State of Japan's Forests and Forest Management

— 3rd Country Report of Japan to the Montreal Process —

July, 2019

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.

FOREWORD

The Montréal Process is one of the initiatives to promote the development and application of criteria and indicators for sustainable forest management. Twelve major temperate and boreal forest countries, including Japan, have participated in the Montréal Process, and the forest area of these countries is equivalent to 50 % of the world.

Efforts to promote sustainable forest management have been made in various forms since the agreement at the Earth Summit in 1992. As a recent movement, 17 Sustainable Development Goals (SDGs), which are an urgent call for action by the international community by 2030, was adopted at the United Nations Summit in 2015. Forests play important role in achieving SDG15 “Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss”, and contribute to 14 goals such as water, energy, climate change, consumption and production, etc.

Also, Paris Agreement, adopted at COP 21, encouraged that all countries to take action to strengthen the role of forest as carbon sinks and reservoirs, and also encouraged implementation and support of REDD +.

Meanwhile, as forest resources mainly in artificial forests have become enriched in Japan, the population declines and the aging progresses, and this trend is particularly intensifying in the mountain area that supports the production activities of forestry. For this reason, in addition to promoting the growth industrialization of forestry, stakeholders decided to work together on the initiative to construct a new system for appropriate forest management, and in 2018, new forest management Law "was enacted, and the introduction of a new tax system was also decided to secure the necessary financial resources for this.

Based on such internal and external circumstances, the Third Country Report was compiled adding new data, keeping the consistency with the trends of each indicator concerning Japan's forests since the Second Country Report in 2009. It is my hope that this report will widely acquaint the world with the state of forests and forest management of Japan and contribute to further promotion of sustainable forest management.

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July 2019

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All these contributions are deeply appreciated.

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－Overview of Japan’s Forests, Forestry and Wood Industry－

Features of forest

Japan has a narrow land area stretching over 3,000km from north to south, where boreal, cool temperate, warm temperate and sub-tropical forests are distributed along these climatic zones. These forests are affected by the human intervention and natural conditions such as distinct monsoons in summer and winter, as well as intricate geographical and geological features.

Figure i: Vegetation map

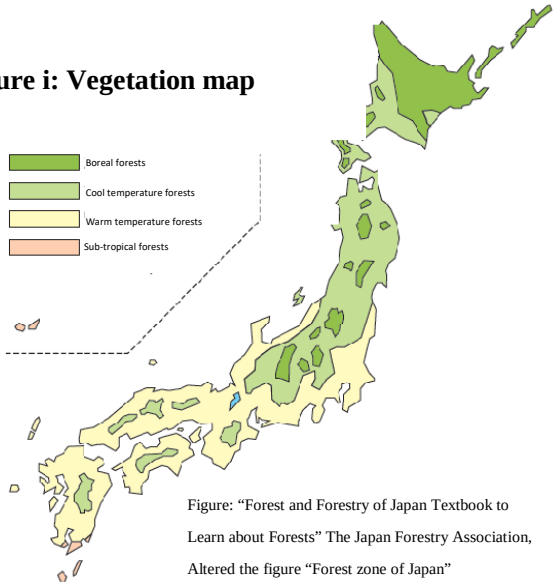


Figure: “Forest and Forestry of Japan Textbook to Learn about Forests” The Japan Forestry Association, Altered the figure “Forest zone of Japan”

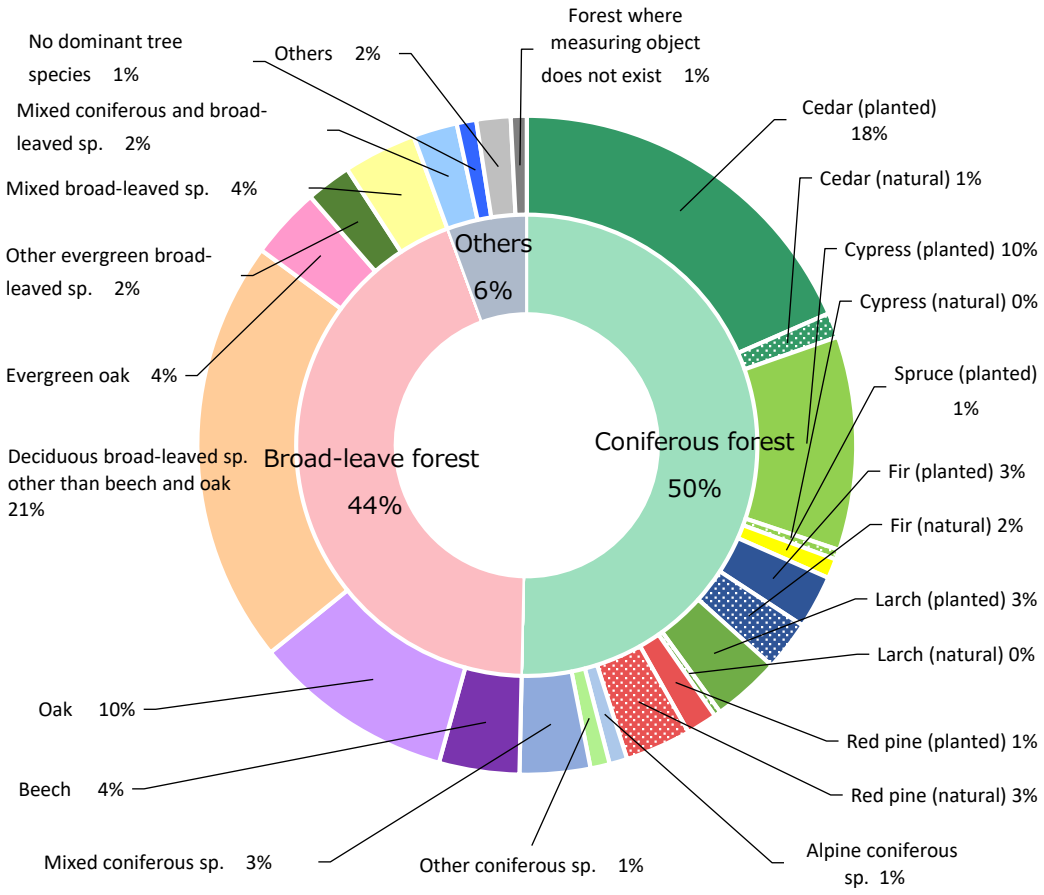
The total area of Japan’s forests is approximately 25 million ha, which corresponds to about two-thirds of the total land area. The coverage of forests has been maintained for more than a half century. While there are long history protecting forests by establishing systems such as harvesting forbidden forests from the 17th century, over harvesting, deforestation, and natural disasters occurred frequently during Meiji Restoration and World War II and after World War II, when the economy grew rapidly. Today's forests have been established and maintained due to the constant efforts by people to restore the people's forests and warm and humid climate of Japan.

Most of the 200 species of terrestrial mammals and over 40 percent of approximately 8,800 species of ferns and seed plants are considered forest associated.

As for the forest ecosystems type, the proportion of forests where coniferous tree species are dominant and forests where broad-leaved tree species are dominant to the total forest area is almost same (50% and 44%, respectively), and there are various other types of forest ecosystems in Japan (Note: The dominant tree species is defined as a tree species that accounts for 30% or more of the total breast height cross section). From the results of the National Forest Inventory of Japan over the past 15 years, there has been no major change in the area by the forest ecosystem type. However, careful monitoring of the beech is required, since the survey found that beech growth depends on the regions: young trees are continuously observed over the past 15 years in some regions, while no young trees

were confirmed at the same period in other regions.

Figure ii: Composition of Forest Ecosystems by Dominant Tree Species

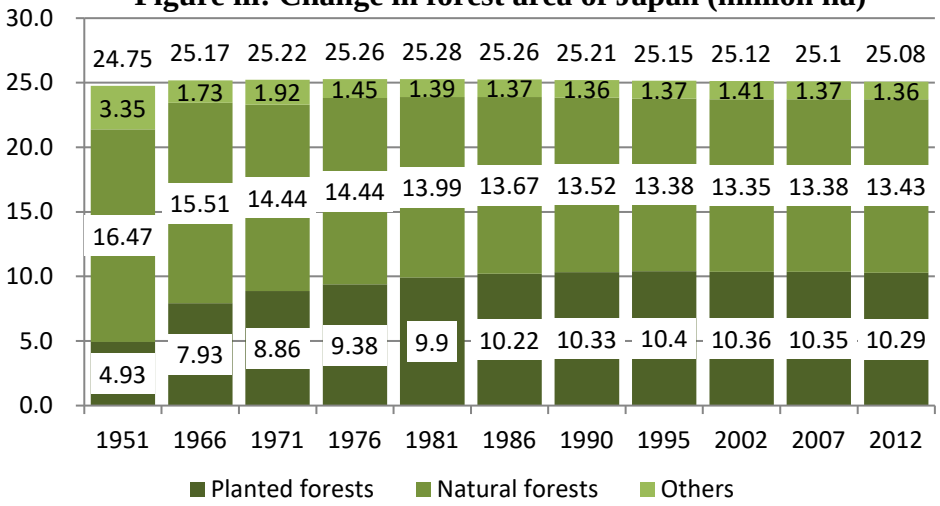


Source: Forestry Agency, National Forest Inventory of Japan (Third stage)

Approximately 54 percent of forests in Japan are classified as natural forests, according to the statistics of Forestry Agency of Japan. Some natural forests distributed in remote areas have preprimary forest ecosystems and fauna and flora. Other natural forests have been normally affected by human interventions, such as fuel wood production, commercial logging and enrichment plantation.

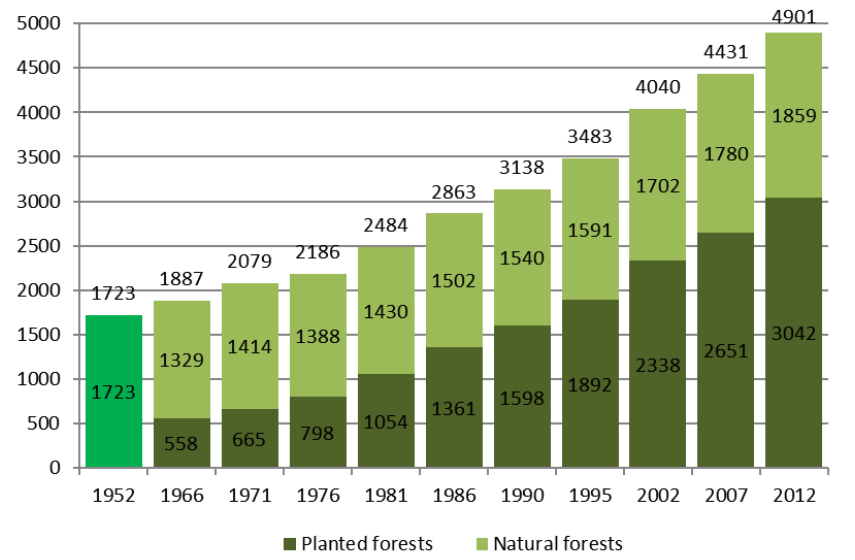
The forest stock has been increasing steadily, particularly in the planted forests. Japan's total growing stock is approximately 4.9 billion m^3, which accounts for about 2.6-fold stock in the 1960s.

Figure iii: Change in forest area of Japan (million ha)



Source: MAFF, Census of Agriculture and Forestry (for 1951 only); Forestry Agency, State of Forest Resources

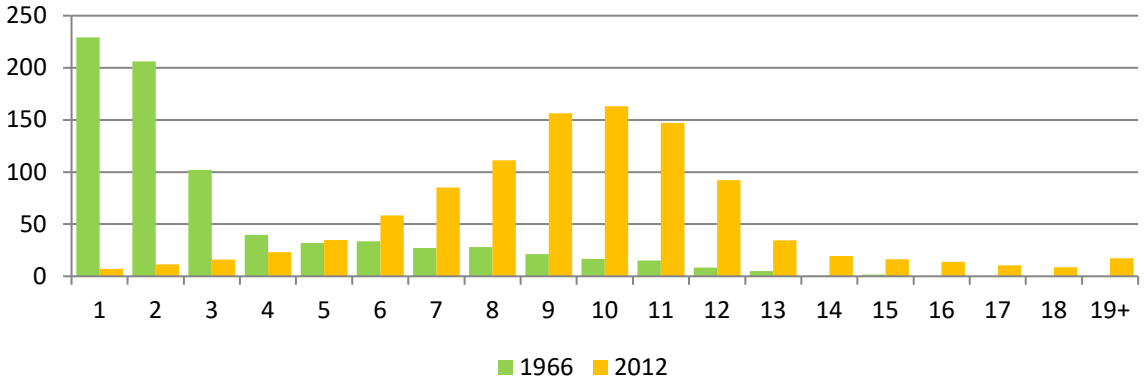
Figure iv: Change in the total growing stock of Japan's forests (million m^3)



Source: Forestry Agency. State of Forest Resources

The majority of the planted forests of Japan were established during the late 1950s through the early 1970s while wood demands for construction and pulp was increasing under the rapidly growing economy. Although there are still many forests that require thinning, more than 50% of the planted forests have reached higher than 50 years, which is a general harvesting age in Japan.

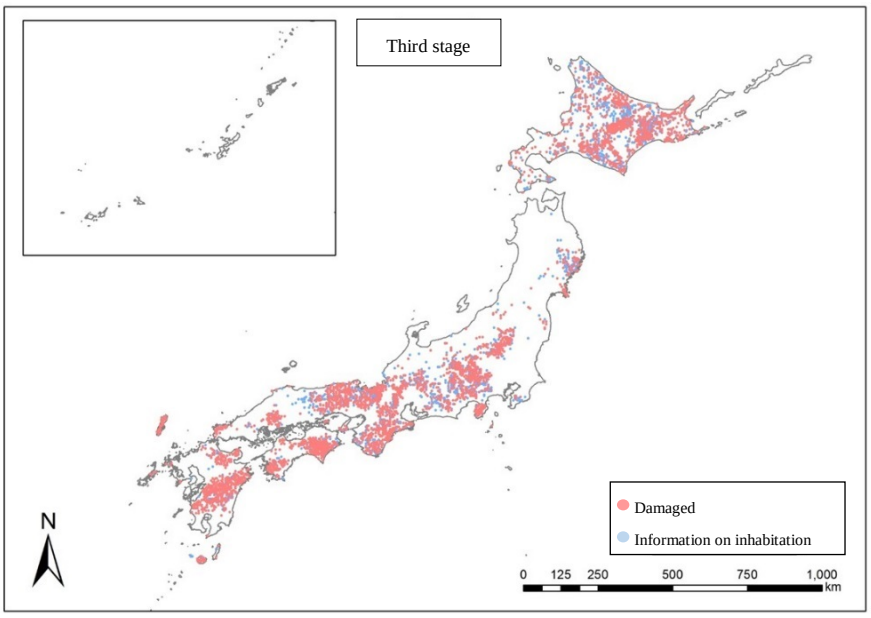
Figure v: Change in composition of age class of planted forests (10 thousand ha)



Source: Forestry Agency, State of Forest Resources

Although there are positive aspects in forest of Japan such as an increase in stocks, Japan encounters many issues on forest protection, such as damage of planted forests by wild animals, damage by Pine wilt disease and Japanese oak wilt, and invasion of bamboo species, etc.

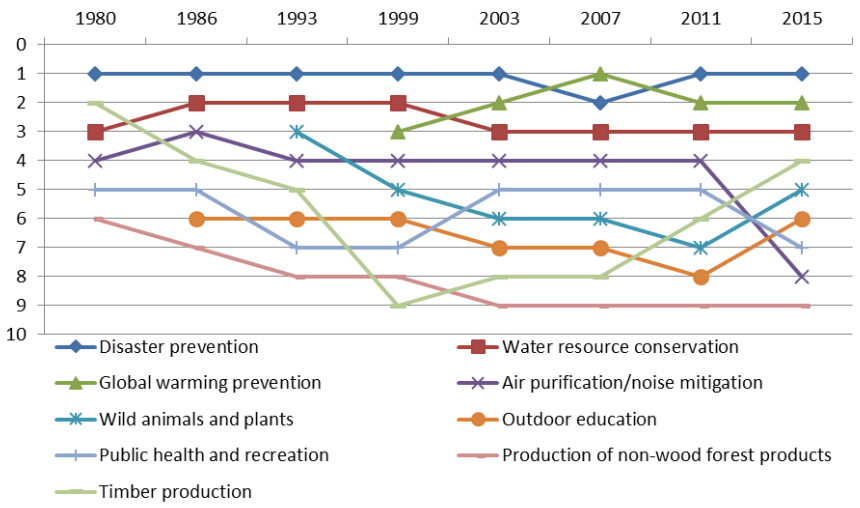
Figure vi: Distribution of plots that contain information on damages caused by deer or their habitation



Source: National Forest Inventory of Japan (Third stage)

Healthy and vital forests provide us socio-economic and environmental benefits. Recent years, with the increase of global environmental issues, people's expectancy on forests for disaster prevention, warming prevention and water resource conservation by forest occupy the top stably.

Figure vii: Change in public expectations on forests (ranking)



In addition, since Japan is surrounded by the seas and suffers frequent earthquakes due to the multiple tectonic plates in and around the territory, tsunami caused by these earthquakes gives severe damages at coastal area as well. The Tsunami occurred by the Great East Japan Earthquake in March 2011 took many people's lives. Coastal forests achieved a certain disaster reduction function against the tsunami and that led to re-evaluation of coastal forests. However, some coastal forests suffered devastating damage. Today, replantation of coastal forest is under operation with cooperation of the government and people.

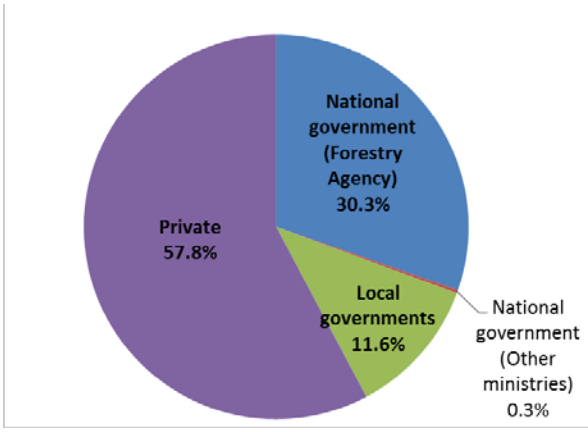
(1986), Poll on Forest and Greenery (1993) and Poll on Forest and Living (1999); Cabinet Office. Poll on Forest and Living (2003, 2007 and 2011); Ministry of Agriculture, Forestry and Fisheries. Survey on Awareness/Intension on Cyclic Use of Forest Resources (October 2015)

Photo i: Restoration of coastal forests (Motoyama town, Miyagi prefecture)

State of forestry

In Japan, 42% of forests are national forests and publicly-owned forests, and 58% are private forests. Among national and publicly-owned forests, 73% belong to the national government and the other 27% belong to local public entities including prefectural and municipal governments and communal districts.

Figure viii: Composition of forests by types of ownership



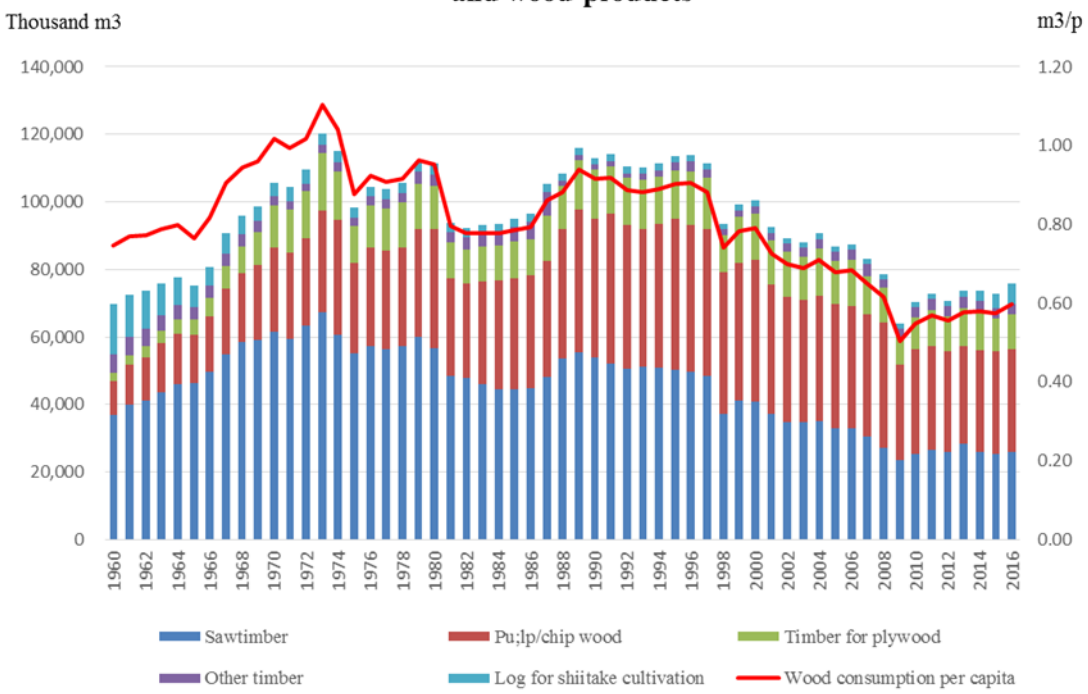
On the other hand, the most of private forests are owned by individual forest owners. According to the Census of Agriculture and Forestry 2015, scale of forests per forest owner or forest management entity is increasing while the number of forest owners who own equal or more than one hectare of forest is decreasing. This shows the slight increase of the portion of forest owners and forest management entity with the larger scale of forests.

However, small scale ownership is still the characteristic of ownership structure among private forests in Japan, considering the existence of forest owners, owning less than one hectare of forest, who are no longer the object of the census. (There were 1,450,000 of small scale owners according to the census in 1990.) This structure chokes off an efficient forest practices and aggressive forest management in combination with steep topography in general.

State of wood industry

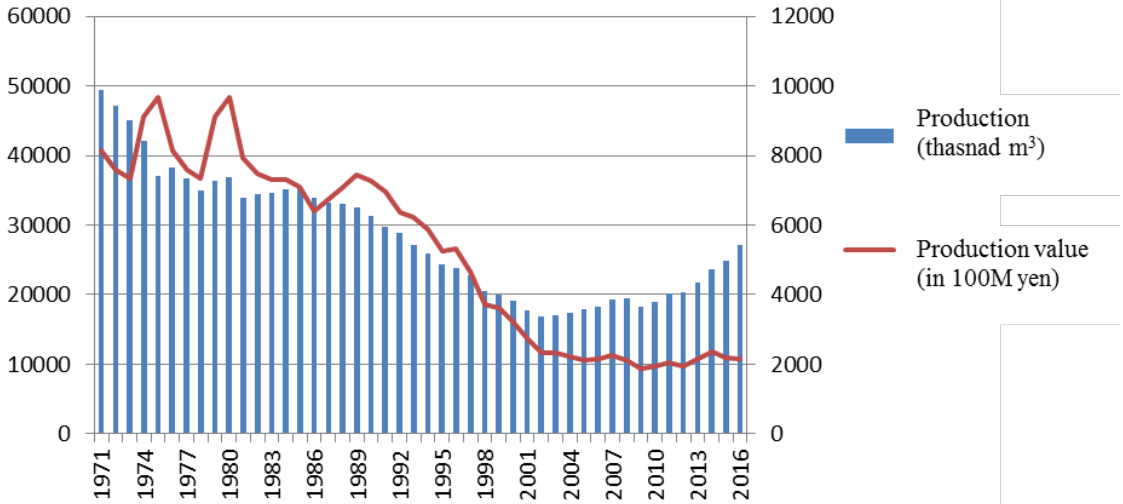
Recent years, wood demand in Japan generally continue to be below 80 million cubic meters in round wood equivalent. The demand is up swinging after it fell to 64 million cubic meters due to the financial crisis in 2009. Woods for pulps and chips accounts for the largest demand (40%), followed by for lumber (30%) and for plywood (10%).

Figureix: Change in Total and per capita consumption of wood and wood products



Sources: Forestry Agency. Wood Demand and Supply Chart; Ministry of Internal Affairs and Communication. National Census and Annual Report on Demographic Shifts

Figure x: Production volume and value of domestic logs



Source : Ministry of Agriculture, Forestry and Fisheries. Report on wood supply-demand and Lumber Statistics

Domestic wood production has recovered to 27 million cubic meters in 2016. 70% of total wood supply is covered by imported woods. While the share of imported log has been on a decreasing trend, the share of imported wood products has been on an increasing trend in recent years. Today, imported wood products shares 90 % of total imported woods.

Domestic wood production has been declined accompanied by a fluctuation since 1960s as a result of competition against imported logs and constructions materials other than woods. The progress of technology development in log processing accelerated this trend. For example, a small-diameter coniferous log produced by forest thinning turned out usable as plywood material and promotion of thinning in the first half of the 2000s. There are new movements such as enactment of the Act on Promotion of Use of Wood in Public Buildings in 2010 and production of cross laminated timbers (CLT), which enables timber use for large-scale public buildings.

Photo ii: Building using CLT (Kochi prefecture)

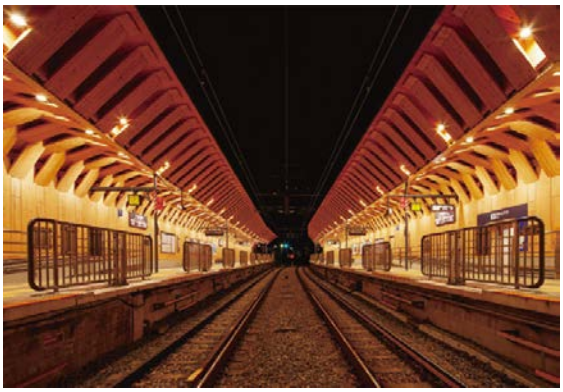


Photo iii: Wooden station building (Togoshi-ginza, Tokyo)

Woody biomass such as lumbering waste are recycled as raw material for paper and particle board, and combusted for heat utilization at a sawmill. In addition to these use, the biomass has been utilized as fuel for electric power selling under feed-in tariff scheme.

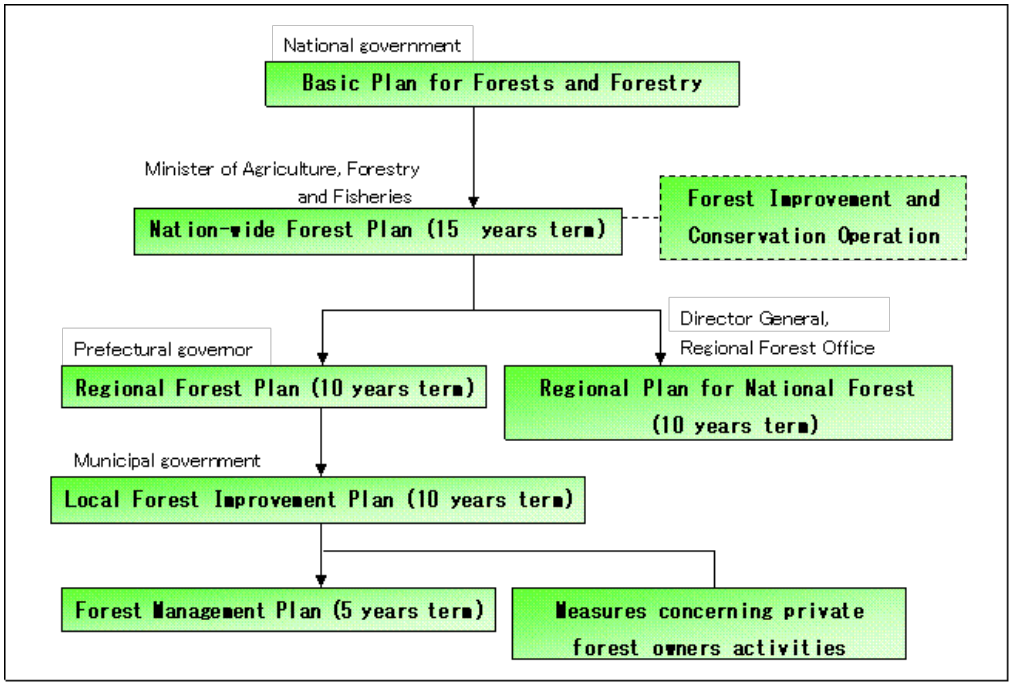
Forestry and wood industry which had been stagnant for long period are expected to play a big role in local economy once again with the background of matured planted forests. Since 2014, the government stated “Forestry as growing industry” as the most important political issue to promote timber use and to work increasing productivity and reducing production cost by introducing new technologies such as mechanization and use of ICTs.

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 2001 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 (the latest plan was in May 2016) to identify Japan's national strategy containing long-term goals and approaches.

Figure xi: Structure of forest planning system of Japan



Sources: Forestry Agency

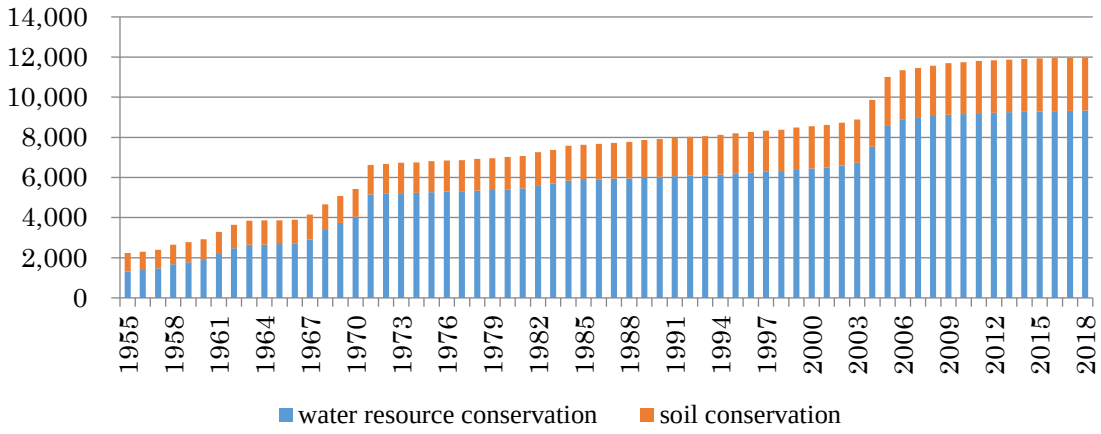
In order to implement a variety of policy measures, institutional frameworks, such as those for the forest planning and forest conservation, are provided by the Forest Act. Forest management plans are formulated at national, district and municipal levels by the respective government bodies and at the 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 protection 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 protection forests depending on the purpose and the required level of conservation. The total area of protection forest accounts for 49% and 32% of forest area and national land area respectively as of 2016. Even in the forests other than protection forest, it is necessary to obtain permit from the prefectural governor in case of exploitation of one hectare or more forest land.

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.

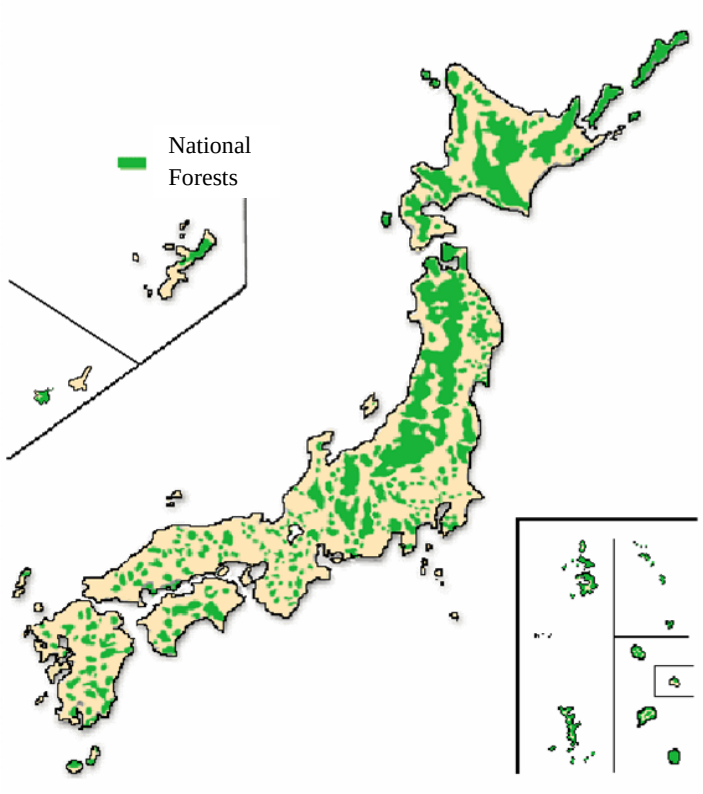
Figure xii: Change in areas of protection forests for soil and water resource conservation (1000ha)



Sources: Forestry Agency (Soil conservation shows the total area of protection forests for soil conservation while water resource conservation shows the total area of protection forests for headwater conservation and drought prevention)

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 and 98 District Forest Offices, are distributed throughout Japan. National forest management system was modified to be operated under the general account of the government from special account in April 2013 so as to contribute to the revitalization of forest and forestry in Japan, as well as to further promote public-benefit-focused forest management. As transforming forestry into a growth industry has become an important policy of the government, it is expected to utilize technologies and experiences accumulated in national forest management operation.

Figure xiii: Distribution of national forests of Japan



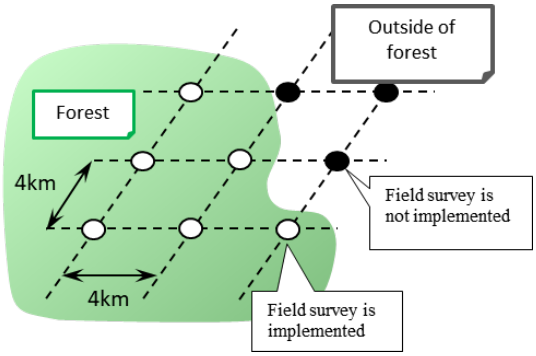
A variety of research and development activities related to forests and forest products are carried out collaboratively or solely by national, prefectural and private institutions and universities, including the Forestry and Forest Products Research Institute (FFPRI).

The newly developed stock seeds for planting are distributed by Forest Tree Breeding Center of FFPRI to prefectures and other organizations, and seeds are produced there for seed/seedling production by private sectors.

National Forest Inventory

The survey data of all the forests, including privately owned forests, 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 the National Forest Inventory (formerly called as forest resource monitoring survey) as NFI with the aim of supplementing conventional forest data, as well as providing data for MP reporting. A wide range of information, including vegetation and endangered species, is collected in the survey in every five years on approximately 13,000 sites at all grid points of 4km intervals. The result of the survey, which entered the fourth stage from 2014, is already utilized in this country report and the FRA2015 also.

Figure xiv: Structure of monitoring spot of NFI



Sources: Forestry Agency

Future Challenges

While the analysis on forest area based on ecosystem type says little change has been seen in recent 15 years, it is important to continuously grasp the real picture of whole forest in statistical methods so that the analysis of the influence of climate change on forest ecosystem would proceed and the results should be utilized for reviewing possible measures.

As transforming forestry into a growth industry has been regarded as one of the important policies of the government, there are positive signs in forestry and wood industry with the background of maturing forest resources and thus people's expectation on wood production function of forest is increasing. However, there remain many issues to be solved like cost-cutting of harvesting and planting activities.

Besides, proper forest management and conservation-related activities, as well as provision of disaster control facilities should be promoted properly against a backdrop of possible increase of torrential downpour due to climate change, to enhance protection and mitigation function from damages caused by mountain disasters.

As for mitigation measures for climate change, it is also important to ensure the function of forest as a carbon sink through forest management and conservation and that of CO2 storage and emission reduction through wood utilization.

The government of Japan recognizes that sufficient forest-related information such as roles of forest, forestry and wood industry and importance of them be provided for the better public understanding and that necessary measures be taken systematically and effectively with the participation of various stakeholders.

Introduction: About the Montréal Process

Development of the Montréal Process

Since the Earth Summit (UNCED) held in Rio de Janeiro in 1992, the promotion of sustainable forest management has become an internationally important challenge. In this context, initiatives to develop criteria and indicators as "measures" for objective monitoring of the sustainability of forest management have advanced in many regions in the world. FAO reports that there are nine criteria/indicator developing processes, including the process by tropical timber exporting countries that are members of International Tropical Timber Organization (ITTO), and that about 150 countries are participating in one or more processes.

The Montréal Process is an initiative to promote the development and application of criteria and indicators for conservation and sustainable management of temperate and boreal forests. Its 12 member countries are Argentina, Australia, Canada, Chile, China, Japan, Republic of Korea, Mexico, New Zealand, Russia, Uruguay, and the United States of America. The initiative is named after the venue of the expert seminar on sustainable forest management of temperate and boreal forests held in 1993 in Montreal, Canada, where discussion started. Since the Working Group was formed, in 1994, it has been working on the development and revision of criteria/indicators, collection of data based on the indicators, and development of country reports. Today the criteria and indicators of the Montréal Process consist of the following seven criteria and 54 indicators.

Criterion 1: *Conservation of biological diversity* (9 indicators, including the area of forests by forest ecosystem types and the number of forest-associated species)
Criterion 2: *Maintenance of productive capacity of forest ecosystems* (5 indicators, including the *area* and growing stock of forestland available for wood production, and area of plantations)
Criterion 3: Maintenance of forest health and vitality (2 indicators, including the area of forests affected by pests, fire, etc. beyond the normal range)
Criterion 4: Conservation and maintenance of soil and water resources (5 indicators, including the area of forests whose designation or land management focus is the protection of soil or water resources)
Criterion 5: Maintenance of forest contribution to global carbon cycles (3 indicators, including total forest ecosystem carbon pools and fluxes)
Criterion 6: Maintenance and enhancement of long-term multiple socio-economic benefits to meet the needs of society (20 indicators, including the percentage of recycling of forest products, and value of investment in the forest sector)
Criterion 7: Legal, institutional, and economic framework for forest conservation and sustainable management (10 indicators, including legal and policy frameworks, cross-sectoral coordination, and monitoring/assessment abilities)

The approach of criteria and indicators

In the Montreal Process, "criteria" are aspects of forests and forest management to be addressed in assessing the sustainability of forest management, while "indicators" are items on which measurements and information are collected to describe the state of forest and forest management along the criteria. Various discussions have been made on sustainable forest management in the international community also after the Earth Summit. The non-legally binding instrument on all types of *forests*[1] adopted at the UN General Assembly in December 2007 presented a concept of sustainable forest management "as a dynamic and evolving concept, aims to maintain and enhance the economic, social and environmental values of all types of forests, for the benefit of present and future generations" (para. 4). It also states that the member states consider the seven thematic elements of sustainable forest management[2] as a reference framework for sustainable forest management and, in this context, identify, as appropriate, specific environmental and other forest-related aspects within those elements for consideration as criteria and indicators for sustainable forest management (para. 6(b)).

Individual criteria/indicator processes adopted their criteria and indicators for sustainable forest management based on the natural, social and other conditions of the regions but there are also international initiatives to standardize definitions of terms, harmonize reporting, and reduce the burden of reporting. For the development of the Global Forest Resources Assessment 2015[3] for example, C&I processes including Forest Europe, the Montreal Process, International Tropical Timber Organization (ITTO), and FAO cooperated to establish the Collaborative Forest Resources Questionnaire (CFRQ) Partnership.

The 2030 Agenda for Sustainable Development adopted at the United Nations Sustainable Development Summit in September 2015 set forth Sustainable Development Goals (SDGs) consisting of 17 goals and 169 targets for the international community to achieve by 2030. The agenda suggests that many of the 17 goals are related to the promotion of sustainable forest management. Goal 15 (terrestrial resources) incorporates targets such as the promotion of the implementation of sustainable forest management and increase of afforestation and reforestation globally. It has been agreed that the progress of SDGs will be measured using the indicators established for each

[1] UN General Assembly Resolution A/RES/62/98. Its formal name is Non-Legally Binding Instrument on All Types of Forests (NLBI). The *11th* Session of the UN Forum on Forests agreed on the resolution, including the change of the name to United Nations Forest Instrument (UNFI) (UN Economic and Social Council (ECOSOC) Resolution 2015/33. The revised UNFI was adopted by the UN General Assembly Resolution in February 2016 (A/RES/70/199).

[2] (a) Extent of forest resources, (b) Forest biological diversity, (c) Forest health and vitality, (d) Productive functions of forest resources, (e) Protective functions of forest resources, (f) Socio-economic functions of forests, (g) Legal, policy, and institutional framework

[3] Global Forest Resources Assessment (FRA) is a report compiled by the Food and Agriculture Organization using various statistics regarding forest and forestry of countries around the world. The report has been published once every five years since 1990.

target—232 indicators in total. The criteria and indicators of the Montreal Process will be useful also for the assessment of the progress of SDGs.

The criteria and indicators of the Montreal Process are an effort to assess the sustainability of forest management at the national or state level. There are also initiatives where third-party organizations certify forests at the management unit level based on certain criteria of the sustainability of forest management, consideration to environmental conservation, and other factors. The certification standards of the SGEC Certification Scheme[4] that was set up as Japan's unique private driven forest certification scheme are regarded as based on the indicators of the Montreal Process.

Operation of the Montreal Process

The Montreal Process is operated by the Working Group, which is the decision-making body consisting of the representatives of the member states, the Technical Advisory Committee, which studies technical issues based on the request of the Working Group, and the Secretariat for liaison and coordination of related parties.

The Working Group holds an annual meeting for which the member states take turns to provide the venue. The host country takes the chair.

The Canadian government served as the secretariat for the liaison and coordination of related parties from 1995 to 2006, but the Forestry Agency of Japan has been serving the office since 2007.

The Technical Advisory Committee consists of forestry experts of all member states. The committee collects data and provides the Working Group with technical and scientific advice on matters related to indicator measurement and reports.

Guiding Principles for Drafting the 3rd Country Report

There are various needs for international reporting concerning forest and forestry according to the purpose, which include country reports based on the Convention on Biological Diversity or the United Nations Framework Convention on Climate Change, Global Forest Resources Assessment (FRA), which was compiled and published by FAO based on forest and forestry statistics of individual countries, and voluntary country reports at the United Nations Forum on Forests (UNFF). It has become a challenge to ensure effective reporting while avoiding duplication. The Forest and Forestry Basic Act obliges the government to create Annual Report on *Forest and Forestry after consulting the Forestry Policy Council, and to submit the report to the Diet.* The report is uploaded on the website of the Forestry Agency. The abridged edition is translated into English.

The country report of the Montreal Process aims to analyze and explain the current state and challenges of Japan's forest, forestry and wood industry based on the seven criteria for sustainabile

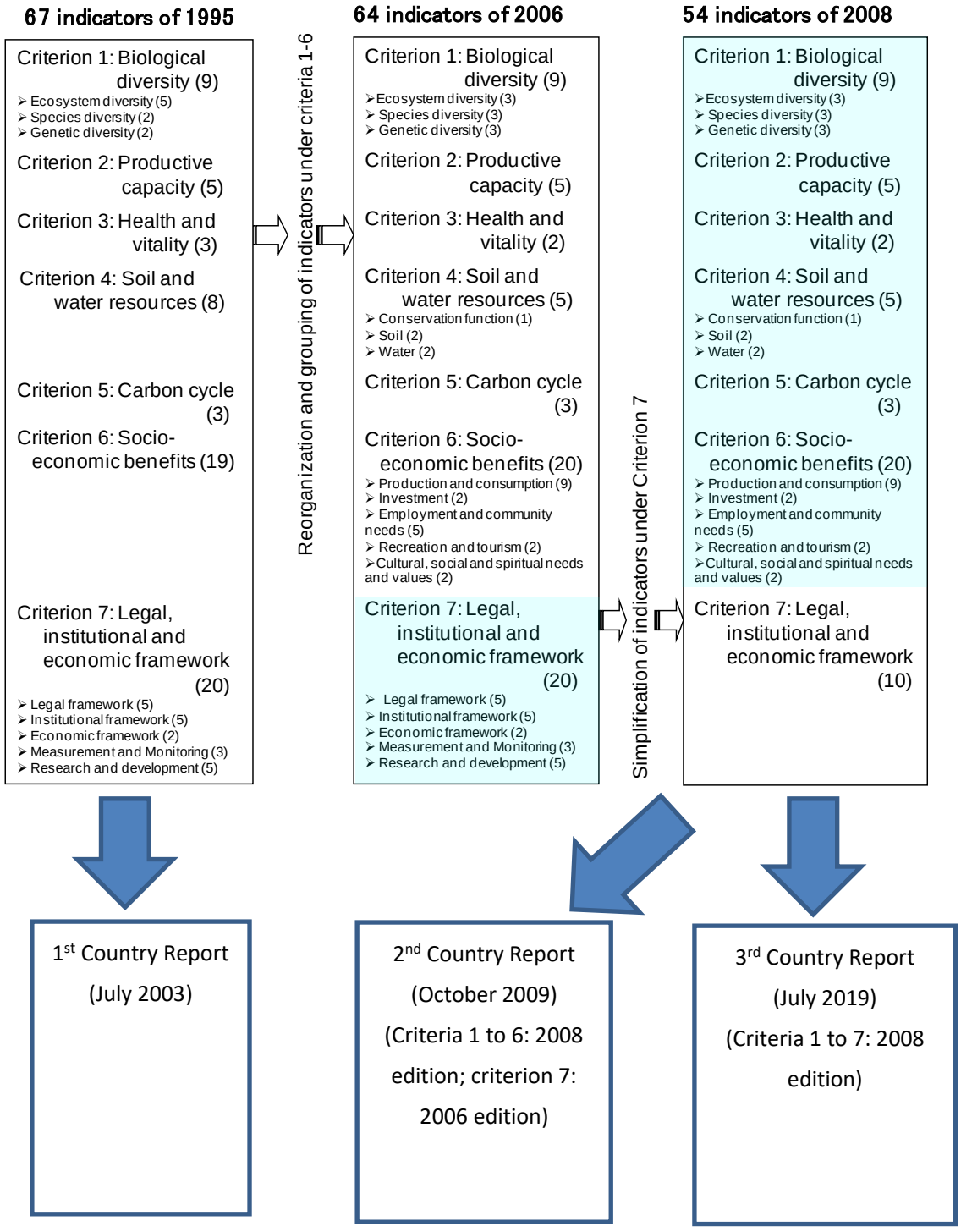
[4] The certification scheme implemented by Sustainable Green Ecosystem Council endorsed by Programme for the Endorsement of Forest Certification Schemes joined PEFC in 2014. The scheme and PEFC became mutually recognized in June 2016.

forest management by making the most of these existing data and information. Japan produced the 1st Country Report (only in Japanese) in 2003 and the 2nd Country Report (in Japanese and English) in 2009. This 3rd Country Report has developed a synthesis of trends of the changes in the circumstances surrounding Japan's forest and forestry after the compilation of the 2nd Country Report, based on the 54 indicators revised in 2009 and in the light of the revised Technical Notes on Implementation of the Montreal Process Criteria and Indicators, Criteria 1-7 (the 3rd edition) (hereinafter the "Note").

The report on each indicator consists of "Rationale" and "Current State and Trends." "Current State and Trends" basically make a report along the approach shown in the Rationale for better comparability of international data while at the same time describing conditions of the forest and forestry characteristics of Japan and high-priority policy challenges in the country wherever possible. For quantitative indicators, we have described medium- to long-term changes, factors behind them and other information that may serve as a useful reference wherever possible. As regards qualitative indicators, we have focused on especially important efforts and easy-to-understand cases to make them readily accessible to the readers.

The quantitative data we have used are basically official statistics of the Forestry Agency, but we have also used the results of the National Forest Inventory of Japan, which is a project conducted by the agency to continuously survey about 13,000 fixed plots across the country in a 5-year cycle (1st stage survey: 1999-2003; 2nd stage survey: 2004-2008; 3rd stage survey: 2009-2013).

Figure 1: Changes in criteria and indicators used for development of country reports



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 stage,[5] age class[6] 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 to 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.

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

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

Current state and trend

(Distribution of Forests)

Japan has a narrow land area stretching over 3,000km from north to south, where boreal, cool temperate, warm temperate and sub-tropical forests are distributed along these climatic zones. Cool temperate forests are also distributed in high altitude areas in the western part of the Honshu island, Shikoku island and Kyushu district[7].

While the average annual rainfall is approximately 1,718mm, there is a wide variation depending on the area[8].

Figure 2: Vegetation map

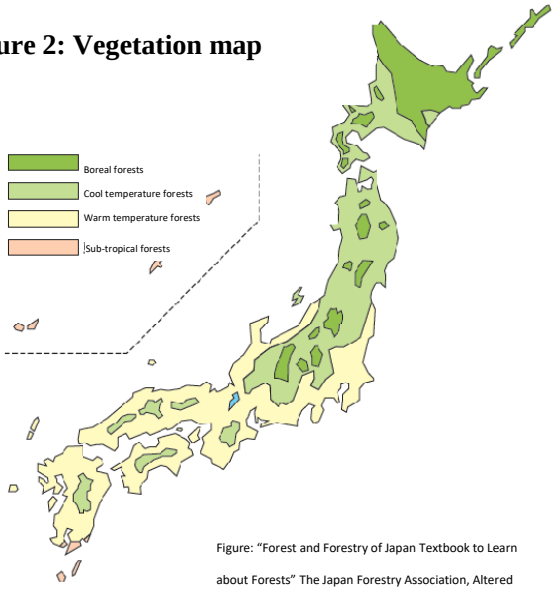


Figure: "Forest and Forestry of Japan Textbook to Learn about Forests" The Japan Forestry Association, Altered

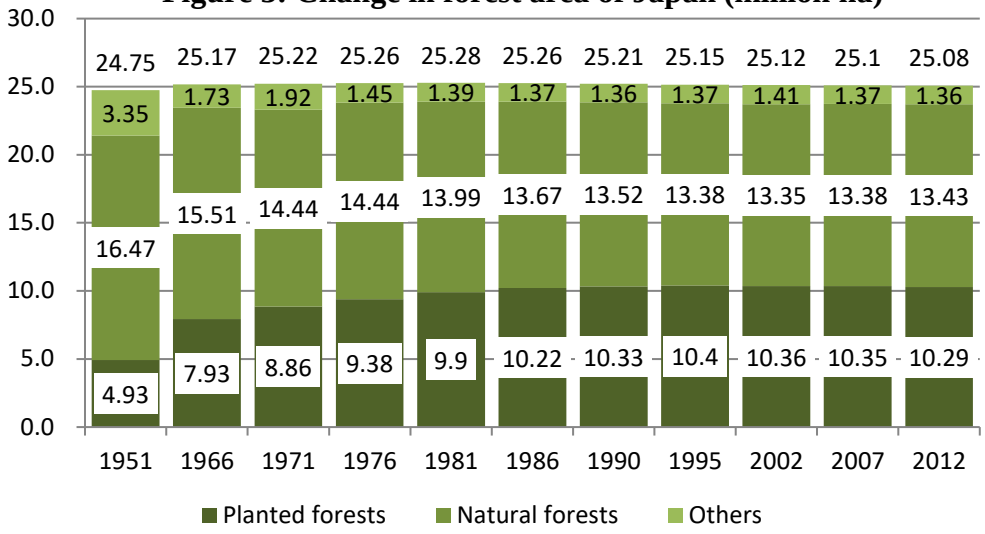
(Forest area)

The total area of Japan's forests is approximately 25 million ha, which corresponds to about two-thirds of the total land area. While the coverage of forests has been maintained for more than a half century, their composition has been changing. In 1951, the forest area was composed of approximately 20% of planted forests and approximately 70% of natural forests. In 2012, planted forests accounted for approximately 40% of the total forest area while natural forests accounted for approximately 50%. This change is mainly due to the active promotion of establishment of planted forests consisting of Japanese cedar or Japanese cypress, etc. from the late 1950s to around 1970.

[7] Forest and Forest Products Research Institute Cited from the "Guide for observing the tree garden" of Tama Forest Science Garden

[8] Based on the record at 1300 sites across the country from 1981 to 2015. Ministry of Land, Infrastructure, Transport and Tourism (2018) "Current State of Water Resources in Japan"

Figure 3: Change in forest area of Japan (million ha)



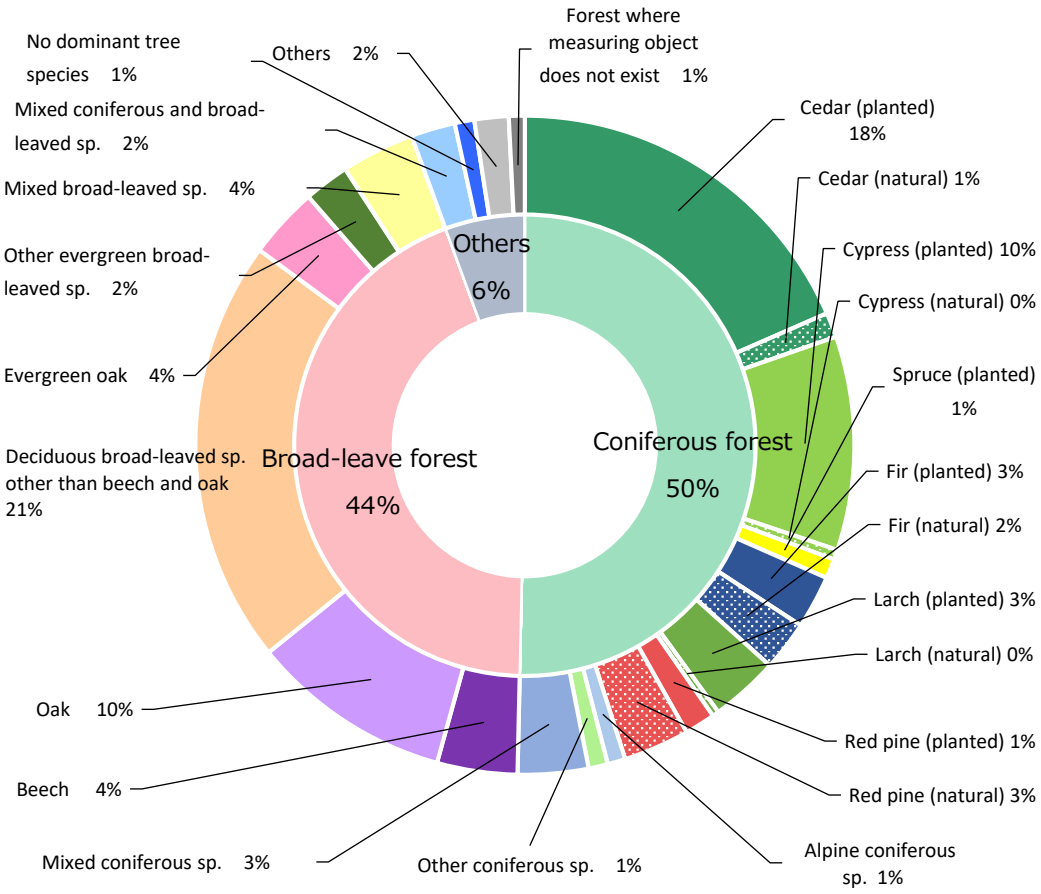
Source: MAFF, Census of Agriculture and Forestry (for 1951 only); Forestry Agency, State of Forest Resources

(Types of Forest Ecosystems)

According to the third stage of the National Forest Inventory of Japan (from 2009 to 2013)[9], the types of forest ecosystems in Japan were as follows: 50% of forests where coniferous tree species are dominant, 44% of forests where broad-leaved tree species are dominant, and 6% of other forests. Among them, coniferous forests are composed of 20% Japanese cedar (*Cryptomeria japonica*) and 10% Japanese cypress (*Chamaecyparis obtuse*); broad-leave forests are composed of 10% Japanese oaks (*Quercus spp.*) and 4% beech (*Fagus crenata*) and evergreen tree species among Japanese chinquapin and oak (*Castanopsis Quercus*).

[9] Since 1999, a nationwide survey has been implemented for 5 years as one cycle and the survey periods were as follows: the first stage was from 1999 to 2003, the second stage was from 2004 to 2008 and the third stage was from 2009 to 2013.

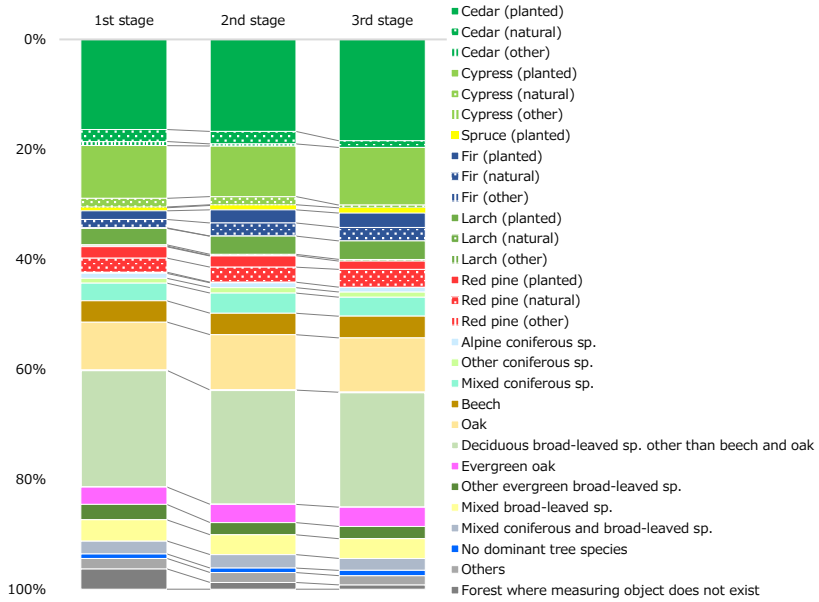
Figure 4: Composition of Forest Ecosystems by Dominant Tree Species



* Aggregated based on the dominant tree species, which are tree species occupying more than 30% of the total basal area of tree species that appear in the spot.

Source: Forestry Agency, National Forest Inventory of Japan (Third stage)

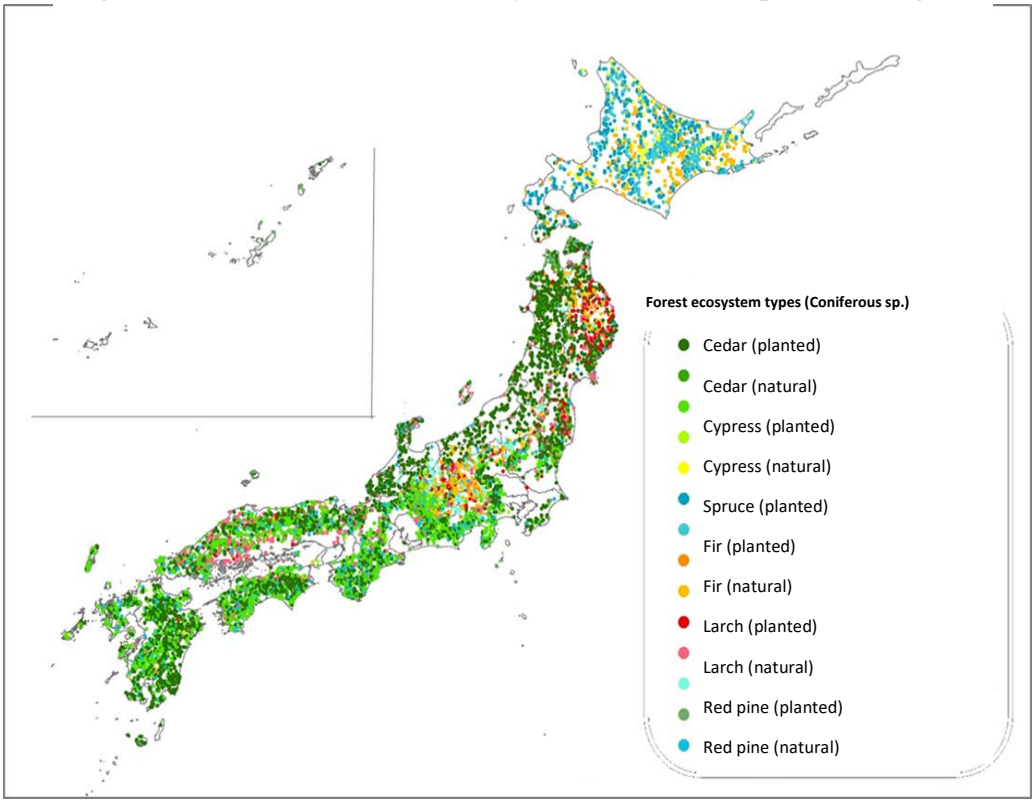
Figure 5: Change in Composition of Forest Ecosystem Types



*Classification for planted / natural forests and others is based on the forest inventory for the first and second stages, and on the ground survey for the third stage.

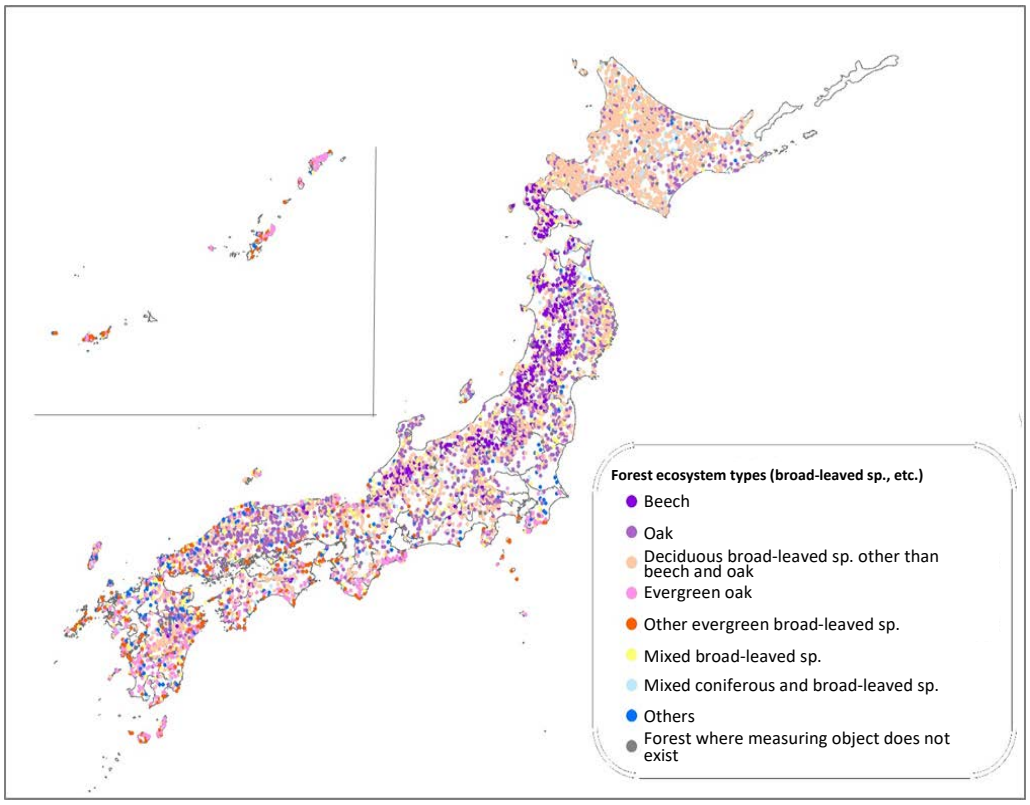
Source: Forestry Agency, National Forest Inventory of Japan (Surveys from first to third stages)

Figure 6: Distribution of Forest Ecosystems (Coniferous sp., Third Stage)



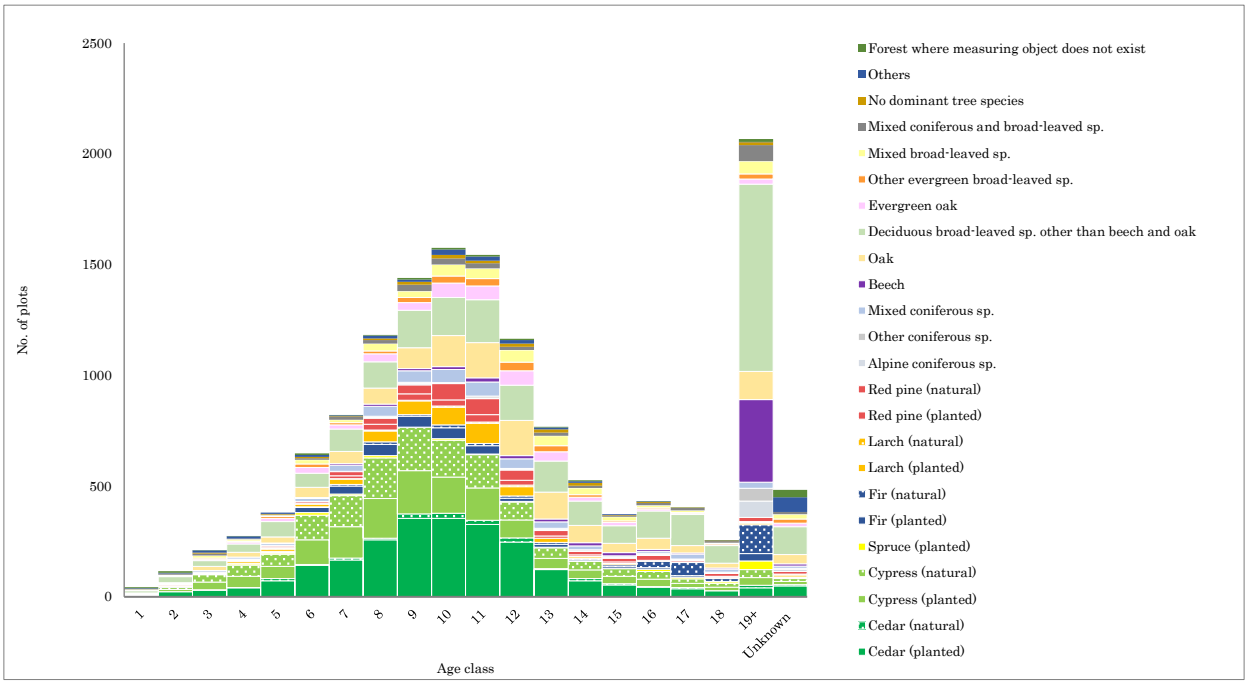
Source: Forestry Agency, National Forest Inventory of Japan (Third stage)

Figure 7: Distribution of Forest Ecosystems (Broad-leaved sp. and others, Third Stage)



Source: Forestry Agency, National Forest Inventory of Japan (Third stage)

Figure 8: Composition of Forest Ecosystems by Age Class

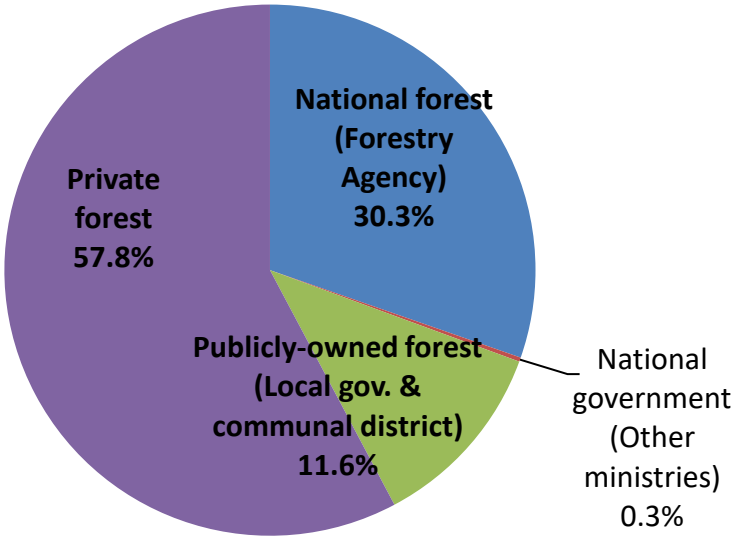


Source: Forestry Agency, National Forest Inventory of Japan (Third stage)

(Forest ownership patterns)

In Japan, approximately 58% of forests are private forest, 31% are national forest and 12% are publicly-owned forest. Publicly-owned forests belong to local public entities, including prefectural and municipal governments and the communal districts[10].

Figure 9: Composition of forests by types of ownership



Source: Forestry Agency, State of Forest Resources (2012)

[10] ***Forest owned by communal districts*** stipulated in the article 294 of the Local Autonomy Act. In case of municipal merger, communal districts are formed for forest used to be owned by community and/or old municipalities that are used and gotten earnings by local community.

INDICATOR 1.1.b Area and percent of forest in protected areas by forest ecosystem type, and by age class or successional stage

Rationale

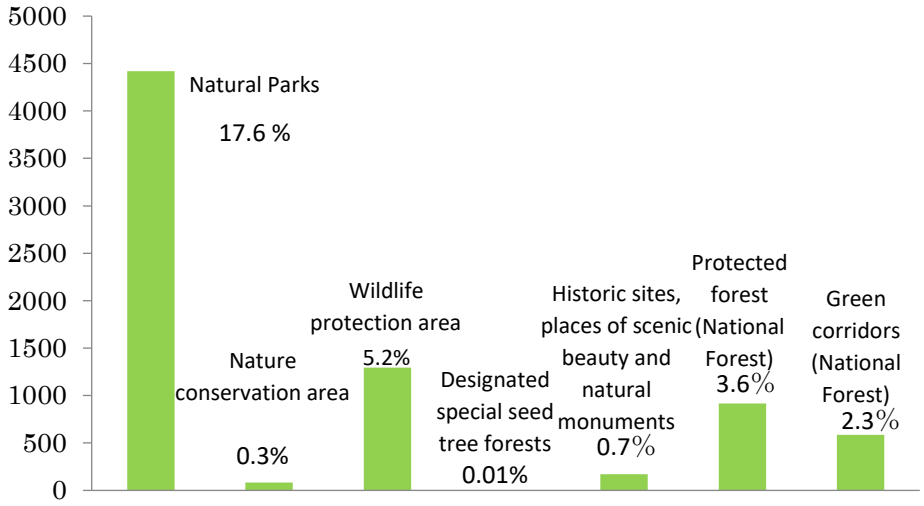
This indicator provides information on the area and extent of forest ecosystem type, age class or successional stage protected to safeguard biological diversity and representative examples of forest ecosystem types. This indicator will also help identify forest types of conservation value that are in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

Current state and trend

In Japan, forests protected for conserving forest ecosystems include the forests designated as follows: natural parks (Natural Parks Act), nature conservation area (Nature Conservation Law), wildlife protection area (Wildlife Protection, Control and Hunting Management Act), natural habitat protection area (Act on Conservation of Endangered Species of Wild Fauna and Flora)designated special seed tree forests (Forestry Seeds and Seedlings Act), Historic sites, places of scenic beauty and natural monuments (Act on Protection of Cultural Properties), protected forest and green corridors.

Aichi Biodiversity Target 11 under the Convention on Biological Diversity set a goal to conserve at least 17% of the terrestrial and inland water area through management of protected areas, etc. In this regard, Japan has reported in the Fifth National Report of the Convention on Biological Diversity that approximately 20.3% of the terrestrial and inland water areas are being conserved as protected areas.

Figure 10: Area of forests in protected areas (1000 ha, 2012)



Note 1: The areas of forest include overlapping areas.

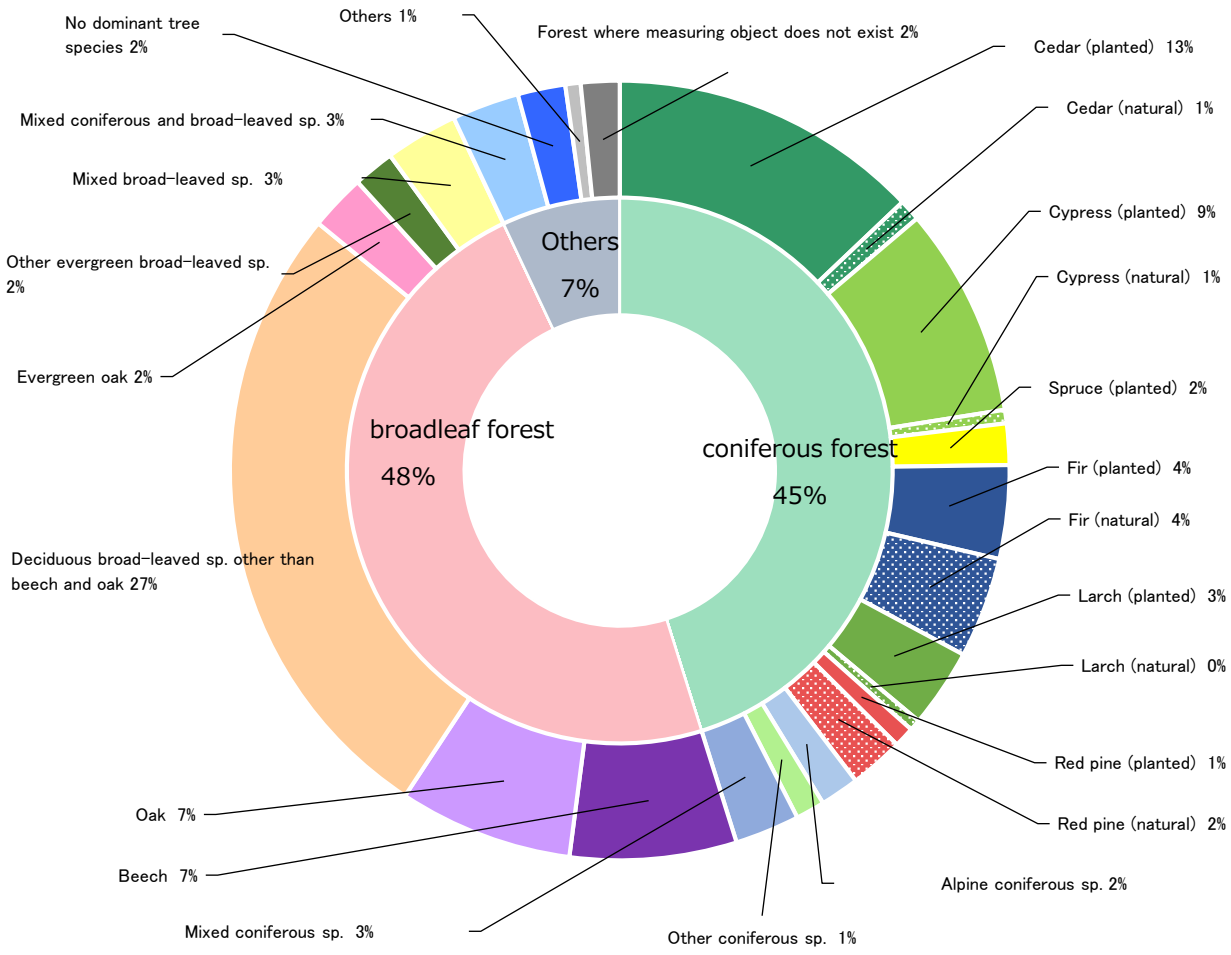
Note 2: The percentages represent the ratio to the total area of forests.

Source: Forestry Agency

(Forest Ecosystems)

According to the third stage of the National Forest Inventory of Japan, the forest ecosystems in protected areas were composed of 45% of forests where coniferous tree species are dominant, 48% of forests where broad-leaved tree species are dominant and 7% of other forests. Trends found in protected areas are similar to that of trends in the overall forests. For instance, planted coniferous forests accounted for 30% of the protected areas.

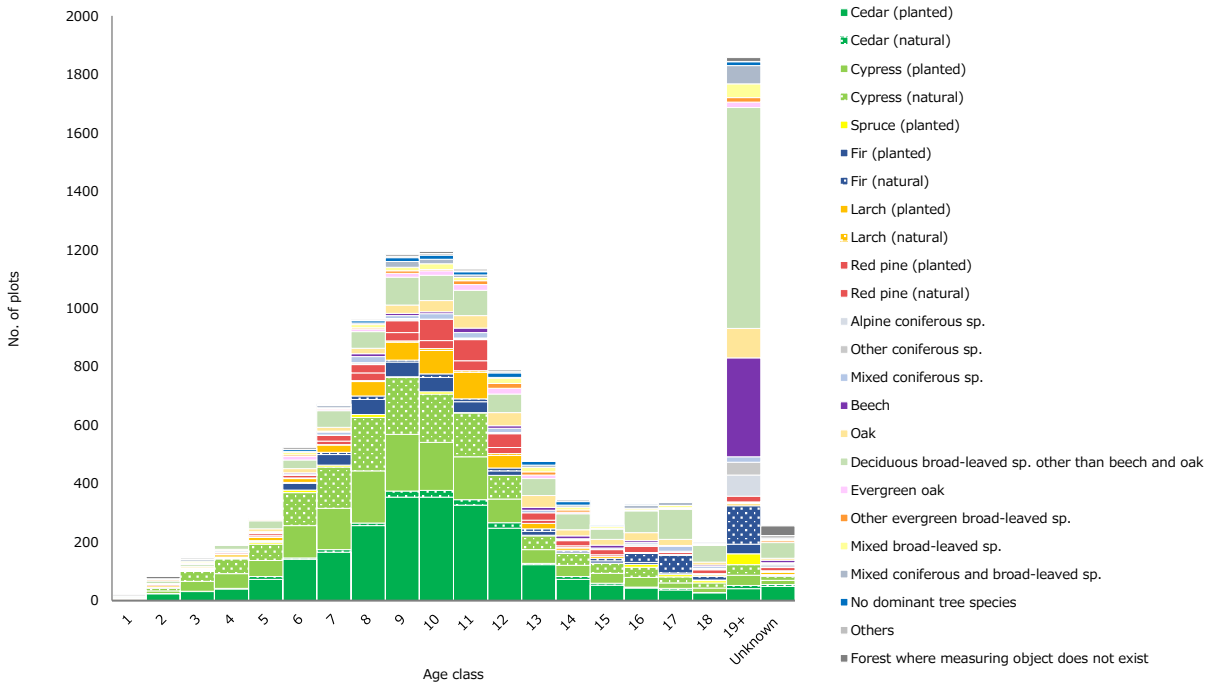
Figure 11: Composition of Forest Ecosystems by Dominant Tree Species in Protected Areas (Third Stage)



Source: Forestry Agency, National Forest Inventory of Japan (Third stage)

The counting method is the same as that applied for Indicator 1.1.a.

Figure 12: Composition of Forest Ecosystems by Age Class in Protected Areas (Third Stage)



Source: Forestry Agency, National Forest Inventory of Japan (Third stage)

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 induced activities and natural 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 Trends

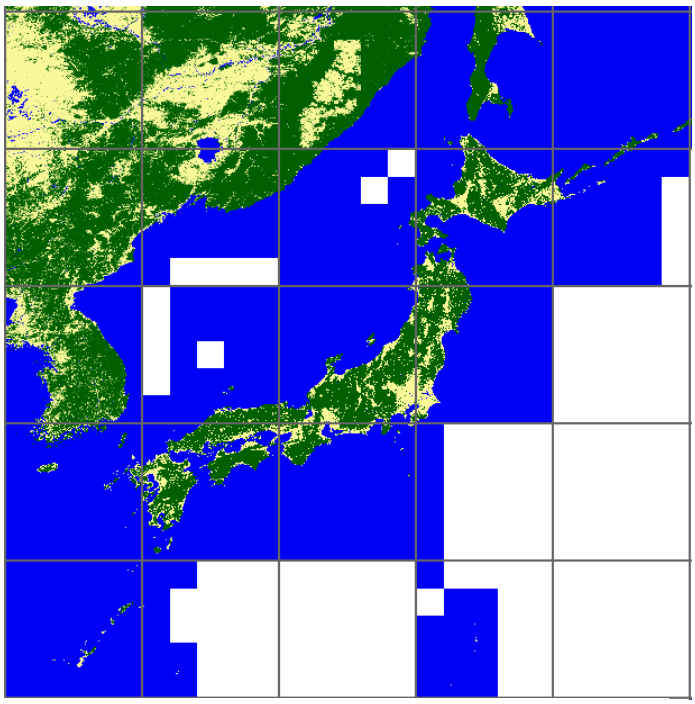
According to the Technical Note of the Montreal Process, this indicator is about the progress of fragmentation as a result of human induced activities in particular. The note points to the risk of natural disasters, including forest fires and storm winds, aggravating the forest fragmentation that is a result of human induced activities.

An example of human induced activities fragmenting forests is the development of farmlands or roads in forests. In Japan, the unregulated progress of forest fragmentation due to human induced activities is not anticipated because about 50% of forests are designated as protection forests, where changes to the form and nature of land are regulated. In forests other than protection forests, the development of land exceeding one hectare requires permission from the prefectural governor.

In this context, a 25 meter-resolution forest/non-forest map based on the global data obtained by using an L-band synthetic aperture radar mounted on Advanced Land Observing *Satellites of Japan Daichi (ALOS) and Daichi-2 (ALOS-2)* is downloadable from the website of JAXA, and the data of Japan has been published. Because a forest as a form of land use is defined regardless of whether there are trees or not, it may not be consistent with the interpretation result of satellite remote sensing, where the tree growing condition at the time of the photographing is visually determined.

The findings of studies on forest fragmentation (caused by farmland/housing land development) and genetic diversity of specific engendered tree species have been also published. As the latest forest fragmentation

Figure 13: 2017 forest/non-forest map



Source: Japan Aerospace Exploration Agency (JAXA)

data will be sequentially available, it is expected that specific research studies on genetic diversity will increase. Because it requires alternation of one or more generations for forest isolation to bring about an impact on the genetics of the natural population, it is necessary to pay attention that genetic decline due to forest fragmentation is not always detectable.[11]

[11] *Forest Genetics* and *Tree* Breeding, IDE Yuji, and SHIRAISHI Susumu, Bun-eido, P117

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.[12] 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 Trends

The third stage of the National Forest Inventory of Japan identified 2,970 native and 301 exotic vascular plants, 3,271 species in total. About 40% of about 8,800[13] vascular plant[14] species growing in Japan are thought to be forest-associated. They are classified into 1,200 woody, 2,065 grass, and 6 unclassifiable plants. In planted forests alone, 932 woody, 1,568 grass, and two unclassifiable plants have been identified. In Japan, planted forests also play an important role as the storehouse of many species for conservation of biological diversity.

The number of identified native and exotic species decreased in the third stage compared with the first and second stages. This may be greatly influenced by the change of the survey method, where the survey area to count the number of vascular plant species was reduced from the 1,000m^2 that is the entire plot to about 48m^2. It may be appropriate to use the survey results of the third stage for comparative analysis with the survey results of the fourth stage and after.

---

[12] ***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.

[13] Source: Table 4 The Number of Known Wildlife Species in Japan (material of the Central Environment Council on March 18, 2002)

[14] ***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: Number of vascular plant species growing in forests in Japan

	Numbers of identified vascular plant species		
	Native species	Exotic species	Total
The 3rd stage	2,970	301	3,271

(Reference)

	Numbers of identifies vascular plant species		
	Native species	Exotic species	Total
The 1st stage	3,632	368	4,000
The 2nd stage	3,558	437	3,995

Note: Understory vegetation was surveyed in the entire plot (1,000m^2) in the first and second stages, and a part of the plot (about 48m^2) was in the third stage.

Source: Forestry Agency. National Forest Inventory of Japan (1st to 3rd stages)

As regards animals, 133 species of mammals, 214 species of birds, 74 species of reptiles, and 50 species of amphibians are regarded as forest-associated according to the literature. Information on other animal and plant species is currently limited.

Table 2: Number of animal species living in forests in Japan

	Known species	Forest-associated native species
Mammals	185	133
Birds	417	214
Reptiles	97	74
Amphibians	64	50

Source: Report of kinetic change analysis project using the forest resource survey data of the Forestry Agency (March 2010)

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 ecosystems and their ability to support species diversity.

Current State and Trends

In Japan, the Ministry of the Environment assesses the extinction risk of individual wildlife species living in Japan from a biological perspective and compiles the results as Red List (list of endangered wildlife species).[15] According to the fourth Red List published in 2012, the number of endangered species[16] has increased in all categories, excluding mammals.

Since FY 2015 it was decided to revise the list individually as needed for species requiring reconsideration of the category (rank) due to deterioration of their living conditions, etc. The first to the third revised MOE Red Lists were published in 2015, 2017, and 2018, respectively. In the 2018 Red List the categories of 67 species were reviewed. As a result, the number of endangered species increased by 41 to 3,675 in total.

Japanese serow, which is a forest-associated native species, is found in Honshu, Shikoku, and Kyushu. Japanese serow in Kyushu and Shikoku were added to the Threatened Local Population (LP) in 2012 and 2015 Red List, respectively. Aging planted forests and decreasing food resources due to an increase of Japanese deer are pointed out as causes. It is found clear that the population size of Japanese serow is on a downward trend (the threatened local population is not included in the table below).

The number of Endangered Plant I (vascular plants) species was 1,779 in 2015.

Table 3: Number of Endangered Species in the MOE Red List (excerpt)

Plant I (vascular plants)	1,779	Amphibians	22
Plant II (bryophytes, etc.)	480	Brackish/fresh water fish	167
Mammals	33	Insects	358
Birds	97	Shellfish	563
Reptiles	36	Other invertebrate animals	61

Source: MOE Red List 2015

[15] Red List is a list of endangered wildlife species

[16] Endangered species are species with a high risk of extinction in the wild in the near future. They are divided into Critically endangered IA (CR), Endangered IB (EN), and Vulnerable II (VU).

The third stage of the National Forest Inventory of Japan identified 230 vascular plants listed in the Red List, including endangered and near-threatened species. One or more endangered or near-threatened species were found in 726 (5.4%) of the 13,380 survey plots.

Simple comparison of the number of the identified Red List species of the 1st and 2nd stages with that of the 3rd stage is inappropriate, because the survey areas of understory vegetation vary greatly. It would be appropriate to conduct the analysis again based on the survey results of 4th stage and subsequent stages.

Table 4: Number of identified plant species listed in Red List

Category		3rd stage
Endangered species	Critically endangered IA (CR)	16
	Endangered IB (EN)	41
	Vulnerable II (VU)	117
	Sub total	174
Near threatened (NT)		55
Data Deficient (DD)		1
Total		230

Reference: Number of identified plant species listed in Red List

Category		1st stage	2nd stage
Endangered species	Critically endangered IA (CR))	43	31
	Endangered IB (EN)	114	74
	Vulnerable II (VU)	176	169
	Sub total	333	274
Near threatened (NT)		41	84
Data Deficient (DD)		0	0
Total		374	358

※ The National Forest Inventory of Japan recorded the species identified through surveys of standing tree and surveys

※ Understory vegetation was surveyed in the entire plot (1,000m^2) in the first and second stages, and a part of the plot (about 48m^2) in the third stage.

※ The number of species in the first and second stage of the National Forest Inventory of Japan is based on the third Red List (published in 2010 and 2011), and the number of species in the third stage survey is based on the fourth Red List (published in 2012).

Source: Forestry Agency. National Forest Inventory of Japan (the 1st to the 3rd stage)

INDICATOR 1.2.c Status of on-site and off-site efforts focused on conservation of species diversity

Rationale

This indicator provides information that describes on-site (or *in situ)* and off-site (or *ex situ)* 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 Trends

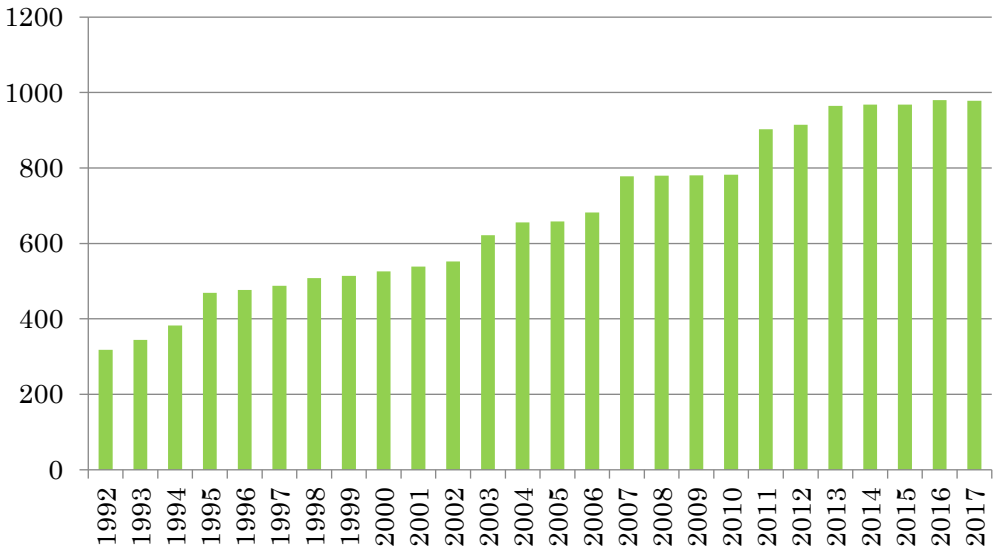
In order to conserve biological diversity, protected forests and green corridors are designated in national forests.

The aim of the protected forest system is to contribute to the protection of wildlife, conservation of genetic resources, etc. in primeval natural forests representing Japan’s climatic or forest zone, forests with a biocoenosis unique to the region, and forests necessary for the growth and inhabitation of rare wildlife species. In these protected forests, "adaptive management" is promoted to accurately assess changes in the condition of the forest ecosystem through monitoring and other means, and to review the management policy and designated areas as needed.

Green corridors are aimed at preserving forest ecosystems more broadly and effectively by connecting habitats of wild fauna and flora and securing migration pathways to encourage interaction among populations. Green corridors are set up to form networks connecting protected forests.

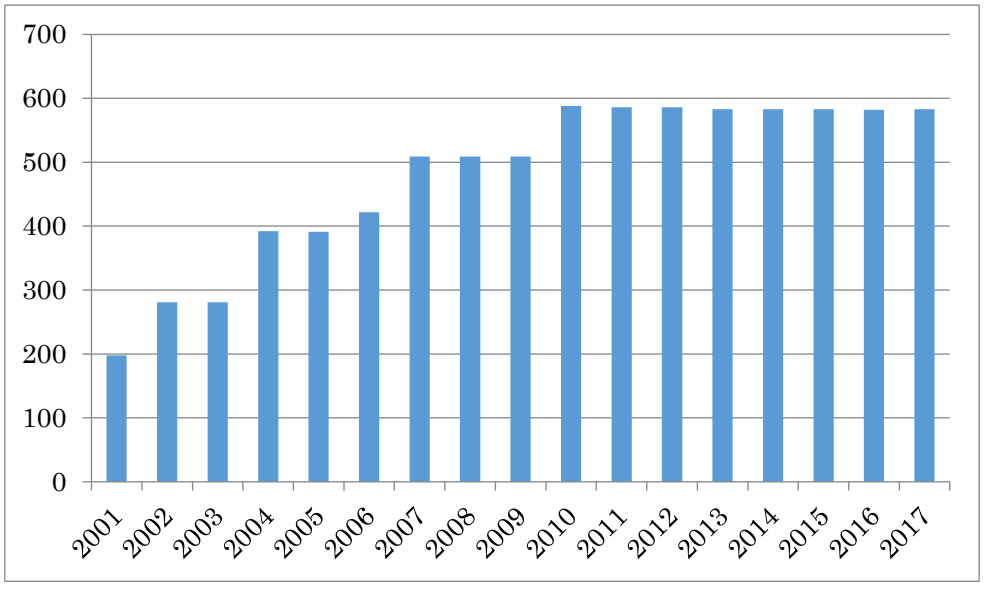
As of 2017, the area of protected forests is about 980,000 ha, or 4% of the total forest area of Japan. The area of Green Corridors is about 580,000 ha.

Figure 14: Change in the area of protected forests in national forests (1,000 ha)



Source: National Forest Management Statistics

Figure 15: Change in the area of Green Corridors in national forests (1,000 ha)

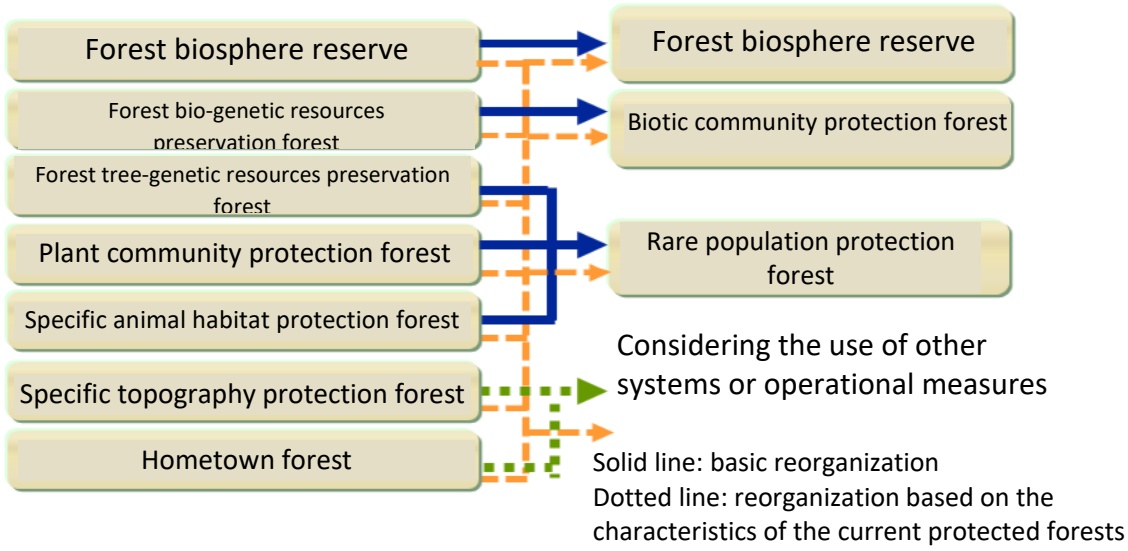


Source: National Forest Management Statistics

Protected forest system is a pioneering system to reserves in Japan and have fulfilled its role through reviews of the system in line with the times since their establishment in 1915. From 2015 to 2018, the system was reorganized in light of the growing public awareness of biodiversity conservation and accumulation of academic knowledge in recent years. Specifically, seven categories have been

reorganized into three for simplification, and an approach of long-term forest management practices to restore forests that have lost autonomous resilience has been introduced.

Figure 16: Review of protected forest categories



Source: Forestry Agency

In addition to the above, based on the provisions of the Acton Conservation of Endangered Species of Wild Fauna and Flora, when the survival of populations of a species designated as a nationally endangered species of wild fauna or flora is difficult just by regulating capture, collection, etc., and it is necessary to conserve their habitats, Natural Habitat Protection Areas are designated. As of March 2018, nine sites, 890ha in total are designated as Natural Habitat Protection Areas, which include ecosystems where forest is a major component.

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 induced 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 Trends

The genetic structures of organisms greatly vary, even within the same species, depending on the region. In Japan research has been conducted on regional genetic variations of some widely distributed tree species. The analysis of the appearance of saplings of the species in the observation points, based on the results of the National Forest Inventory of Japan, is expected to contribute to the understanding of the geographical distribution of the tree species in peril of losing genetic diversity and genotypes.

Selecting Japanese beech from among the tree species whose geographical gene structure has been elucidated, the sustainability of the species, regional genetic types, and diversity was analyzed based on the basic genetic data and the change in appearance of saplings found by the National Forest Inventory of Japan. The results are as follows.

It has been clarified that the gene structures of Japanese beech on the Sea of Japan side, in the region from Kanto to the Kii Peninsula, and in Shikoku/Kyushu differ. The appearance of saplings [17] and

[17] Standing tree of less than 5cm in diameter at breast-height identified in the standing tree survey is defined as young tree.

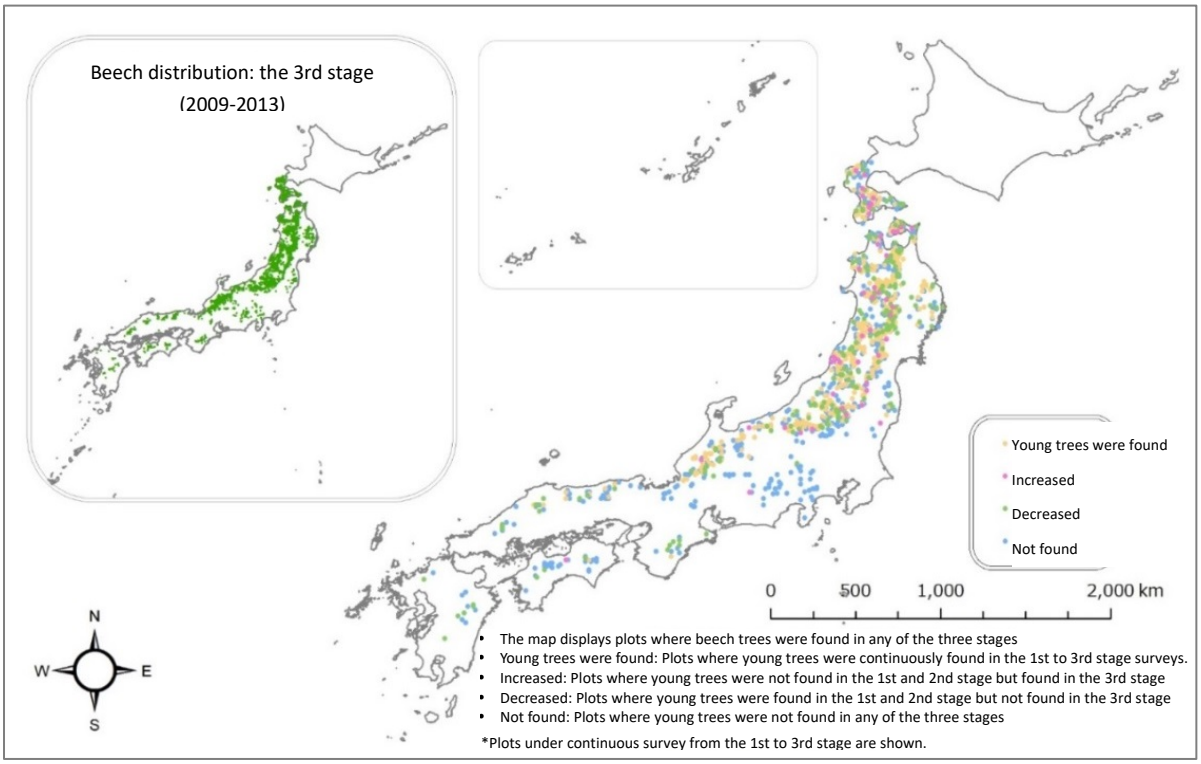
their changes in the first to the third stage of the National Forest Inventory of Japan were studied, classified as shown in the table below, and mapped in Figure 17.[18]

Category	Description
Saplings were found	Plots where saplings were continuously found in the 1st to 3rd stage surveys.
Saplings Increased	Plots where saplings were not found in the 1st and 2nd stage but found in the 3rd stage
Saplings Decreased	Plots where saplings were found in the 1st and 2nd stage but not found in the 3rd stage
Saplings Not found	Plots where saplings were not found from the 1st to the 3rd stage surveys

There were a large number of plots where “saplings were found" and "increased" on the Sea of Japan side of eastern Japan, but almost none in the region from Kanto to western Japan. It has been known that the gene structures of Japanese beech on the Sea of Japan side, in the region from Kanto to Kii Peninsula, and in Shikoku/Kyushu differ. The analysis shows that saplings are not stably found in the regions from Kanto to Kii Peninsula and Shikoku/Kyushu and suggests the possibility of poor regeneration. While it is known that isolation has progressed with high genetic diversity in western Japan, inferior renewal is observed in such area. The result may indicate the regions that require focused attention for sustainability.

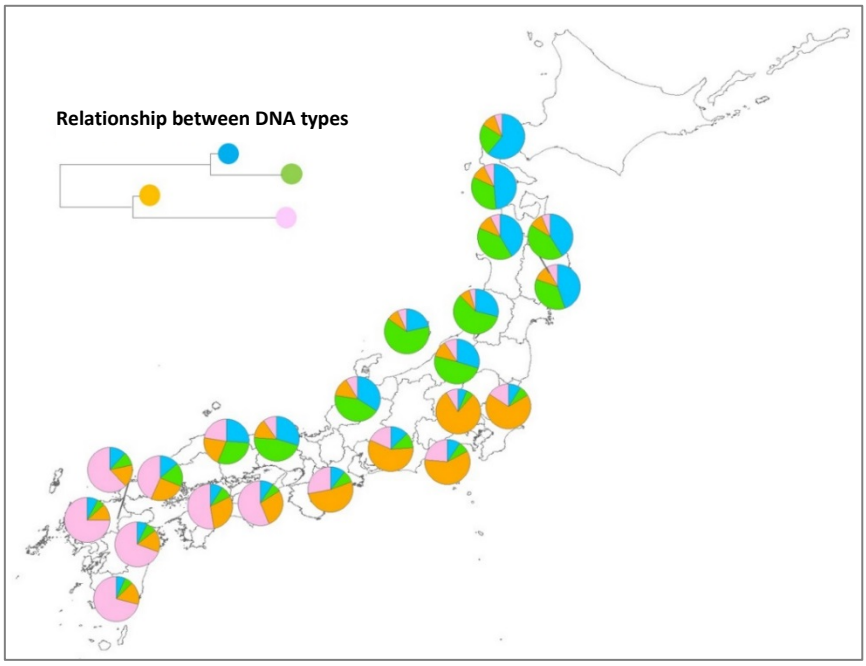
[18] In order to investigate changes during the survey period, only plots under continuous survey from the 1st to the 3rd stage were analyzed.

Figure 17: Japanese Beech distribution and appearance of saplings



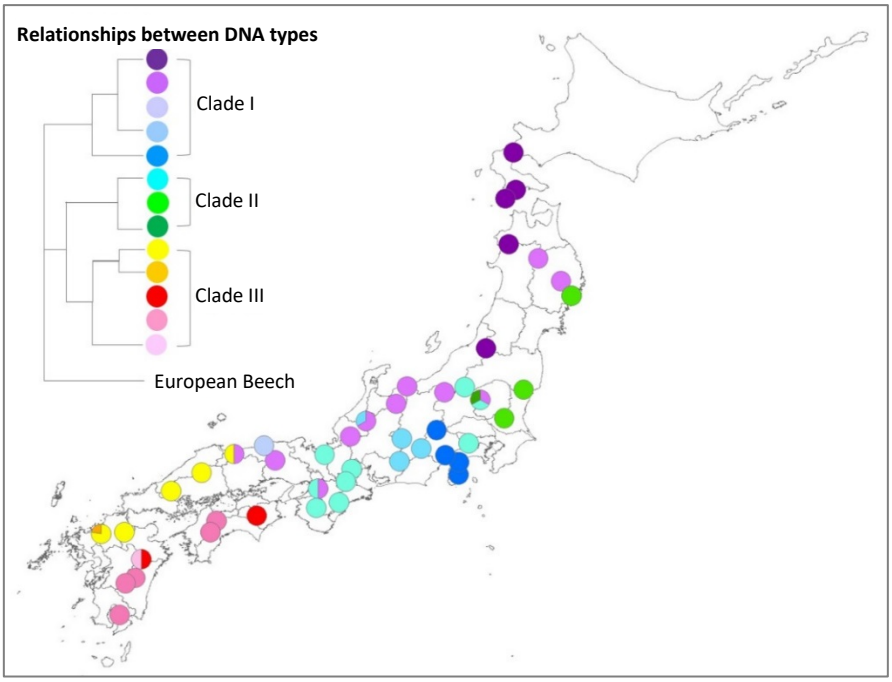
Source: Forestry Agency. National Forest Inventory of Japan (1st to 3rd stages)

Figure 18: Genetic population structure based on nuclear DNA analysis of Japanese beech



Source: Tsumura and Suyama (2015)[19]

Figure 19: Genetic population structure based on chloroplast DNA analysis of Japanese beech



Source: Tsumura and Suyama (2015)

[19] Tsumura Y and Suyama Y (2015), Seedling Transfer Guideline of Japanese Tree Species, p.176, ISBN-10: 482996524X, Bun-ichi Co Ltd, Tokyo (in Japanese)

INDICATOR 1.3.b Population status 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 highly rely on particular forest structure, patterns, associations, and functions, and can therefore be used to describe the status of genetic diversity in forests as a whole.

Current State and Trends

Information enough to identify the representative forest species reflecting the genetic diversity in forest ecosystems is not currently available in Japan.

As described in Indicator 1.3.a, studies have been conducted on the genetic diversity of some tree species in forests.

INDICATOR 1.3.c Status of on-site and off-site efforts focused on conservation of genetic diversity

Rationale

This indicator provides information that describes on site (or *in situ)* and off-site (or *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 Trends

The protected forest and green corridor in national forest, and other systems described in Indicator 1.2.c play a major role in the conservation of genetic diversity, as they do at the species level. The previous report included only the areas of forest bio-genetic resources preservation forests and forest tree-genetic resources preservation forests, but each of these forests have been reorganized into any of the current three categories as a result of the reorganization of the protected forest system described above. Forests of all these three categories are protected and managed as forests being to contribute to biological diversity, including intraspecific (genetic) diversity.

Green corridors mentioned in Indicator 1.2.c are aimed at conserving forest ecosystems more broadly and effectively by connecting the habitats of wild fauna and flora and securing migration pathways to encourage interaction among populations. Green corridors are set up to form networks connecting protected forests.

As of 2017, the area of protected forests is about 980,000 ha or 4% of the total forest area of Japan. The area of Green Corridors is about 580,000 ha.

In order to conserve the genetic diversity of forest-associated tree species, the Forest Tree Breeding Center has been conserving/preserving forest tree genetic resources in the various ways described below in consideration of the purpose of storage, including the securing of species diversity and intraspecific genetic diversity, local renewal status of genetic resources, and utilization of genetic resources.

・off-site conservation/preservation: about 26,000 adult organisms in the premises of the Forest Tree Breeding Center, etc., about 14,000 organisms of seeds, pollen or DNA in storage facility, and 932.34ha of 234 Preservation Stand (planted forests) as of the end of FY2016

・on-site conservation/preservation: 616.08ha of 53 Preservation Stand Forests (mainly natural forests) as of the end of FY2016

The Forestry and Forest Products Research Institute has been exploring, collecting, assessing, storing and distributing tree pathogenic microbes, wood rotting fungi, mycorrhizal fungi, and insect pathogenic microbes, which are genetic resources related to forests and forestry. Collected microorganism resources are identified by researchers specialized in the respective fields, and their characteristics are investigated. Identified strains are, after confirmation of their proliferation, stored and maintained in a stable condition, and distributed to research institutes and other organizations that use them for test research or education on mushrooms.

Criterion 2 - Maintenance of productive capacity of forest ecosystems

Many communities depend on forests directly or indirectly for a wide range of forest-based goods and services. The sustainable provision of these services is clearly linked to the productive capacity of the forests. If this capacity is exceeded there is the risk of ecosystem decline and collapse.

For forests to be sustainable it is necessary to understand the levels at which goods and services may be extracted or used without undermining the functioning of forest ecosystems and processes. The nature of goods and services provided by forests change over time due to social and economic trends, and technological developments. Change in the productive capacity of forests may be a signal of unsound forest management practices or other agents that are affecting forest ecosystems in some way.

INDICATOR 2.a Area and percent of forest land and net area of forest land available for wood production

Rationale

This indicator measures the availability of forest land for wood production compared with the total forest area of a country. It provides information that will help assess the capacity of forests to produce wood to meet society's needs.

Current state and trend

In Japan, forests where logging is prohibited in principle by laws and regulations are as follows: a part of protection forests designated under the Forest Act, forests located within the special protection zone of the natural park designated under the Natural Parks Law, the nature conservation area designated under the Nature Conservation Law and special seed tree forests designated under the Forestry Seeds and Seedlings Act. These forests account for about one to two percent of the total forest area. Regarding the protection forests, logging method and limitations must be established while designating the area under the Forest Act. Among these protection forests which are highly likely to suffer from soil run-off or landslide, rock-fall or avalanche due to logging are prohibited in principle. There are approximately 340,000 ha of such protection forests (as of the end of March 2018).

Forests other than mentioned above are allowed to produce timber under certain rules and guidelines, which is to secure fulfillment of the multiple functions of forests. In addition, there is 14 types of areas, such as soil erosion control area or special protection zone in the wildlife protection area, stipulated under Article 10 of the Regulation for Enforcement of the Forest Act. In the areas, the following requirements are prescribed for logging: (i) the logging must be conducted by thinning in principle, (ii) the logging must not conducted to the forests lower than the standard logging age; and (iii)

permission by the administrative agency must be acquired in advance to conduct logging. Also, notification must be submitted to the relevant mayor of the municipality prior to logging pursuant to the Forest Act.

INDICATOR 2.b Total growing stock and annual increment of both merchantable and non-merchantable tree species in forests available for wood production

Rationale

This indicator measures the growing stock[20] and annual increment of forest areas available for wood production to meet society's needs. The annual increment and growing stock can be related to the volume harvested each year so as to provide a means to demonstrate the sustainable management of forest resources.

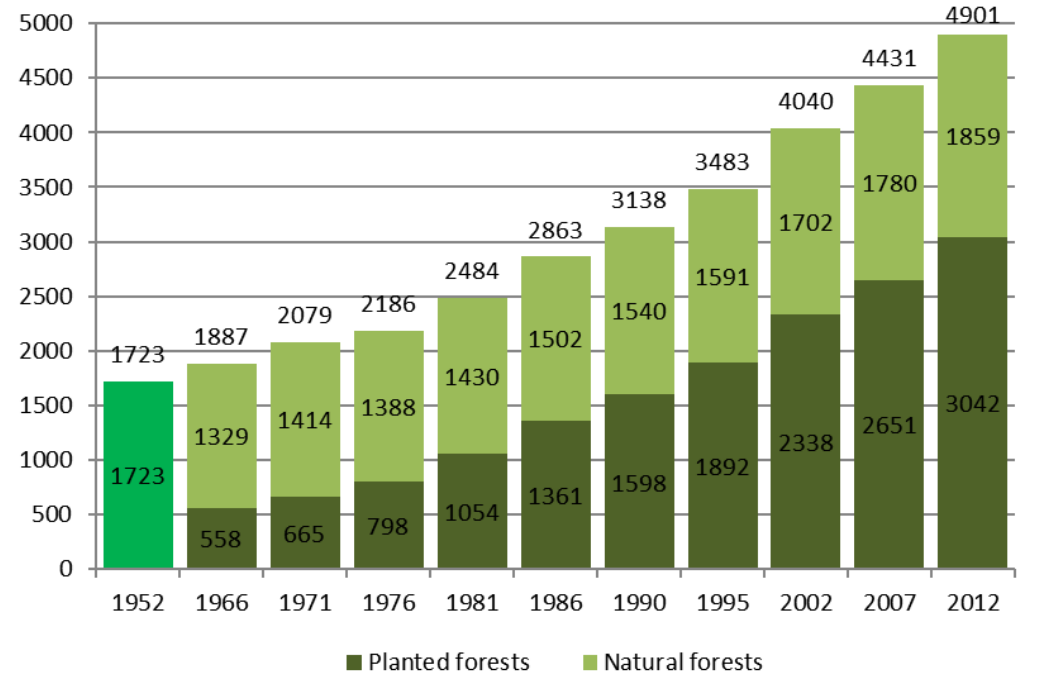
Current State and Trends

Japan's total growing stock has increased 2.6-fold, from 1.887 billion to 4.901 billion m^3, in the nearly half-century period from 1966 to 2012. Since 1990 the stock has been increasing at an annual average of about 80 million m^3.

The increase of the planted forest stock is particularly remarkable. It increased 5.5-fold, from 558 million m^3 in 1966 to 3,042 million m^3 in 2012. Its ratio to the total growing stock also increased from 30% to 62% during the same period.

[20] ***Growing stock*** is the volume of the stems of standing trees in forests.

Figure20: Change in the total growing stock of Japan's forests (million m³)



Note 1: Values as of March 31 of each year since 1966

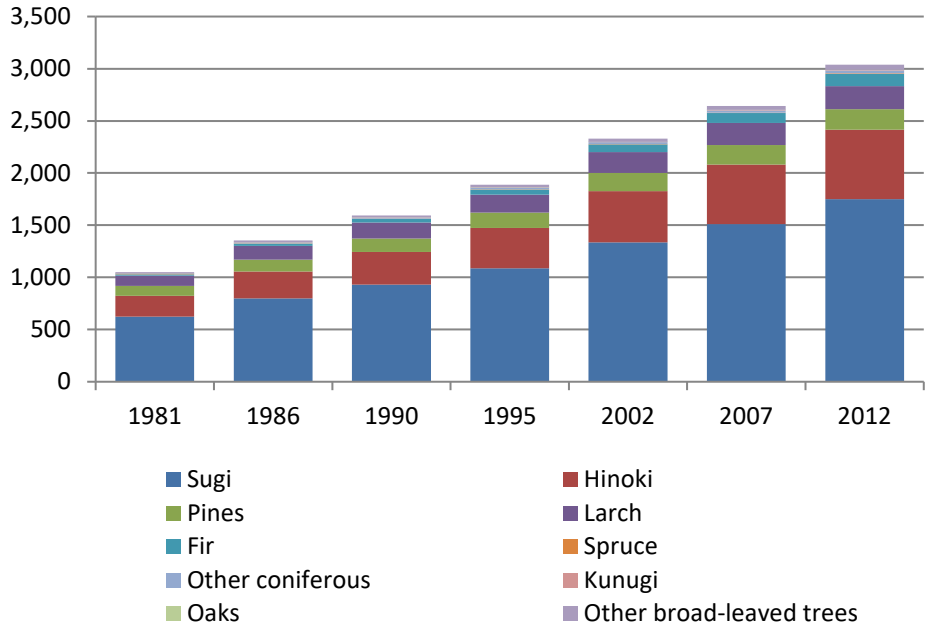
Note 2: Simple comparison with the values of 2007 and 2012 is not possible because prefectures tried to improve accuracy by reviewing yield tables, for example.

Source: Forestry Agency. State of Forest Resources

As regards the composition of species in growing stock of planted forests, *sugi* (*Cryptomeria japonica*) accounts for the largest part, followed by *hinoki* (*Chamaecyparis obtusa*). They are Japan's indigenous forest species that have been used for planting from old times and that are also widely used for commercial purposes, including building material thanks to their straight shape, good workability, and relatively rapid growth.

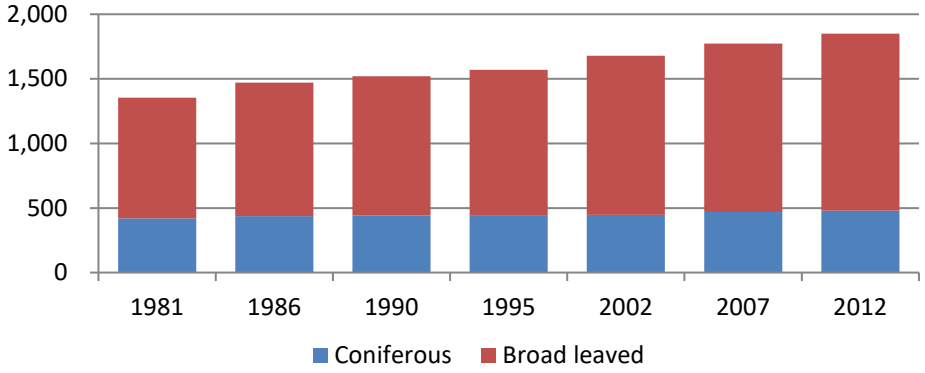
The growing stock of natural forests, mostly consisting of broad-leaved trees, is also increasing with the progress of their succession as a result of the disuse of fuel wood forests surrounding communities.

Figure 21: Change in the growing stock of planted forests (million m^3)



Source: Forestry Agency. State of Forest Resources

Figure 22: Change in the growing stock of natural forests (million m^3)



Source: Forestry Agency. State of Forest Resources (as of March 31, 2007)

INDICATOR 2.c Area, percent and growing stock of plantations of native and exotic species

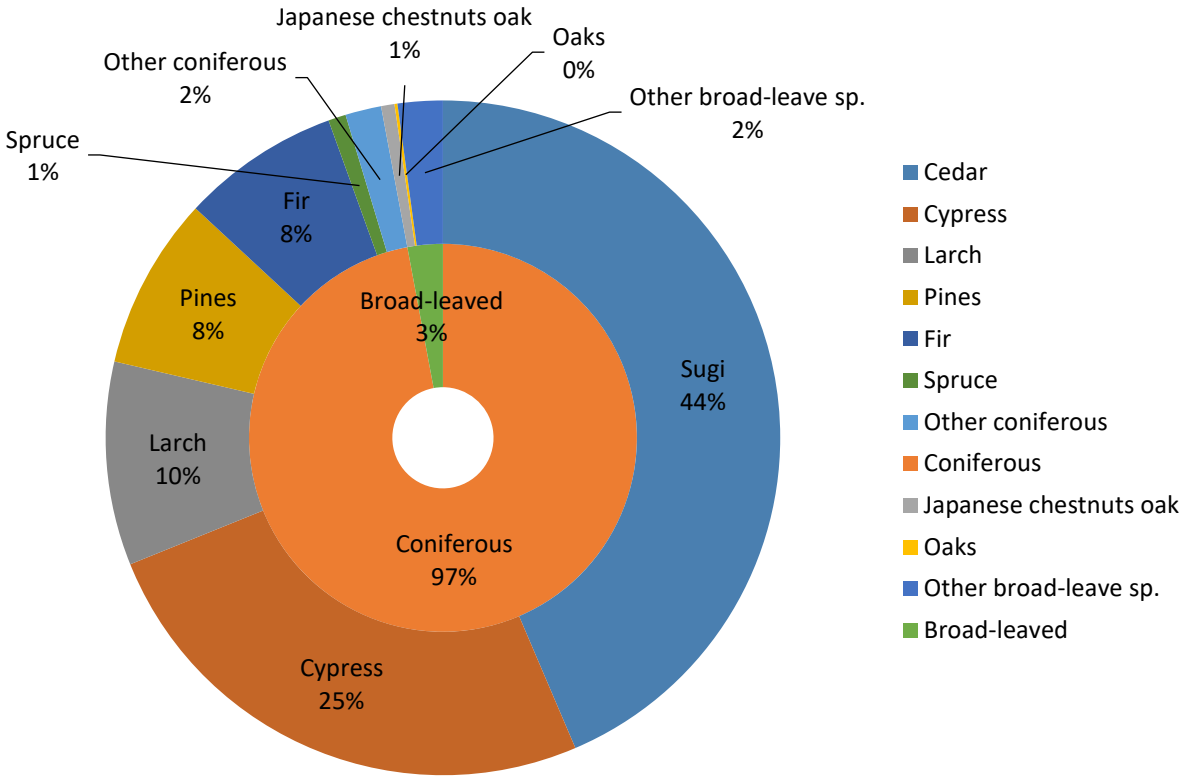
Rationale

This indicator provides information on the nature and extent of plantation forests. Changes in the area of plantation reflect society's present and future needs or the impact of competing land uses on forest cover. The use of both native and exotic plantation species may enhance the range and quantity of goods and services available.

Current state and trend

Planted forests cover approximately 10.29 million ha in Japan, accounting for 41% of its total forest area. Regarding the species, Japanese cedar holds the highest percentage, occupying 44%, and is followed by Japanese cypress and Larch (*Larix kaempferi*), occupying 25% and 10% respectively. The major species for planting in Japan are all native species.

Figure 23: Composition of species in area of Japan's planted forests (%)

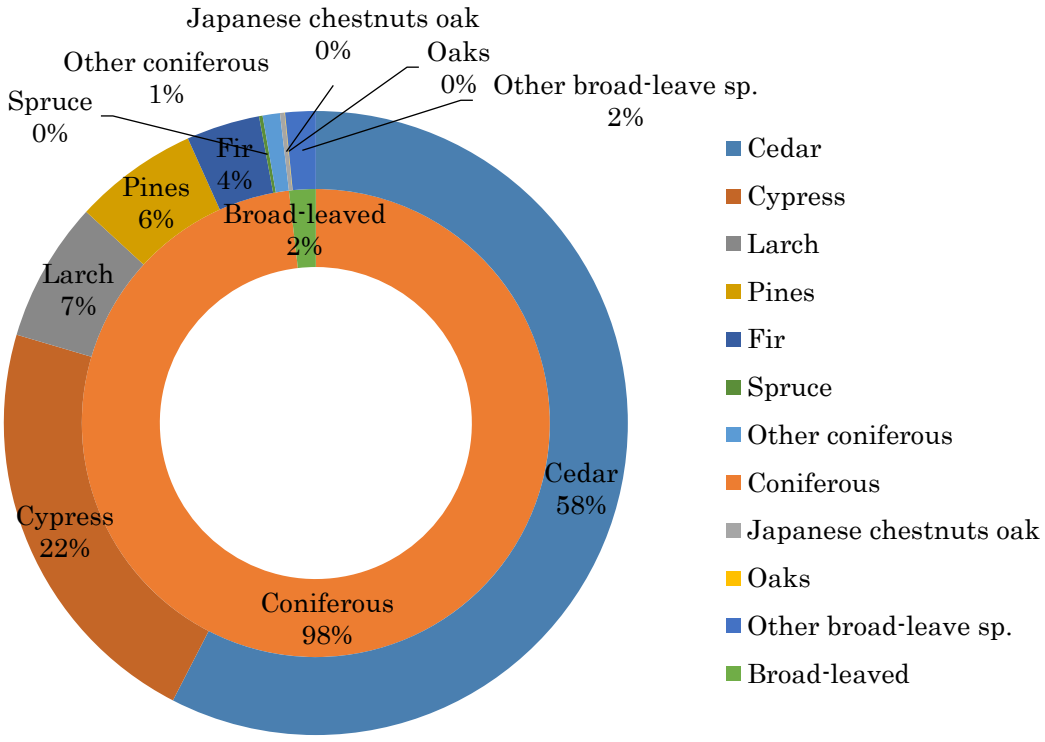


Source: Forestry Agency, State of Forest Resources (2012)

According to the third stage of the National Forest Inventory of Japan, among planted forests, the plots in which exotic species have become the dominant is accounted for 1.03% of the overall plots. Of which, bamboos, such as thick-stemmed bamboo (*Phyllostachys edulis*), giant timber bamboo (*Phyllostachys bambusoides*) and henon bamboo (*Phyllostachys nigra var. henonis*), coniferous trees, such as strobe pine (*Pinus strobus*), Dahurian larch (*Larix gmelinii*) and Norway spruce (*Picea abies*), and broad-leaved trees, such asblack lotus (*Robinia pseudoacacia*), kaki (*Diospyros kaki*) and empress tree (*Paulownia tomentosa*), were observed.

In 2012, the growing stock of planted forests was approximately 3.042 billion m^3, accounting for approximately 62% of the total growing stock of the forests in Japan. Japanese cedar, Japanese cypress and larch accounted for 58%, 22% and 7% of such growing stock, respectively.

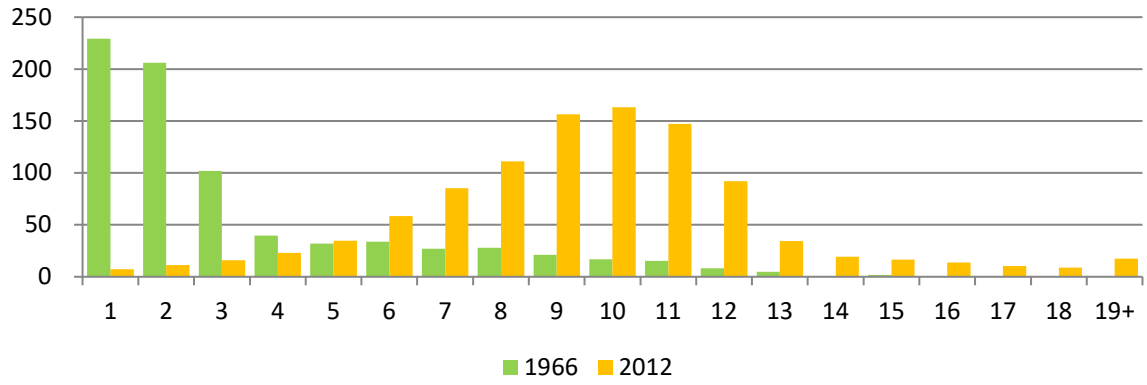
Figure 24: Composition of species in growing stock of planted forests (%)



Source: Forestry Agency, State of Forest Resources (2012)

The majority of the planted forests of Japan were established during the late 1950s through the early 1970s while wood demands for construction and pulp was increasing under the rapidly growing economy. Nowadays, about half such forests have reached the age higher than age class 10, a stage in which they can be used as resource.

Figure 25: Change in composition of age class of planted forests (10 thousand ha)



Source: Forestry Agency, State of Forest Resources

New movement is emerging in development of silviculture techniques. This movement is supported by increasing interests to coniferous and broad leaves trees that grow fast, in the context of reducing re-planting costs etc.

INDICATOR 2.d Annual harvest of wood products by volume and as a percentage of net growth or sustained yield

Rationale

This indicator compares actual harvest levels against what is deemed to be sustainable. The purpose is to assess whether forests are being harvested beyond their ability to renew themselves or are being under-utilised for wood products.

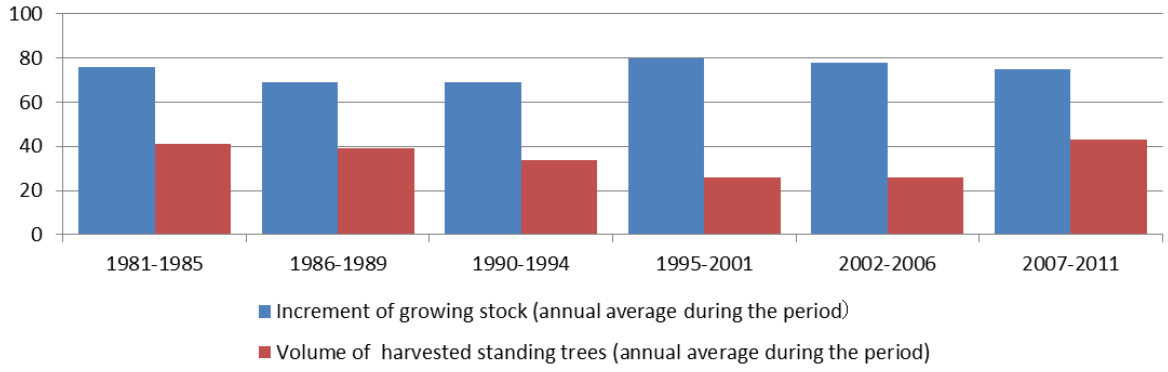
Current State and Trends

In the past 30 years, forest growing stock has increased by about 70 to 80 million m^3 on annual average. The change of growing stock is obtained by subtracting the harvest and loss through natural processes from the net growth of forests. An increasing trend means that the harvest is within the range of the net growth of forests as a whole. Therefore, the level of forest harvest is within a sustainable range.

The volume of harvested standing trees had continued to decline at an annual average of 30 to 40 million m^3, but increased by 43 million m^3 on annual average for five years from 2007 to 2011. This is considered to be partly because a goal of thinning 3.3 million ha for six years from FY2007 to FY2012 was set toward securing of the forest sequestration set forth in the Kyoto Protocol Target Achievement Plan and efforts were made for its steady implementation.

An additional boost may have been provided by the progress of technology development. For example, small-diameter coniferous log produced by thinning turned out usable as plywood material in the first half of the 2000s. As mentioned in Indicator 2.c, Japan’s planted forests as a resource has reached maturity. In order to establish a cyclic utilization system of forest resource of cutting, planting and tending, the promotion of regeneration cutting is also expected.

Figure 26: Changes in average annual increment of growing stock and harvested volume (million m³)



Note: Increase in growing stock for 2007-2011 includes estimated values.

Source: Forestry Agency. State of Forest Resources, Statistics on forest and forestry

INDICATOR 2.e Annual harvest of non-wood forest products

Rationale

This indicator reports on the sustainability of the harvest of non-wood forest products. The wellbeing of indigenous and other communities dependent on non-wood forest products may be closely allied to forests' ability to maintain productive capacity over time

Current State and Trends

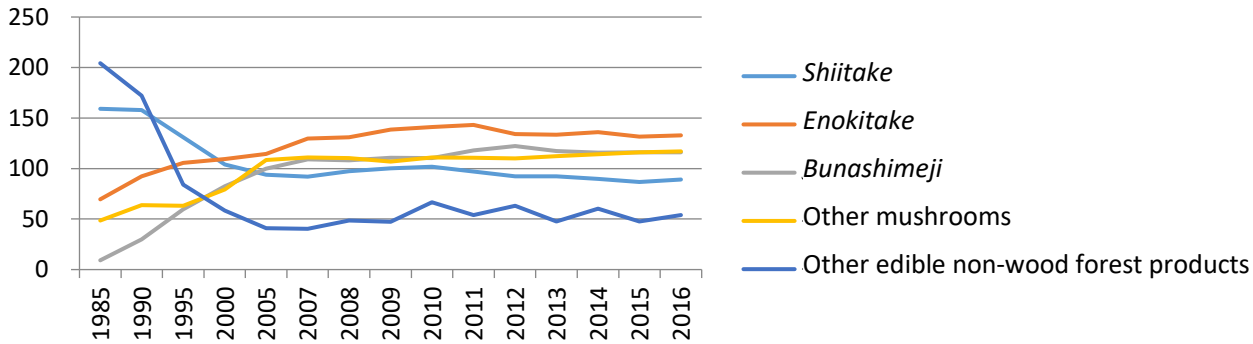
Edible mushrooms such as *shiitake*, *enokitake*, and *bunashimeji* mushrooms, tree fruits, and edible wild plants are included in non-wood forest products. The production and sales of these products are one of the industries using local resources of farming and rural mountain communities and have been fulfilling a major role in ensuring the stability of the regional economy and securing job opportunities.

Edible mushrooms, in particular, are major products which account for about 90% of edible non-wood forest products in volume. The production of *enokitake* mushroom is the largest, at 133,000 tons, followed by *bunashimeji*, at 116,000 tons in 2016. These data are on cultivated mushrooms. The yield of wild mushrooms that are mainly for domestic consumption is not known.

In Japan, more than 2,000 kinds of wild plants have been processed and eaten as preserved food. Representative kinds are young shoots of certain ferns, such as bracken fern and Asian royal fern, and young sprouts of trees, such as Japanese angelica trees.

Damage to crops caused by wild birds and animals living in forests, including deer, wild boars, and monkeys has become a very serious problem. The damage reached 17.6 billion yen in 2015. As a result of the promotion of countermeasures, the number of captured wild animals has been increasing year by year. In response, efforts to use captured animals as local resources, such as game meat, are spreading to many regions. The Ministry of Agriculture, Forestry and Fisheries, in cooperation with the Ministry of Health, Labour and Welfare, are working to ensure the safety of game meat as food while at the same time supporting efforts to develop meat processing facilities for captured birds and animals, develop game-meat products based on consumer needs, and establish distribution and marketing channels. Because the distribution of game meat requires the development of unified handling standards and display information, the ministry supports the formulation and operation of unified specifications of game meat by private groups. Its experimental operation started in FY2017.

Figure 27: Change in volume of production of on-wood forest products (thousand tons)



Source: Forest Agency. Basic Data of Edible Non-wood Forest Products

Criterion 3 Maintenance of forest ecosystem health and vitality

The maintenance of forest health and vitality is dependent upon the ability of the forest ecosystem's functions and processes to recover from or adapt to disturbances. While many disturbance and stress events are natural components of forest ecosystems, some may overwhelm ecosystem functions, fundamentally altering their patterns and processes and reducing ecological function.

Decline in forest ecosystem health and vitality may have significant economic and ecological consequences for society including a loss of forest benefits and the degradation of environmental quality.

Information gained on the impacts of biotic and abiotic processes and agents may inform management strategies to minimize and mitigate risk. The maintenance of forest ecosystem health and vitality is the foundation of sustainable forest management.

INDICATOR 3.a Areas and percent of forest affected by biotic processes and agents (e.g. disease, insects, invasive alien species) beyond reference conditions

Rationale

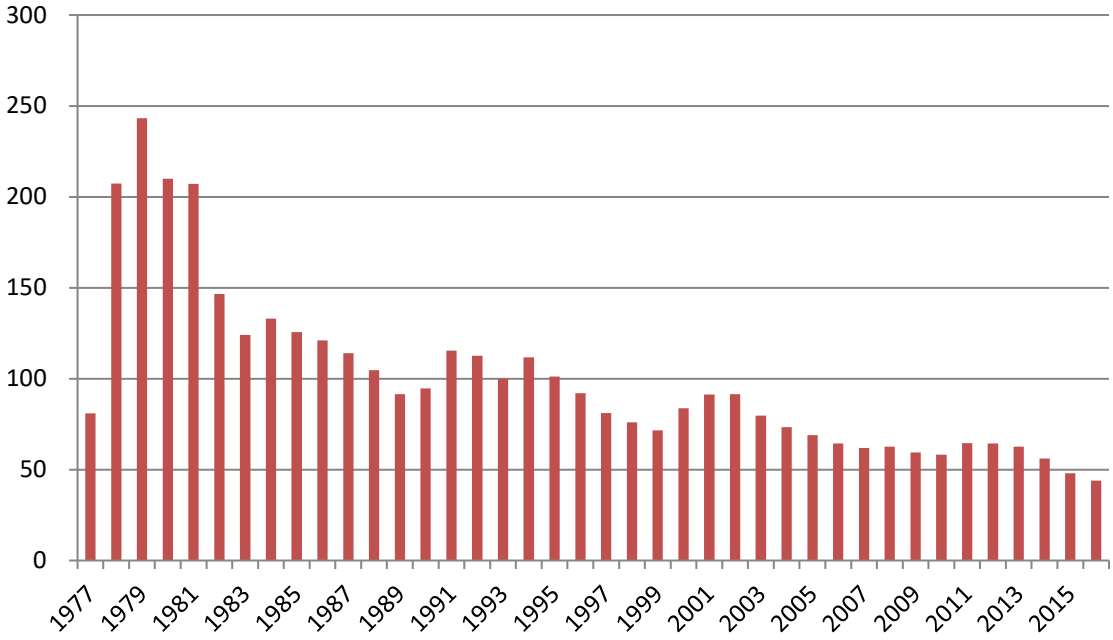
This indicator identifies the impact that biotic processes and agents have on forests. Where change due to these agents and processes occurs beyond a critical threshold, forest ecosystem health and vitality may be significantly altered and a forest's ability to recover could be reduced or lost. Monitoring and measuring the effects of these processes provides information helpful in the formulation of management strategies to mitigate risk.

Current state and trend

Pine wilt disease and Japanese oak wilt are major forest pests and diseases which damages forests in Japan.

Pine wilt disease occurs when pine wood nematode (*Bursaphelenchus xylophilus*) carried by the pine sawyer beetle (*Monochamus alternatus*) enter inside the body of pine trees. The volume of trees damaged by the disease recorded the highest of approximately 2.43 million m^3 in 1979 but has been declining over the long-term. In 2016, the volume was approximately 0.44million m^3, about one-fifth of the peak. However, it is still the most significant forest pests and disease in the country, and damages still occurr in all prefectures but Hokkaido in Japan.

Figure 28: Change in volume of trees damaged by pine wilt disease (10,000 m³)



Source: Forestry Agency

Figure 29: Plots that were suffered pine beetle syndromes (Third stage)

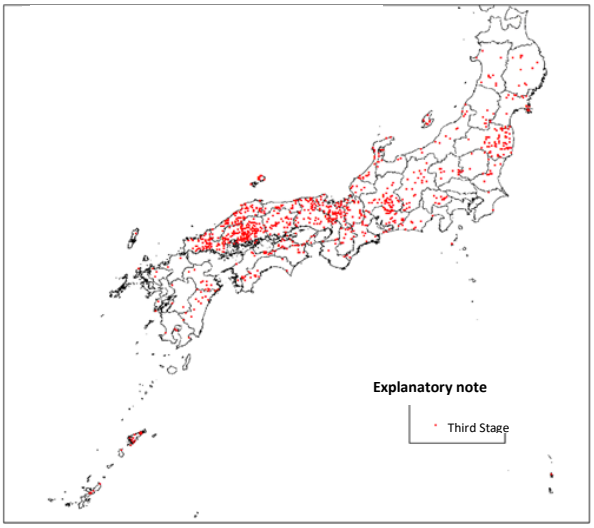
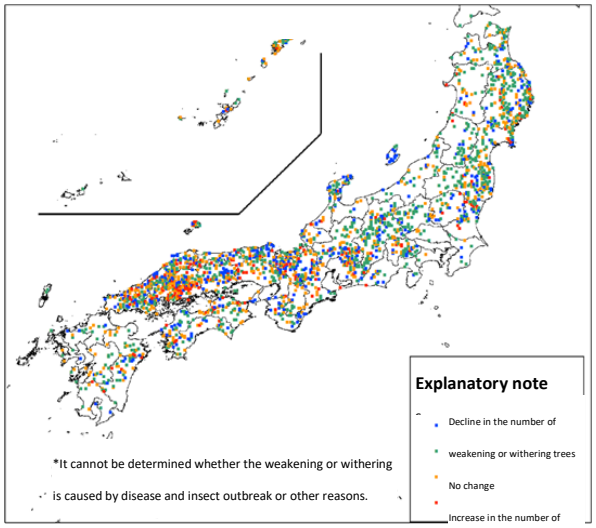


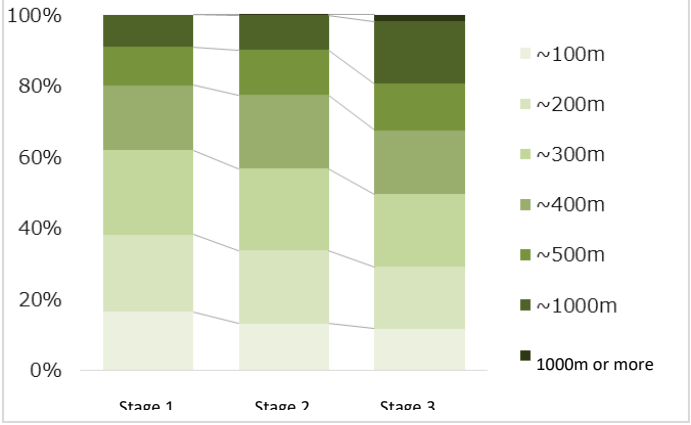
Figure 30: Plots that emerge weakening and withering of pine trees (comparison of second and third stage)



In the National Forest Inventory of Japan, the survey of the state of weakening or withering of standing trees is also taken. The survey is carried by visual observation, and identification test to determine whether the weakening or withering of pine trees is caused by pine beetle syndrome is not conducted. However, it is considered that the survey could contain important information which shows

the distribution of pine beetle syndrome. Especially, in recent years, attention is paid to the fact that occurrence of weakening and withering of pine trees is shifting to higher altitude areas.

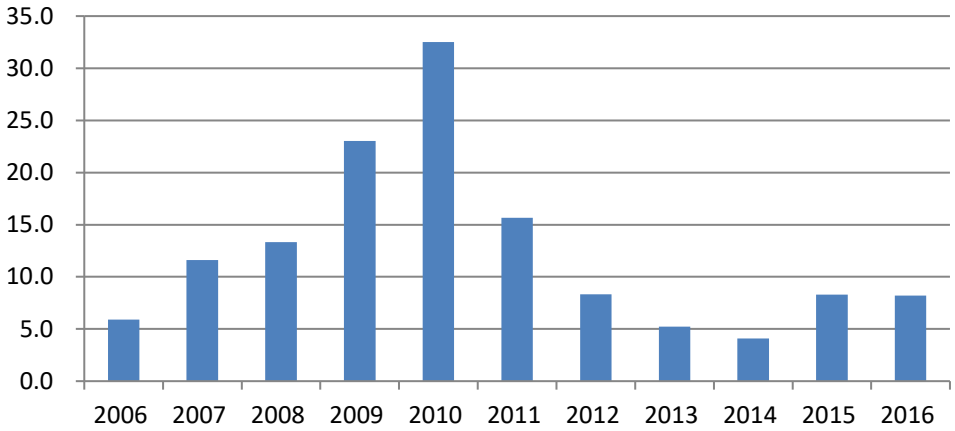
Figure 31: Ratio of plots that emerged weakening and withering of pine trees by altitude



Source: Forestry Agency, National Forest Inventory of Japan (Surveys of first to third stages)

Japanese oak wilt causes collective dieback of oak trees such as Mongolian oaks (*Quercus crispula Blume)*, with pathogenic fungus (*Raffaelea quercivora*) mediated by the Oak platypodid beetle (*Platypus quercivorus*). it is mainly found in the Sea of Japan side of the Honshu island. The volume of the tree damaged across the country was approximately 84,000 m^3 in 2016, about one-fourth of the maximum volume recorded in 2010. However, the area that suffered such damages extends to 32 prefectures.

Figure 32: Change in volume of trees damaged by Japanese oak wilt (10 thousand m^3)



Source: Forestry Agency

Similar to pine beetle syndromes, the distribution of weakening and withering of oak trees can be grasped from the results of the National Forest Inventory of Japan.

Figure 33: Areas that suffered oak withering disease (Third stage)

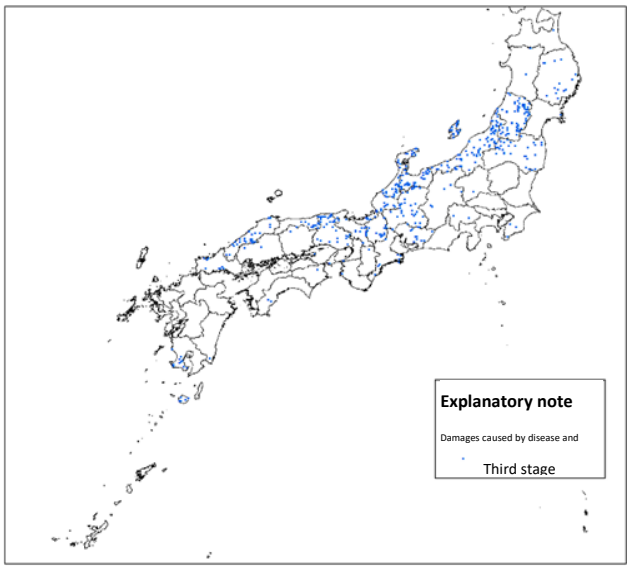
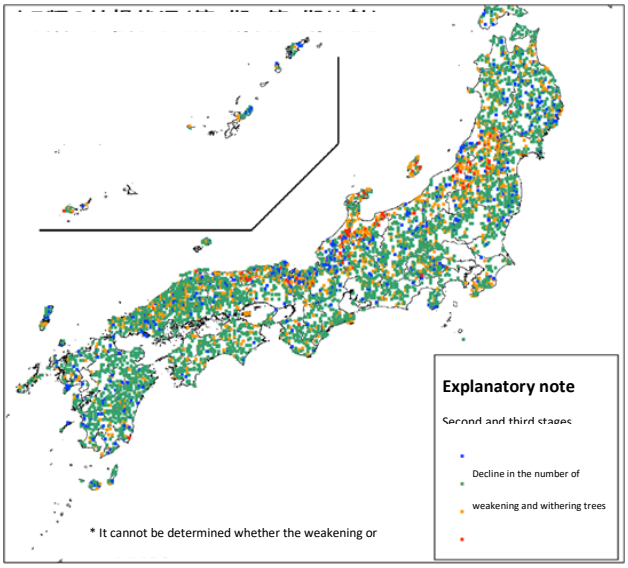


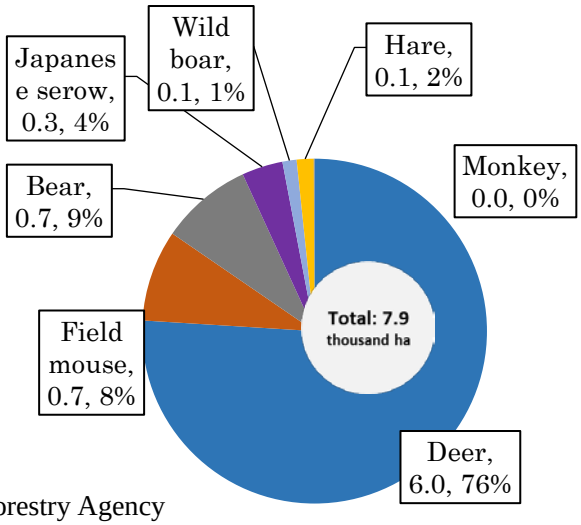
Figure 34: Comparison of the state of weakening and withering of oak trees



Source: Forestry Agency, National Forest Inventory of Japan (Surveys of first to third stages)

In addition, recently, as the habitat of wildlife, such as deer and bear, has been expanded, damage on forests caused by such wildlife has become more serious. The the damaged area in 2015 was approximately 8,000 ha across the country, of which approximately 80% caused by deer. Damages by deer leads to withering of trees or loss of the value of wood due to bark peel of matured trees in addition to inhibition of growth or withering of trees due to browsing of young shoots and bark of planted seedlings. In some forests where the density of deer is substantially high, planted seedlings and understory vegetation less than approximately two meters height can be reached by deer and are lost almost completely due to feeding pressure. In such places, there are concerns over the negative impact on the multiple functions of forests caused by the soil run-off due to loss of ground vegetation damaged by deer stomping.

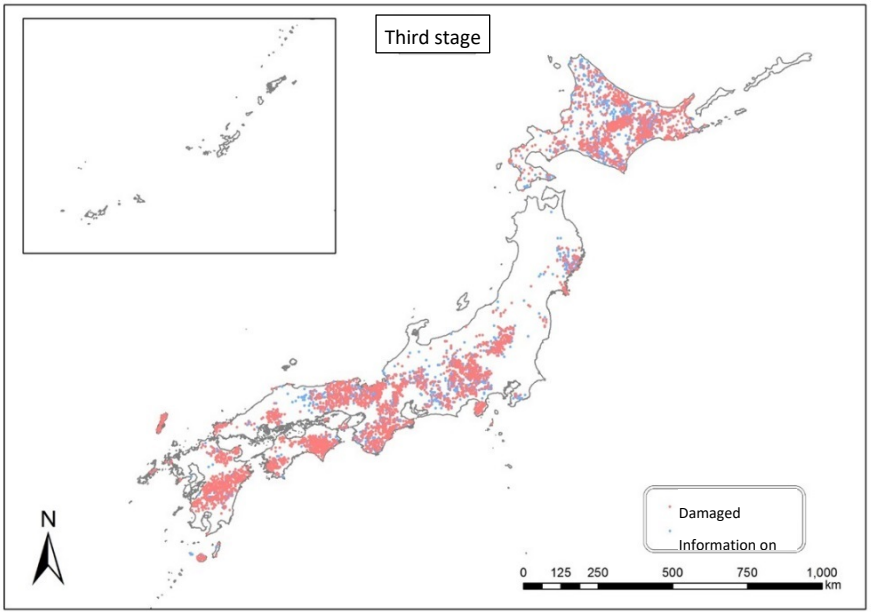
Figure 35: Area and ratio of damages on forests caused by major wildlife (2015)



Source: Forestry Agency

In the National Forest Inventory of Japan, damages caused by wildlife (peeling and feeding damage) as well as information on their habitation (droppings, footprints and furs, etc.) are also surveyed. With respect to deer, information including the distribution of damages is shown as follows.

Figure 36: Distribution of plots that contain information on damages caused by deer or their habitation



Source: National Forest Inventory of Japan (Third stage)

Some exotic species are invasive and threatening the ecosystem by eating the native species in Japan or depriving their habitat or food, thereby posing a serious problem in conserving the biodiversity of Japan in which the biota and ecosystems unique to each area are formed. In Japan, invasive alien species have been designated under the Invasive Alien Species Act and their importation, rearing, etc. are controlled. The number of designated invasive alien species as of May 2018 is 146 (including 2 families, 15 genera, 122 species and 7 crossbreed).

INDICATOR 3.b Area and percent of forest affected by abiotic agents (e.g. fire, storm, land clearance) beyond reference conditions

Rationale

This indicator identifies the impact that abiotic agents, both natural and human-induced, have on forests. Where change occurs due to these agents and processes beyond a critical threshold, forest ecosystem health and vitality may be significantly altered and a forest's ability to recover from disturbance could be reduced or lost. Monitoring and measuring the extent of forest affected by physical agents provides information to guide the formulation of management strategies to mitigate risk.

Current state and trend

Natural disasters in mountainous areas caused by typhoons, snow melting and volcanic activity etc., such as hillside failures and debris flow, tend to occur due to Japan's geographic nature, such as its steep terrain, geological vulnerability, steep river water flow and Japan's global location in volcanic zone.

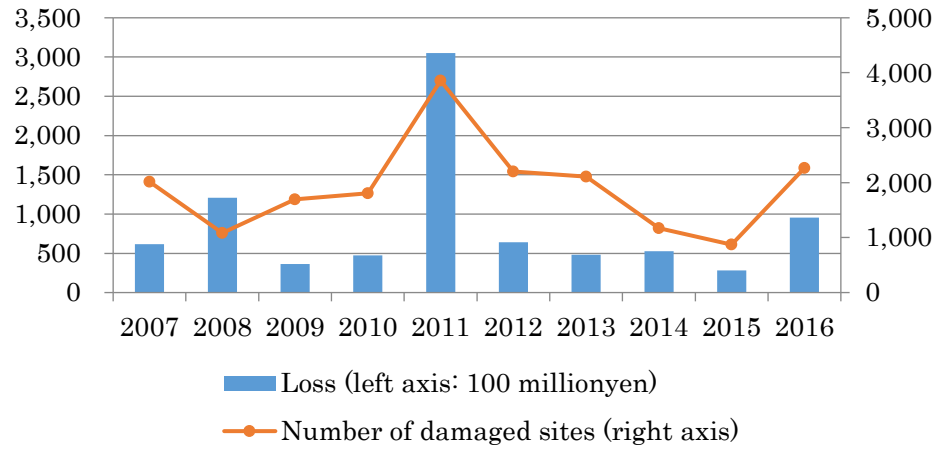
Annual average precipitation is approximately 1,718 mm; about 1.6 times as much as the global average (approx. 1,065 mm)[21]. Some precipitation is brought as torrential rain during the rainy season from early June to mid-July and the typhoon season from July to October and snowfall in the winter season.

In recent years, in addition to the increase trend in intense rainfall, it has been pointed out that heavy rainfall events are likely to be more frequent, in the context of climate change. Thus, there are concerns to the increasing risks of natural disasters in mountainous areas, especially associated with rainfall, in the future.

In the past 10 years from 2007 to 2016, natural disasters in mountainous areas occurred in approximately 1,900 sites per year and the damages are estimated approximately 85.5 billion yen per year. Large damage in 2011 indicates the Great East Japan Earthquake that occurred in March.

[21] Average of Japan is based on "Current State of Water Resources in Japan" (MLIT 2018), and the global average is based on FAO/AQUASTAT.

Figure 37: State of occurrence of forest disasters in recent years



Source: Forestry Agency

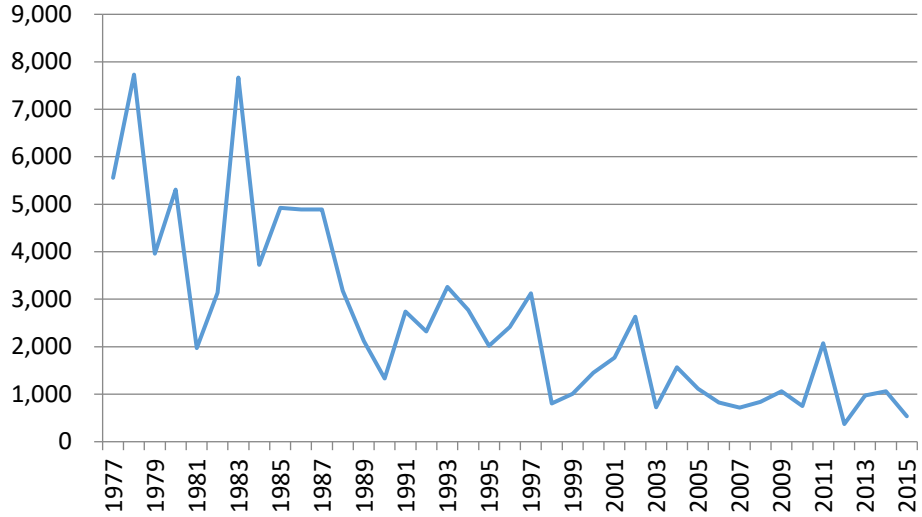
In the Great East Japan Earthquake that occurred in March 2011, a large area of coastal forests on the Pacific Ocean, approximately 140km length in total between Aomori and Chiba prefecture, was destroyed by the resulting tsunami. The coastal forests helped to reduce the damage from the tsunami to some extent by mitigating the tsunami energy and preventing the inflow of drifting materials while trees in lowland were uprooted or washed away. Currently, restoration of damaged coastal forests are carried out and are planning to be completed by the end of 2020.

Picture 1: Damages on coastal forests (Sendai city, Miyagi prefecture)

Picture 2: Restoration of coastal forests (Sendai city, Miyagi prefecture)

Forest fire may record more than 5,000 ha annually until the 1980s, but has been tracking a downward trend and declined to a level of 1,000 ha recently. The causes of forest fires in Japan are mostly human-induced, such as the careless handling of open fire and slash burning. Activities for preventing forest fires, such as awareness raising activities including forest patrol and nationwide campaign for forest fire prevention, are operated as well as institutional development of early warning and control system.

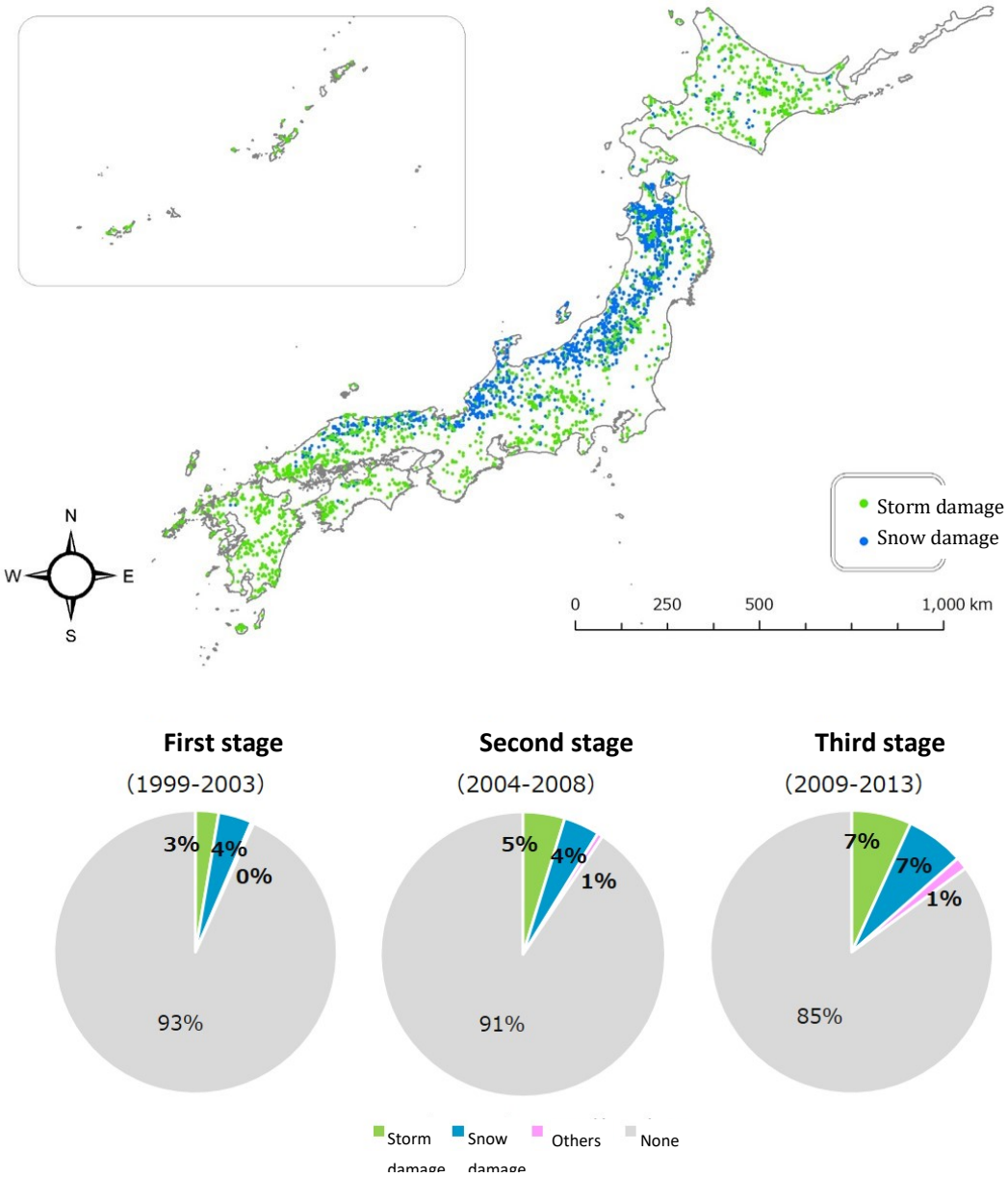
Figure 38: Area of forest burned by forest fires (ha)



Source: Forestry Agency, data based on statistical information available from the Fire and Disaster Management Agency

According to the results of the National Forest Inventory of Japan, 15% of the forests in Japan has suffered damages caused by extreme weather events, such as storm and snow, during the five year period 2009 - 2013.

Figure 39: Occurrence of damages caused by extreme weather events (Third stage)



Source: Forestry Agency, National Forest Inventory of Japan (Surveys of first to third stages)

Criterion 4 – Conservation and maintenance of soil and water conservation

Soil and water underpin forest ecosystem productivity and functions. Forest ecosystems play an important role in the regulation of surface and groundwater flow and, together with associated aquatic ecosystems and clean water, they are essential to the quality of human life.

The interactions of soil, water, climate, topography, and biological activities influence the character and health of streams and rivers flowing through and from forests. Monitoring change in the chemical, physical, and biological characteristics of soil, water and aquatic systems provides valuable information to support sustainable forest management.

Forest management activities can significantly alter forest soils, water quality and quantity, and associated aquatic habitats. Appropriate forest management can protect and conserve the soil and water values of a forest and of downstream land uses. Inappropriate management may result in soil compaction, soil erosion, loss of riparian buffering capacity, increased sediment loads in streams, degradation and destruction of riparian and aquatic habitats and altered flow regimes. The quantity of water flowing from a catchment can vary due to forest management activities in the catchment, including both forest harvesting and the establishment of new forests, depending on previous land use in that catchment. Change in water flow can lead to an increased risk of flooding or to a reduction in the quantity and flow of water in streams and affect other land use activities downstream. Both outcomes can have detrimental implications for human safety, property, and economies.

Soil and water health, quality and resources may be protected through the allocation of land for that purpose or through appropriate management regimes and best management practices.

4.1 PROTECTIVE FUNCTION

Healthy and productive forests depend on the maintenance of the soil and water resource. Forests also regulate these resources by moderating the flow of water, controlling erosion, maintaining water quality, and preventing catastrophic events such as flooding, avalanches and mudslides.

INDICATOR 4.1.a Area and percent of forest whose designation or land management focus is the protection of soil or water resources

Rationale

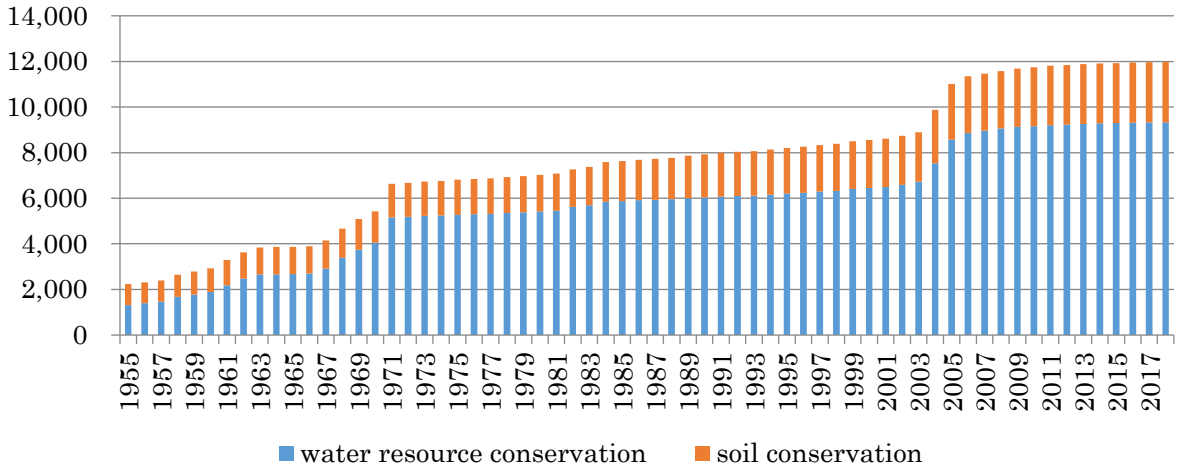
The area and percent of forest designated or managed primarily for the protection and regulation of soil and water reflects the importance of these resources to society, including the tradeoffs made between other uses.

Current state and trend

Currently, approximately 12 million ha of forests, which account for 48% of the total area of Japan's forests, are designated as the protection forest for the conservation of soil and water resources. The area of these protection forests has constantly increased since their establishment in 1897.

Protection forests are forests designated by the Minister of Agriculture, Forestry and Fisheries or the prefectural governor in order to achieve specific public objectives, such as headwater conservation, disaster prevention including erosion control and formation of living environments. In protection forests, logging operations and changes to the form and nature of land, etc. are regulated to secure the function of forests in line with the respective purpose. There are 17 types of protection forests based on the designated objective including those other than water resource conservation and soil conservation as mentioned herein.

Figure 40: Change in areas of protection forests for soil and water resource conservation (1,000ha)



Source: Forestry Agency (Soil conservation shows the total area of protection forests for soil conservation while water resource conservation shows the total area of protection forests for headwater conservation and drought prevention)

Table 5: Area of protection forests related to conservation of water resources and soil (as of March 31, 2018)

	Area of protection forests (ha)
Headwater conservation	9,204,127
Drought prevention	126,050
Subtotal related to water resources	9,330,177
Soil run-off prevention	2,595,753
Landslide failure prevention	59,769
Subtotal related to soil conservation	2,655,522
Total (ha)	11,985,699

Table 6: Categories of protection forests

Category No.1	Headwater conservation
2	Soil run-off prevention
3	Hillside failure prevention
4	Sand shift prevention
5	Windbreak
6	Flood damage mitigation
7	High tide and salty wind damage mitigation
8	Drought prevention
9	Snow-break
10	Fog inflow prevention
11	Avalanche prevention
12	Rockfall prevention
13	Fire spread prevention
14	Fish breeding
15	Navigation landmark
16	Public health
17	Landscape conservation

4.2 SOIL

Forest soils support forest productivity and other ecological and hydrological functions through their ability to hold and supply water and nutrients, store organic matter, and provide habitats for plant roots and for a wide range of soil organisms. These soil-related functions are mainly found on or around the forest floor. A decrease or loss of soil resources or inappropriate disturbance of the forest floor may bring about a decline and deterioration of the provision and adjustment of forest health and other ecosystem services.

INDICATOR 4.2.a Proportion of forest management activities that meet best management practices or other relevant legislation to protect soil resources

Rationale

This indicator provides information about the extent to which soil resource protection, legislation, and best management practices have been embodied and integrated into forest management activities. Inappropriate activity may result in the loss of soil nutrients, forest productivity, and other ecosystem services that soils provide.

Current State and Trends

As stated in Indicator 4.1.a, protection forests are designated for the conservation of soil and water resources and other purposes. Currently about 3 million ha forests are designated as protection forests mainly for the conservation of soil resources. In protection forests, logging operations and changes to the form and nature of land, etc. are regulated in line with the respective purpose. A technical guideline is also provided for the effective and efficient implementation of the forest conservation program, which is carried out for the restoration of devastated forests and forest land.

As a basic guideline on the handling of forests toward the fulfillment of the multiple forest functions, the nation-wide forest plan establishes guidelines on forest management practices and protection for each of (1) water resource conservation, (2) mountainous disaster prevention/soil conservation, (3) comfortable environment creation, (4) health and recreation, (5) culture, (6) biological diversity conservation, and (7) timber production functions.

For forests requiring the prevention of soil run-off, hillside failure, or other mountainous hazards—including forests at risk of a landslide, etc. that could involve human lives and damage houses and other facilities—, the plan promotes improvement and conservation to maintain and enhance mountainous disaster prevention/soil conservation functions. Specifically, in order to develop a disaster-resilient nation, the plan sets forth the promotion of management practices to reduce and avoid forest-floor denudation, and management practices using natural forces with consideration of the topography, nature of the soil and other conditions. For areas with a high risk of mountainous disasters close to rural communities, the plan promotes the designation and appropriate management of protection forests to secure fulfillment of the functions to prevent sediment outflow, and when necessary to prevent bank erosion or fix spurs, promotes the setting up of valley closing, soil retaining, or other facilities.

Forest areas for which maintenance and enhancement of mountainous disaster prevention/soil conservation functions are promoted are identified in the Local Forest Improvement Plan, which are formulated by municipal mayors for private forests, and in the Regional Plan for National Forest.

Currently 4.81 million ha are designated across the country. These forests are managed in line with the management practice policy set force in the respective plans above, technical guidelines for forest conservation, facility management guidelines for appropriate management of forest conservation facilities, and other relevant rules and guidelines.

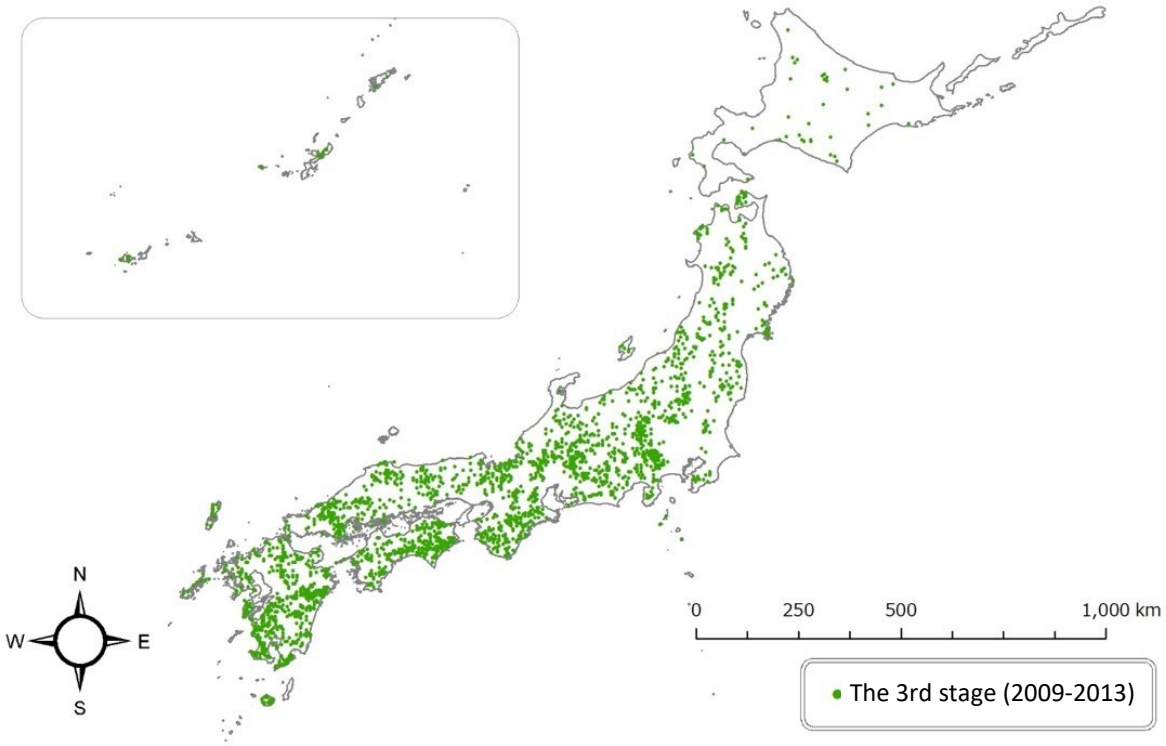
INDICATOR 4.2.b Area and percent of forest land with significant soil degradation

Rationale

This indicator provides information on the extent of significant soil degradation in forests likely to affect productivity, hydrology, ecosystem processes, or social and cultural benefits. This indicator is primarily concerned with degradation caused directly or indirectly by human induced activity.

Current State and Trends

Figure 41: Distribution of soil erosion



Note: The dots indicate the plots where any of a soil column, rill, or gulley was found.

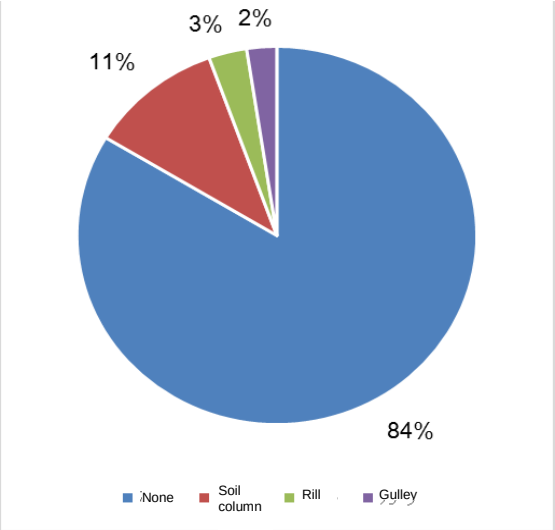
The situation of forest soil erosion was assessed based on the results of the third stage of the National Forest Inventory of Japan. Specifically, incidences of a soil column,[22] rill, or gulley[23] are considered

[22] A type of soil erosion trace where the soil layers under stones, roots on the ground, or branches/leaves were protected from rain drop erosion and have remained in the shape of a column of 2cm or higher.

[23] A type of soil erosion trace. A groove caused by surface running water and whose depth is less than 30cm (excluding grooves that gather water due to the landform such as the head slope of a swamp) is called a "rill," and a groove that

as soil erosion, and are checked in the vegetation survey area set up in plots. Soil erosion was found in 16% of the plots: in the breakdown, soil columns account for 11%, rills for 3% and gullies for 2%. As regards geographical distribution, soil erosion seems to be found more often in plots in central and western regions. Whether the soil erosion was caused by human induced activities or natural processes cannot be determined.

Figure 42: Percentage of the plots where soil erosion was found



Picture 3: Soil column

Picture 4: Rill

Picture 5: Gulley

Source: Forestry Agency. National Forest Inventory of Japan (Third stages) and its website

Looking at the percentage of the plots with soil erosion by forest type, the ratio was 18% for planted forests, and 15% for natural forests. No significant differences were found.

has further developed reaching 30cm or deeper (excluding a groove that gathers water due to the landform, such as head slope of a swamp, and a groove constantly having running water) is called a "gulley."

4.3 WATER

Water is one of the most important forest-based ecosystem services. Forests and soil, and how they are managed, have an impact on the volume, quality and runoff time of surface and ground water. Effect factors include logging, forest development on land where there was no forest or other planned activities, as well as changes in the forest structure and species structure as a result of unplanned events, such as a forest fire. Changes to water quality and flow can have a severe impact on forest resources as well as human wellbeing. In addition, aquatic and riparian habitats close to forests are some of the most biologically diverse and productive forest ecosystems.

The quality and quantity of water supplied by forested areas, including their annual and long-term changes, is commonly regarded as a main constituent of an indicator of the quality of forest management. Water quality is widely understood to be a measure that captures many potential impacts on forest sustainability and a good indicator of overall ecosystem health

INDICATOR 4.3.a Proportion of forest management activities that meet best management practices, or other relevant legislation, to protect water related resources

Rationale

This indicator provides information about the extent to which water resources have been identified and safeguarded during forest management. This indicator is primarily concerned with activities that may affect riparian zones,[24] water quality, quantity, and flow, rather than the designation of land for water-related conservation. The protection of the water resources and associated forest and aquatic ecosystems[25] is vital for the human populations dependent on them.

Current State and Trends

As stated in Indicator 4.1.a, protection forests are designated for the conservation of soil and water resources, and other purposes. Currently about 9 million ha of forests are designated as protection forests mainly for the conservation of water resources. In protection forests, logging operations and changes to the form and nature of land, etc. are regulated in line with the respective purpose. A technical guideline is also provided for the effective and efficient implementation of the forest conservation program, which is carried out for the restoration of devastated forests and forest land. In addition, as a basic guideline on the handling of forests toward the fulfillment of the multiple forest functions, the nation-wide forest plan has established guidelines on forest management practices and protection for each of (1) water resource conservation, (2) mountainous disaster prevention/soil conservation, (3) comfortable environment creation, (4) health and recreation, (5) culture, (6) biological diversity conservation, and (7) timber production functions.

In this plan, the improvement and maintenance of water resource conservation functions will be promoted for forests surrounding water sources situated in dam catchment or upstream of major rivers as well as forests around reservoirs, water welling places, mountain streams and other places important as a region's water source. Specifically, in order to secure the stable supply of quality water, appropriate tending and thinning activities will be encouraged with the promotion of management practices to nurture understory vegetation and root systems. In addition, ground vegetation stripping associated with logging will be reduced and dispersed, management practices using natural potentials will be promoted, including the development of multilayered mixed forests of coniferous and broadleaved species in plantations of interior headwater forests. To ensure the fulfillment of water

[24] ***Riparian zone*** is an area along streams. Riparian zones, which occur in a variety of forms, such as forest, grassland, and wetland, play an important role in conserving soil and biological diversity, as well as conserving water resources and aquatic ecosystems.

[25] ***Aquatic ecosystem*** is an ecosystem found in water bodies, such as oceans, rivers, lakes and wetlands.

resource conservation functions upstream of dams and other water-utilization facilities, the designation and appropriate management of protection forests will be promoted.

Forest areas for maintenance and enhancement of the water resource conservation function are identified in the Local Forest Improvement Plan formulated by the municipal mayor for private forests, and in the Regional Plan for National Forest. Currently 16.47 million ha has been designated across the country. These forests are managed in line with the management practice policy set forth in the respective plans, technical guidelines on forest conservation, facility management guidelines on appropriate management of forest conservation facilities, and other relevant rules and guidelines.

INDICATOR 4.3.b Area and percent of water bodies, and stream length, in forest areas with significant changes in physical, chemical, or biological properties from reference conditions

Rationale

This indicator provides information relating to water quality in forests. Significant changes in the physical, chemical or biological properties of water in forest lakes, rivers and streams may reveal the extent to which management activities or natural events are affecting water quality. Maintaining water quality is important for human use and consumption and to support healthy forest and aquatic ecosystems. Where water quality is being adversely affected by human induced activity, forest management practices may be adapted to protect water values.

Current State and Trends

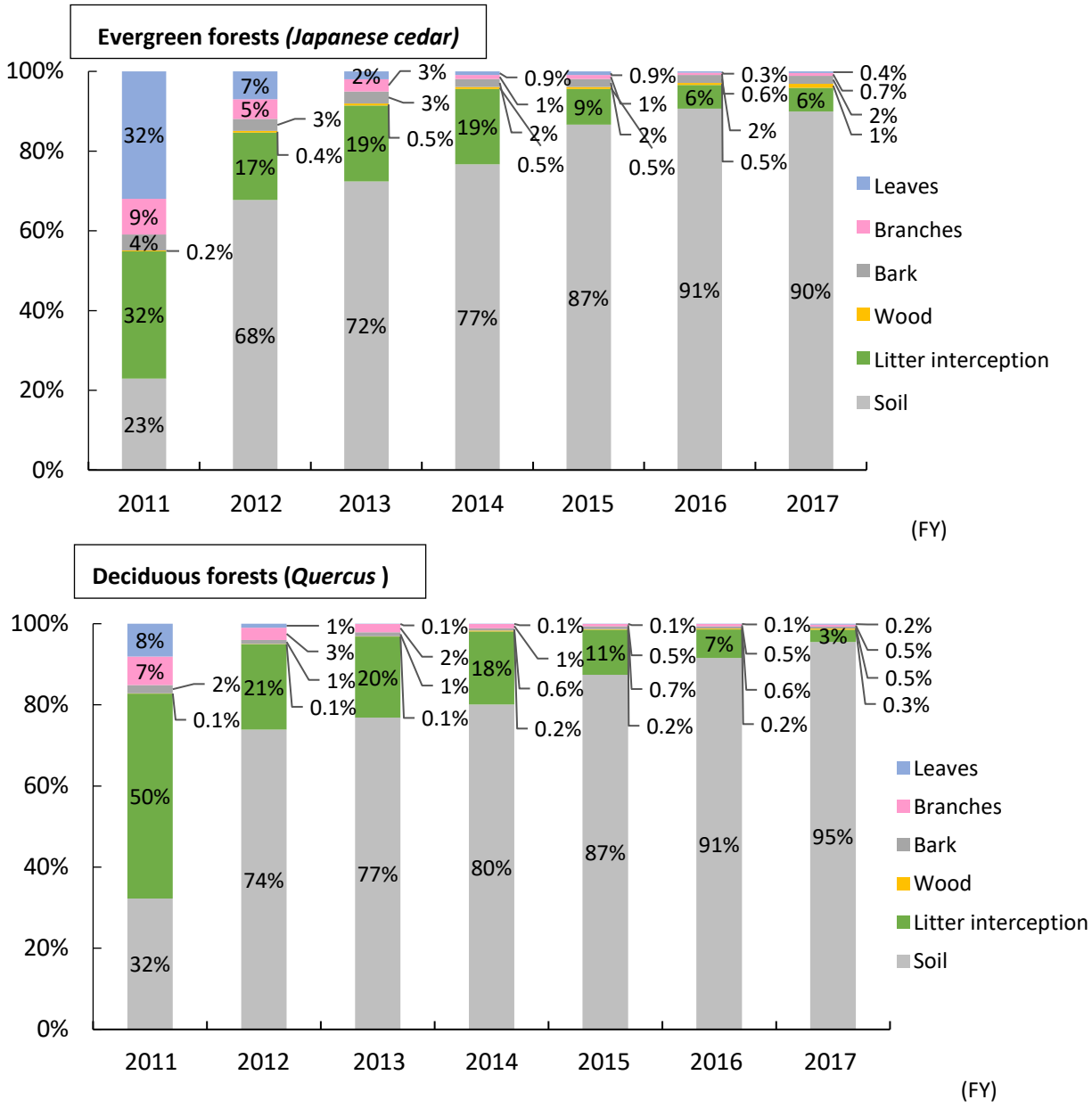
As an attempt to monitor changes in water quality in forest areas, there is "Forest Atmospheric Depositions and Stream Water Chemistry Database" created by the Forestry and Forest Product Research Institute (FFPRI). The database was constructed using water quality data of precipitation and mountain streams that had been observed at branches of the institute since 1995, and related information on water quality observation points. The database includes water quality analysis values (pH, EC, Na+, K+, Ca2+, Mg, Cl-, NO3-, PO43-, etc.) of precipitation (precipitation in- and out-of-forest, and stem flow) and torrent water. According to the Database, no significant change has been found in the water quality of mountain streams to date.

Though not directly related to forest management across the country, emissions of radioactive substances caused by the accident at the TEPCO’s Fukushima Daiichi Nuclear Power Station accompanying the Great East Japan Earthquake that occurred in March 2011 provide an example of an impact on the water quality of mountain streams in forest areas.

The Forestry Agency in cooperation with FFPRI has been monitoring changes in the concentration and accumulation of radioactive cesium since FY2011. No clear change in the accumulation of radioactive cesium in the overall forest area was found on any of the surveyed sites. In terms of distribution, the ratio of accumulation in trees decreased, while the ratio in litter interception and soil increased. Based on the survey on changes in the radioactive cesium accumulation of the whole forest and radioactive cesium concentration in mountain streams, it has become clear that deposited radioactive cesium has remained in the forests and only a small part of them has flown out of the forests.

The Agency will conduct a continuous survey of the distribution, etc. of radioactive substances in forests. Based on the survey results, the Agency will advance the verification of technologies to address radioactive substances, which is necessary for forest improvement.

Figure 43: Change in the percentage of radioactive cesium accumulation by part in the surveyed sites



Source: Forest Agency website, "FY2017 Survey Result of Radioactive Substance Distribution in Forests"

Criterion 5 - Maintenance of forest contribution to global carbon cycles

Forests are renewable and one of the largest terrestrial reservoirs of biomass and soil carbon. They have an important role in global carbon cycles as sinks and sources of carbon. Carbon stocks in forests include above ground biomass, belowground biomass, dead and decaying organic matter and soil carbon. Carbon is also stored in wood products.

The biosphere has a significant influence on the chemical composition of the atmosphere. Vegetation draws CO2 from the atmosphere, through photosynthesis and returns it through respiration and the decay of organic matter. The interchange between the biosphere and atmosphere is large; approximately a seventh of total atmospheric CO2 passes into vegetation each year.

Global climate change could have significant impacts on the structure, distribution, productivity, and health of temperate and boreal forests as well as impacts on forest carbon stocks and fluxes, and the prevalence of forest fires, disease and insect outbreaks, and storm damages.

Forest management practices also affect the carbon cycle and fluxes. Deforestation has a negative impact, but management activities that maintain and enhance the carbon stored in forests and forest products over the medium to long term can make a positive contribution to mitigating atmospheric carbon dioxide levels. In addition, biomass from forests can be used as a substitute for fossil fuels thereby reducing greenhouse gas emissions.

Change in the global carbon cycle and associated climate change will have major impacts on human wellbeing, especially rural communities and indigenous peoples dependent directly on the natural environment.

INDICATOR 5.a Total forest ecosystem carbon pools and fluxes

Rationale

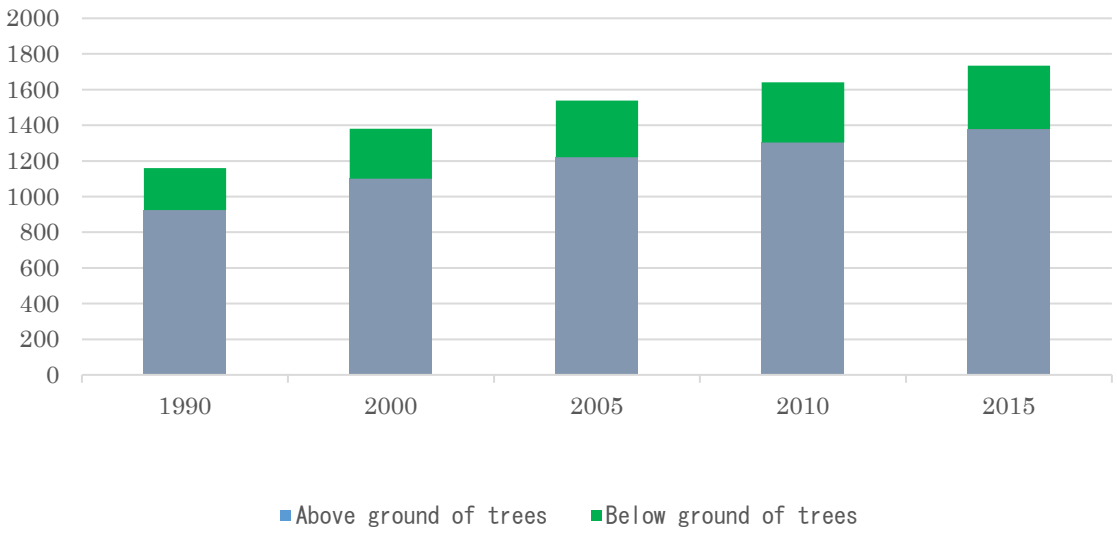
This indicator provides information about the total amount of carbon stored in forest ecosystems. It also describes changes, fluxes or flows in carbon between forests and the atmosphere. A better understanding of these processes will aid the development of appropriate responses to the effects of climate change.

Current state and trend

The total amount of carbon stored in trees is approximately 1.7 billion tons in Japan. Approximately 80% of the carbon stock is stored in the above ground of trees[26] and the rest is stored in their below ground[27].

Regarding the carbon flux, it is estimated that Japan's forests absorbed approximately 16.55 million tons of carbon (approximately 60.7 million CO_2 tons) from the atmosphere in 2016.

Figure 44: Change in amount of carbon stored in trees (million ton)



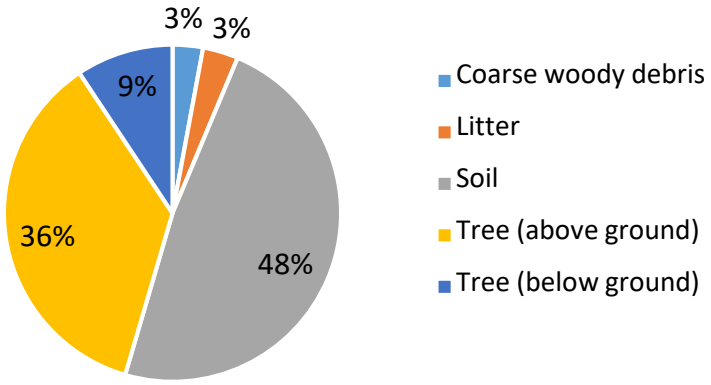
Source: Forestry Agency

The amount of carbon stored in the forest ecosystem other than trees is shown in the results of the

[26] ***Above ground part*** includes stems, bark, branches and leaves.
[27] ***Below ground part*** includes living roots.

survey conducted during the period from 2006 to 2010.[28] In combination with the amount of carbon stored in trees mentioned above, ratio of carbon stored in the forest ecosystem is estimated. The result shows that carbon stored in soil is accounted for about half of that in the forest ecosystem.[29]

Figure 45: Ratio of carbon stored in the forest ecosystem (2010)



Source: Forestry Agency

[28] Ugawa et al. (2012), "Course woody debris, sedimentary organic matter, amount of carbon accumulated in soil in the forest of Japan: First report of forest and soil inventory" Research Report of the Forestry and Forest Products Research Institute, Volume 11, No. 4

[29] The results were obtained as a result of surveying soil 30cm deep based on the most standard international method.

INDICATOR 5.b Total forest product carbon pools and fluxes

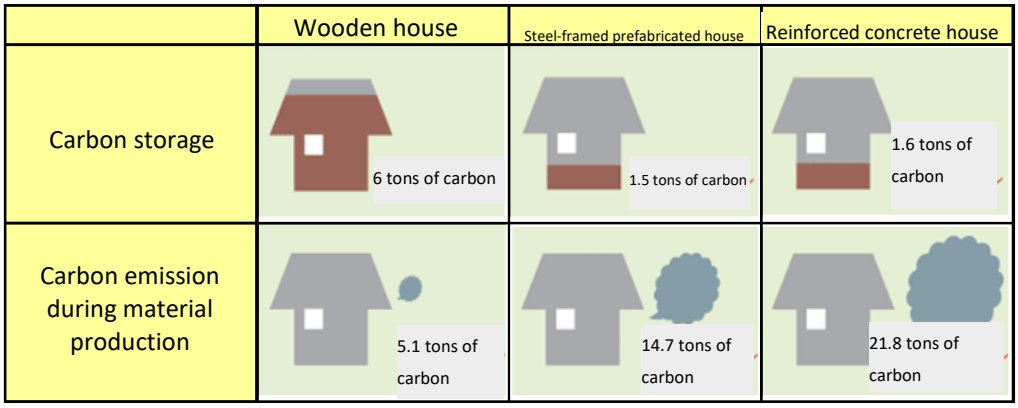
Rationale

This indicator provides information on the role that forest products play in storing, cycling, and releasing carbon. Forest products delay the release of carbon into the atmosphere and are more sustainable than products with manufacturing processes that have significant carbon footprints.

Current State and Trends

Wood contributes to the prevention of global warming in the three aspects of providing carbon storage, acting as an alternative for energy intensive materials, and acting as an alternative for fossil fuel. Because trees take carbon dioxide from the air through photosynthesis and store carbon as wood, using timber for houses, furniture, etc. leads to a reduction of carbon dioxide in the air. For example, it is known that a wooden house stores about four times as much carbon as a steel-framed prefabricated house or a reinforced concrete house does. Furthermore, by processing wood once used as housing materials into particle boards for furniture etc., the time of fixing carbon in wood can be extended.

Figure 46: Carbon storage per house and CO_2 emissions during material production



Source: OHKUMA Motoaki (2003), Global Environment Protection and Wood Use, Zenrinkyo 54.; OKAZAKI Yasuo and OHKUMA Motoaki (1998), Mokuzaikogyo, Vol.53-No.4: 161-163.

The Kyoto Protocol, which was agreed upon under the United Nations Framework Convention on Climate Change, sets a CO_2 reduction goal for each country and presents the rules for calculation of emissions and removals to achieve the goal. The rule of the First Commitment Period (2008-2012) considered that carbon in timber was emitted into the atmosphere when timber is cut and carried out of the forest. For the Second Commitment Period (2013-2020), however, in order to more accurately assess the change in carbon content in wood after cutting and carrying out, and to count this as GHG removal or the relevant country's emissions, countries can count changes in the carbon content stored

in wood used for houses, etc.[30] as their GHG removals or emissions. In this way, the effect of the increase of carbon storage through wood products to mitigate climate change is recognized in the international rule.

In the National *Greenhouse Gas Inventory Report* of Japan that was submitted in April 2018, the country reported CO_2 emissions and removals by harvested wood products as shown in the following table.

Table 7: Changes in CO2 emissions and removals from HWPs (kt-Co2 eq.)

	1990	1995	2000	2005	2007	2008	2009
Emissions/removals	-365	1,481	1,830	618	-402	-444	644
	2010	2011	2012	2013	2014	2015	2016
Emissions/removals	64	2,485	48	301	-923	-1,381	-1,365

Source: National Institute of Environmental Studies (2018)
National Greenhouse Gas Inventory Report of Japan

[30] HWP: Harvested Wood Products

INDICATOR 5.c Fossil fuel carbon emissions avoided by using forest biomass for energy

Rationale

This indicator provides information about the amount of energy produced from forest biomass and the extent to which it offsets the need to burn fossil fuels, thereby benefitting the global carbon budget and lowering carbon emissions.

Current State and Trends

As of 1890, wood and charcoal accounted for 70% of the primary energy supply in Japan, but as the use of coal began in earnest since the time of the Meiji Restoration, the ratio dropped to lower than 10% before around 1920,[31] and their role as a major energy source became limited. In rural areas, wood in the form of charcoal and firewood was widely used as an everyday energy source before the energy revolution in the 1960s, when mainstream fuel changed from coal to oil. Since then, forest biomass was rarely used as energy.

Afterward, especially in the context of global warming, interest in the use of biomass energy as a countermeasure increased. Since the Cabinet Decision on Biomass Nippon Strategy in 2002, measures for the promotion of biomass use have been strengthened and include Agriculture, forestry and fishery biofuel law enacted in 2008 and the Fundamental *Law* of Promoting Usage of *Biomass enacted in 2009.* Based on the Act on Special Measures Concerning Procurement of Electricity from Renewable Energy Sources by Electricity Utilities enacted in August 2011, the feed-in tariff scheme of renewable energy was introduced in July 2012 to oblige electricity utilities to procure electricity generated using renewable energy, including woody biomass, at a fixed price and for a fixed period of time, which has further pushed the trend.

Woody biomass used as an energy source includes mill ends (lumbering waste) generated in sawmills, demolished lumber/scrap wood (building-material waste) generated by demolishing buildings, and thinned wood, forest scraps, etc. generated through timber production activities. According to the "Woody Biomass Energy Use Trend Survey," the volume of wood chips used as energy in 2016 was 7.73 million tons in total (absolute dry weight), consisting of 1.65 million tons of lumbering waste, 3.98 million tons of building material waste, and 1.92 million tons of thinned wood, forest scraps, etc. In addition, 210,000 tons of wood pellets, 50,000 tons of firewood, and 320,000 tons of wood meal were used for energy.

[31] 2018 Energy White Paper

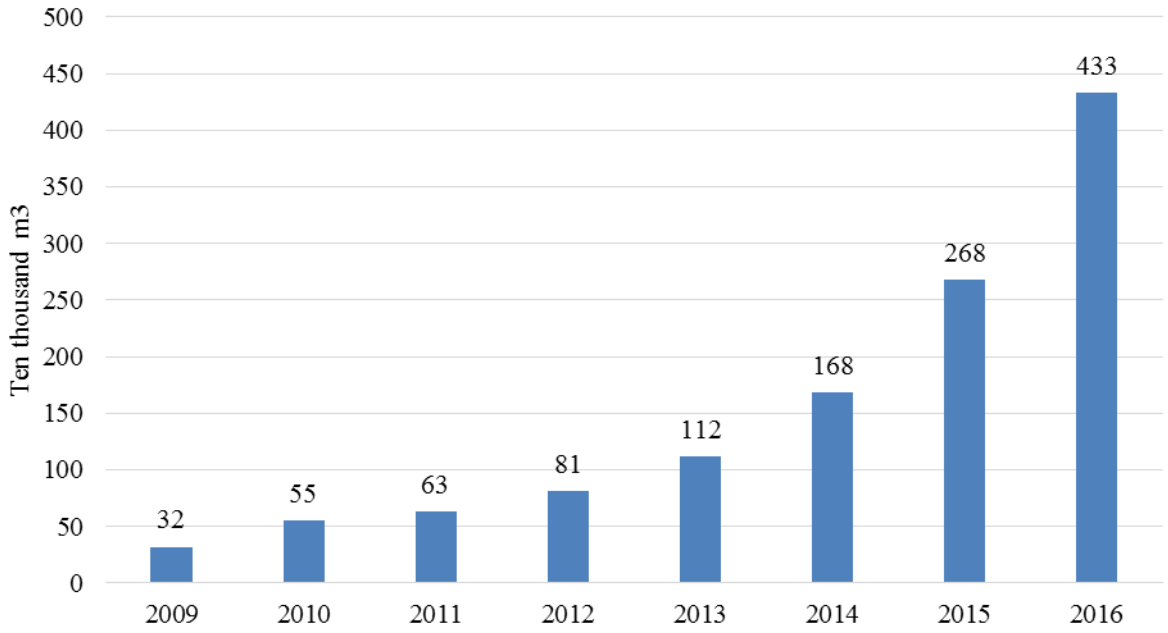
Table 8: Use of woody biomass by type and ownership of the equipment at establishments (2016)

Ownership of the equipment	Woody biomass used in the establishment				
	Wood chips	Woody pellets	Firewood	Wood meal (sawdust)	Other woody biomass
	ADW/ thousand tons	thousand tons	thousand tons	thousand tons	thousand tons
Total	7,734	214	50	323	559
Only the generator is owned	3,969	166	-	61	79
Only the boiler is owned	1,240	42	48	154	302
Both generator and boiler are owned	2,525	5	2	108	179

The use of thinned wood, forest scraps, etc. for energy in the form of wood chips and pellets has been increasing year after year. In 2016 it increased 61% from the previous year to 4.33 million m^3. The Basic Plan for Biomass Usage Promotion revised in September 2016 sets the goal to increase the utilization rate of forest scraps[32] from about 9% of the current annual generation of about 8 million tons to about 30% by 2025.

[32] Tree tops, branches, damaged trees, etc.

Figure 47: Change in the woody biomass quantity derived from thinned wood, forest scraps, etc. and used as energy source



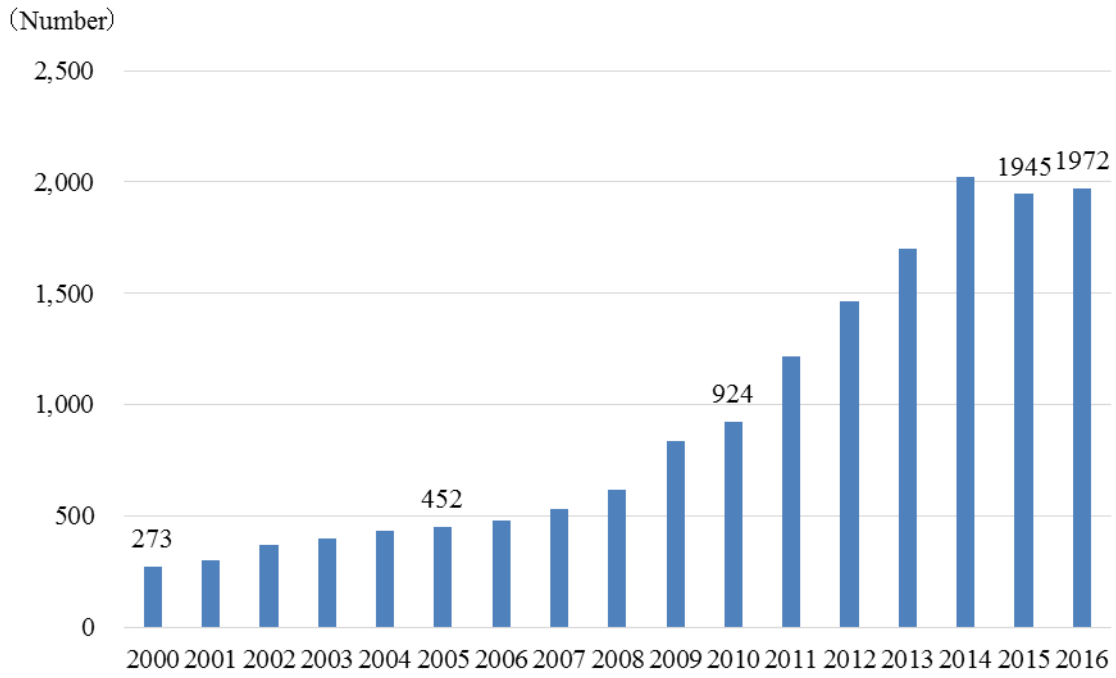
Note: The quantity of thinned wood, forest scraps, etc. used for wood chips and pellets is converted to volume using conversion factors (2.2m3/ton for wood chip)

Source: Survey by the Forestry Agency Wood Utilization Division up to 2014;
"Woody Biomass Energy Use Trend Survey" and "Survey of Special Forest Product Production" by

As regards power generation facilities mainly using biomass derived from thinned wood, 38 facilities with outputs over 2,000kw and 15 facilities with outputs below 2,000kw are selling electric power under the feed-in tariff scheme for renewable energy as of September 2017. The total generation capacity is 40,140kW.

The introduction of boilers and stoves using woody biomass as fuel is spreading in public facilities, general households, and other places. In 2016, 1,972 boilers using woody biomass were introduced across the country.

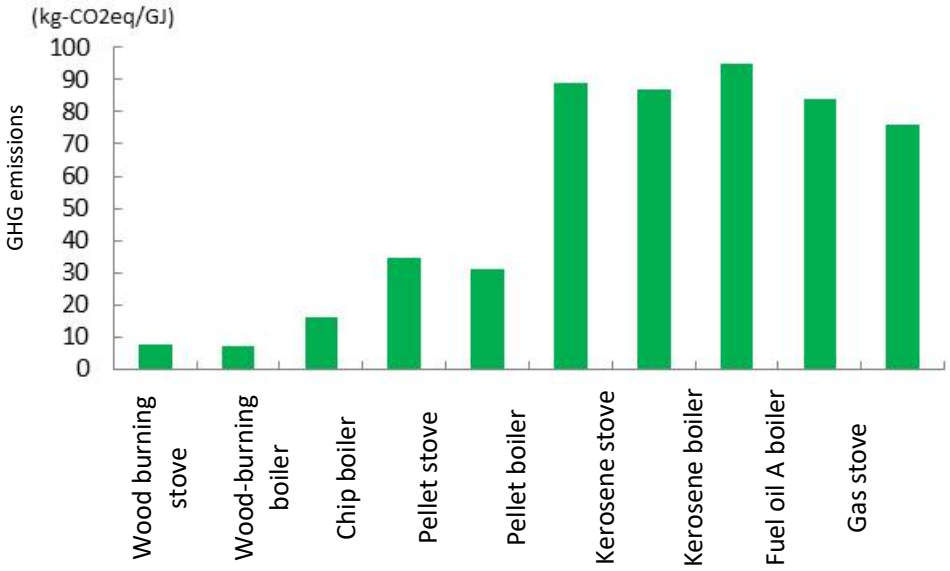
Figure 48: Change in the number of boilers using wood resources



Note 1: Total number of boilers using wood scrap, wood chips, wood pellets, etc. as fuel
Note 2: Value at the end of each fiscal year up to 2014, and the value at the end of each calendar year for 2015
Source: Survey by the Forestry Agency up to 2014; "Woody Biomass Energy Use Trend Survey" by the Forestry Agency for 2015 and after

The use of wood as an energy source has a carbon neutral characteristic that does not influence the carbon dioxide concentration in the atmosphere. Using wood that cannot be used as material in place of fossil fuel leads to the reduction of carbon dioxide emitted by the combustion of fossil fuel. In addition, it has been reported that, when comparing GHG emissions throughout the process from raw material procurement to production and combustion, GHG emissions per heat release unit of woody biomass fuel are significantly lower than those of fossil fuel.

Figure 49: Comparison of GHG emissions by fuel type



Source: Forest Energy research Institute (2012) Report on woody biomass LCA assessment

Criterion 6 Maintenance and enhancement of long-term multiple socio-economic benefits to meet the needs of societies

Forests provide a wide variety of social, cultural and economic goods, services and other benefits that contribute to meeting the needs of society. Many people and communities, including indigenous peoples, are dependent on forests for their livelihood and well-being. Information on the production and consumption of forest products, investment and employment in the forest sector, forest-based recreation and tourism, and other social and cultural forest values illustrate the many benefits forests provide.

6.1 PRODUCTION AND CONSUMPTION

These indicators provide information on the contribution of wood and non-wood products, and environmental services, to national and local economies. The value, volume and revenues associated with domestic production and consumption of forest products and services, including through international trade, demonstrates the type and scale of the contribution of forests to domestic economies. They also provide information about market conditions relevant to forest management and the forest sector.

INDICATOR 6.1.a Value and volume of production of wood and wood products, including primary and secondary processing

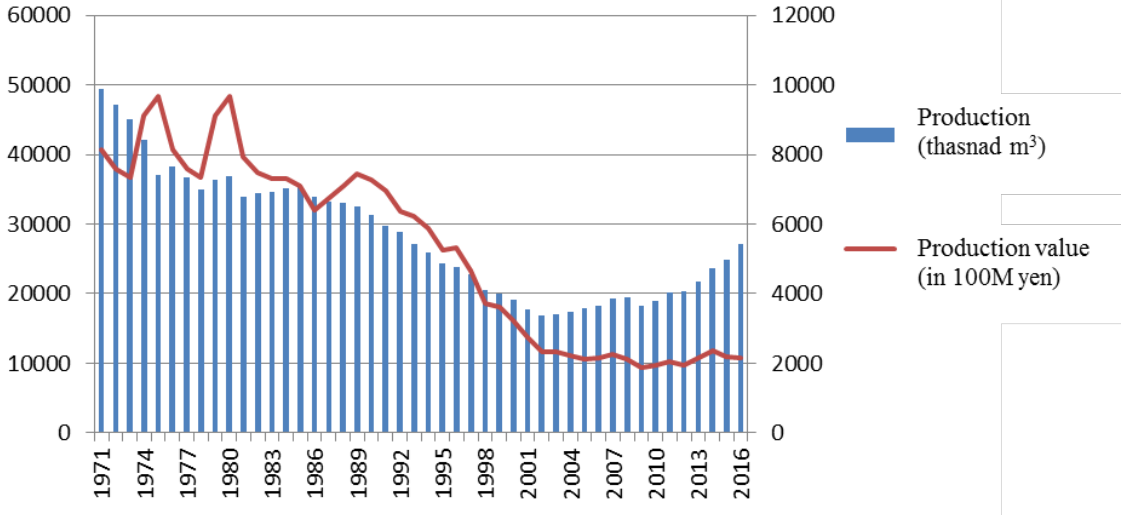
Rationale

This indicator provides information on the value and volume of wood and wood products at various stages of processing. It reflects the importance of forests and the wood products industry to domestic economies.

Current State and Trends

Japan's forestry has long been in difficult situations, including declining production value and falling wood prices, but the production volume is recovering in recent years.

Figure 50: Production volume and value of domestic logs

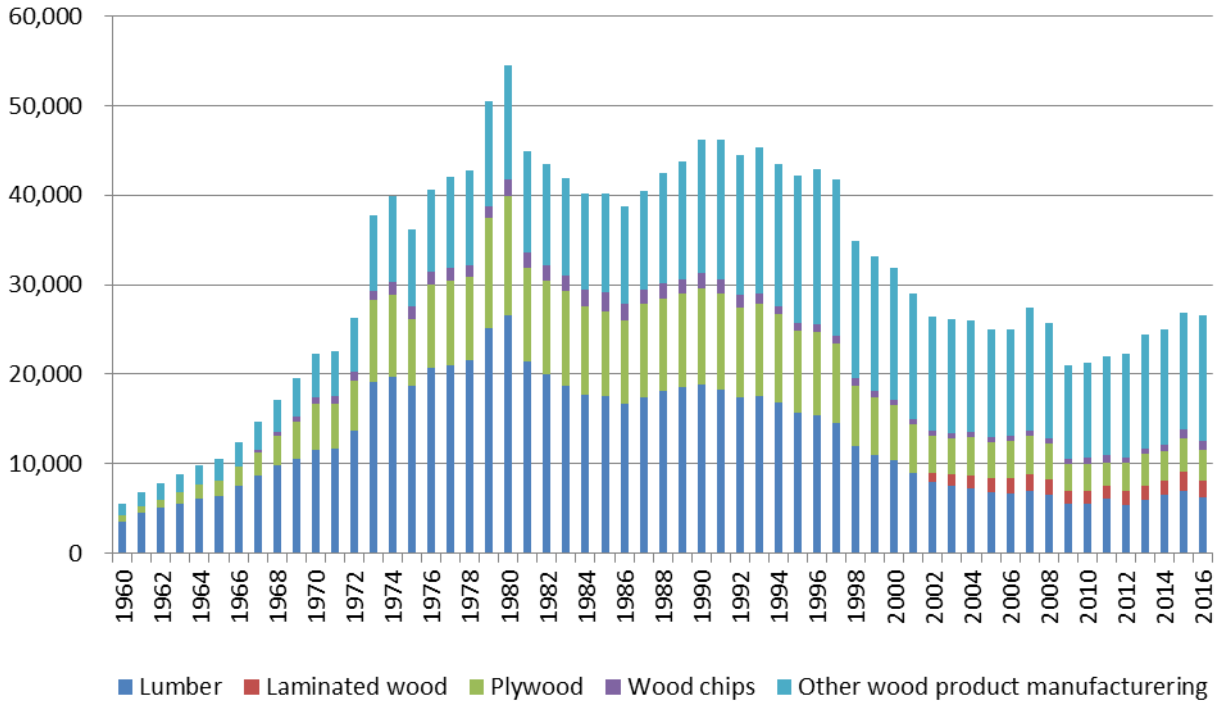


Source: Forestry Agency, Wood Demand and Supply Chart

Ministry of Agriculture, Forestry and Fisheries, Statistic report on forestry income

The value of shipments of the lumber and wood product manufacturing industry has long been on a decline and dropped sharply in 2009, affected by the financial crisis of 2007–2008 but slightly increased since then, reaching about 2.66 trillion yen in 2016. The breakdown is as follows: 624 billion yen (23% of the total) by lumber manufacturing, 185 billion yen 7%) by laminated wood manufacturing, 348 billion yen (13%) by plywood manufacturing, and 94 billion yen (4%) by wood chip manufacturing.

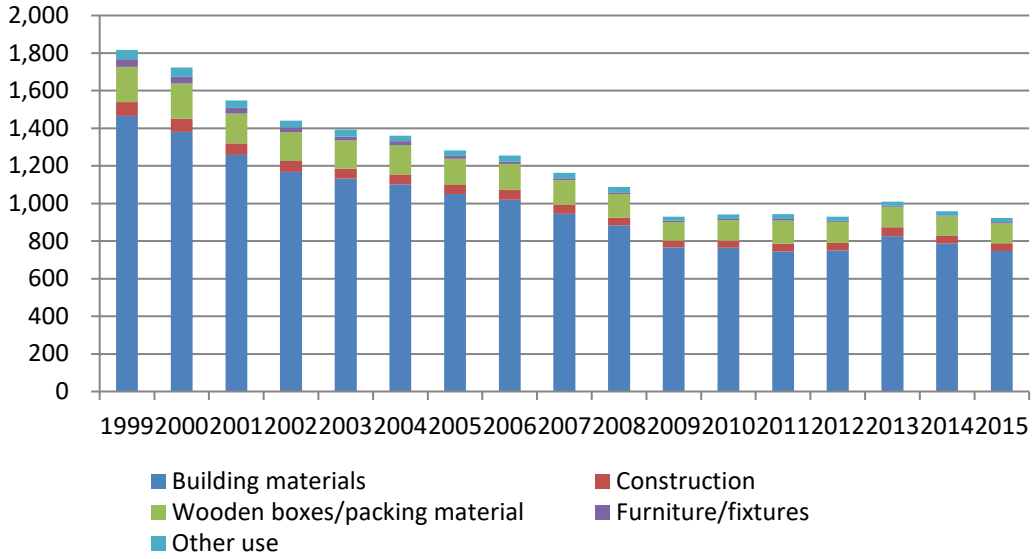
Figure 51: Change in the value of shipment of lumber and wood product manufacturing industry (100 million yen)



Note 1: Statistics of businesses with more than four employees
Note 2: The value of laminated wood manufacturing was included in the value of plywood manufacturing in and before 2001
Source: Ministry of Economy, Trade and Industry. Statistics of Industry; Ministry of Internal Affairs and Communication and Ministry of Economy, Trade and Industry. 2012 Economic Census for Business Activity

Shipments of lumber were on a decreasing trend up to 2009 and have been flat afterward. The volume of lumber shipments in 2015 was 9.23 million m3. The breakdown of lumber shipments by use in 2015 was 7.48 million m3 (81% of the total shipment) for building materials, 410,000 m3 (4%) for construction materials, 1.05 million m3 (11%) for wooden boxes/packing materials, 60,000 m3 (1%) for furniture/fixtures, and 230,000 m3 (2%) for other use.

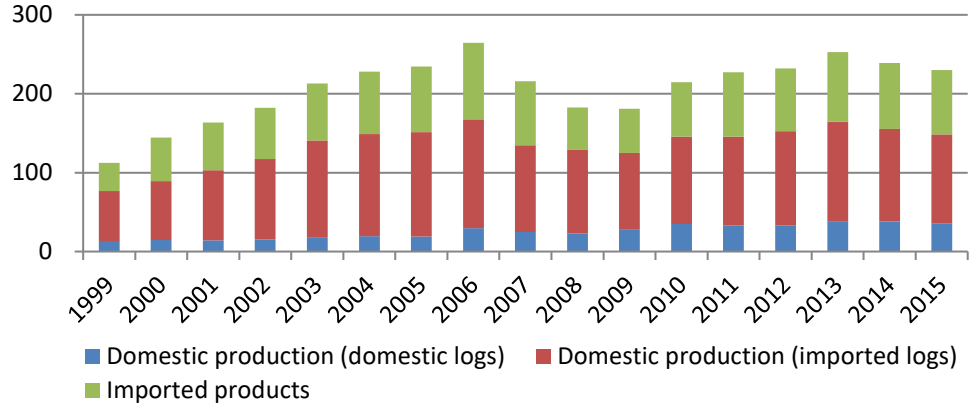
Figure 52: Changes in lumber shipment (by use) (10,000 m^3)



Source: Ministry of Agriculture, Forestry and Fisheries. Report on wood supply-demand and Lumber Statistics

The production of laminated wood using domestic or imported lumber has been declining, after reaching a peak of 1.68 million m^3 in 2006, but started to increase in 2010 due to the recovery in the number of new housing starts. It has been around 1.45 million m^3 in recent years. In 2015 the volume of imports of laminated wood products was 0.82 million m^3 or about 36% of the total supply of laminated wood.

Figure 53: Change in supply of laminated wood (10,000 m^3)



Note 1: Values of domestic production (imported logs) and domestic production (domestic logs) are calculated based on the use ratio by tree species of the laminated wood material.

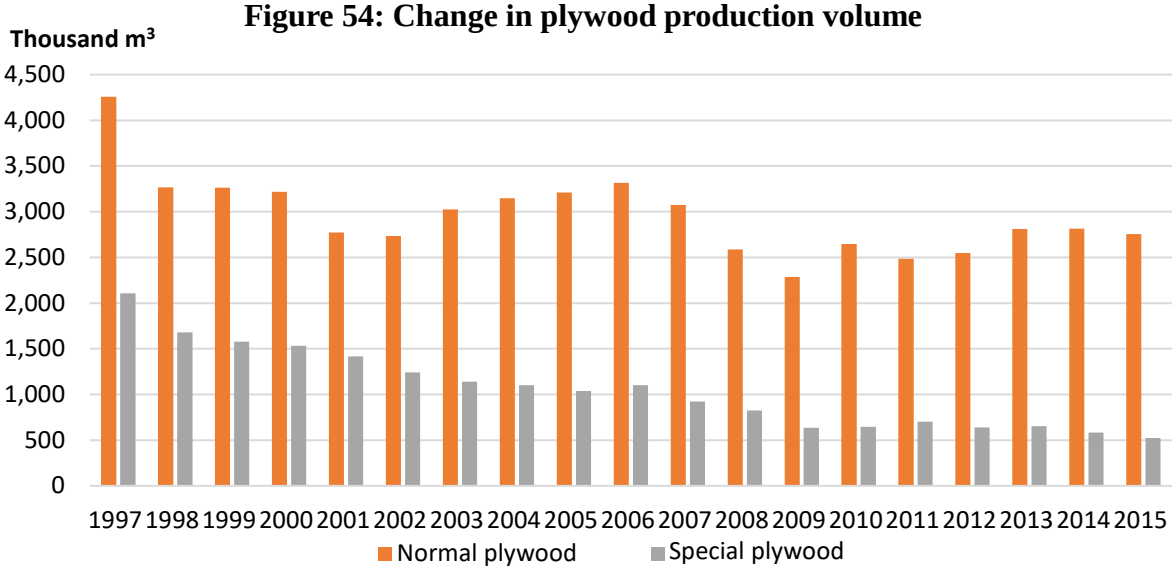
Note 2: Imported products are the total of 4412.10－910, 4412.94－110-190, 4412.99－110-190 and 4418.90－231-233 of the Harmonized Tariff System classification .

Note 3: The totals do not agree due to rounding.

Source: Survey by Japan Laminated Wood Products Association; Ministry of Finance. Statistics of Foreign Trade

The production volume of plywood has been around 2.50 million m^3 for normal plywood and around 0.5 million m^3 for special plywood[33] in recent years.

Figure 54: Change in plywood production volume

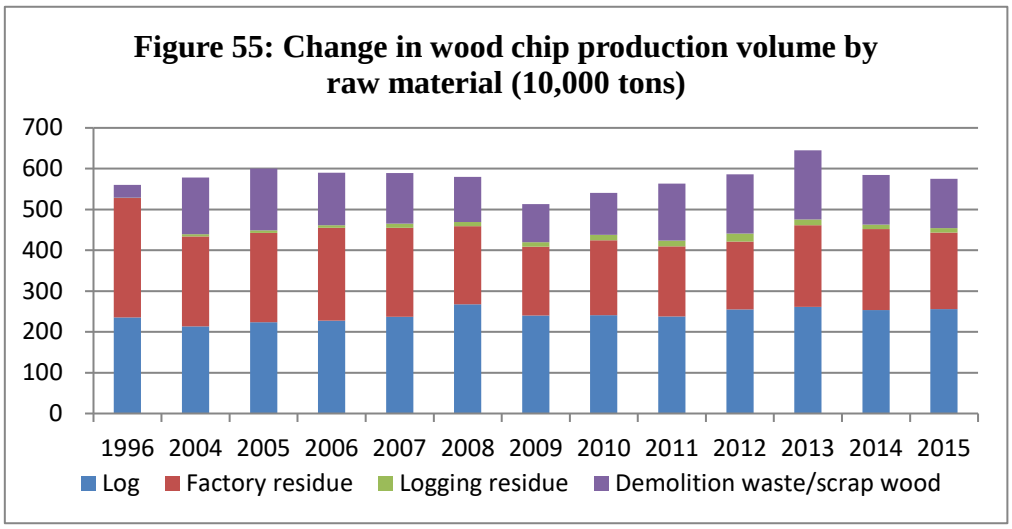


Source: Ministry of Agriculture, Forestry and Fisheries. Report on wood supply-demand

The production volume of wood chips was on an increasing trend since 2010 but decreased in 2015 to 5.75 million tons. Production volume by raw material is: 2.56 million tons (or 45% of total production) from logs, 1.87 million tons (33%) from factory residue, 0.11 million tons (2%) from logging residue, and 1.21 million tons (21%) from demolition waste/scrap wood.

The ratio of demolition waste/scrap wood to all chip materials was 6% in 1996 but increased to 21% in 2015. This may be attributed to the progress of recycling of demolition waste/scrap wood from houses, etc. under the Construction Material Recycling Law enacted in 2000.

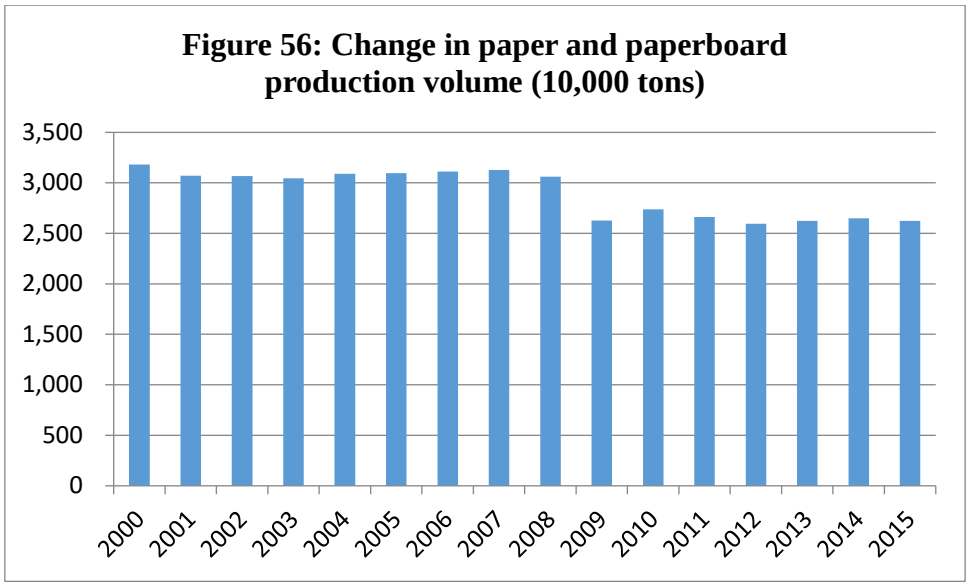
[33] Special plywood: plywood with surface finishing such as overlays for beauty, sliced sheets of selected natural wood, papers of wood grain or abstract patterns, synthetic resin, or other coating



Note: The totals do not agree due to rounding.

Source: Ministry of Agriculture, Forestry and Fisheries. Report on wood supply-demand and Lumber Statistics

The volume of paper and paperboard production in Japan had been around 30 million tons after 2000 but has been slightly decreasing since 2009 to about 26 million tons.



Source: Ministry of Economy, Trade and Industry. Yearbook of Paper and Pulp Statistics, Yearbook of Current Production Statistics Paper, Printing, Plastic Products and Rubber Products

INDICATOR 6.1.b Value of non-wood forest products produced or collected

Rationale

This indicator provides information on the value of non-wood forest products. The collection, processing and use of non-wood forest products are important dimensions of the economic value of forests. In some countries, non-wood forest products are vital to the livelihoods and lifestyles of indigenous and other rural communities.

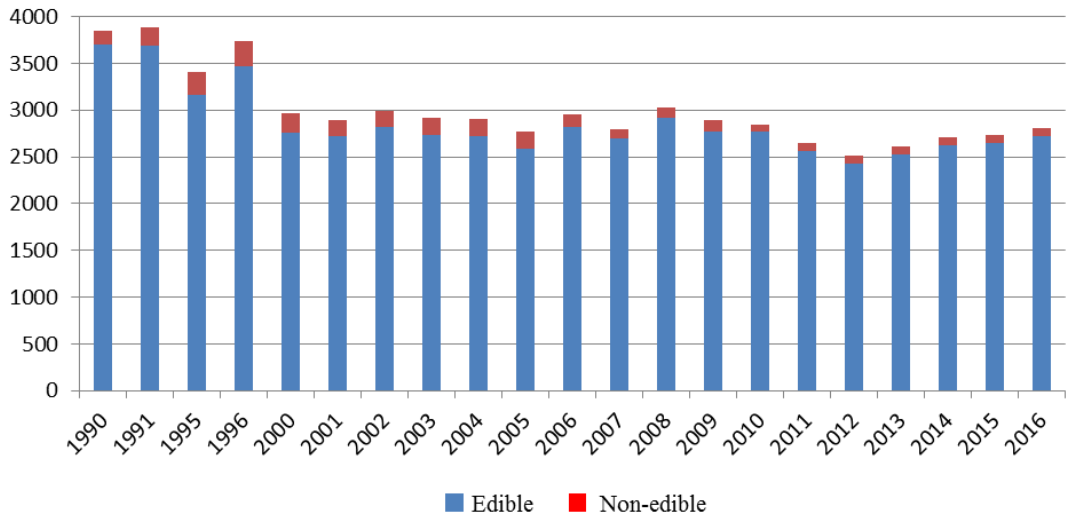
Current State and Trends

The production value of Japan's edible and non-edible non-wood forest products[34] has been 250 to 300 billion yen since the 2000s. Edible non-wood forest products account for more than 90% of the value.

Over half of the value of non-wood forest products is accounted for by mushrooms, including *shiitake, maitake,* and *bunashimeji*. Mushrooms have been popular as a harvest from forests or as autumn flavor since long ago. Today, with the progress and extension of growing techniques, about 20 kinds of mushrooms are artificially cultivated and available anytime. Mushrooms have low calorie content but are rich in fiber, B-complex vitamins, Vitamin D, and other nutrients. Effects to strengthen the immune system, lower blood cholesterol level and blood pressure, and other contributions to health are also expected.

[34] "Non-wood forest product" is the collective term for edible mushrooms, such as *shiitake, enokitake,* and *bunashimeji*, tree fruits, edible wild plants, materials for traditional handcraft, such as non-edible Japanese lacquer and Japan wax, bamboo, paulownia wood, charcoal, and other products originating from forests/wilderness, excluding some timber

Figure 57: Change in the production value of edible/non-edible special forest products (100 million yen)



Sources: Forest Agency. Basic data of non-wood-forest products; Ministry of Agriculture, Forestry and Fisheries. Crop Statistics

According to the result of The *Survey* of the State on Utilization of Wildlife Resources,[35] 55,668 deer (2,769 tons) and 27,476 wild boars (1,244 tons) were sent to meat processing facilities in 2016. Meat processing facilities purchase animals, process them into game meat and sell, or only undertake butchering and deliver the meat, to clients. Average purchase prices are 445 yen/kg for deer and 740 yen/kg for wild boar, while the average butchering fee is 314 yen/kg for deer and 592 yen/kg for wild boar.

[35] The *Survey* of the State on Utilization of Wildlife Resources started in 2017 with the aim of assessing the state of processing of wild birds and animals, and obtaining the data necessary for calculation of the market size related to their use as meat in order to develop basic data for precise planning and promotion of measures for utilization of wildlife as meat, etc. as part of initiatives to prevent damage caused by wildlife.

INDICATOR 6.1.c Revenues from forest-based ecosystem services

Rationale

This indicator provides information about forest-based environmental services for which markets and revenues are emerging or currently exist. Revenues from forest-based ecosystem services are or may become an important component of the economic value of forests.

Current State and Trends

Millennium Ecosystem Assessment Reports led by the United Nations classify ecosystem services into Provisioning Services, Regulating Services, Cultural Services and Supporting Services. Forests provide many of these services.

Specific examples of Provisioning Services are: mushrooms, wild edible plants, and other food; drinking and irrigation water; raw materials, including lumber, fuel, and minerals; genetic and medicinal resources; and appreciation resources, including materials for crafts. Examples of Regulating Services include climate regulation, disaster mitigation, water quality purification, and pollination. Furthermore, forests provide Cultural Services, including opportunities for recreation and sightseeing, cultural/artistic inspiration, and knowledge related to science and education. Supporting Services include the provision of wild habitats.

Because there is a wide variety of economic activities, and transactions of products and service industries which are drawing income directly or derivatively from these services, it is difficult to assess the income size quantitatively. Progress of relevant research is desirable.

INDICATOR 6.1.d Total and *per capita* consumption of wood and wood products in round wood equivalents

Rationale

This indicator provides information on consumption, including consumption *per capita*, of wood and wood products. The quantity consumed illustrates an aspect of dependence of the people on forests as a source of raw materials.

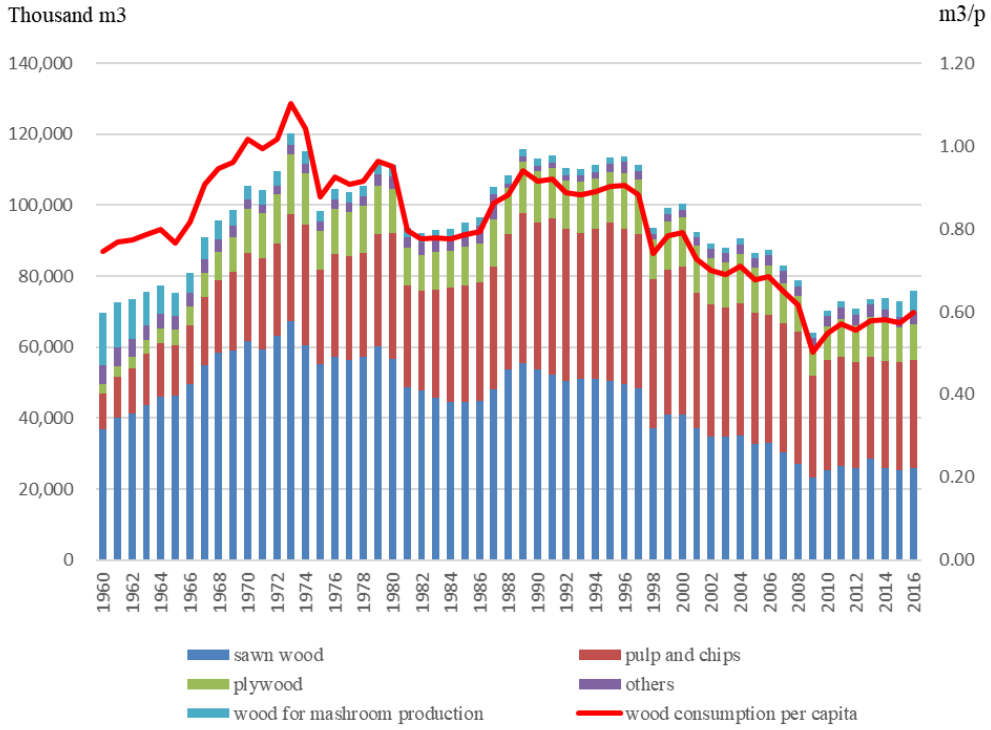
Current State and Trends

About 76 million m^3 of wood and wood products in round wood equivalent was consumed in Japan in 2016. Due to the impact of rapid economic downturn and other factors, total consumption of wood and wood products fell to 64 million m^3 in 2009. It was the first time in the 46 years since 1963 that the consumption fell below the 70 million m^3 level. Since then, consumption has been between 70 million and 76 million m^3.

As is the case with total consumption, the consumption of wood and wood products per capita dropped to a minimum of 0.5m^3 in 2009 and has been between 0.55m^3 and 0.60 m^3 since then.

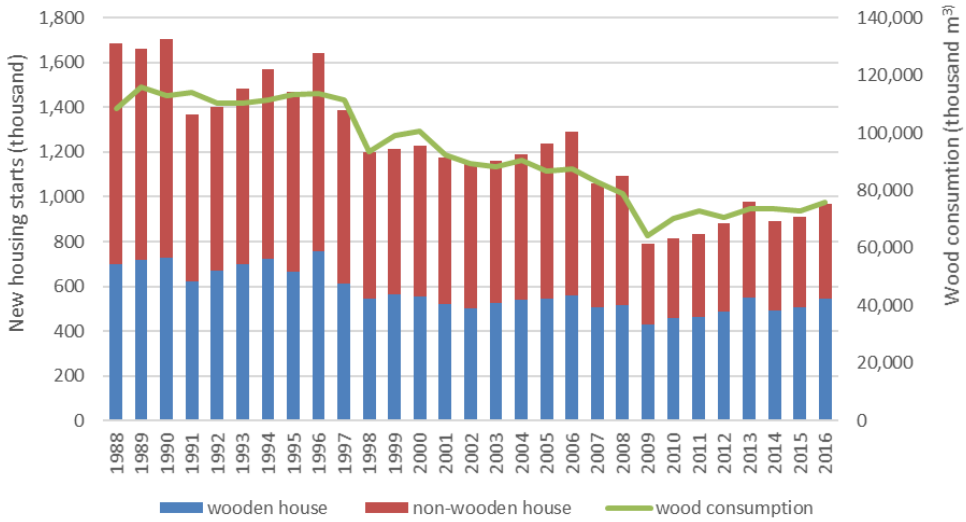
The consumption of wood and wood products is closely related to new housing starts. In 2016, new housing starts were about 0.97 million, of which wooden houses were about 0.55 million or 56%.

Figure 58: Change in total and per capita consumption of wood and wood products



Sources: Forestry Agency. Wood Demand and Supply Chart; Ministry of Internal Affairs and Communication. National Census and Annual Report on Demographic Shifts

Figure 59: Change in total wood consumption and new housing starts



Sources: Forestry Agency. Wood Demand and Supply Chart; Ministry of Land, Infrastructure, Transport and Tourism. Statistics on housing construction

With new housing starts expected to decrease in Japan in future, the expansion of wood use in non-residential sectors has become a challenge. In this context, recently there has been a trend to use wood for public facilities, such as schools and libraries, and also for shopping malls, convenience stores and other commercial facilities and offices. In addition, there are various efforts to increase demand for wood, including the expansion of wood use in the civil engineering sector and use of woody biomass energy.

INDICATOR 6.1.e Total and *per capita* consumption of non-wood forest products

Rationale

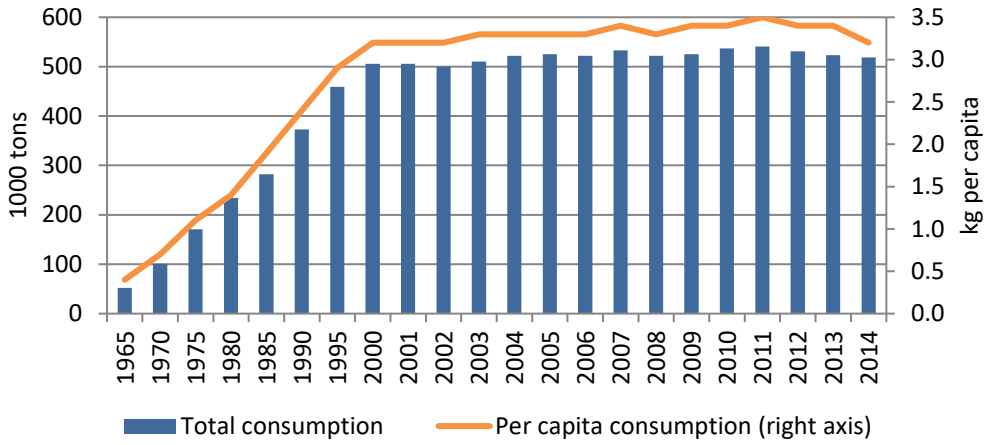
This indicator provides information on the consumption of non-wood forest products. The quantity consumed illustrates the dependence of the people on forests as a source of these products.

Current State and Trends

Since 2000, more the 500,000 tons of edible mushrooms, which is equivalent to over 3 kilograms *per capita*, are consumed every year in Japan.

Various kinds of mushrooms are consumed: the consumption of fresh *shiitake* has remained at the same level, the consumption of dried *shiitake* has been on a decline, and consumption of other mushrooms has been increasing.

Figure 60: Change in total and per capita consumption of edible mushrooms



Source: Forest Agency. Basic Data of Edible Non-wood Forest Products

Other than mushrooms, edible tree fruits and wild plants, Japan wax, raw lacquer, camellia oil, and other various non-wood forest products are consumed. However, their consumption has undergone a lot of changes along with the changing lifestyles. The consumption of raw lacquer, for example, greatly declined from 515 tons in 1975 to 45 tons in 2015.

INDICATOR 6.1.f Value and volume in round wood equivalents of exports and imports of wood products

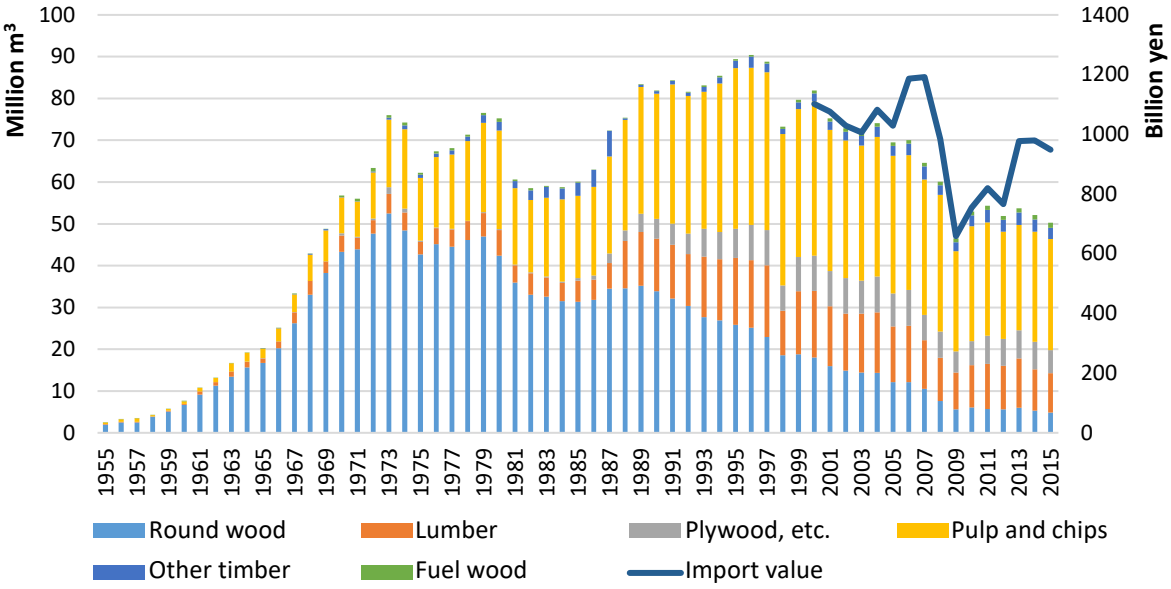
Rationale

This indicator provides information about the value and size of a country's exports and imports in wood products and their contribution to the domestic economy. International trade in wood products may be a significant factor in the management, commercial use, and economic value of forests.

Current State and Trends

The value of Japan's wood imports has been on a declining trend from the peak of 90 million m^3 (in round wood equivalents) in 1996, and fell to 51 million m^3 in 2016. Wood imports have shifted from round wood to products: products account for about 90% of wood imports, while round wood imports account for about 10%. Import value is around one trillion yen with significant yearly fluctuation.

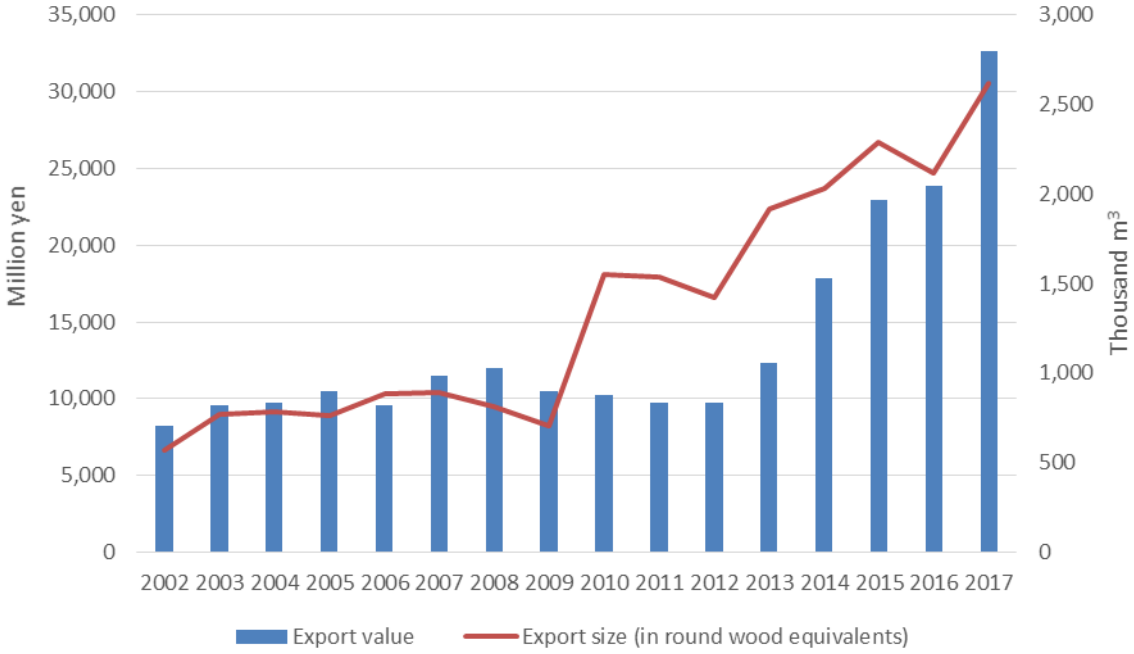
Figure 61: Changes in import value and volume of wood and wood products



Sources: Import volume (in round wood equivalents) of wood and wood products: Ministry of Agriculture, Forestry and Fisheries. Wood Demand and Supply Chart; Import value: Ministry of Finance. Trade Statistics (total of round wood [4403], lumber, work timber, etc. [4406, 4407 and 4409 (excluding drawn wood, beading, and molding)], plywood [4412.10-111 to 4412.10-299, 4412.31, 4412.32, 4412.39], veneer and veneer sheets for plywood [4408], laminated wood [laminated wood in 4412] and structural glued laminated wood [4418.90-231 to 4418.90-233])

Japan's wood exports had been around 10 billion yen in recent years but rapidly increased since 2013 due to increased wood demand in China and improved recognition of wood of Japan. Export value reached 32.6 billion yen in 2017.

Figure 62: Changes in value and volume of exported wood and wood products from Japan



Sources: For export volume (in round wood equivalents) of wood and wood products: Ministry of Agriculture, Forestry and Fisheries Wood Demand and Supply Chart; export value: Ministry of Finance. Trade Statistics (total of HS 44)

INDICATOR 6.1.g Value of exports and imports of non-wood forest products

Rationale

This indicator provides information about the value of a country's exports and imports of non-wood forest products and their contribution to the domestic economy. International trade in non-wood products may be a significant factor in the management, commercial use, and economic value of forests.

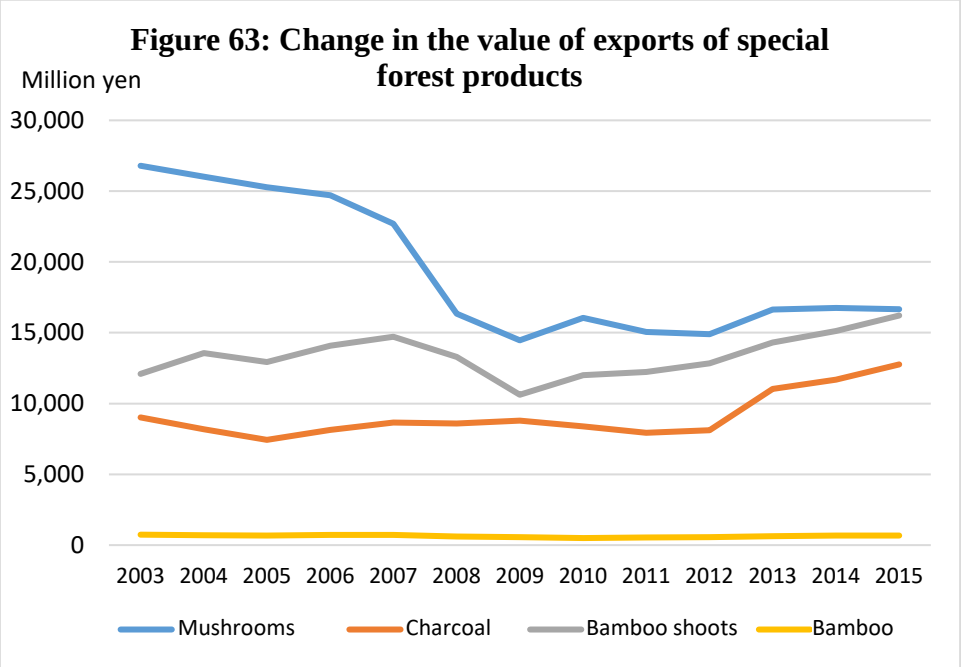
Current State and Trends

The total import value of non-wood forest products into Japan was about 46 billion yen in 2015. Mushrooms account for the largest part of import value of non-wood forest products and have been at the same level in recent years, while the import value of bamboo shoots has been increasing and was about 16 billion yen in 2015, which is almost the same as the value of mushrooms.

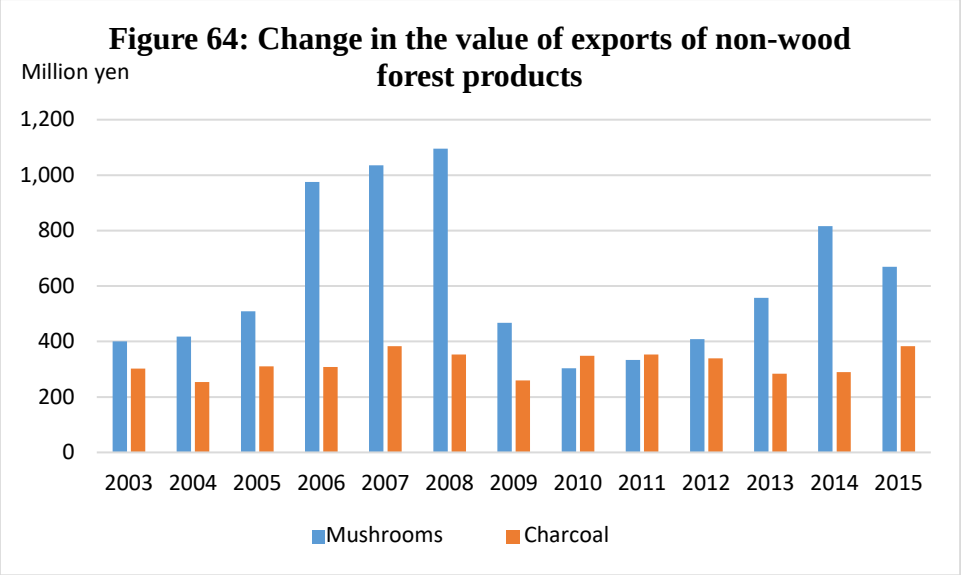
The value of charcoal imports is also increasing.[36] Major exporters are China, Malaysia, and Indonesia, together accounting for 80% of the total value. The advantages of charcoal include use without a power source, use for both cooking and heating, little smoke, and long storage. It can be used also as fuel in times of disaster. For this reason, the charcoal industry is working to increase demand for charcoal as fuel through publication of uses of charcoal, spread of charcoal cookers for household use, for example. As charcoal is porous and therefore a good absorbent, its use as soil improvement material, water purifying material, humidity adjusting material, etc. is also promoted.

The export value of non-wood forest products is small compared with the import amount. It is around one billion Japanese yen annually.

[36] Because charcoal is classified as a non-wood forest product in Japan's statistics, it is not included in Indicator 6.1.f but in this indicator.



Source: Ministry of Finance. Trade Statistics (Total of 0709.59-011, 0709.59-020, 0709.59-090, 0712.32 and 0712.39-010 for mushrooms; 4402 for charcoal; 2004.90-220 and 2005.91 for bamboo shoots and; 1401.10 for bamboo)



Source: Ministry of Finance. Trade Statistics (total of 0709.59 and 0712.39-100 for mushrooms; 4402 for charcoal)

INDICATOR 6.1.h Exports as a share of wood and wood products production, and imports as a share of wood and wood products consumption

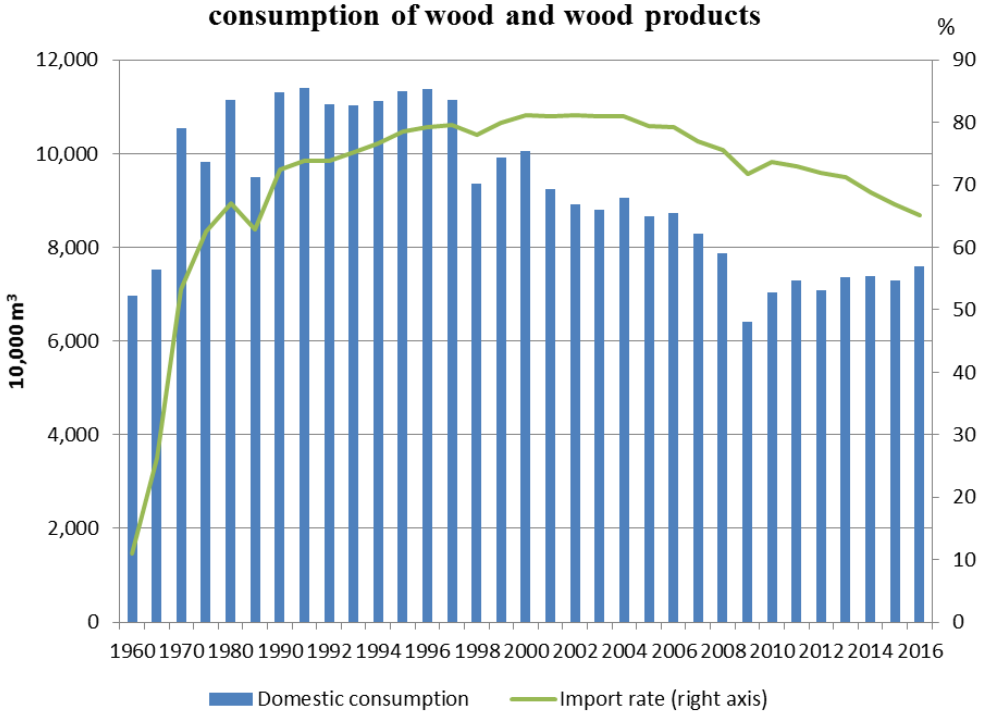
Rationale

This indicator provides information on the relative importance of international trade in wood and wood products to domestic production. Wood and wood product exports can be a significant source of revenue for domestic economies. Imports may supplement or substitute production from domestic forest sources.

Current State and Trends

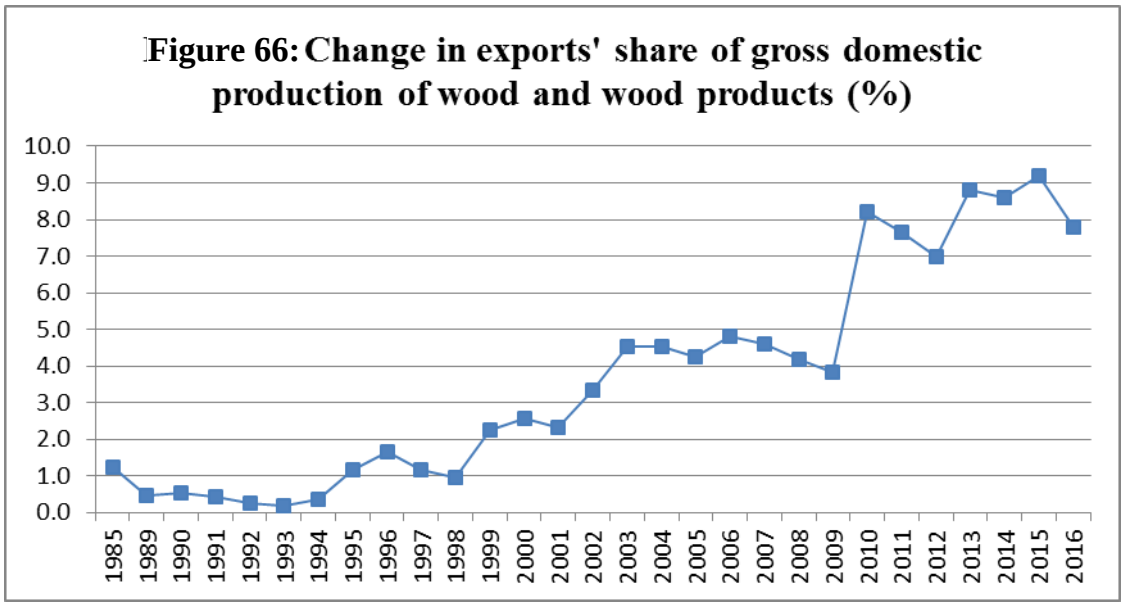
In 2016, imported wood and wood products accounted for 67 % of the total volume of consumption in Japan in round wood equivalents. The share of imported wood has been on a decreasing trend in recent years.

Figure 65: Change in the share of imports to total consumption of wood and wood products



Source: Forestry Agency. Wood Demand and Supply Chart

On the other hand, the share of exports in gross domestic production was under 1% up to the first half of the 1990s but has been on an increasing trend since then, reaching 7.8% in 2016



Source: Forestry Agency. Wood Demand and Supply Chart

INDICATOR 6.1.i Recovery of recycling of forest products as a percent of total forest products consumption

Rationale

This indicator provides information on the extent to which forest products are recycled or recovered. Recycled and recovered products are an important source of wood fiber for many industries and may compete with or substitute harvested wood. Such products can help meet the demand for forest products without increasing harvest levels.

Current State and Trends

There is no available statistical data on the ratio of recovered or recycled forest products to total consumption.

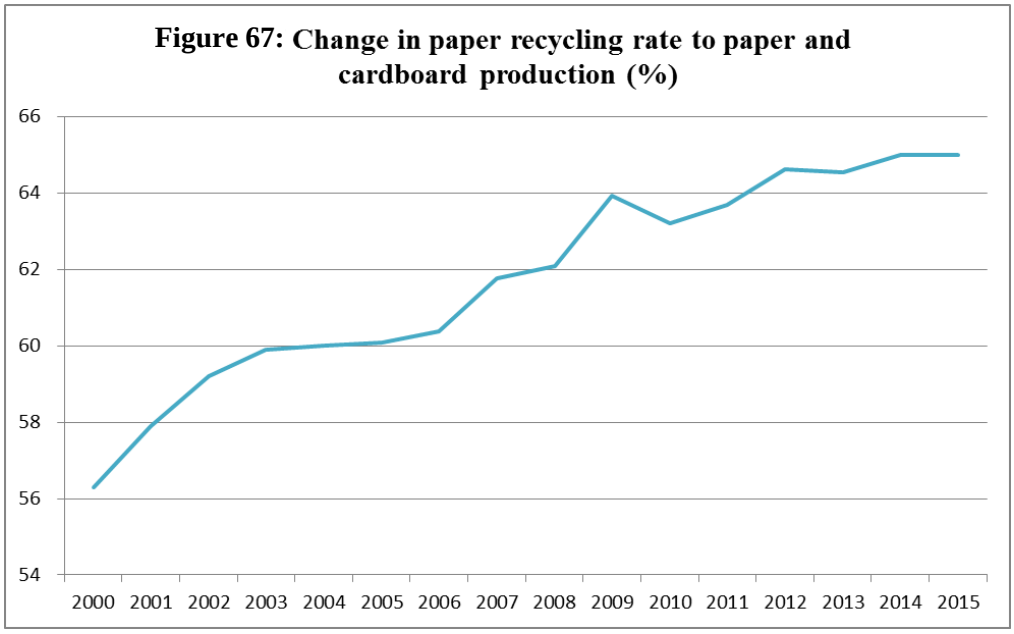
About 97% of sawmill residue is recycled for wood board, paper, energy, and other purposes. The percentage is considered to have reached the current recovery limit. For wood derived from construction, the Basic Principle based on the Construction Material Recycling Act and the Construction Material Recycling Promotion Plan 2014 set goals for recycling and reduction rates, and measures are taken to achieve the goals. As a result, about 94% is used for various purposes, including paper stock, board material, bedding for livestock and energy.

Table 9: Annual biomass generation and utilization rates

Type of biomass	Annual generation	Utilization rate
Sawmill residue	About 6.4 million tons	About 97%
Wood derived from construction	About 5.0 million tons	About 94%

Source: Basic plan for the promotion of biomass utilization (Cabinet Decision in September 2016)

Paper recycling rate in 2015 was about 65%. The rate has remained on the same level in recent years.



Source: Calculated annually by the Forestry Agency based on the METI Paper and Pulp Statistics

6.2 INVESTMENT IN THE FOREST SECTOR

These indicators provide information on long-term and annual expenditures to enhance forest management, forest-based enterprises, and the knowledge and skills of people who are engaged in the forest sector. Maintaining and enhancing the long-term multiple socio-economic benefits derived from forests depends in part on investment in the forest sector, including both long-term capital investments and annual operating expenditures.

INDICATOR 6.2.a The value of capital investment and annual expenditure in forest management, wood and non-wood forest product industries, forest-based environmental services, and recreation and tourism

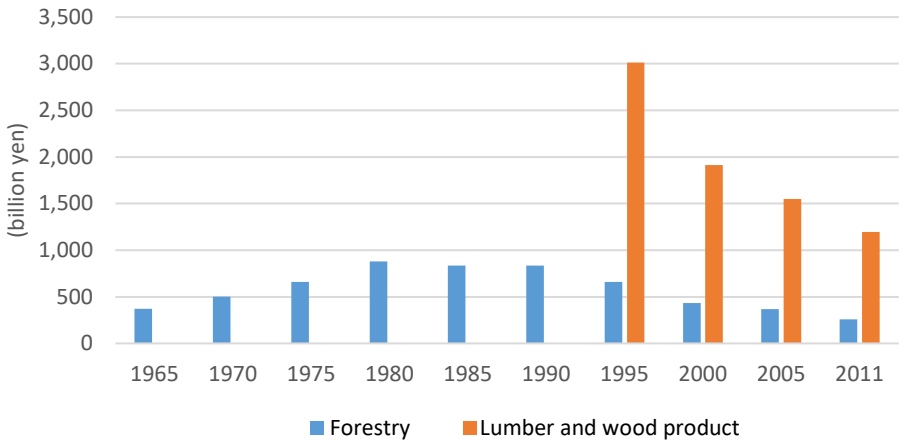
Rationale

This indicator quantifies investment and expenditure in developing, maintaining, and obtaining goods and services from forests. Maintaining and enhancing forests and their benefits often depends on regular investments in restoration, protection and management, as well as in operations, forest industry, and forest-based environmental services. When the capacity to protect, manage, and use forests is eroded through a lack of funding, the benefits that forests provide may decline or be lost.

Current State and Trends

There is no data for comprehensive assessment of the value of capital investment in the forest sector. In the Input-Output Tables, annual capital investments[37] in the forestry[38] and the wood industry[39] in 2011 were estimated as 257 billion yen and 1.194 trillion yen respectively. Investments in the forestry and wood industry have been declining since 1980s.

Figure 68: Change in the value of capital investment in the forestry and the wood industry



Source: Ministry of Internal Affairs and Communication. Input-output tables

[37] Total of the intermediate inputs of the endogenous sector
[38] Corresponds to silviculture (column sector classification code: 0151), logging (0152) and non-wood forest products (0153)
[39] Corresponds to lumber (column sector classification code: 1611) and other wood product (1619).

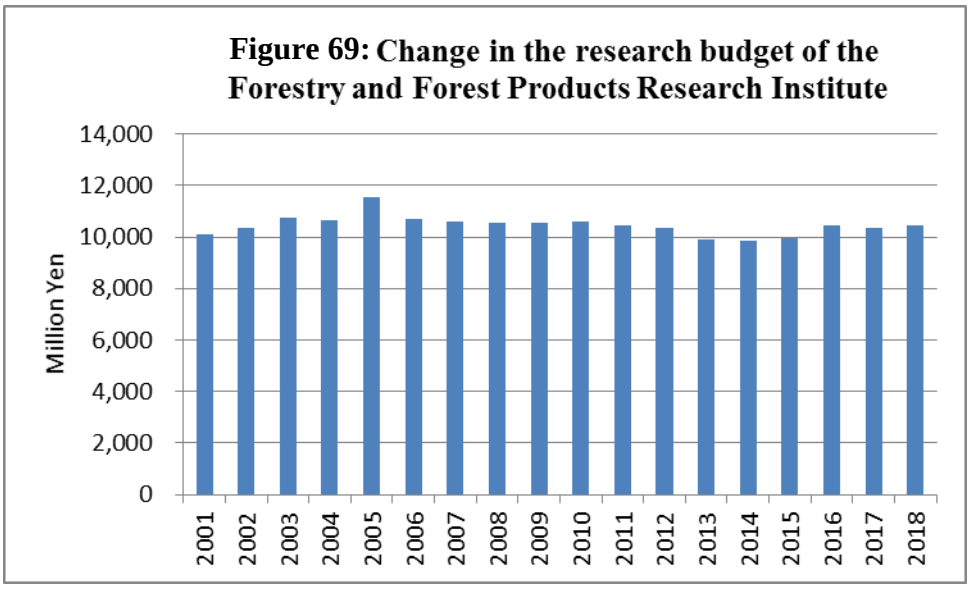
INDICATOR 6.2.b Annual investment and expenditure in forest-related research, extension and development, and education

Rationale

This indicator provides information on annual investment and expenditure in forest-related research, extension and development, and education. Research underpins scientific understanding, including the ability to practice improved forest management and to develop and apply new technologies. Education, including extension activities, increases public awareness of the multiple benefits provided by forests.

Current State and Trends

Various entities, including the national and prefectural governments and private companies, are conducting research and development, extension and education, but there is no aggregate data on the total investment values. Research budgets of the Forestry and Forest Products Research Institute and the Forest Tree Breeding Center, which mainly conduct research and experiments under the *Forest* Research and Management Organization have been around 10 billion yen in recent years.



Sources: Forestry and Forest Products Research Institute Annual Report; Former Forest Tree Breeding Center. Annual Report

6.3 EMPLOYMENT AND COMMUNITY NEEDS

Forest-based and forest-related employment is a useful measure of the social and economic importance of forests at the national and local level. Wage and income rates and injury rates are indicators of employment quality. Communities whose economies are concentrated in forest industries, or who rely on forests for subsistence purposes, may be vulnerable to the short or long-term effects of economic or policy changes in the forest sector. These indicators provide information on levels and quality of forest employment, community resilience to change, use of forests for subsistence purposes, and the distribution of revenues from forests.

INDICATOR 6.3.a Employment in the forest sector

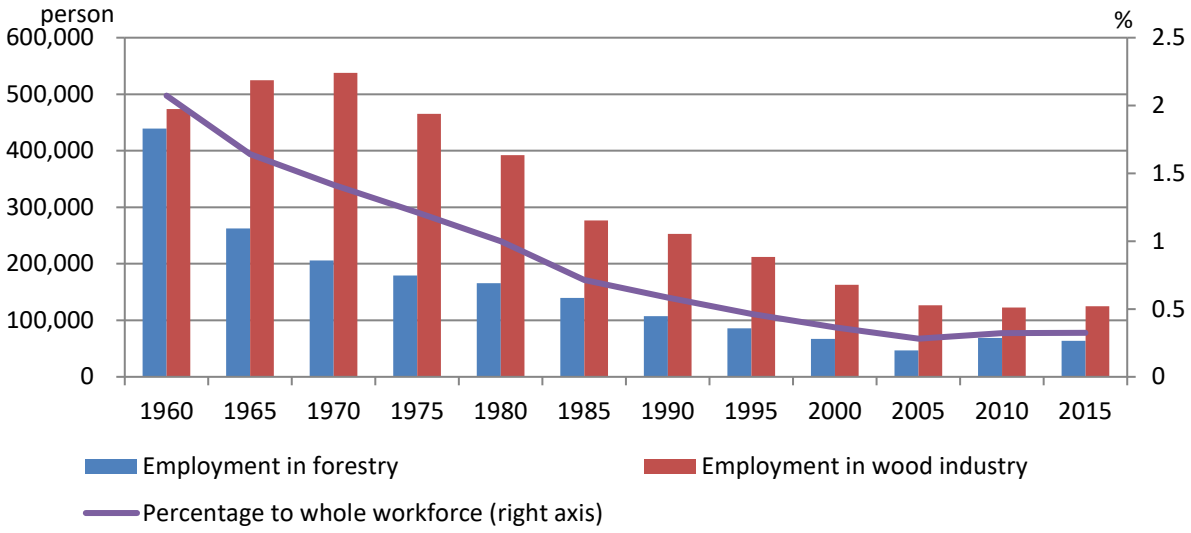
Rationale

This indicator provides information on the level of direct and indirect employment in the forest sector. Employment is a widely understood measure of economic, social and community wellbeing.

Current state and trend

In 2015, the number of workers in the forest sector in Japan (the total number of workers engaged in forestry[40] and the wood industry) was approximately 189 thousand. Among them, the number of workers engaged in forestry was approximately 64 thousand; a slight decrease from approximately 69 thousand in 2010 while the number of workers engaged in the wood industry was approximately 125 thousand. The ratio of the number of workers in the forest sector to the number of workers in all industries had continuously been declining from the approximately 2.1% in 1960 and has recently been remaining at the same level and was about 0.3% in 2015.

Figure 70: Change in employment and percentage of recruit in forest sector



Note: The figures based on the 2015 National Census are preliminary figures (publicized on June 29, 2016).

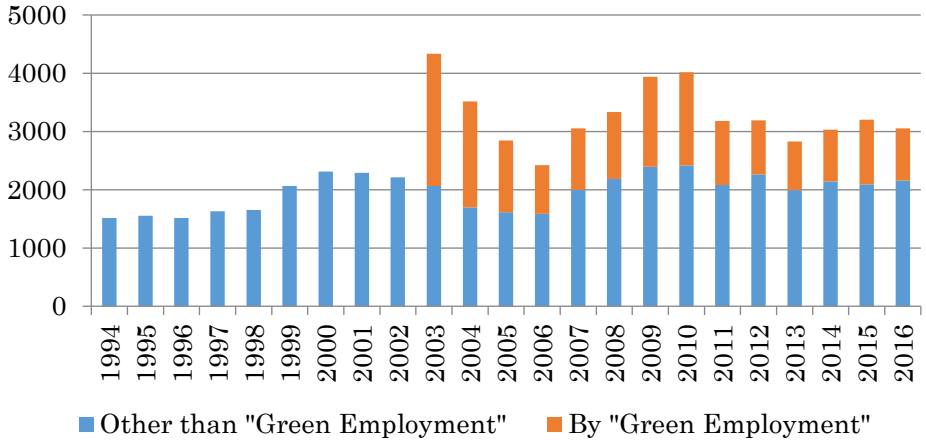
Source: Ministry of Internal Affairs and Communications, National Census

[40] Persons working at a forestry enterprise which is classified in the category of "forestry" based on the Japan Standard Industrial Classification. These persons include managing members and office workers in addition to persons engaged in field work in the forests. The increase seen during the period from 2005 to 2010 is mainly due to the fact that some of the persons who were classified in categories other than forestry were newly classified in the category of forestry as a result of the revision of the Japan Standard Industrial Classification in 2007.

In Japan, the program for the “Green Employment” has started from 2003 to support young people who are willing to work in the forest sector in acquiring basic techniques that are necessary for forestry. Under the program, implementation of on-the-job training by the enterprises and joint training by training organizations for persons who have been newly employed by forestry enterprises is supported. By 2016, approximately 17 thousand persons were newly employed in the forest sector utilizing the program.

Although the number of workers newly employed by forestry enterprises was approximately 2,000 persons per year before the program started, the number has increased to approximately 3,300 persons per year after the program started. Among the persons who have completed the training under the program, more than 70% of the persons are still engaged in the same work after the passage of three years.

Figure 71: Change in the number of persons who newly joined forestry



Source: Forestry Agency

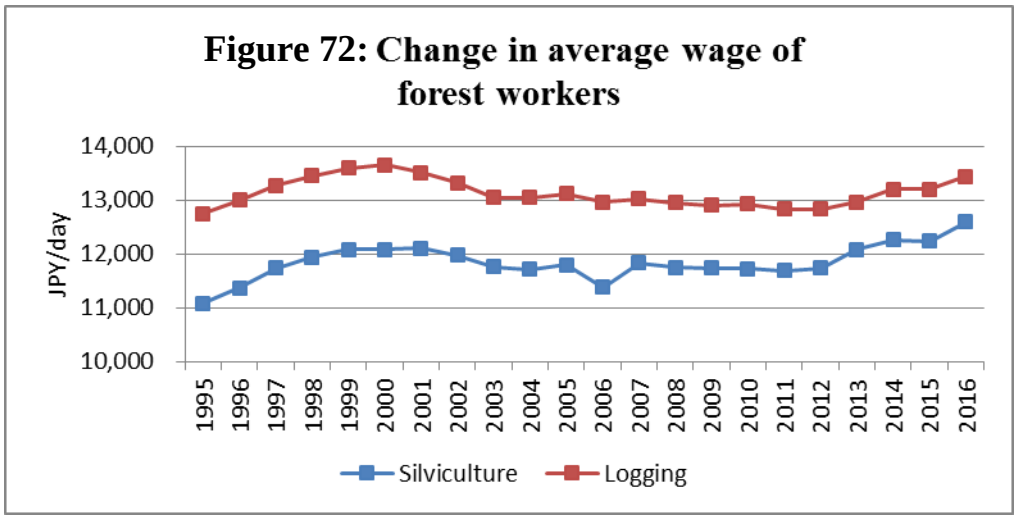
INDICATOR 6.3.b Average wage rates, annual average income, and annual injury rates in major forest employment categories

Rationale

This indicator provides information on average wage and income rates, and injury rates. These are important aspects of employment quality and the economic value of forest-related employment for the region.

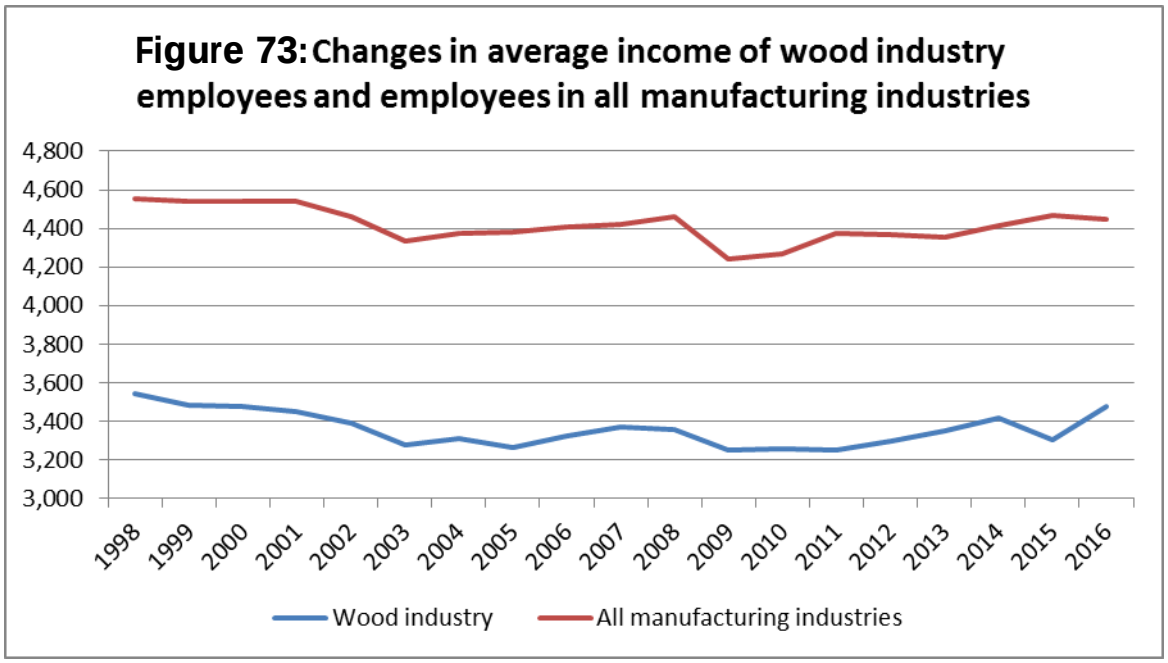
Current State and Trends

Because forestry activities often have to be suspended in bad weather and, therefore, the number of operation days is greatly influenced by the weather, a day-rate system is still prevailing in this sector. The average daily wage of forest workers in 2016 is around 12,600 yen for silviculture work and 13,400 yen for logging operation. Since 2011 the average wage of forest workers has slightly increased.



Source: National Chamber of Agriculture. Results of survey on farm work fees and agricultural wages

The average annual income of wood industry employees in 2016 was around 3.5 million yen, which is 78 % of the average income of about 4.4 million yen in all manufacturing industries. The average annual income of wood industry employees has been slightly increasing since 2011.



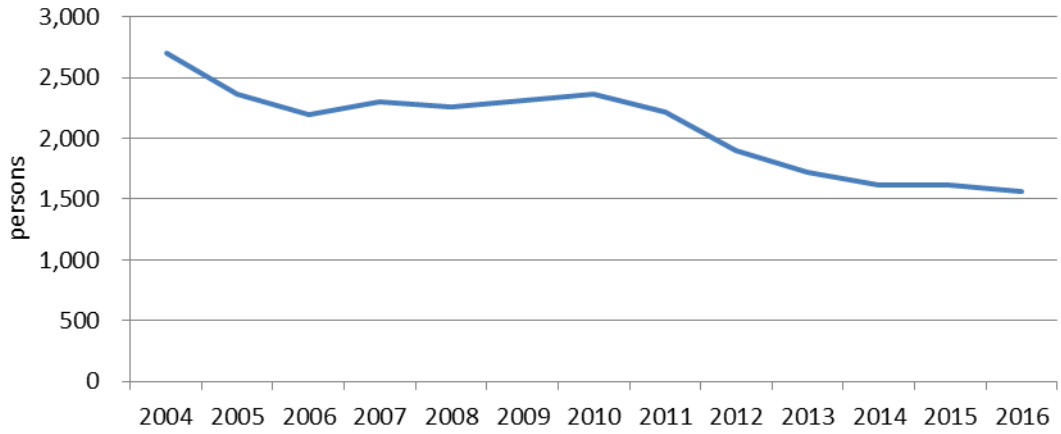
Sources: Ministry of Economy, Trade and Industry. Statistics of Industry

Occupational accidents in forestry have been decreasing in the long term. This may be a result of the reduced workload thanks to the introduction of harvesters, processors, forwarders, and other high-performance forestry machines as well as the development of forest road systems, including logging roads. The spread of protective wear for chainsaw work may also have contributed to the reduction.

Because of the nature of works which frequently require the handling of massive objects, such as harvested logs on steep slopes, the annual accident *rate* per *1,000* workers[41] of forest workers was 31.2 in 2016. This is about 14.2 times as high as the average of all industries that is 2.2.

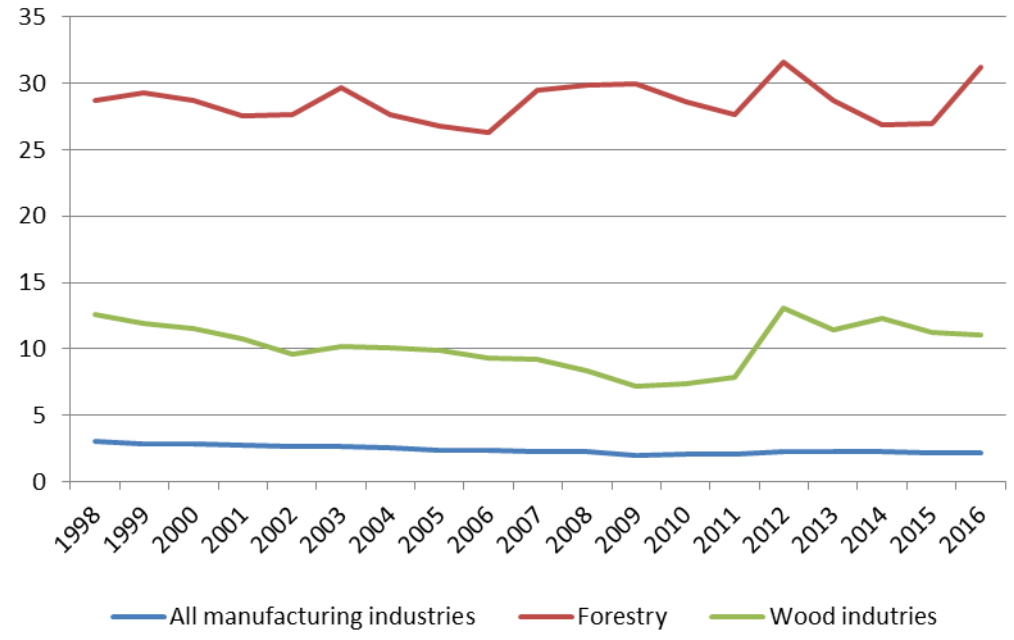
[41] Annual accident *rate* per *1000* workers is the annual number of fatalities and injuries requiring an *absence* of four *days* or more due to an occupational accident per thousand workers.

Figure 74: Chnage in the number of fatalities and injuries in forestry



Source: Ministry of Health, Labor and Welfare. Reports of Worker Casualties

Figure 75: Change in annual accidents rate per 1000 workers in forestry and wood industry



Sources: Ministry of Health, Labor and Welfare. Annual Report on Industrial Accidents Compensation Insurance Program and Data on Industrial Accident Compensation Insurance Benefits

INDICATOR 6.3.c Resilience of forest-dependent communities

Rationale

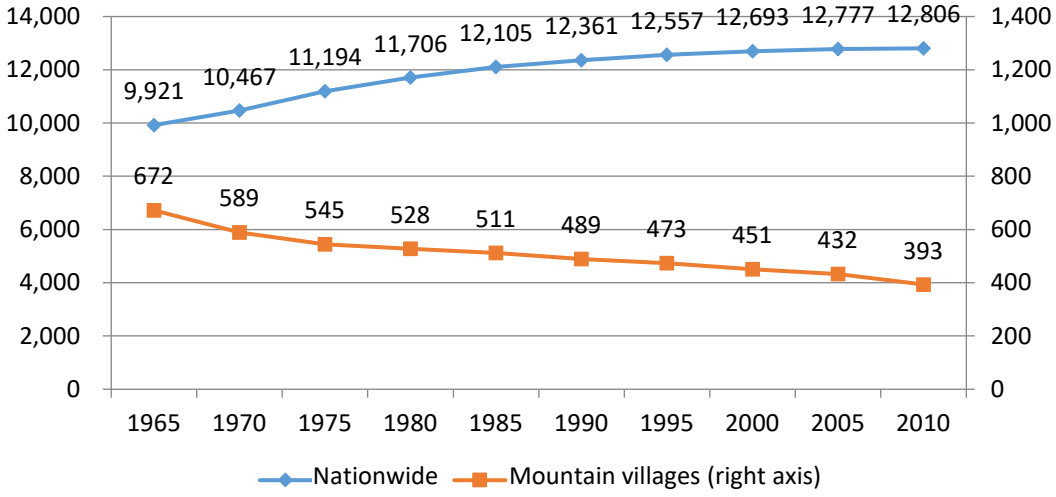
This indicator provides information on the extent to which communities dependent on forests for their wellbeing, livelihoods, subsistence, quality of life, or cultural identity are able to respond and adapt to social and economic change.

Current State and Trends

Japan's population had increased for a long time and exceeded 120 million in the 1980s but started to decrease in the 2015 census, for the first time since its launch in 1920. The populations of mountain village areas[42] decreased due to young people leaving the communities and fell slightly under 0.4 million in 2010. Its ratio to Japan's overall population was about 7% in 1965 but fell to about 3% in 2010. Depopulation and aging are further advancing.

In 2010, the ratio of persons aged 65 or over is 23% in terms of the national average but 34% in mountain village areas. Indicators concerning convenience in everyday life, including the rates of flush lavatories and medical facilities, are also low in mountain village areas.

Figure 76: Change in Japan's Population

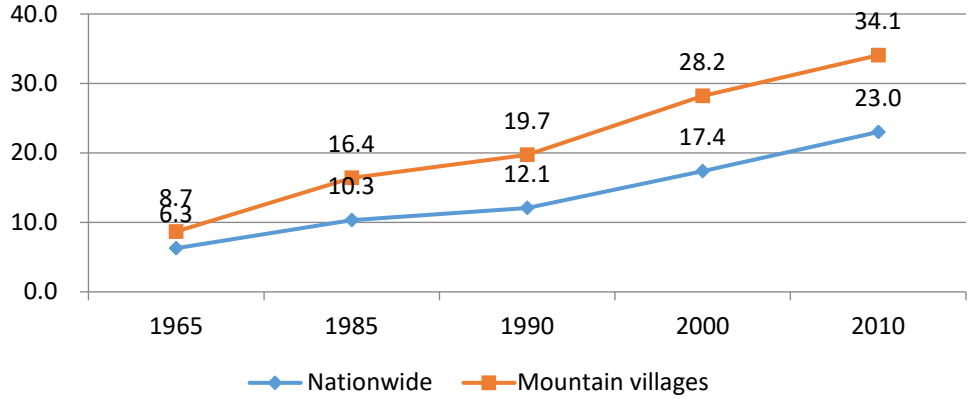


Note: Population and the number of the elderly in mountain village areas are estimated by MAFF Rural Development Bureau

Sources: Ministry of Agriculture, Forestry and Fisheries. Survey on mountain village areas; Ministry of Internal Affairs and Communication. National Census

[42] Mountain Village Areas Due for Development designated pursuant to the Mountain Villages Development Act. They are former municipalities (municipalities as of 1950) with forest land rate of 75% or higher, and a population density of 1.16/ha or lower as of 1960. About 60% of all forest lands lie in mountain village areas.

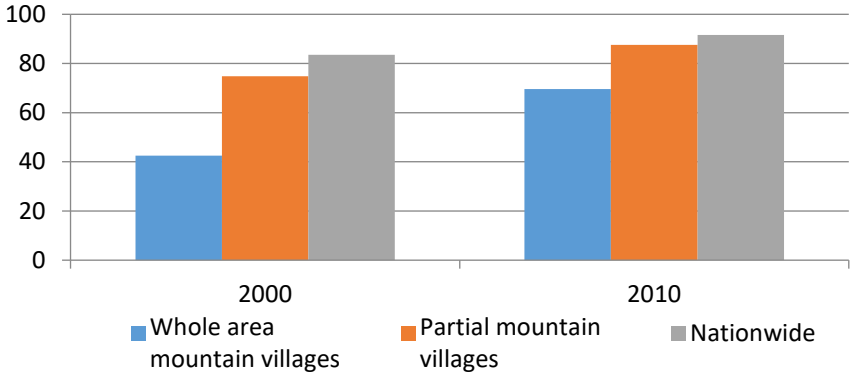
Figure 77: Change in the rate of aging (proportion (%) of the population aged 65 or older)



Note: Population and the number of the elderly in mountain village areas are estimated by MAFF Rural Development Bureau

Sources: Ministry of Agriculture, Forestry and Fisheries. Survey on mountain village areas; Ministry of Internal Affairs and Communication. National Census

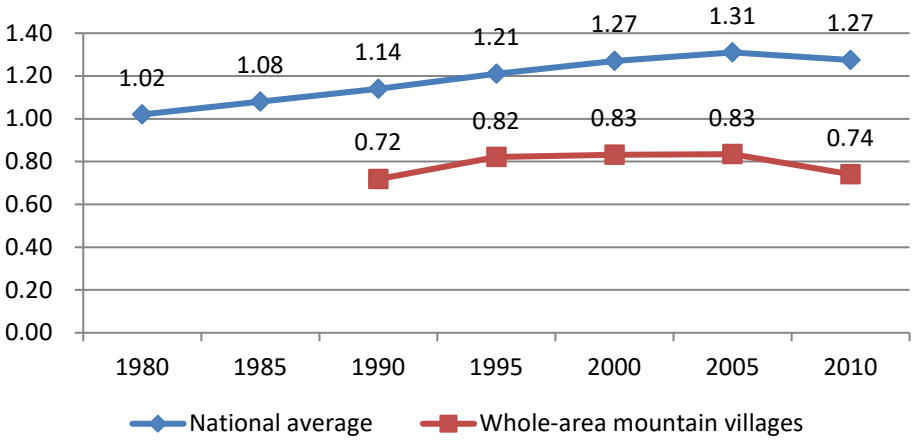
Figure 78: Comparison of the rate of flush lavoratories (%)



Note: A municipality of which the whole area is comprised of "mountain village areas" is called a "whole mountain village areas," while municipalities of which a part is a "mountain village areas" is called a "partial mountain village areas"

Sources: Ministry of the Environment. Waste Treatment in Japan; Ministry of Agriculture, Forestry and Fisheries. Survey on mountain village areas.

Figure 79: Change in the number of hospitals/clinics per thousand people



Sources: Ministry of Internal Affairs and Communication. Survey on public facilities; Ministry of Agriculture, Forestry and Fisheries. Survey on mountain village areas.

INDICATOR 6.3.d Area and percent of forests used for subsistence purposes

Rationale

This indicator provides information on the extent to which indigenous and other communities rely on forests as a source of basic commodities, such as food, shelter and medical plants. In some countries, the survival of cultural identity and the practice of forest-based subsistence livelihoods may be closely linked.

Current State and Trends

In Japan, there had been forest management systems, such as forests owned by the communities and common forests where people were customarily allowed to use the forest resources. With the implementation of the municipal system in 1889, some of them were transferred to municipalities and some became forests owned by multiple people through change of ownership to common ownership by right holders.

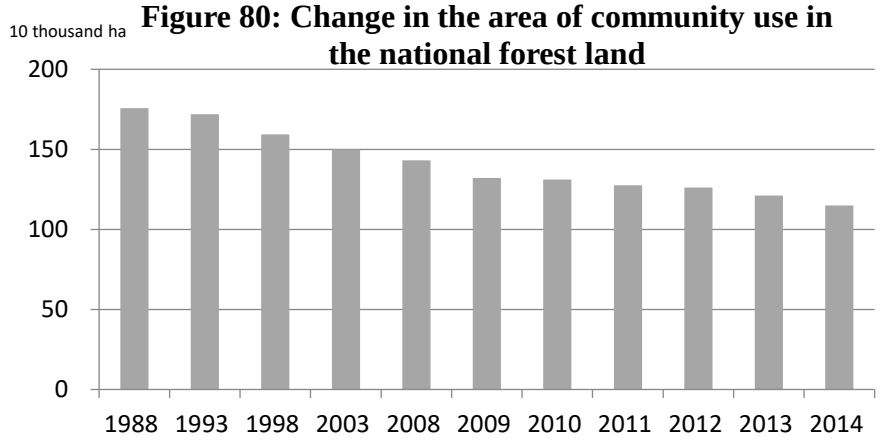
The Act on Advancement of Modernization of Rights in Relation to Forests Subject to Common Rights was enacted in 1966. Considering that rights in common forests such as village mountains jointly used by village communities were mainly customary common rights and rights to use based on old customs before the introduction of modern legal system in Meiji Restoration, the act aimed to dissolve these rights and promote modernization.

Later, many of the groups owning a forest in common were organized into forestry production associations based on the Forest Owner's Cooperatives Act. As of 2016 there were 2,949 forestry production associations, 59% of which answered that they were established for joint management of a forest owned by the community. The area of managed forests is 320,000 ha. Activities carried out there include forest management, production of trees for greening or edible mushrooms, and farming.[43]

In 2016 about 1.18 million ha of national forest land was designated as reserved forests permitted to customary use of local dwellers. Usually the use of national forests is limited to public undertakings, but local communities are given exceptional status for customary use based on the Act on Management of National Forest Land. Based on a contract with the District Forest Office concerned, local residents can collect commodities for daily consumption, such as fuel wood and edible wild plants and mushrooms for their own consumption. However, the total area of the common forests has been decreasing because of the diminishing and aging population.

[43] Source: Forestry Agency, Survey on Forest Owners' Cooperative

Figure 80: Change in the area of community use in the national forest land



Source: National Forest Management Statistics

INDICATOR 6.3.e Distribution of revenues derived from forest management

Rationale

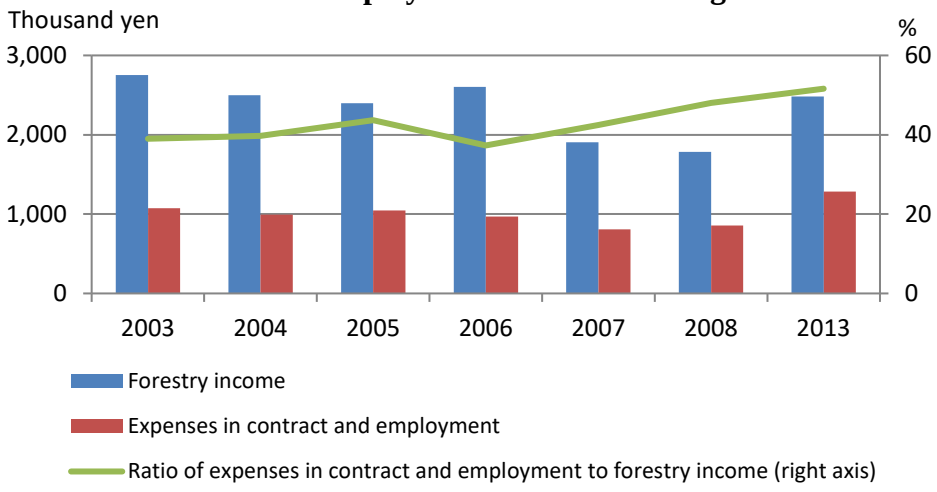
This indicator provides information about the flow and distribution of revenues from forest services, their management, and their use back into forest-based communities, wider society and the forest sector. Such distribution of revenues provides information about the extent to which forest-based communities, the forest sector, and broader society are sharing economic earnings generated from forest.

Current State and Trends

The annual forestry income of forest owners per household, including timber sales, and annual expenses in contracts and labor for forest management were 2.5 million yen and 1.3 million Japanese yen respectively in 2013. It is considered that about 50 % of the revenue generated from forest resources was directly distributed to the local community as labor expense, etc.

While gross forestry income[44] has increased in recent years, the ratio of expenses in contract and employment to forestry income has also increased, which may result in a lower profit rate.

Figure 81: Change in forestry income and expenses in contracts and employment for forest management



Source: Ministry of Agriculture, Forestry, and Fisheries. Statistical Survey on Forest Management

Note: Forestry income and expenses in contracts and employment are per forest owner household

[44] Gross income from forest management for the year, which is the total of forest product sales, market value of forest products for household consumption, and increase of unprocessed stock of forest products.

6.4 RECREATION AND TOURISM

Forests have long been used as a place for recreation and other leisure activities. These activities provide local employment, generate income, and contribute to the quality of life of urban and rural communities. Environmental quality, location, availability of on-site services and accessibility are important to forest-based recreation and tourism. Levels of use are an indication of the extent to which forests are valued by society for these uses.

INDICATOR 6.4.a Area and percent of forests available and/or managed for public recreation and tourism

Rationale

This indicator provides information on the area and extent of forests available and/or managed for recreation and tourism activities. The existence of forests available for these activities and management for this purpose reflect public awareness of the value of forests for recreation and tourism activities.

Current State and Trends

As stated in Indicator 4.1.a, protection forests are designated for various public functions, including conservation of soil and water resources. Currently about one million ha is designated as protection forests for public health or scenic site conservation mainly for forest recreation and tourism activities.

In addition, about 0.38 million ha of national forest land with excellent natural landscapes and suitable for forest bathing, nature observation, outdoor sports, and other purposes is designated as Recreation Forests.

Furthermore, there are about 4 million ha of forests in National Parks and other natural parks.

INDICATOR 6.4.b Number, type, and geographic distribution of visits attributed to recreation and tourism and related to facilities available

Rationale

This indicator provides a measure of the level and type of recreation and tourism use in forests. The number and geographical distribution of visitors and available facilities reflects the level of public participation in leisure activities in forests and the importance of forests for recreation and tourism activities.

Current State and Trends

Though it is difficult to accurately grasp the number of available facilities for recreation/tourism activities in forests, 1,055 sites, or 0.38 million ha of national forest in total, have been selected as Recreation Forests. Recreation Forests are divided into six types: nature recreation forests, nature observation education forests, landscape forests, sports forests, outdoor sports areas, and forests for enjoying scenic beauty. About 110 million people in total visited these forests in 2015.

Table 10: Purpose and utilization of Recreation Forests

Type	Characteristics	No. of sites	Area (thousand ha)	No. of visitors (million)
Nature recreation forests	Forests with special beauty in landscapes and suitable for recuperation. Visitors can enjoy multiple activities, including nature trips, climbing, hiking, and camping.	88	103	12
Nature observation education forests	Forests with varied scenes and suitable for nature observation and learning. Visitors can observe wild flora and fauna, and learn forest functions.	159	31	7
Landscape forests	Forests and historic spots forming a scenic area. Visitors can appreciate the grand prospect of the forest and the history of the region	464	176	61
Sports forests	Forests suitable for outdoor sports in contact with the forest. Visitors can feel nature through camping, cycling, etc.	55	7	1
Outdoor sports areas	Areas incorporating ski slopes, accommodation facilities, etc. Visitors can work out in a magnificent landscape.	184	45	23
Forests for enjoying scenic beauty	Areas where forests, lakes, and valleys form an excellent natural landscape. Visitors can enjoy various trees and natural beauty.	105	20	6
	Total	1,055	383	110

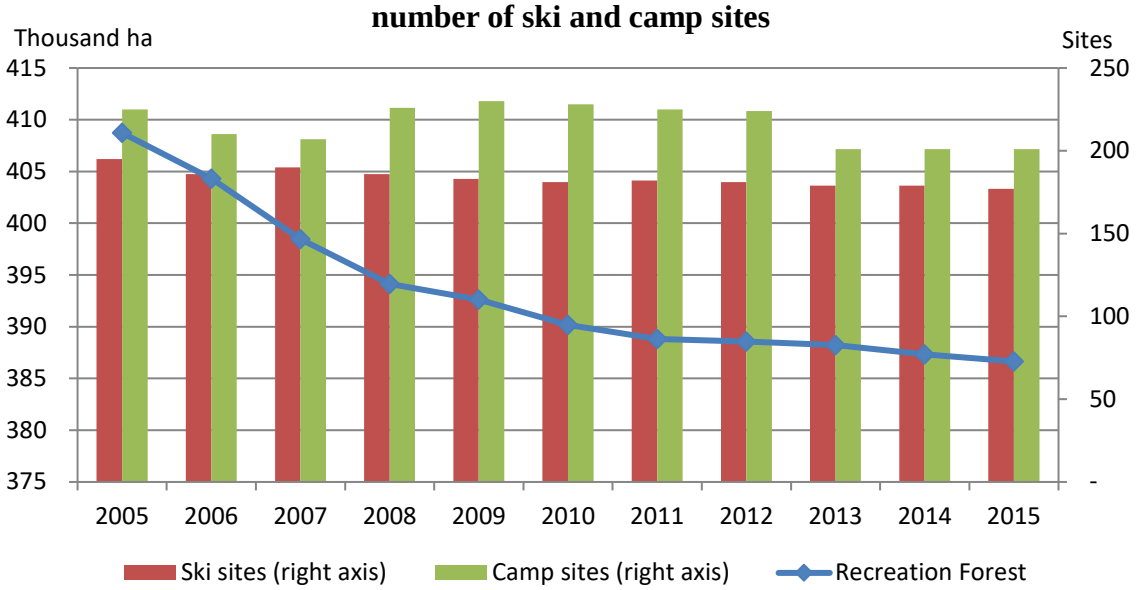
Note 1: The number of sites and areas are values as of April 1, 2016. The numbers of visitors are references from FY2015.

Note 2: The totals do not agree due to rounding.

Source: Forestry Agency. FY2015 implementation status of the basic plan for management and operation of national forests

In Recreation Forests, forests and facilities are developed in a planned way according to the conditions, while at the same time maintaining a good natural environment and considering regional development. 177 ski sites and 201 camp sites have been developed.

Figure 82: Change in the area of Recreation Forests and the number of ski and camp sites



Source: Forestry Agency. National Forest Management Statistics

6.5 CULTURAL, SOCIAL AND SPIRITUAL NEEDS AND VALUES

There are many social, cultural and spiritual connections between forests and people. These values may be deeply rooted in their traditions, experiences, beliefs, and other factors both in rural and urban areas.

These values may be deeply held and may influence attitudes to forests and their management. Spiritual and cultural associations between indigenous people and forests often form part of their identities and livelihoods. Beliefs, values, traditions, and knowledge may have shaped forest management for many generations. The following indicator provides information about the level of existence and public awareness of cultural, social, and spiritual needs and values.

INDICATOR 6.5.a The area and percent of forests managed primarily to protect the range of cultural, social, and spiritual needs and values

Rationale

This indicator measures the extent of forest management primarily for cultural, social, and spiritual values for people and communities, including indigenous and other communities that have strong associations with forests. Forest protection to satisfy these needs and values reflects the extent of public awareness of the needs and values.

Current State and Trends

As stated in Indicator 4.1.a, protection forests are designated for various public functions, including the conservation of soil and water resources. Currently about one million ha of forest land are designated as protection forests for public health or scenic site conservation for the purpose of forest recreation and sightseeing.

As stated in Indicator 7.5.a there is an initiative in national forests to support “wood culture” for activities to supply lumber, bark, etc., necessary to pass down the “wood culture”, including historic wooden structures and traditional woody crafts, to future generations.

In addition, there are about 4 million ha of forests in natural parks, including national parks.

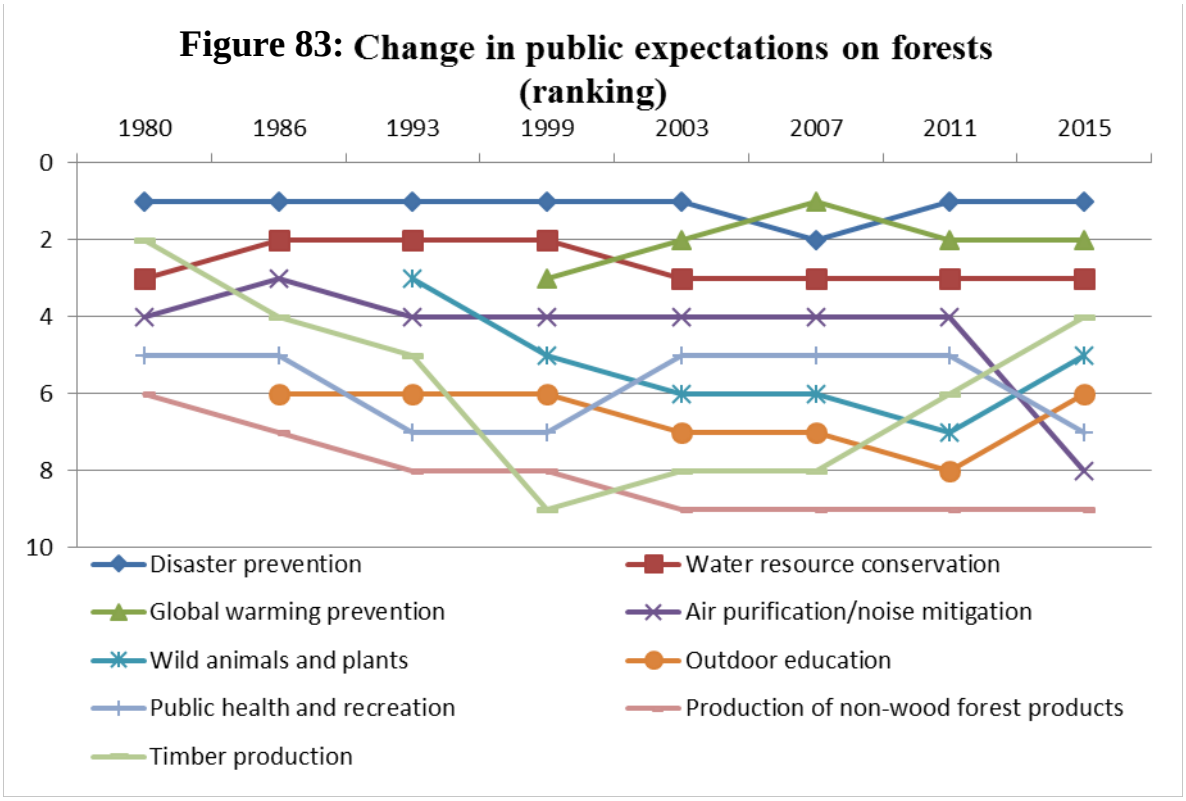
INDICATOR 6.5.b The importance of forests to people

Rationale

This indicator provides information on the range of values that communities and individuals hold for forests. These values shape the way people view forests, including their behaviors and attitudes to all aspects of forest management.

Current State and Trends

In the Survey on Awareness/Intension on Cyclic Use of Forest Resources conducted by the Ministry of Agriculture, Forestry and Fisheries in 2015, consumer monitors[45] were asked what functions they expect among multiple forest functions. A high ratio of the respondents answered "function to prevent disasters such as landslides and floods (disaster prevention)," "function to contribute to global warming prevention through absorption of carbon dioxide (warming prevention)," and "function to store water resources (water resource conservation)."



Note: Multiple answers to select three of the alternatives

Note 2: "nothing in particular", "don't know," and "other" are excluded from the alternatives.

[45] "Consumers" in this survey are people aged 20 or older who are interested in agriculture, forestry, and fisheries administration, and can use the Internet through a personal computer in principle.

Source Created by the Forestry Agency based on: Prime Minister's Office. Poll on Forest and Forestry (1980), Poll on Greenery and Trees (1986), Poll on Forest and Greenery (1993) and Poll on Forest and Living (1999); Cabinet Office. Poll on Forest and Living (2003, 2007 and 2011); Ministry of Agriculture, Forestry and Fisheries. Survey on Awareness/Intension on Cyclic Use of Forest Resources (October 2015)

Criterion 7 Legal, institutional and economic framework for forest conservation and sustainable management

Criterion Seven relates to the overall economic, legal, institutional, and policy environment of a country. This Criterion provides a context for the consideration of Criteria One to Six.

Legislation, institutional capacity and economic arrangements, with associated policy measures at both national and sub-national levels, create an enabling environment for the sustainable management of forests. Reporting against these indicators contributes to raising public and political awareness of issues affecting forests and builds support for their sustainable management.

INDICATOR 7.1.a Legislation and policies supporting the sustainable management of forests

Rationale

This indicator provides information on legislation and policies, including regulations and programmes, which govern and guide forest management, operations and use. Legislation and policies designed to conserve and improve forest functions and values are prerequisite to achieving the sustainable management of forests.

Current state and trend

While various laws and regulations are enacted to support the sustainable management of forests in Japan, the basic framework is supported by the Forest and Forestry Basic Act and the Forest Act.

The Forest and Forestry Basic Act provides sustainable fulfillment of multiple functions of forests as its basic philosophy, and stipulates sound forest management and conservation, promotion of rural area and sustainable and sound development of forestry as its principle. It provides that the national government, in consideration of the importance to promote sustainable fulfillment of multiple functions of forests with international collaboration, is to promote international coordination of efforts to establish rules relevant to the forest management and conservation. This provides justification for activities on the criteria and indicators of the Montreal Process.

In addition, based on the Act, in order to promote comprehensive and systematic promotion of forest and forestry policies, the government establishes the “Basic Plan for Forest and Forestry”. The plan is to be revised approximately every 5 years, taking into consideration the changes in circumstances surrounding forest and forestry and other relevant matters. Current plan was established in May 2016. It contains policies for transforming forestry into a growth industry: improvement of productivity of forestry practices such as harvesting and re-planting, as well as creation of wood demand in areas where wood has not been used so much.

The Forest Act is enacted for providing basic matters concerning the forest planning system, protection forests and other fundamental issues on forest, seeking the sustainable forest management, and promoting forest productivity, thereby contributing to the conservation of the national land and development of the national economy. The Act contains provisions serving as the basis for various regulations, rules and guidelines, etc. concerning the forest planning system which is to be established for promoting systematic and appropriate management of forests from a long-term perspective, forest land development permission system for securing sound use of forestland, protection forest system for achieving specific public objectives such as headwater conservation and disaster prevention, etc.

Under the Forest Act, the Minister of Agriculture, Forestry and Fisheries is to establish the “Nation-wide Forest Plan” every five years with a period of fifteen years and thereby present the goals for

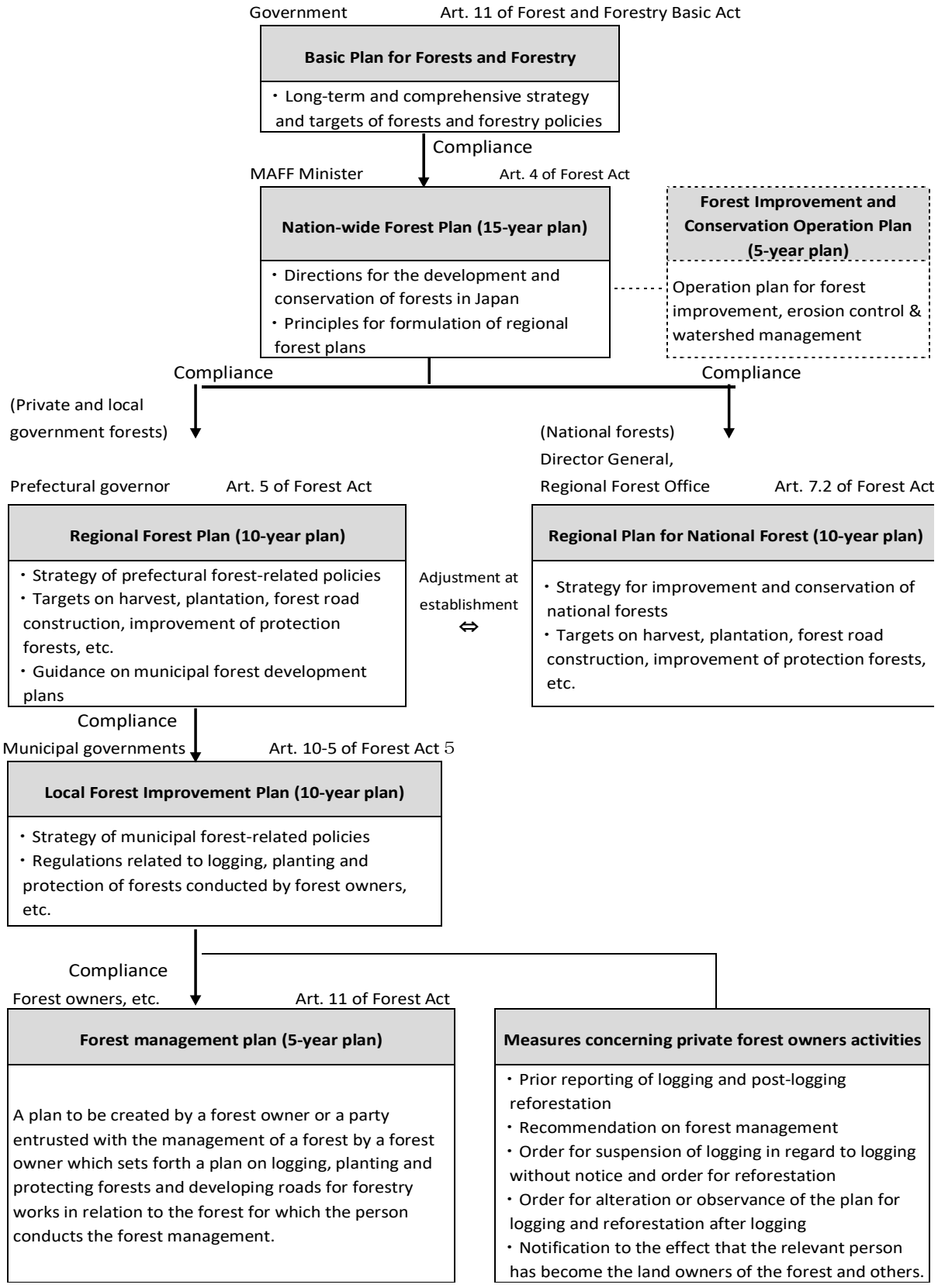
management and conservation of forests, designed volume of harvest and re-planting, and criteria for forestry practices, etc.

The prefectural government and regional forest office are to formulate the “Regional Forest Plan” and “Regional Plan for National Forest” for private forests and national forests, respectively, for each of the 158 planning areas. These plans provide the goals for management and conservation of forests, as well as the concept of the forest management practices such as zoning of forests, logging, etc., based upon the situation of each area.

The municipality is to formulate the “Local Forest Improvement Plan” compatibly with the regional forest plan. The plan provides residents with the long-term concept concerning the forest management in the area and code of concept for forestry operation and forest protection, and thereby indicates the specific forestry practices by zone and the plan on forest road system, etc.

In addition, forest owners and those entrusted with forest management are allowed to establish a “Forest Management Plan” for a period of five years, which provides specific forest management practices and protection measures for the forests under their management as a whole entity, and thereby to apply for the approval by the mayor of the municipality. For the approved forest management, various incentive measures are taken in the aspect of finance and taxation to enable forest management in a sustainable manner.

Figure 84: Structure of forest planning system



There are other laws which contribute to realizing sustainable forest management. In 2017, the “Act on Promotion of Use and Distribution of Legally-Harvested Wood and Wood Products” (also called “the Clean Wood Act”) was enacted to combat illegal logging. Under this Act, every business entity is required to make efforts to use legally-harvested wood and wood products. Also, a wide range of business entities (Wood-related Business Entities) which deal with wood and wood products including paper and furniture, build homes and other structures using wood and supply electricity obtained by combusting woody biomass are required to confirm the legality of the wood and wood products they handle. This Act aims to promote use of wood and wood products which have been confirmed to be legally harvested and consequently eliminate illegally harvested wood and wood products in Japan.

INDICATOR 7.1.b Cross-sectoral coordination of measures and programs

Rationale

This indicator provides information about the extent of the coordination of policies and programs across sectors to support sustainable management of forests. Decision making on land use and development in a non-forest sector can have a significant impact on forests and their use. Cross-sectoral coordination of forest/non-forest policies and programs will help minimize negative impacts. By strengthening capabilities to address domestic and global challenges, the government can promote the improvement of forest management.

Current State and Trends

Because forests are closely related to various aspects of economy, society, and environment, coordination is made at various levels of policy formation and implementation.

For example, the Forest and Forestry Basic Act provides that the Basic Plan for Forests and Forestry, which is Japan's basic policy on forests and forestry measures, is not formulated by the Minister of Agriculture, Forestry and Fisheries, who holds direct jurisdiction over forests, but by the government. When developing or changing the plan, detailed discussions and coordination are made among relevant ministries and agencies.

In addition, policies under the jurisdiction of other ministries and agencies are also coordinated with policies related to forests and forestry in various ways. Efforts made in recent years include the following:

(i) In response to the sediment disaster that occurred in Hiroshima Prefecture in August 2014, the Working Group to Study Comprehensive Countermeasures for Sediment Disaster was set up under the Central Disaster Prevention Council of the Cabinet Office in June 2015. The working group compiled "About Comprehensive Countermeasures for Sediment Disaster" as a basic policy for the future. Based on this, effective coordination between forest conservation measures under the jurisdiction of the Forestry Agency (FA) and sand erosion control measures under the jurisdiction of Ministry of Land, Infrastructure, Transport and Tourism (MLIT) is further promoted.

(ii) In order to disseminate Cross Laminated Timber (CLT), FA and MLIT jointly published "Roadmap toward Increased Use of CLT" in November 2014. Later, notification on the strength of CLT materials, general design methods of building using CLT, etc. were promulgated and enforced through experiments by FA and MLIT. In addition, FA and MLIT formulated and published "New Roadmap toward Increased Use of CLT – for further expansion of demand" in January 2017 and cooperated in enhancement of the will for construction using CLT, increase

of architects and builders using CLT, promotion of technology development, cost reduction, and other efforts.

(iii) Based on the Act on Promotion of Use of Wood in Public Buildings, etc. enacted in 2010, the basic policy was formulated. The policy includes a goal to use wood for all public low-rise buildings developed by the government if they are not required by ordinance to be fireproof or have fire-proof principal structural parts (partially changed in FY2017). In FY2015 FA and MLIT set up an investigation team to examine why some of such buildings were not built as wooden structures. The Ministry of Education, Culture, Sports, Science and Technology (MEXT) revised the Structural Design Standard for Wooden School Buildings in March 2015 so that even engineers without experience of designing a large-scale wooden structure can plan and design wooden school buildings relatively easily. MEXT also developed "Build Schools with Wood – Guide for construction of three-story wooden school buildings" in March 2016.

(iv) For mitigation of and adaptation to climate change, the Ministry of the Environment led broad-ranging coordination with relevant ministries and agencies. Based on the Paris Agreement adopted by COP21 and Japan’s Intended Nationally Determined Contribution (INDC) submitted to the United Nations in July 2015, the government made a “Cabinet decision on the Plan for Global Warming Countermeasures” in May 2016 for comprehensive and strategic implementation of global warming countermeasures. The plan defines countermeasures to be taken by individual entities and national measures to achieve the medium-term goal to reduce emissions by 26% from the FY2013 level by FY2030, and it set the long-term goal of 80% reduction of GHG emissions by 2050. The plan is the foundation for Japan's promotion of global warming countermeasures. In addition, a Cabinet Decision on the National Plan for Adaptation to the Impacts of Climate Change was made in November 2015 for integrated and strategic promotion of efforts that are coordinated to address various impacts of climate change. Later the Climate Change Adaptation Act was enacted in June 2018 in order to legally define adaptation strategy and promote climate change adaptation efforts through united efforts by all parties.

(v) MAFF and METI set up a joint workshop to promote the use of woody biomass. The workshop studied measures to promote new woody biomass in three sessions from December 2016 to June 2017. In July 2017, the workshop published "Toward construction of ‘local ecosystems’ – promotion of new woody biomass use in villages," compiling new measures to review local forest resources as energy sources and promote low cost energy use that is relatively small-scale, can be completed within a village, and contributes to the village's maintenance and vitalization.

(vi) In order to ensure close coordination among related administrative organs for comprehensive and effective promotion of SDGs, the SDGs Promotion Headquarters was set up in the Cabinet

in May 2016 and consists of the entire cabinet led by the Prime Minister. Under the SDGs Promotion Headquarters, the SDGs Promotion Roundtable was set up with broad-ranging participants, including NGOs, NPOs, experts, private sectors, and international organizations. In December 2016, SDGs Implementation Guiding Principles was decided as Japan's national strategy for implementation of the 2030 Agenda.

INDICATOR 7.2.a Tax system and other economic measures that have impact on sustainable management of forests

Rationale

This indicator provides information about economic measures that have an impact on the sustainable management of forests. The government's policies and measures pertaining to investments, tax system, and international trade may have an impact on forest management and the level of long-term investment in forestry.

Current State and Trends

In order to promote sustainable forest management, Japan provides finance and credit guarantee measures.

Normally, it takes several decades for forest investment to make a profit, however, taking into consideration such long-term investment, tax reductions and exemptions have been made for income tax, inheritance tax, etc.

In addition, following the "FY 2018 Tax Reform" decided by the Cabinet in December 2017, it was decided to create Forest Environment Tax and Forest Environment Transfer Tax for forest improvement, etc., conducted by municipalities in the FY2019 tax reform.

The forestry insurance system has been established as comprehensive insurance to compensate for damage to forests due to fire, meteorological disasters, and volcanic eruptions. Forest insurance is the only safety net provided by forest owners and is indispensable for stable forestry management and promotion of reforestation.

INDICATOR 7.3.a Clarification and conservation of property rights and ownership of land/resources

Rationale

This indicator provides information on ownership, laws and rights concerning land, forests, and resources. Clear property rights establish rights and responsibilities based on laws related to land and resources, while due legal processes guarantee that these rights can be protected and also contested. If clear property rights and a due legal process do not exist, it may hinder the active participation of stakeholders in sustainable management of forests, or encourage illegal or unsustainable use of forests.

Current State and Trends

In Japan, an individual's property right is guaranteed by the constitution, and the Civil Code is enacted to provide basic matters concerning ownership of land, including forests.

On the other hand, there are forests with unknown boundaries and forests of unknown ownership by not making transfer registration at the time of inheritance, as a result of reduced owners' interest in forests due to the fall in wood prices, aging of forest owners, and other factors. Identification of the owners and clarification of boundaries have become a challenge for appropriate forest management.

For the identification of forest ownership, the revision of the Forest Act in 2011 led to the start of a system to require new forest land owners to notify the mayor of the relevant municipality of the ownership in April 2012.

In addition, an administrative body can use information on forest owners and request other administrative bodies to provide information necessary to identify forest owners, etc. Furthermore, the 2016 revision of the Forest Act led to the establishment of a system whereby the municipalities create a forestland registry including forest land ownership and the implementation status of boundary surveys, and publish a part of the content.

INDICATOR 7.3.b Enforcement of forest-related laws

Rationale

This indicator provides information on the extent to which forest-related laws and regulations are being enforced. The ability to successfully prosecute offenders is essential to address harmful acts (such as illegal forest land diversion and logging) that could threaten forests and their sustainable management.

Current State and Trends

Laws, regulations, and policies that support the sustainable forest management mentioned in Indicator 7.1.a are enforced by the national, prefectural, and municipal governments based on their roles.

At the national level, about 5,000 officials are working at the Forestry Agency under the Ministry of Agriculture, Forestry and Fisheries. They develop basic policies and plans based on various laws and regulations, grant subsidies for private forest administration, provide technical guidance and advice, and directly manage national forests. For the conservation and management of national forests, they conduct patrols and educational activities in cooperation with local public bodies, police, volunteer groups, and others to prevent forest fires, illegal collection of plants, and damage by pests/animals. For example, the heads of District Forest Offices and foresters are given strong authorities, such as special judicial police officers, to crack down on thefts in national forests.

Prefectures and municipalities enforce forest-related laws and regulations for private forests and manage forests owned by them.

There are about 9,000 officers responsible for forestry in 47 prefectures across Japan[46]. They engage in the development of regional forest plans and forest conversion permission, grant subsidies to forest improvement projects of municipalities, and carry out forest conservation programs, etc. from a broad-based perspective of river basins and so on.

There are 1,724 municipalities (including cities designated by Cabinet Order, as of August 2018) in Japan, some of which do not have a forest, and about 3,000 officers in total are responsible for forestry at the municipal level. As administrators closely attached to the communities, they develop local forest improvement plans and supervise forest management practices by forest owners.

As for the forest development among activities that could threaten forests and their sustainable management, logging operations and changes to the form and nature of land, etc. are regulated in protection forests. For private forests other than protection forests, forest land development permission system has been established to ensure appropriate use of forest land. Under the system, forest conversion exceeding a certain scale requires a permit from the prefectural governor. In response to

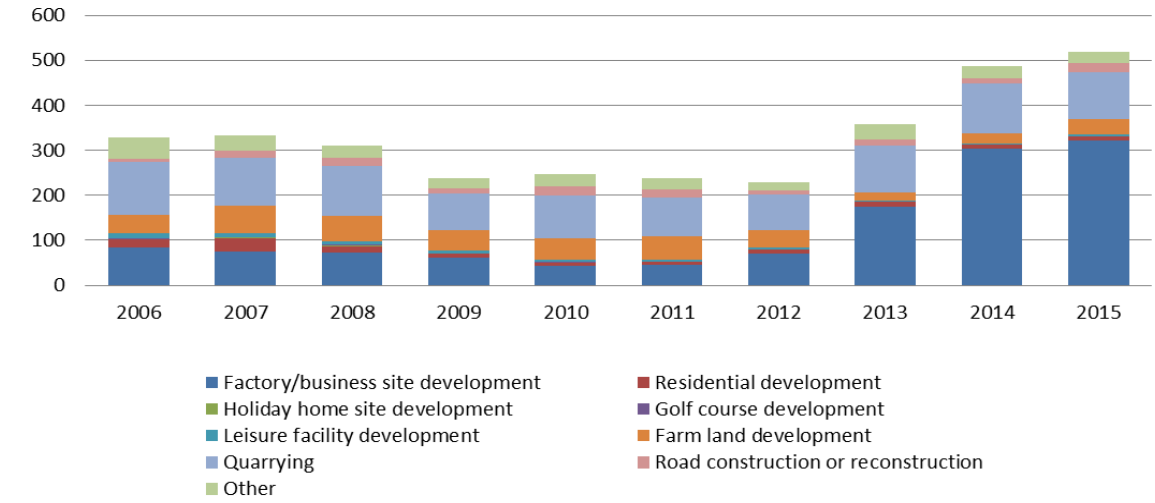
[46] Ministry of Internal Affairs and Communication, the Survey on local government quota management

the increased number of violations to the system and worsening of their nature in recent years, the revision of the Forest Act in 2016 added imprisonment to the penalties for violations, and the upper limit of the relevant fine was raised (imprisonment with work for not more than three years or a fine not exceeding 3 million yen).

In cases where logging operation is restricted, logging operation requires prior permission by the prefectural governor. In order to conduct logging in area where logging is not restricted, it is mandatory to submit a plan of logging operation and subsequent afforestation to the mayor in advance. There are also penalties for failure to do so appropriately. It is also mandatory to report the forest conditions related to the logging and afforestation after completing the afforestation.

In addition to the above, the Forest Act provides punishment for theft, arson, and violations of a permit for lighting fires and various other restricted activities in protection forests.

Figure 85: Change in the number of forest land development permits



Source: Forestry Agency

To address illegal logging, the Act on Promotion of Use and Distribution of Legally- harvested Wood and Wood Products (commonly called the Clean Wood Act) enforced in May 2017 requires all business entities to endeavor to use legally harvested wood and wood products, and a broad range of business entities handling wood and wood products (Wood-related Business Entities), to confirm the legality of the wood and wood products they handle. Wood-related Business Entities include those which deal with wood and wood products including paper and furniture, build homes and other structures using wood and wood and supply electricity obtained by combusting woody biomass. Under the act, Wood-related Business Entities that properly and reliably take measures to confirm the legality can apply to be Registered Wood-related Business Entities to a Registering Organization that is a third-

party organization designated by the competent ministers. After registration, they can use the title of Registered Wood-related Business Entity. In October 2017, the competent ministers designated five Registering Organizations, which started registration services in the same month. As of November 30, 2018, 153 Wood-related Business Entities were registered.

INDICATOR 7.4.a Programs, services, and other resources supporting sustainable management of forests

Rationale

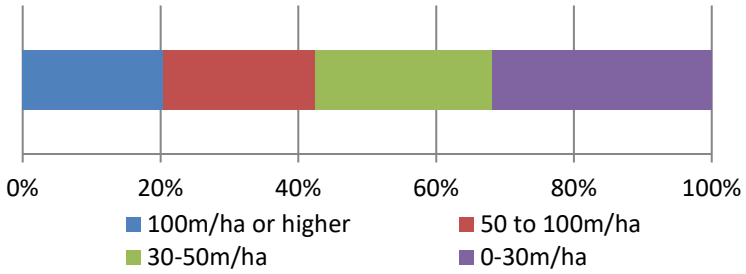
This indicator provides information on the ability of the government and private organizations to provide programs and services necessary to support the sustainable management of forests, maintain and develop infrastructure, and access financial and human resources.

Current State and Trends

The forest-road network is developed for a stable supply of wood and efficient implementation of management practices which are necessary for sustainable fulfillment of multiple functional roles for forests. It is the most important production infrastructure of forestry. Because the development of the forest-road network can improve access to workplaces, improve safety through the introduction of machinery, and reduce the time required for emergency transport at the time of an industrial accident, it contributes to the improvement of forestry working conditions. In addition, when public roads have been blocked due to an earthquake or other natural disaster, the forest-road system has been used as a bypass.

In a survey on forest-road development of forest worker monitors, about 60% of them answered that the density of forest-road is less than 50m/ha. In Japan, the forest-road network is underdeveloped due to steep topography, a large variety of geological features, and other factors. As of the end of FY2014, the density of forest roads was 20m/ha.

Figure 86: Status of development of forest-road system



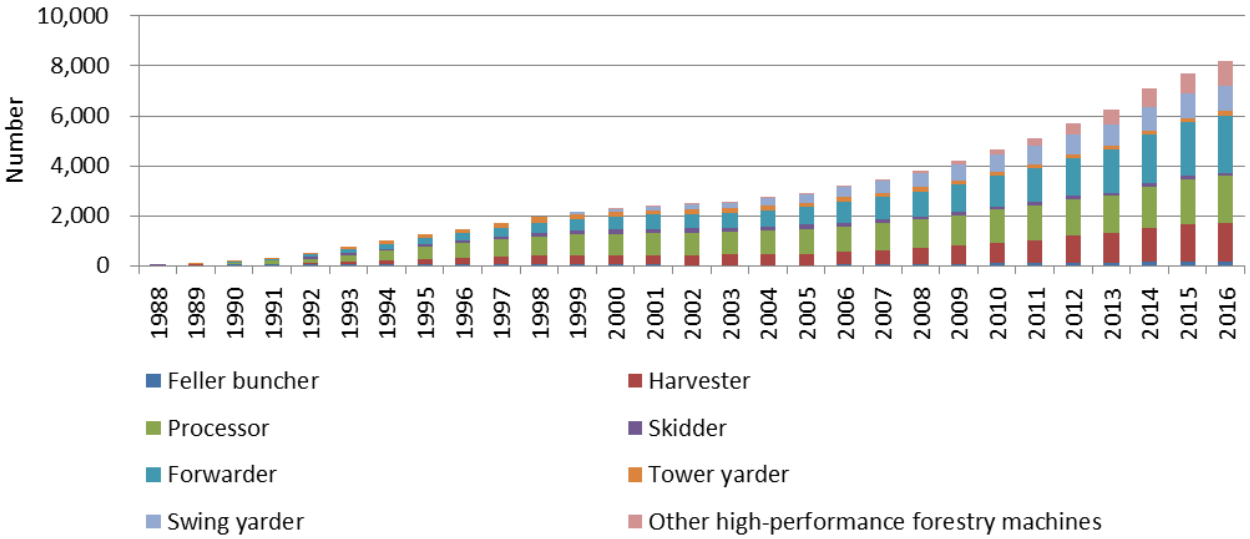
Note 1: Result of a survey of forest worker monitors

Note 2: The total does not agree due to rounding

Source: Ministry of Agriculture, Forestry and Fisheries. Survey on Awareness/Intension on Cyclic Use of Forest Resources (October 2015)

High performance forestry machines significantly improve work efficiency and reduce the burden on the human body compared with conventional machines such as chainsaws and bush cutters. In Japan, the introduction of high-performance forestry machines started in the latter half of the 1980s. The number of such machines, especially forwarders, processors, harvesters, and other vehicle-type machines, which essentially require forest-road system, has been increasing in recent years. As of the end of March 2017, 8,202 machines in total were owned, increasing 7% from the previous year.

Figure 87: Change in the number of high-performance forestry machines



Source: Forestry Agency

There are broad-ranging human resources engaging in the promotion of sustainable forest management, which include technical experts, people who convey information on forests to the public and people who protect and grow trees.

Table 11: Forest-/forestry-related technical experts

Forestry extension advisor	Prefectural officers who have the national qualifications based on the Forest Act, disseminating techniques and knowledge on forests and forestry as well as providing guidance on forest management practices to forest owners. They also conduct research on specialized subjects in cooperation with research and development institutes.
Forester	Forest management advisors who have the national qualifications based on the Forest Act, providing support to local municipalities to plan their regional policy plan on forests and forestry, as well as guiding forest owners in forest management practices.
Professional engineer (forest sector)	Persons who have national qualifications based on the Professional Engineer Act and are registered to the government, and have technical expertise on science and technology, high practical skills, and rich operational experience (there are 21 technology divisions, including forest, construction, machinery, electric/electronic, and agriculture)
Forestry expert	Persons who have private-sector qualification recognized by the Japan Forest Technology Association and practice expertise concerning technical operations, including forest civil work
Forest instructor	Persons who have the qualification recognized by the Japan Forest Recreation Association and provide general public with knowledge on forests and forestry, lead the way in forests and provide instructions on outdoor activities in forests
Tree doctor	Persons who have the qualification recognized by the Japan Greenery Research and Development Center and engage in protection, vigor recovery, treatment of giant trees, old trees, etc. beloved as symbols of a hometown.

Table 12: Change in the number of forest-/forestry-related Technical experts

	1995	2010	2011	2012	2013	2014	2015
Forestry extension advisor	2,378	1,398	1,370	1,353	1,350	1,324	1,304
Forester	0	0	0	0	0	461	717
Professional engineer (forest sector)	411	960	1,028	1,080	1,131	1,187	1,260
Forestry expert	7,168	11,341	11,765	12,103	12,430	12,726	12,983
Forest instructor	425	2,926	3,022	3,071	3,087	3,092	3,104
Tree doctor	389	1,909	2,020	2,134	2,247	2,356	2,464

Note 1: Forestry extension advisor: Value of FY2015 is as of April 1, 2015

Note 2: Forester: Value of FY2015 is as of the end of December, 2015

Note 3: Professional engineer (forest sector): Value of FY2015 is as of the end of March, 2016

Note 4: Forestry expert: Value of FY2015 is as of April 1, 2015

Note 5: Forest instructor: Value of FY2015 is as of the end of February, 2016

Note 6: Tree doctor: Value of FY2015 is as of December, 2015

Sources: Forestry Agency. The data of forestry expert are based on the survey of the Japan Forest Technology Association.

Japan is affected by many natural disasters, including heavy rain accompanying fronts or typhoons, and earthquakes under the condition of the steep and vulnerable topography. To address this challenge, the government is promoting forest conservation programs as one of the important pillars of land conservation measures. Forest conservation programs enhance the disaster prevention/mitigation effects of forests through proper forest management that strengthen soil binding by the tree root system intrinsic to forest ecosystems and, in combination with the development of forest conservation facilities which prevent the erosion of forest land and stabilize spurs, programs strengthen mountainous hazard prevention functions of forests in a comprehensive manner. As of the end of FY2012, about 0.44 million dam works have been developed across the country. Today, not only new infrastructure development but also appropriate operation and maintenance of existing stock have become an important issue. Based on the "Basic Plan for Life-Span Extension of Infrastructure," formulated as a policy of the entire government to promote strategic operation, maintenance, and renewal of infrastructure in November 2013, the “Forestry Agency’s Plan for Life-Span Extension of Infrastructure” was formulated for the steady promotion of the operation, maintenance, and renewal of the infrastructure managed by and under the jurisdiction of the Agency. Efforts have been made for the rennovation, renewal, and functional enhancement of the facilities based on the plan.

INDICATOR 7.4.b Research, technology development and application for sustainable management of forests

Rationale

This indicator provides information on abilities to develop new science, research and technologies and incorporate these in forest management. Continuing the deepening and expansion of knowledge and its application will help with the steady progress of sustainable management of forests.

Current State and Trends

The Forestry and Forest Products Research Institute under the Forest Research and Management Organization is Japan's largest comprehensive research and development institute conducting R&D on forests, forestry, wood industry, and forest tree breeding. The institute cooperates with the government and relevant organizations to solve problems facing forests and the forestry sector, to promote various research and development supporting forests and forestry, and is working to extend the results broadly to the industry, academic and public sectors. Its medium- to long-term plan covering the period from FY2016 to FY2020 identifies the following priority research tasks. Various experiments and research are being implemented in line with the policy.

(1) Priority research tasks

a. Develop forest management techniques for the fulfillment of multiple forest functions
   (a) Sophisticate forest conservation technologies and develop disaster prevention/mitigation technologies utilizing forest ecosystems
   (b) Sophisticate climate change impact assessment technologies and develop adaptive/mitigation technologies
   (c) Develop forest management techniques with consideration to preservation of biological diversity

b. Develop a sustainable forestry system toward stable supply of logs
   (a) Develop sustainable and efficient forest management practices and forestry production technologies
   (b) Develop a wood supply system for utilization of diverse forest resources

c. Develop technologies for utilization of wood and wood products
   (a) Develop and advance wood utilization technologies in response to resource conditions and needs
   (b) Develop technologies to convert unused wood resources into useful materials and use them

d. Advance technologies for utilization of forest organisms, develop diverse varieties through forest tree breeding, and enhance generic breeding technologies

(a) Advance new technologies for effective utilization of forest resources through elucidation of biofunctions

(b) Develop diverse superior varieties and enhancement of generic breeding technologies

(2) Collection, storage and evaluation of long-term fundamental data, and production and distribution of seeds and seedlings

(3) Efforts to maximize research and development results

a. Strengthen "bridging" functions

(a) Strengthen industry-academia-government collaboration

(b) Strengthen the hub function for research and development

b. Return R&D outcomes back to society

c. Strengthen evaluation of research tasks, resource allocation, and PDCA cycle

In addition to the above, research and technology development for sustainable management of forests are conducted broadly at research institutes of local public bodies and private companies as well as at universities.

INDICATOR 7.5.a Partnership to support sustainable management of forests

Rationale

This indicator provides information on partnership and its contribution to sustainable forest management. Partnership helps to share a common purpose and is also an important means for capacity development, boosting of financial, technical, and human resources, and enhancement of political commitment and public support for progress of sustainable management of forests.

Current State and Trends

Partnership to promote the improvement and conservation of forest, and the sustainable use of forest resources is formed by various bodies at various levels.

An example of a public-private partnership agreement pertaining to the national forest program is "public function maintenance and promotion agreement system," which was established through the revision of the Forest Act in 2012. In this system, owners of private forest land adjacent or between national forests and the director of the relevant Regional Forest Office sign an agreement for integrated improvement and conservation under a national forest project. By the end of FY2016, 14 agreements were made, and thinning to maintain public functions, elimination of foreign tree species for preservation of World Natural Heritage Sites, etc. has been implemented under the agreement.

In addition, there is a program to improve national forests with citizen participation. The responsible organization and the head of the District Forest Office conclude an agreement for plan-based implementation of forest development activities. The program provides various schemes, including: *Fureainomori* (forest for interaction with nature) conducted by volunteer groups; "Forests for social contribution," where companies improve the forest as their social responsibilities; "forests to support wood culture" for activities to supply wood, bark, and other materials necessary for passing down the culture of wood, including historic wood buildings and traditional woody crafts, to the next generations; and *Yuyunomori* for school experience and learning activities.

An example of state-level partnership is "Joint Statement on Cooperation of Sustainable Forest Management, Combating Desertification and Wildlife Conservation," made at The Fifth Japan-China-ROK Trilateral Summit Meeting (Beijing, May 2012). This statement reaffirmed the need to establish dialogue among the three countries on sustainable forest management and enhance in-depth and all-round cooperation on sustainable forest management policy, administration, and technology. Based on the statement, the three countries take turns to host the annual Japan-China-ROK Director General level Meeting among Japan-China-ROK on Forestry Cooperation.

In 1999, Japan and China set up a Japan-China private sector planting cooperation committee to support Japanese private groups cooperating with planting in China. Planting activities are conducted every year by the committee. In 2005, Japan and China agreed to establish regular forum to exchange

opinions on broad-ranging subjects related to forests and forestry and take turns to host biennial dialogue. In 2012, Japan and ROK also agreed to establish similar forum.

In 2015, Japan and India signed a memorandum on cooperation in the field of forests and forestry. A joint working group meeting is held every year to exchange opinions on the cooperation between the two countries.

INDICATOR 7.5.b Citizen participation in forest-related decision making and dispute settlement

Rationale

This indicator provides information on the process to encourage public participation in forest-related decision making and ease or settle disputes between forest stakeholders. Participation of the general public in decision making processes and efforts to settle disputes may bring about widely accepted decision making, leading to better forest management.

Current State and Trends

Generally there are broad-ranging opportunities for citizen participation in the policy-making process in Japan. For forest-related policies, the Forestry Policy Council has been set up based on the Forest and Forestry Basic Act. It consists of members from a wide range of fields, including scholars, people involved in forests/forestry, and environmental organizations. Various laws and regulations provide that the government should consult with the council when formulating a plan, etc. At the local level, prefectural forestry administration councils are set up based on the provision of the Forest Act. A prefectural governor must consult with the council when making a decision on forest-related policy, including the establishment of a regional forest plan.

In addition, the Administrative Procedure Act has established a public comment procedure. Opinions and information on proposed plans are invited from the general public.

To address disputes, there is a legal framework to provide a means for settlement, including the Code of Civil Procedure according to the content of the dispute.

INDICATOR 7.5.c Monitoring, assessment, and reporting of the progress toward sustainable forest management

Rationale

This indicator provides information on abilities to monitor and assess forests and report the results. Transparent monitoring and a report system opened to the public with the aim of providing the latest and reliable forest-related information is indispensable for promoting general and political interest in matters influencing forests, and information-based decision making on policies to support sustainable forest management.

Current State and Trends

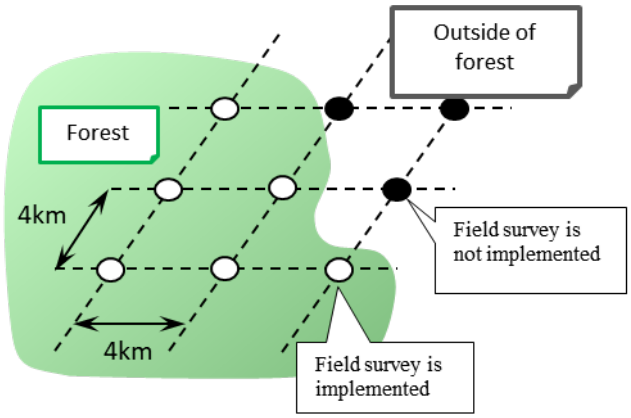
Regarding forest resource information, a forest plan is established for each of the 158 river basins in Japan. Every five years, prefectural governors establish regional forest plans for private forests, while Director Generals of Regional Forest Offices create a Regional Plan for National Forest for respective region. To provide basic data for this purpose, inventory data and forest planning maps are prepared. They form a database of tree types and growing stock, land regulation status, etc. of each forest sub-compartment. All prefectures introduced forest GIS by the end of FY2009 and developed a system for digitalization and unified management of basic forest data, including forest inventory and forest planning maps. It is important to continuously update the information and improve the accuracy. In order to intensify management practices, it is necessary to build a system where parties who belong to different organizations can share forest information. To this purpose, a forestry-cloud has been developed. This is a system to connect local public bodies and forestry establishments using communication lines based on cloud technology to enable the sharing and utilization of forest information. Furthermore, in addition to the data that is already fed to the forest GIS, detailed data of forest resources based on aerial laser measurement, aerial photographs, satellite images, forest road plans, and other information are fed to facilitate intensification of management practices.

Carbon flow is calculated based on these forest resource data and incorporated in the country report and the biennial report that Japan submits to the secretariat of the United Nations Framework Convention on Climate Change.

In addition, the National Forest Inventory of Japan has been conducted since 1999 with the aim of obtaining objective data necessary for establishing basic matters for forest management in forest plans by assessing forest conditions and trends of their changes based on nationally unified methods. This is a sample survey that sets a lattice at 4km intervals across the country and surveys its intersections. Detailed data have been gathered on tree type composition, withering of standing trees, understory vegetation, soil, and other conditions. The survey of entire country is conducted in a 5-year cycle, and

about 13,000 sites across the country were surveyed in the third stage. The fourth stage of the survey started in 2014.

Figure 88 Structure of monitoring spot of National Forest Inventory



Sources: Forestry Agency

In addition, various statistics are published, including damage to forests and socioeconomic trends related to the forestry and wood industry. "State of Forest Resources, Statistics on Forests and Forestry" is published every year with comprehensive data related to forests, forestry, and wood industry.

The Forest and Forestry Basic Act provides that the government must submit to the Diet a report on the trends in forests and forestry, and the measures for them taken by the government every year. Based on the report, the White Paper on Forests and Forestry is created and published every year. White Papers on Forests and Forestry since 1989 are posted online. An English version of abridged editions also began to be published, starting from the 2002 edition.

Based on the Government Policy Evaluations Act enacted in 2001, each administrative organ implements policy evaluation with the aim of measuring, analyzing, and evaluating the effects of their policy and to reflect the results of this evaluation in the planning and development of policy, and to promote efficient, high-quality, and output–oriented administration, and ensuring the government's proper discharge of its responsibility to remain accountable to the public for its operations. Performance indicators are set for evaluation of policies related to forest and forestry: 18 indicators in the policy area of fulfillment of multiple forest functions, 7 in the policy area of sustainable and sound development of forestry, and 5 in the policy area of supply and use of forest products. Information on their progress is reported every year.

TABLES and FIGURES

TABLES

FIGURES

CRITERION2

CRITERION3

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CRITERION6

PHOTOS/PICTURES

Picture 5: Gulley

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