, 98 District Forest Offices and 1,260 Forest Ranger Offices, are distributed throughout Japan. A variety of research and development activities related to forests and forest products are carried out by national, prefectural and private institutions and universities, including the Forestry and Forest Products Research Institute.

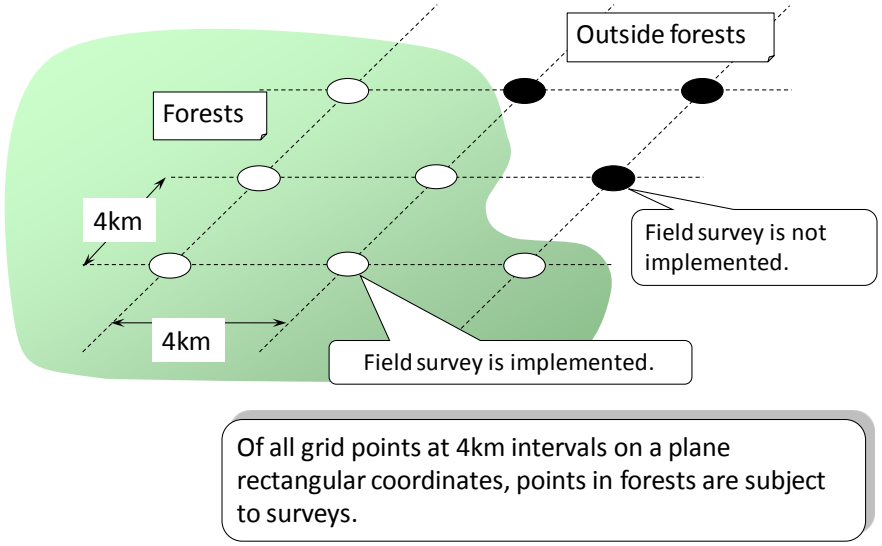
Figure 11: Distribution of national forests of Japan



Sources: Forestry Agency

The inventory data of all the privately owned forests, as well as the publicly owned forest, have been compiled by compartment and reviewed in every five years on the occasion of the revision of the district forest plans. In 1999, the Forestry Agency introduced a new forest monitoring survey with the aim of supplementing such traditional forest inventory data. A wide range of information, including the vegetation and endangered species is collected in the survey in every five years on 16 thousand spots allocated at every 4 kilometer grid. The result of the survey, which will enter the third round in 2009, is already utilized in this country report and the FRA2010 also.

Figure 12: Structure of monitoring spot of Forest Resource Monitoring Survey of Japan



Sources: Forestry Agency

INTRODUCTION

Overview of the Montreal Process and International Debates

Development of the Montreal Process

The roots of the Montreal Process are traced back to the chapter 11 of Agenda 21 adopted in the Earth Summit in 1992 in which the "formulation of scientifically sound criteria and guidelines for the conservation, management and development of all types of forests (11.23. (b))" was included as one of the activities to be carried out in pursuit of sustainable forest management. With this as a start, inauguration of a voluntary initiative to develop a set of criteria and indicators for the conservation and sustainable management of temperate and boreal forests was agreed at the expert seminar held in 1993 in Montreal, Canada, after which "the Montreal Process" was named.

Figure 13: Relevance to C&I in the documents of the Earth Summit

Forest Principles

8. (d) Sustainable forest management and use should be carried out in accordance with national development policies and priorities and on the basis of environmentally sound national guidelines. In the formulation of such guidelines, account should be taken, as appropriate and if applicable, of relevant internationally agreed methodologies and criteria.

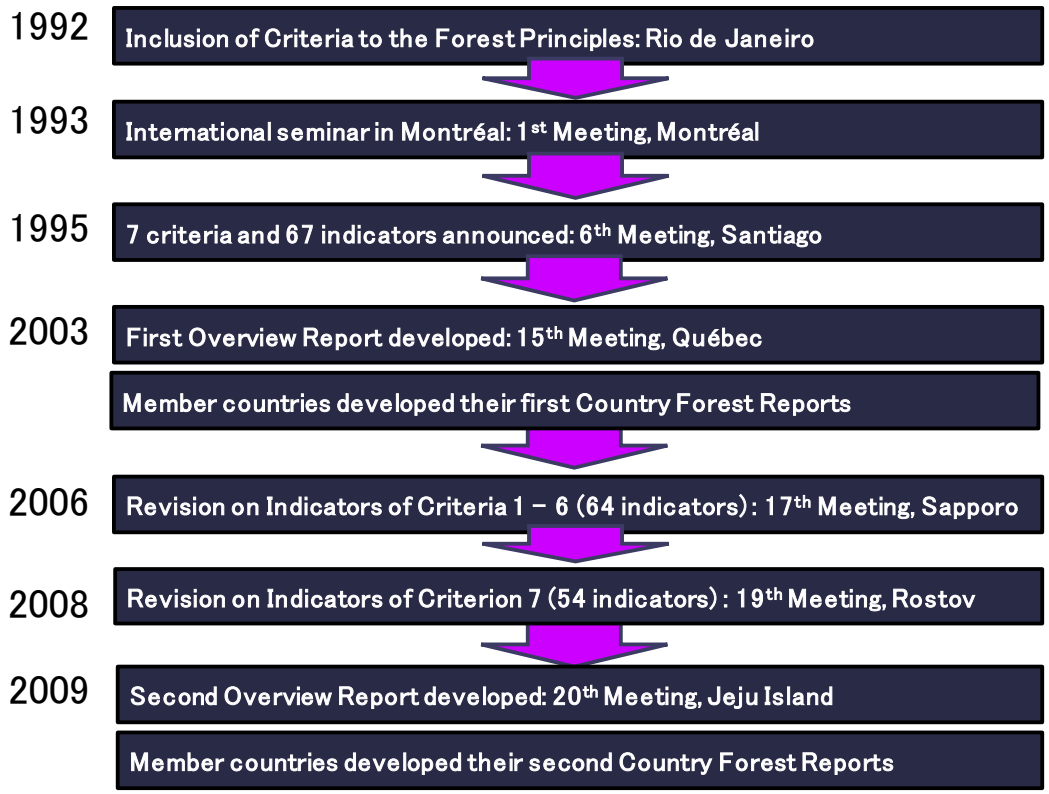
Agenda 21

11.22 (b) Formulating scientifically sound criteria and guidelines for the management, conservation and sustainable development of all types of forests;

Sources: "Forest Principles", "Agenda 21"

After the intensive deliberations of fifteen months, a set of seven criteria and 67 indicators was adopted by ten countries at the 6th meeting of the Working Group held in Santiago, Chile in 1995. Those countries are Australia, Canada, Chile, China, Japan, Republic of Korea, Mexico, New Zealand, Russia and the United States of America. Japan has been proactively participated in the Montreal Process from its inauguration through the close collaboration between the Forestry Agency, Forestry and Forest Product Research Institute and the Environment Agency(FFPRI). The contribution of Japan at this stage was demonstrated by the success of the 5th meeting of the Working Group held in Tokyo in 1994, by which the road was paved to the agreement in Santiago by clearing outstanding issues.

Figure 14: Progress and achievements of the Montreal Process

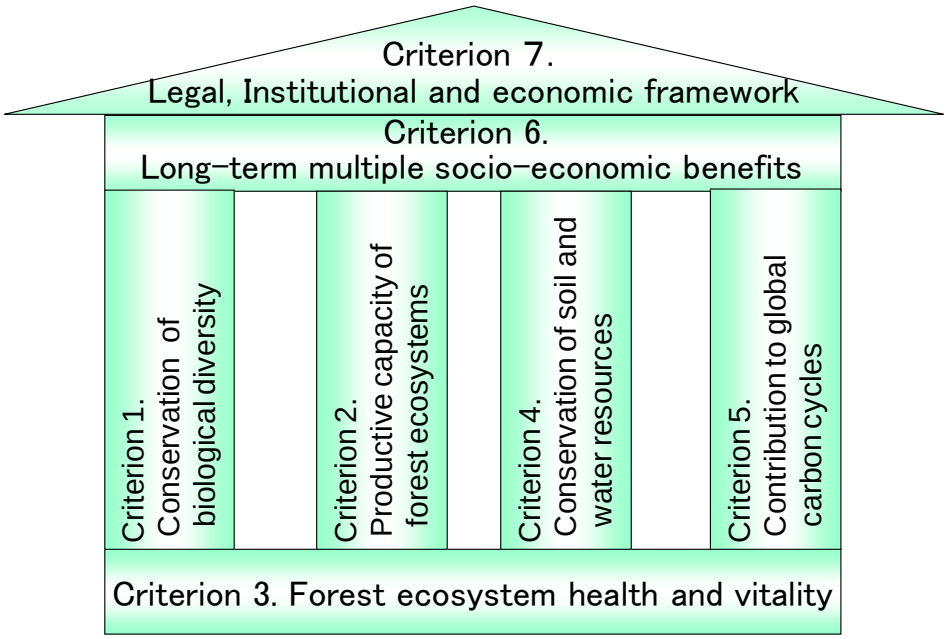


Sources: Forestry Agency

Criteria represent the aspects of forests, such as the major functions and values of forests, from which the sustainability of forest management is to be monitored, assessed and reported. Criteria can be viewed, in

this regards, as a list of major components of sustainable forest management. Indicators, on the other hand, are specific items along which data or information are collected to describe the state of the respective functions or values represented by each criterion. As the economic indices, such as GDP growth, unemployment rate and price indices, indicators help countries monitor the conditions of their forests with respect to a range of forest functions and values.

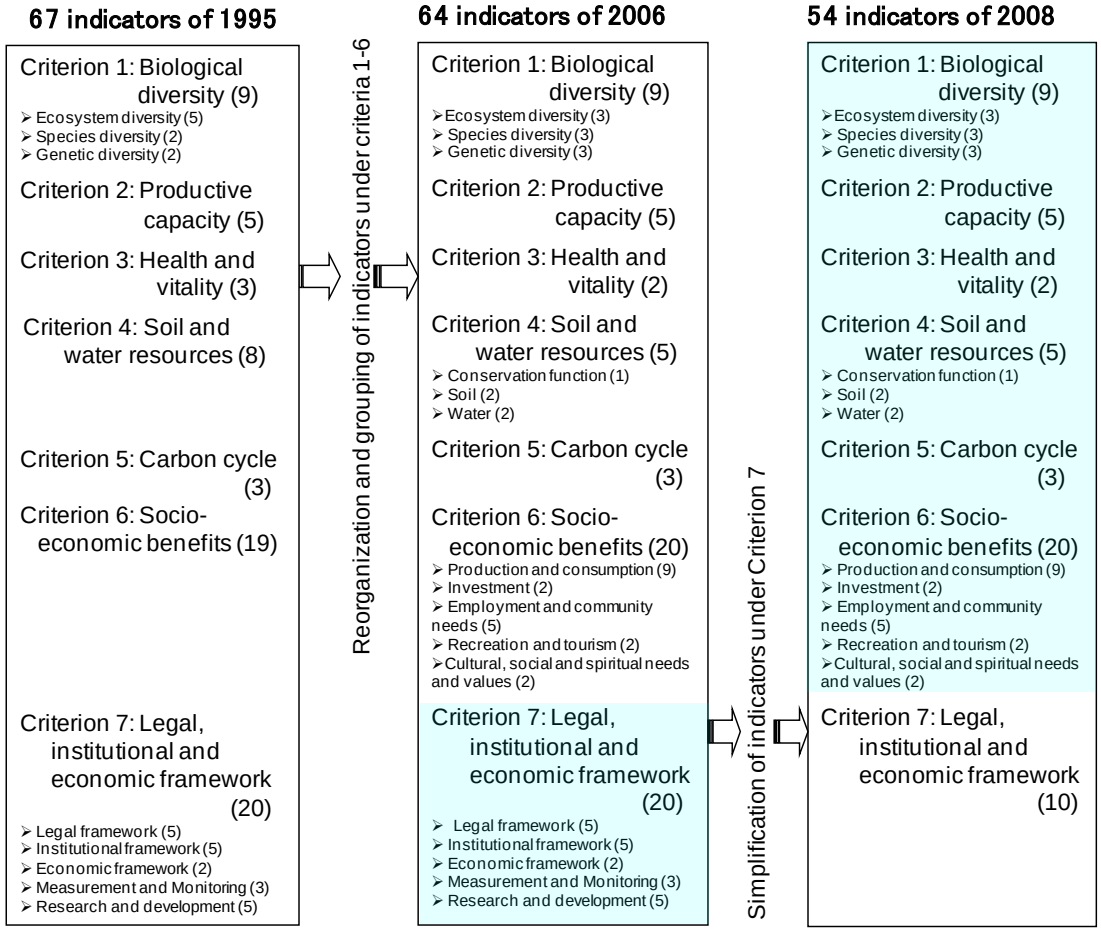
Figure 15: Conceptual structure of the Montreal Process criteria



Sources: Goto (2000)

With the participation of Argentina and Uruguay, the Montreal Process moved into the application process in 1995 for monitoring, assessing and reporting on their forest management. The first overview report of the whole Montreal Process, as well as the country reports of the respective member countries, were produced in 2003 and presented on the occasion of the XII World Forestry Congress held in Quebec City, Canada. Based on the experiences gained through the application, the Montreal Process proceeded to the review of its 67 indicators in 2004. This review process was completed in 2009 and the revised 54 indicators were adopted at the 19th meeting of the Working Group held in Rostov, Russia.

Figure 16: Change in Montreal Process indicators



Sources: Forestry Agency

For the purpose of facilitating the activities of the Montreal Process, a liaison office was set up within the Canadian Forest Service at its inauguration and subsequently moved to the Forestry Agency, Japan in 2007. A variety of services, including the coordination for the preparation and following up of the meetings and updating of the website, are provided by the liaison office. In 1996, an expert group called the Technical Advisory Committee (TAC) was established in order to provide the Working Group with advices on technical matters, such as the definitions of terms and technical notes for indicators. The duties of the TAC convener had been assumed by the US Forest Service since its establishment and succeeded by New Zealand in 2005.

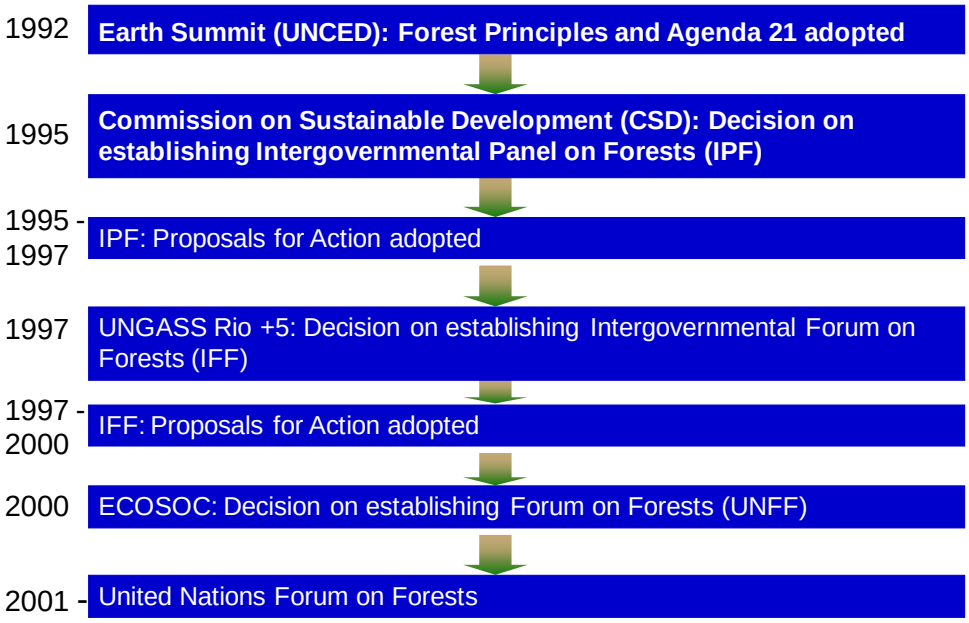
A UNFF meeting

International Cooperation Office

Trends in International Debates on Forests

One of the major achievements of the Earth Summit was the launch of the concept of sustainable forest management, which has provided a the subsequent international debates on forests, as well as the policy formulation and management practices at national, local and field levels with a guiding principles. The controversial issue of the international arrangement on forests, which resulted in the adoption of the Forest Principles at the Earth Summit, has been carried over to a series of succeeding forums at the United Nations, namely the Intergovernmental Panel on Forests (IPF), the Intergovernmental Forum on Forests (IFF) and the United Nations Forum on Forests (UNFF). After the careful consideration, UNFF adopted at its 7th session held in 2007 the Non-legally Binding Instrument on All Types of Forests (NLBI) and decided to further pursue the issue at its 11th session to be held in 2015.

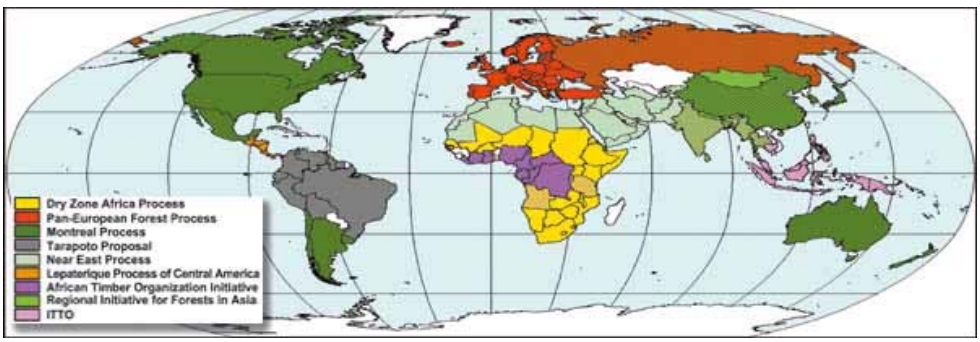
Figure 17: Flow of deliberations on forests at United Nations



Sources: Forestry Agency

These intergovernmental deliberations at the UN have also produced a range of useful proposals for practical actions to be taken by countries and the international community as a whole. The development and application of criteria and indicators is one of those measures which have been well recognized and encouraged internationally. Today, nine processes, including the Montreal Process, exist in the world, and about 150 countries are participating at least in one of these processes. The Montreal Process has provided them with a good model as one of the pioneering initiatives since its establishment.

Figure 18: Coverage of nine C&I processes



Sources: FAO Website

Although no clear definition of sustainable forest management exists, a common understanding of sustainable forest management has evolved and shared through the international collaborative works within and among those processes. At an international conferences held in Guatemala City in 2003, following seven common thematic areas were identified in the criteria and indicators of these processes: (1) extent of forest resources; (2) biological diversity; (3) health and vitality; (4) productive functions; (5) protective functions; (6) socio-economic functions and (7) legal, policy and institutional framework. The seven thematic areas are now reflected to a variety of activities and actions, such as the forest certification schemes and FAO's Forest Resources Assessment (FRA).

Figure 19: Outline of FRA2010 of the FAO

Chapter 1	Introduction
Chapter 2	Extent of forest resources
Chapter 3	Biological diversity
Chapter 4	Forest health and vitality
Chapter 5	Productive functions of forest resources
Chapter 6	Protective functions of forest resources
Chapter 7	Socio-economic functions
Chapter 8	Progress towards sustainable forest management
Chapter 9	Conclusions

Sources: FAO. Global Forest Resources Assessment 2005

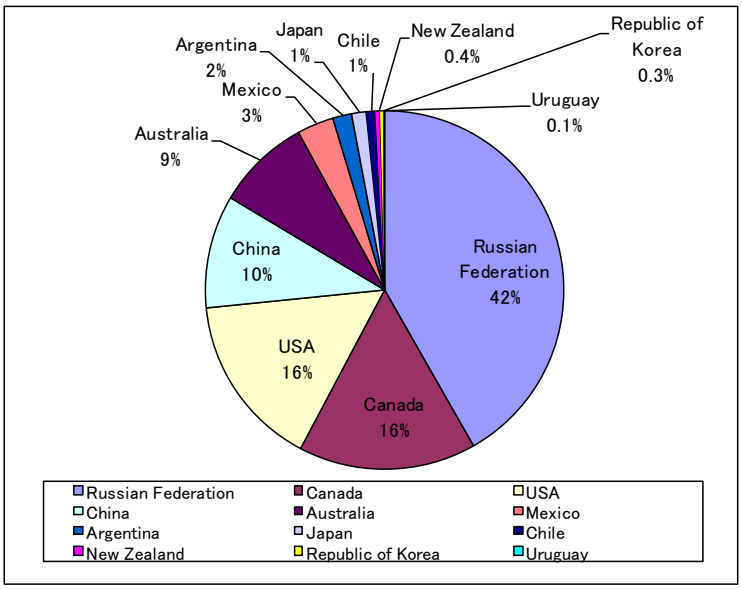
One of the most notable achievements in the tackle to the global environment issues is the delivery of the three Rio Conventions, namely the UN Framework Convention on Climate Change (UNFCCC), the Convention on Biological Diversity (CBD) and the UN Convention to Combat Desertification (UNCCD). Forests have always been a subjects in the deliberation under these conventions, particularly under the UNFCCC since the Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (REDD) was put on the agenda of the 13th Conference of Parties (COP13) held in Bali, Indonesia in 2007. It has been increasingly recognized in the global forest community that the concept of sustainable forest management should be incorporated further into the strategies for the respective global environment issues.

Achievements and a Way Forward

Field trip at the Working Group meeting in Russia

Forests of the twelve member countries of the Montreal Process together cover approximately 80% of the temperate and boreal forests and 50% of all types of forests in the world. Besides, the twelve countries are home to 30% of the world's population and 40% of the world's wood production. Taking those facts into consideration, the individual and collective actions taken by the member countries of the Montreal Process for the achievement of sustainable forest management will certainly have a significant impact on the global economy and environment and, in consequence, the well-being of the present and future generations of the world.

Figure 20: Coverage of forests of the Montreal Process countries



Sources: FAO. Global Forest Resources Assessment 2005

At its 19th meeting held in Moscow and Rostov, Russia in 2008, the Working Group of the Montreal Process decided to produce its second

report, as well as the country reports of the respective member countries, in 2009. The report, titled "A Vital Process for Addressing Global Forest Challenges" focuses how the countries have been benefitted from the Montreal Process in tackling the four global issues, namely climate change, biodiversity, bioenergy and water. One of the most notable findings obtained through the drafting work was the identification of (1) a common framework for monitoring, assessing and reporting, (2) a common understanding of sustainable forest management, (3) a common ground for collaborative actions and (4) a forum and networks for knowledge exchange as what have been built up through the Montreal Process.

After the collaboration for fifteen years since its inauguration in 1994, the member countries now share a view that the Montreal process should open up a new horizon for the further pursuit of the sustainable forest management of temperate and boreal forests and all types of forests. The Working Group agreed at its 20th meeting held in Jeju-do, Korea in 2009 to take new challenges, such as the exploration of approaches to identify and monitor forest degradation and the development of means for visualizing the full range of information collected along the indicators. The Montreal Process will keep adding new pages to its history through the close collaboration of the twelve member countries.

Guiding Principles for Drafting the 2nd Country Report

The Working Group decided at its 19th meeting that the indicators to be reported in the 2nd country report are the revised ones for Criteria 1-6 and the original ones for Criterion 7 because some member countries had already started the reporting process by November, 2008 when the revision of the indicators under Criterion 7 was completed. As the result, the number of indicators reported in this country report is 64 all together.

The reporting work, including the collection of data and information, as well as the drafting, was carried out on the principle that the report follows the aim of each indicator as closely as possible. It should be noted, in this connection, that the rationales included in the Technical Notes of

the Montreal Process are repeated as “Rationale” of this report with the aim of guiding the readers in interpreting the nature of indicators properly.

The “Current State and Trend” section of this report is drafted in a way for quantitative indicators that the most recent measurements are presented first then the long-term trends are described. The background factors behind the current state and/or trend are also included as much as possible, as well as the guiding information as needed. For qualitative indicators, the report focuses on the selected activities or simple cases in order to help readers grasp the gist.

CRITERION 1

CONSERVATION OF BIOLOGICAL DIVERSITY

Forests, and particularly native forests, support a substantial proportion of the planet's biological diversity and terrestrial species. Biological diversity enables an ecosystem to respond to external influences, to recover after disturbance, and to maintain essential ecological processes.

Human activities and natural processes can impact adversely on biological diversity by altering and fragmenting habitats, introducing invasive species, or reducing the population or ranges of species. Conserving the diversity of organisms and their habitats supports forest ecosystems and their ability to function, reproduce, and remain productive.

1.1 ECOSYSTEM DIVERSITY

Maintenance of the variety and quality of forest ecosystems is necessary for the conservation of species. Without sufficient habitat size, adequate connectivity, necessary structural diversity and appropriate protection and management measures, species may decline and become vulnerable to extinction.

These indicators provide information on the area and extent of ecosystem types, forest area under formal protection and the effects of fragmentation.

INDICATOR 1.1.a

Area and percent of forest by forest ecosystem types, successional stage, age class and forest ownership or tenure

Rationale

This indicator provides information on the area and extent of forest ecosystem types, including successional[1] stage, age class[2] and the nature of tenure or ownership. The sustainability and stability of forest ecosystems may depend on their size and diversity. If these are not maintained, forests may become vulnerable habitat degradation and loss. Tenures or ownership types may have a variety of management regimes associated with them – each with a different impact on biological diversity

Current State and Trend

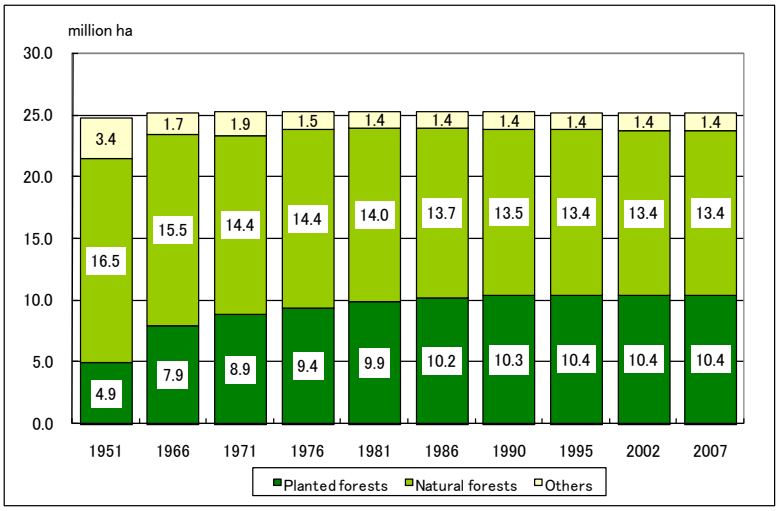
(Forest area)

The total area of Japan's forests is approximately 25 million ha, which corresponds to about two-third of the total land area. The coverage of forests has been maintained for more than a half century presumably by the efforts of the people, including forest owners and relevant public entities, coupled by the warm and wet climate as well as the steep terrains hindering the conversion of forest to other uses.

[1] ***Successional stage*** is the phase of the natural process observed in the vegetation, normally starting from bare land to matured forest.

[2] ***Age class*** is the grouped ages of stands by five years. The ages of 1-5 years are classified as the 1st age class, counting the year of plantation in the case of planted forests, the ages of 6-10 years are classified as the 2nd age class, and so on.

Figure 21: Change in forest area of Japan



Sources: Forestry Agency. State of Forest Resources

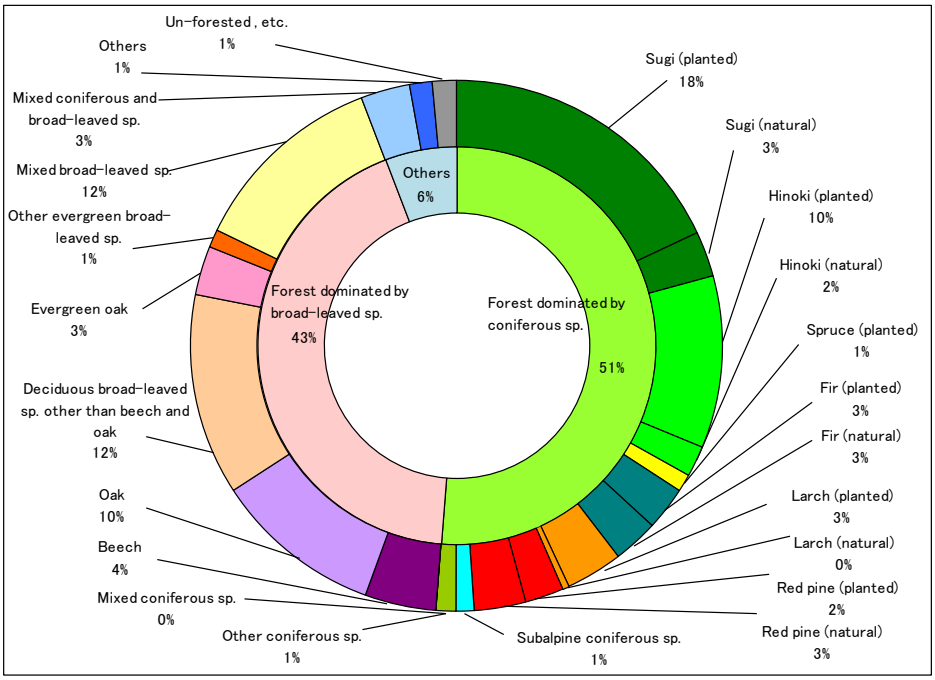
(Forest ecosystem types)

The major forest ecosystem types found in Japan are “Sugi (*Cryptomeria japonica*) plantation” and “mixed broad-leaved forest” and “forest dominated by deciduous broad-leaved tree species” each of which occupies 18%, 12% and 12% of the total forest area respectively. They are followed by “Hinoki (*Chamaecyparis obtusa*) plantation” and ”Oak forest”, both of which account for 10% respectively. All forest types dominated by broad-leaved species account for 42% of the total forest area.

Both distribution and share of the forest ecosystem types have been assumedly stable since 1980’s when the expansion of planted forest settled down.

Forest ecosystem types are classified in this report by the dominating tree species, which is defined here as those occupying more than 30% of the total basal area, based on the results of the Forest Resource Monitoring Survey.

Figure 22: Composition of forest ecosystem types of Japan

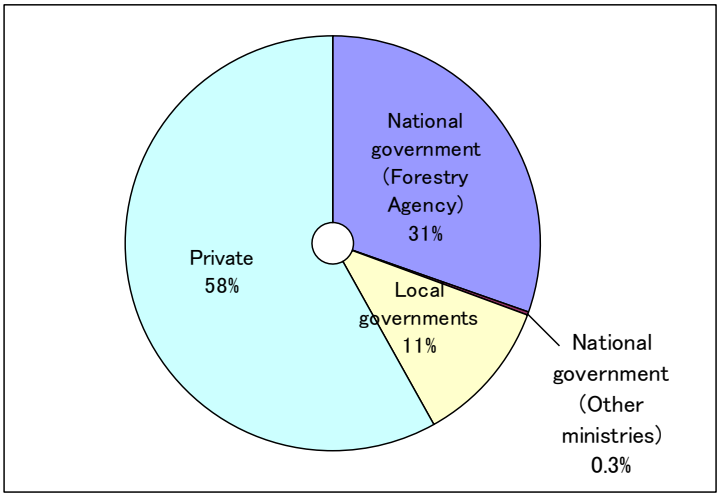


Sources: Forestry Agency. Forest Resource Monitoring Survey

(Forest ownership patterns)

In Japan, approximately 42% of forests are publicly owned and 58% are privately owned. About 73% of the publicly owned forests belong to the national government and the remaining 27% belong to the local public entities, including prefectural and municipal governments and the district properties[3]. The national forests alone occupy approximately 31% of the total forest area of Japan. The share of forest ownerships in Japan has not dramatically changed since the end of the 19th Century when the land ownership patterns established.

Figure 23: Composition of forest ownership in Japan



Sources: Forestry Agency. State of Forest Resources

[3] ***District properties*** are one of the special local public entities established under the Local Autonomy Act in order to take over the forests owned by the consolidated municipality.

INDICATOR 1.1.b

Area and percent of forest in protected areas by forest ecosystem type, and by age class or successional stage

Rationale

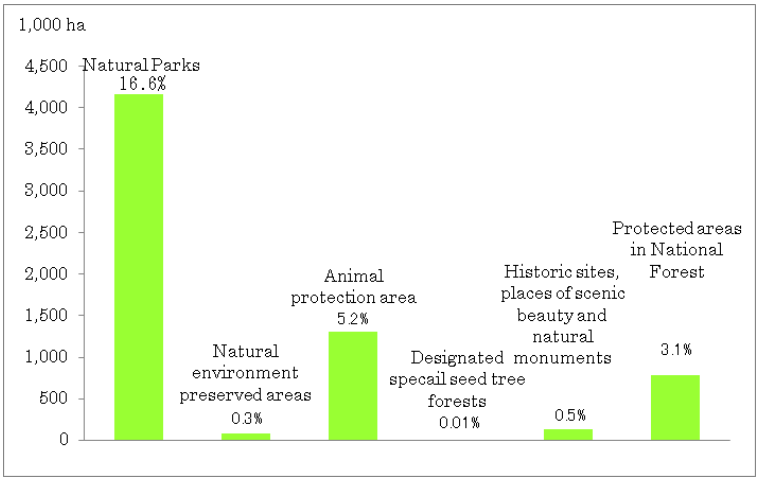
This indicator provides information on the area and extent of forest by ecosystem type, age class or successional stage protected to safeguard biological diversity and representative examples of forest ecosystem types. This indicator will also help identify forest types of conservation value that are in need of protection. The formal protection given to forests is a reflection of the importance society places on their conservation.

Current State and Trend

(Forest area in protected areas)

Forests which are protected primarily for the conservation of ecosystems in Japan include forests in the natural parks, wildlife sanctuaries and protected forests in the national forests, which occupy approximately 17%, 5% and 3% of the total forest area respectively. The area of forests in the protected areas has been increasing in recent years mainly due to the expansion of the protected forests in the national forests.

Figure 24: Area and percentage of major forests protected for the conservation of ecosystems as of 2007

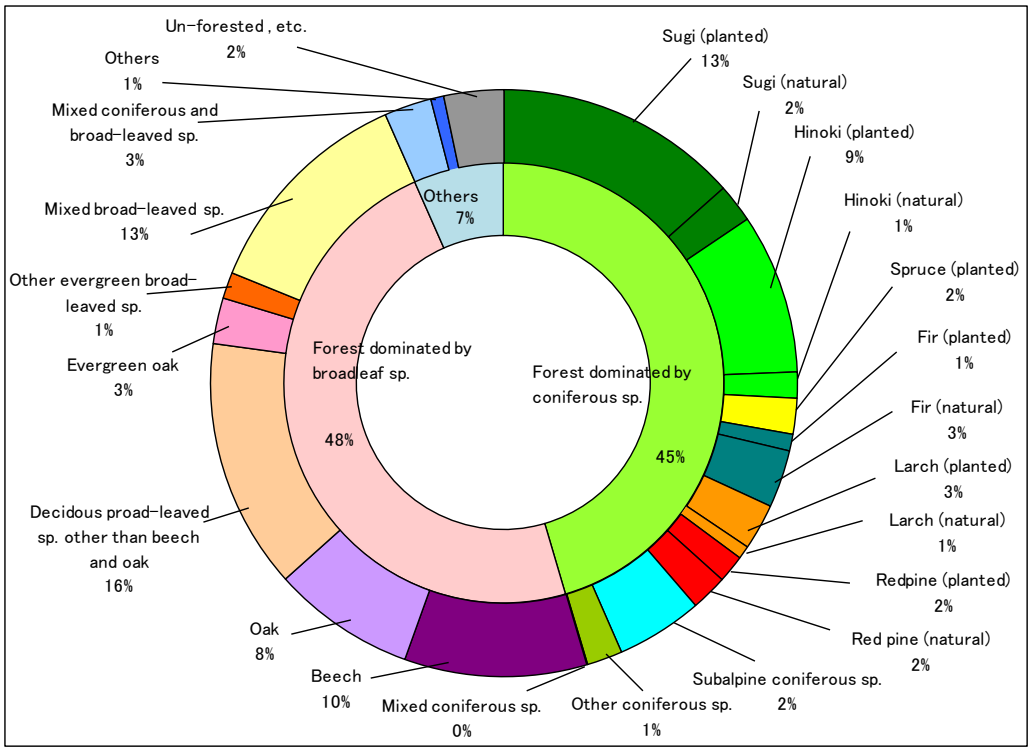


Sources: Forestry Agency

(Forest ecosystem types in protected areas)

Forests protected for the ecosystem conservation are characterized by the larger share of “Beech (*Fagus crenata*) forest” and “Mixed subalpine coniferous forests” compared with the whole forests of Japan. Because many unique and vulnerable ecosystems and species are found in forests categorized in these forest ecosystem types, about 37% of “Beech forest” and 69% of “Mixed subalpine coniferous forest” are located in those protected forests.

Figure 25: Composition of forest ecosystem types in protected areas

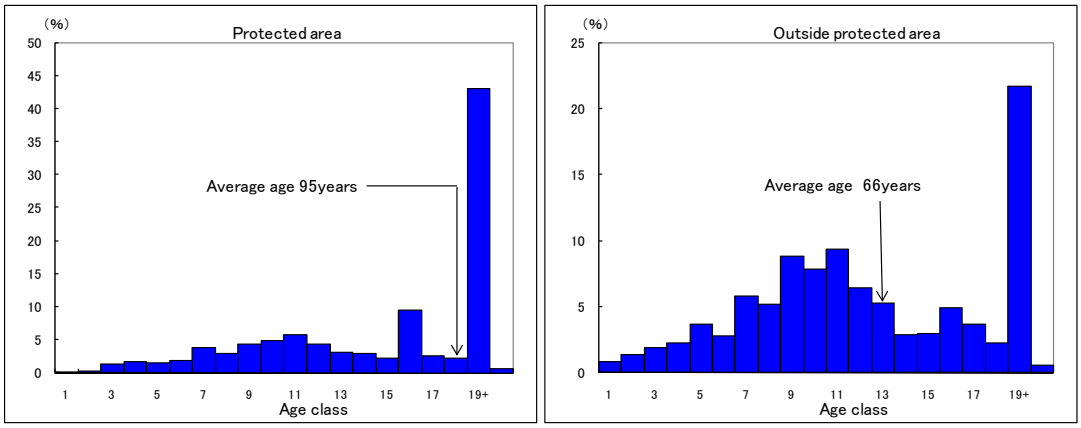


Sources: Forestry Agency. Forest Resource Monitoring Survey

(Age class distribution of forests in protected areas)

The average age of forests distributed in those protected forests is higher than that of other forests. In particular, the average age of natural forests in the protected areas, which have higher conservation values, is 95 years, and much higher than 6 years of the natural forests outside those protected areas.

Figure 26: Average age and age class distribution of natural forests in and out of protected areas



Sources: Forestry Agency. Forest Resource Monitoring Survey

INDICATOR 1.1.c

Fragmentation of forests

Rationale

This indicator provides information on the extent to which forests are being fragmented over time by human activities and other processes. Fragmentation may lead to the isolation and loss of species and gene pools, degraded habitat quality and a reduction in the forest's ability to sustain the natural processes necessary to maintain ecosystem health.

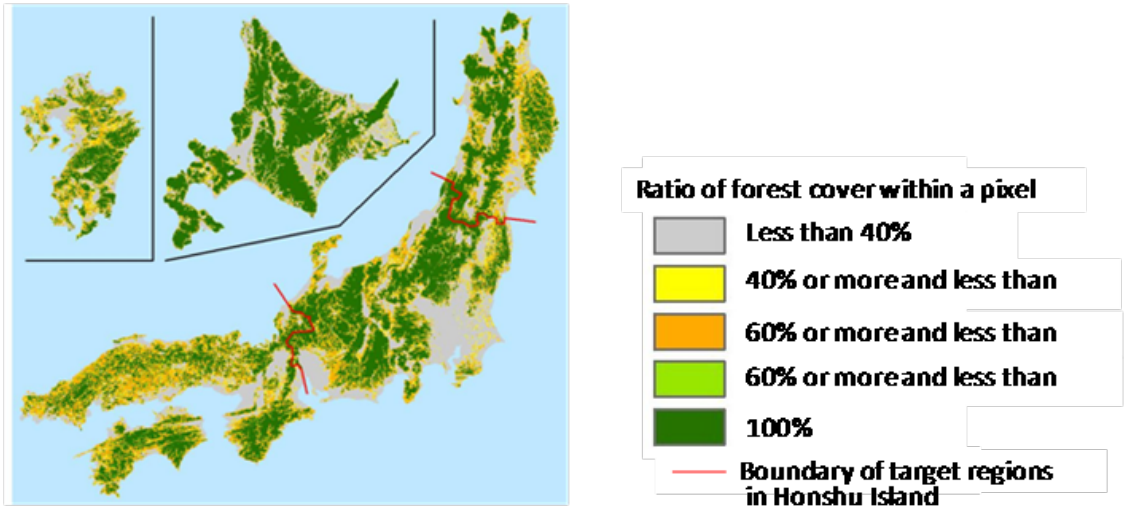
Current State and Trend

A series of maps derived from the Maps attached to Basic Land Use Plan[4] indicates that less fragmented forests are located along central ridges of the islands surrounded by more fragmented forests resulted from other land uses, such as agriculture and urbanization. Geographically, the extent of forest fragmentation is lower in the areas of Hokkaido, Tohoku, and Chubu and higher in the areas of Kansai, Chugoku and Kyusyu.

The maps were produced in a way that the whole area of Japan is divided into square blocks, called "pixels", which are colored according to the respective rate of forest cover. As the size of pixel increases, the rate of forest cover generally decreases because neighboring other land uses are to be included in pixels. In other words, if forests are less fragmented, the higher rate of forest cover maintains even the size of pixel increases.

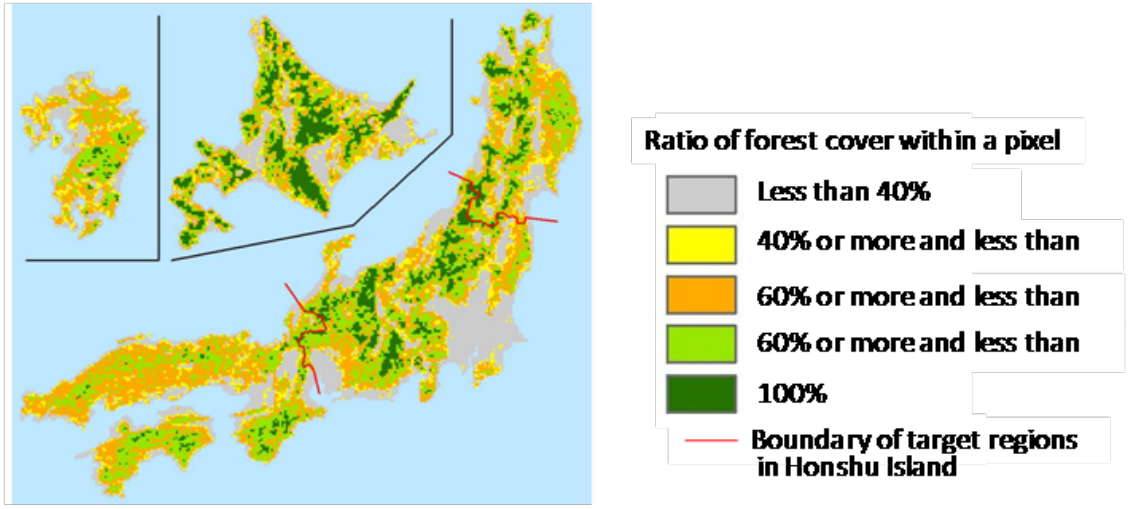
[4] ***Maps attached to the Basic Land Use Plan*** are maps produced by the prefectural governments in accordance with the National Land Use Planning Act, which illustrate the boundaries of the five land use areas, namely urban area, agriculture area, forest area, natural park area and natural conservation area, on the one-to-five-thousand maps.

Figure 27: Distribution of forest cover rate in 500 x 500 meter pixels



Sources: Forestry Agency. Report on the data analysis of forest resources survey

Figure 28: Distribution of forest cover rate in 4,000 x 4,000 meter pixels



Sources: Forestry Agency .Report on the data analysis of forest resources survey

1.2 SPECIES DIVERSITY

The greatest and most readily recognisable aspect of biological diversity is the variety of species and their population levels. A key objective for the conservation of biological diversity is slowing down the rate of population decline, and species depletion and extinction due to human factors. Changes in species population levels and distribution may also provide an early warning of changes in ecosystem stability and resilience, as will increases in the number of invasive, exotic forest-associated species.

INDICATOR 1.2.a

Number of native forest-associated species

Rationale

This indicator provides information on the health of forest ecosystems through the number of native forest-associated species[5]. Knowledge of the number of native forest- associated species highlights the importance of certain forest types in meeting conservation objectives and in understanding the relationships species have within ecosystems. The loss or addition of species in an ecosystem can provide valuable insights into the overall health and productivity of the system.

Current State and Trend

About a half of the 88 hundred species of the vascular plants[6] found in Japan are considered forest-associated based on the findings of the Forest Resource Monitoring Survey conducted during 2004-2008. As for the animals, 133 species of mammals, 214 species of birds, 74 species of reptiles and 50 species of amphibians are regarded as forest-associated as well according to the literature concerned. Information on other animal and plant species is currently limited.

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[5] ***Native forest-associated species*** are species living in close association with forests in a variety of aspects, including habitats, food, nesting and breeding, among those which originally have habitats in Japan.

[6] ***Vascular plants*** are the group of plants which have an organ known as a vascular bundle. Vascular plants, which include seed plants and ferns, are considered as a higher form compared to those which lack vascular bundle, such as bacteria, algae and moss plants.

Table 1: Forest-dependent species found in Japan

Category		Number of known species in Japan	Number of forest-associated species	Notes
Plants	Tracheophytes	about 8,800	about 4,000	Based on the Forest Monitoring Survey
	Other plant species	about 25,400	–	
	Total	about 34,200	–	
Animals	Mammals	185	133	Based on the related documents
	Birds	417	214	
	Reptiles	97	74	
	Amphibians	64	50	

Sources: Forestry Agency. Report on the data analysis of forest resources survey

INDICATOR 1.2.b

Number and status of native forest-associated species at risk, as determined by legislation or scientific assessment

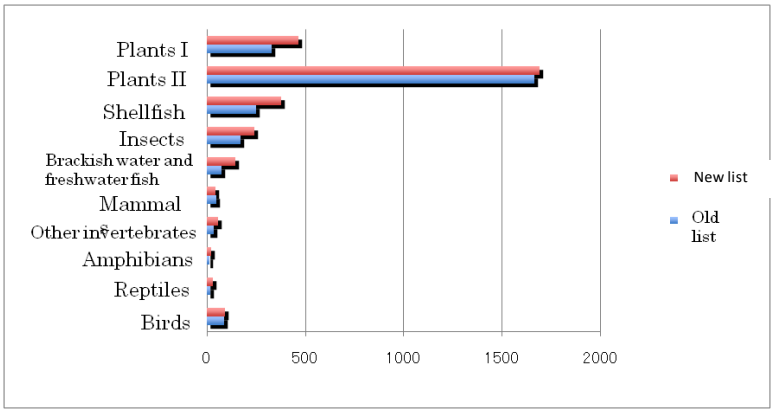
Rationale

This indicator provides information on the number and status of forest-associated species at risk or in serious decline. As a result, these species may require specific action or intervention to ensure their survival. The number of species at risk and their status is a measure of the health of forest ecosystem and their ability to support species diversity.

Current State and Trend

The number of endangered species[7] has increased in all categories except for mammals, according to the Red Lists[8] of 1997 and 2006 published by the Ministry of Environment. Although some of those endangered species are not forest-associated, many of plants and mammals are normally regarded as forest dependant.

Figure 29: Change in number of species on Red List of Japan



Sources: Ministry of Environment. Red List

[7] ***Endangered species*** are those categorized as the species in danger of extinction in the wild in the near future. Other categories include extinct, extinct in the wild and near threatened.

[8] ***Red List*** is a list of endangered species produced and published by a variety of organizations, including the International Union for Conservation of Nature (IUCN), Ministry of Environment, prefectural governments, Nature Conservation Society of Japan (NACS-J) and WWF Japan.

More than 300 tracheophytes species found on the Red List have appeared in the monitoring spots of the Forest Monitoring Survey. It is highly expected that the changes in the number and geological distribution of these endangered tracheophytes species will be identified through the Monitoring Survey.

Table 2: Number of endangered Tracheophytes species identified in the Forest Monitoring Survey

Category	1st Round Survey	2nd Round Survey
Critically Endangered	43	29
Endangered	114	65
Vulnerable	176	167
Near Threatened	41	78
Data Deficient	6	1
Total	374	340

Sources: Forestry Agency. Report on the data analysis of forest resources survey

INDICATOR 1.2.c

Status of *in situ* and *ex situ* efforts focused on conservation of species diversity

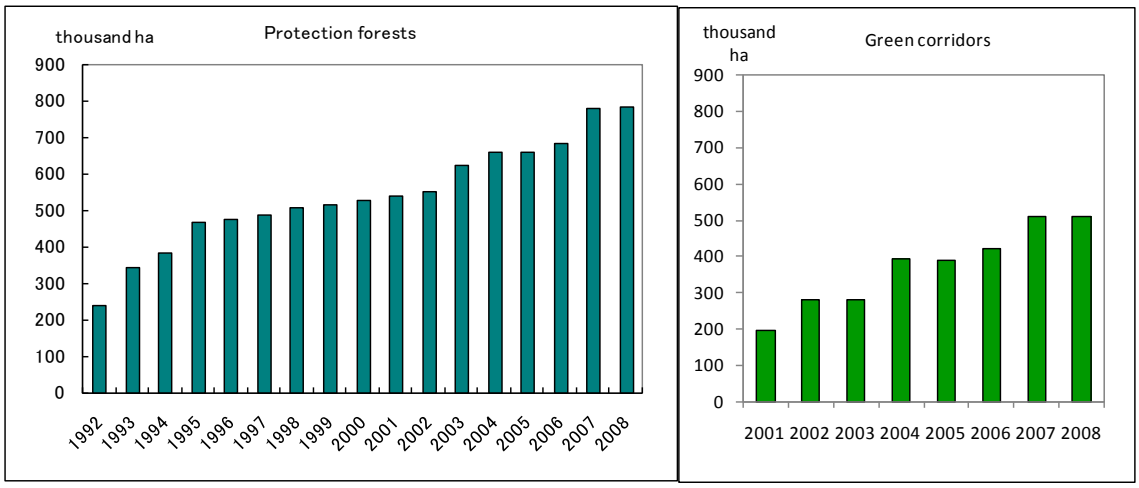
Rationale

This indicator provides information that describes *in situ*[9] and *ex situ*[10] efforts to conserve species diversity. Some forest species and habitats may have declined to such an extent that intervention is required to safeguard them for the future.

Current State and Trend

Currently, about 780 thousand ha of national forests, which account for 3 % of the total forest area of Japan, are protected for the conservation of biological diversity. The Forestry Agency has constantly expanded the protected forests and "Green corridors" in order to sustain unique native forest ecosystems, fauna and flora, habitats of endangered species and diverse genetic resources of tree species distributed in national forests.

Figure 30: Change in area of protected forests and Green Corridors in national forests

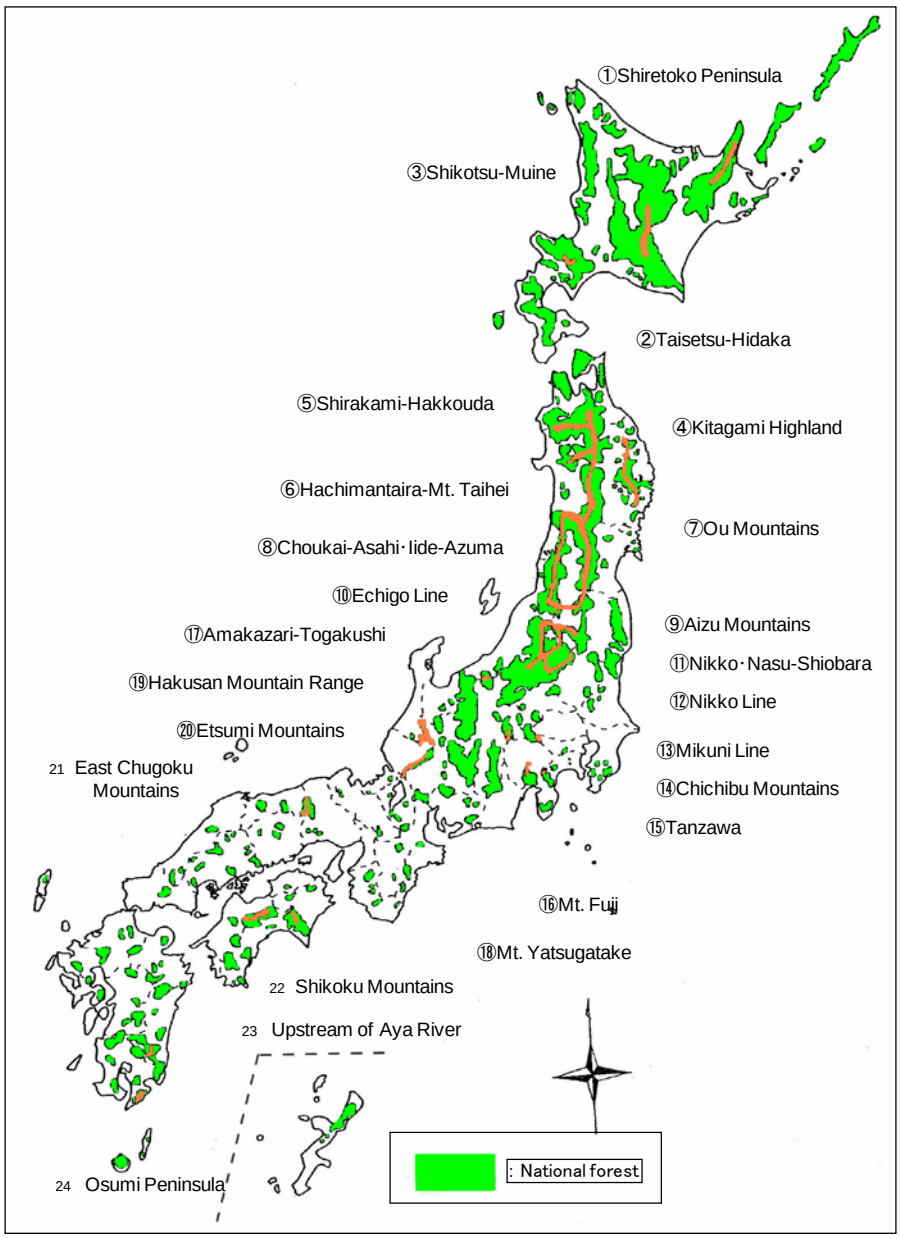


Sources: Forestry Agency

[9] ***In situ*** means "within habitats"
[10] ***Ex situ*** means "out of habitats"

The Green Corridors are allocated mainly along central ridges connecting protected forests with the aim of facilitating the interactions among populations of wildlife by bridging their habitats.

Figure 31: Distribution of Green Corridors in national forests



Sources: Forestry Agency

In addition to the expansion of protected forests, the National Forest Service has also carried out variety of projects to protect the endangered species through the population monitoring and habitat conservation and improvement.

A collaboration projects, so called “Alkaya Project”, in which the Regional and District Forest Offices work together with the local community and a conservation group for the protection of biological diversity and the sustainable community development, has been under way.

Box1: Akaya Project

“AKAYA Project” is a collaboration project among the Nature Conservation Society of Japan, local communities and the Kanto Regional Forest Office of National Forest Service, to sustain both biological diversity and stakeholder participation in “AKAYA Forest” of 10 thousand hectares located between Gunma and Niigata prefectures.

In the project, a variety of research and educational activities for biodiversity conservation are being carried out. The outcomes are reflected in the formulation of national forest management plan.

1.3 GENETIC DIVERSITY

Genetic diversity, or the variation of genes within populations and species, is the ultimate source of Biological Diversity at all levels and is important for the functioning of healthy forest ecosystems. Threats to gene pools come from climate change, catastrophic events, and human activities and pressures.

Loss of genetic variation reduces the ability of species to adapt to environmental change and for society to maximise the potential benefits available from forest species, for example for medicines and other bio-resources. High levels of genetic diversity within populations are usually a measure of their greater potential for survival. The loss of genetic variation within species also makes forest ecosystems less resilient to change.

INDICATOR 1.3.a

Number and geographic distribution of forest-associated species at risk of losing genetic variation and locally adapted genotypes

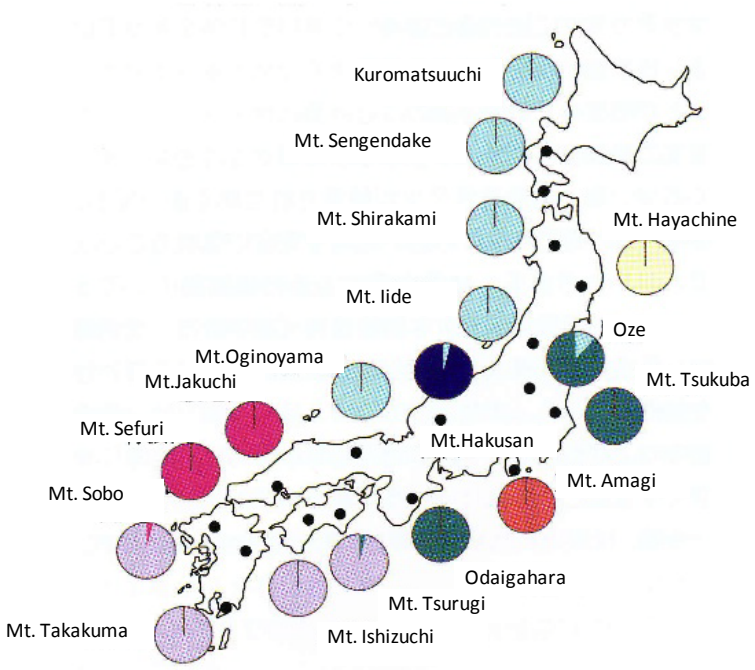
Rationale

This indicator provides information on the number and distribution of forest-associated species at risk of losing genetic variation across their population. This erosion in genetic variation makes species less able to adapt to environmental change and more vulnerable to extinction. Some local populations with unique gene pools may also risk being swamped by large populations introduced intentionally, by accident, or by natural processes.

Current State and Trend

The study on mitochondrion DNA indicates that Japanese beech, which is one of the major native species representing natural forests of Japan, maintains a wide range of genetic diversity across its population.

Figure 32: Variation of mitochondrion DNA of Japanese beech



Sources: Tsumura (2008)

Quite few studies have been conducted on the status or loss of genetic diversity of tree species in Japan, and much yet remains yet to be found. Researches on the local genetic variation, on the other hand, are now being carried out for some widely distributed tree species. Through the Forest Resource Monitoring Survey, information of some tracheophytes species appearing in the fixed plots has been compiled, as well. More information on the extent of genetic diversity and the changes in the distribution of forest- associated species is expected to be obtained through those the continuation of those researches and the Survey.

INDICATOR 1.3.b

Population levels of selected representative forest species to describe genetic diversity

Rationale

This indicator provides information on the population status of forest-associated species that are considered to reflect the genetic diversity present in forest ecosystems. Some forest species support or rely on particular forest structure, patterns, associations and processes and can therefore be used to describe the status of genetic diversity in forests as a whole.

Current State and Trend

Information enough to identify the representative forest species reflecting the genetic diversity in forest ecosystems is not currently available in Japan. Further studies are required to illustrate the state of genetic diversity in forests, as described also under Indicator 1.3.a.

INDICATOR 1.3.c

Status of *in situ* and *ex situ* efforts focused on conservation of genetic diversity

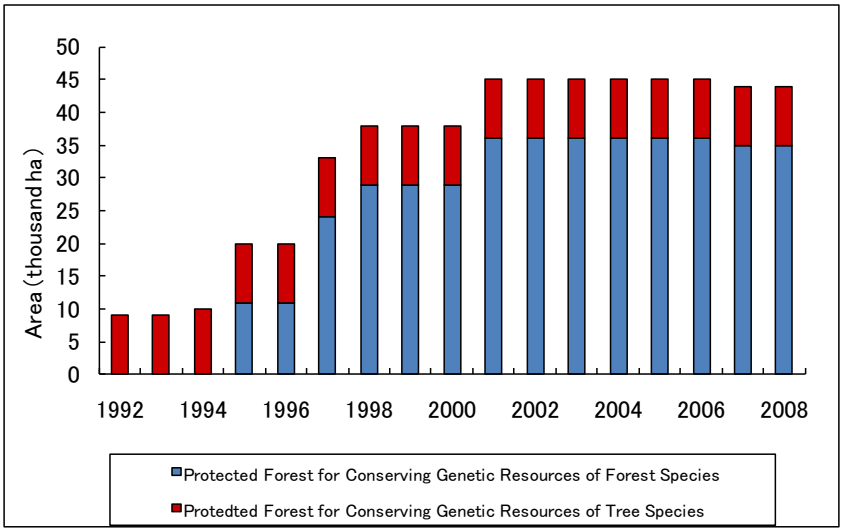
Rationale

This indicator provides information that describes *in situ* and *ex situ* efforts to conserve genetic diversity within species. Some species have suffered from a loss of genetic variability due to population decline and a reduction in their former range and distribution. Continued loss of genetic variability will threaten the viability of these species and may accelerate a decline that may lead ultimately to extinction.

Current State and Trend

Approximately 44 thousand ha of national forests are protected particularly for conserving genetic diversity of forest-associated species, including tree species. Two types of protected forests, namely "Protected Forest for Conserving Genetic Resources of Forest Species" and "Protected Forest for Conserving Genetic Resources of Tree Species", are included in this category. The former, which are to protect all species composing forest ecosystems, are distributed in 12 locations, occupying about 35 thousand ha in total. The latter, which are to conserve genetic resources of major commercial tree species and rare tree species, are distributed in 325 locations, occupying about 9 thousand ha in total.

Figure 33: Change in area of protected forest for conserving genetic resources



Sources: Forestry Agency

Regarding the *ex situ* conservation activities, Forest Tree Breeding Center (FTBC) under the Forestry and Forest Products Research Institute (FFPRI) has been conducting the collection and storage of organisms and seeds of endangered tree species and designated monumental gigantic and landmark trees at risk. The FTBC is also engaged in the development of "Gene Conservation Forest" which is generated from seeds collected from the high quality stands.