

## **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,<sup>24</sup> 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<sup>25</sup> 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

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<sup>24</sup> *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.

<sup>25</sup> *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**

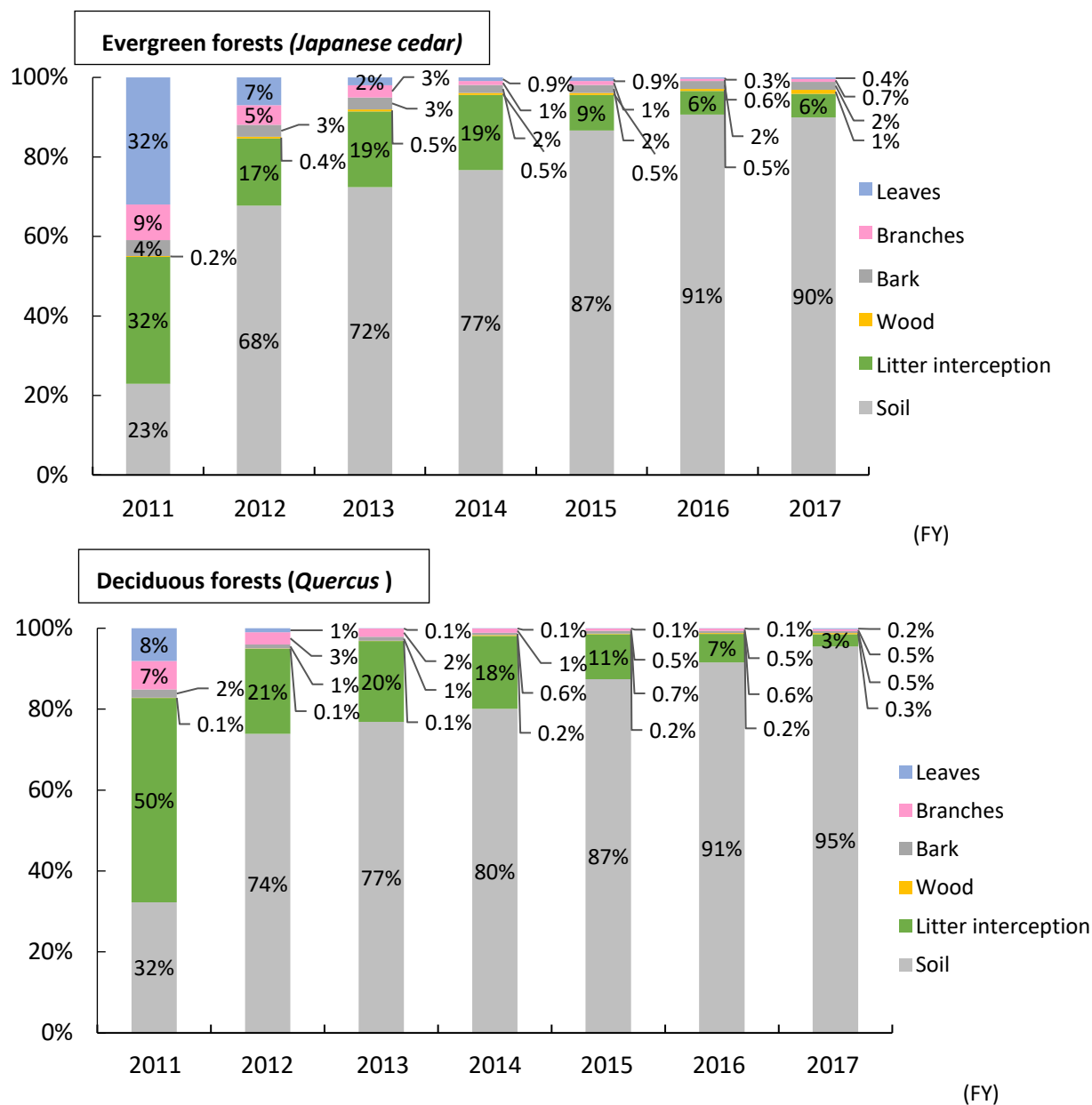
As an attempt to monitor changes in water quality in forest areas, there is "Forest Atmospheric Depositions and Stream Water Chemistry Database" created by the Forestry and Forest Product Research Institute (FFPRI). The database was constructed using water quality data of precipitation and mountain streams 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<sup>+</sup>, K<sup>+</sup>, Ca<sup>2+</sup>, Mg, Cl<sup>-</sup>, NO<sub>3</sub><sup>-</sup>, PO<sub>4</sub><sup>3-</sup>, 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 CO<sub>2</sub> 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 CO<sub>2</sub> 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

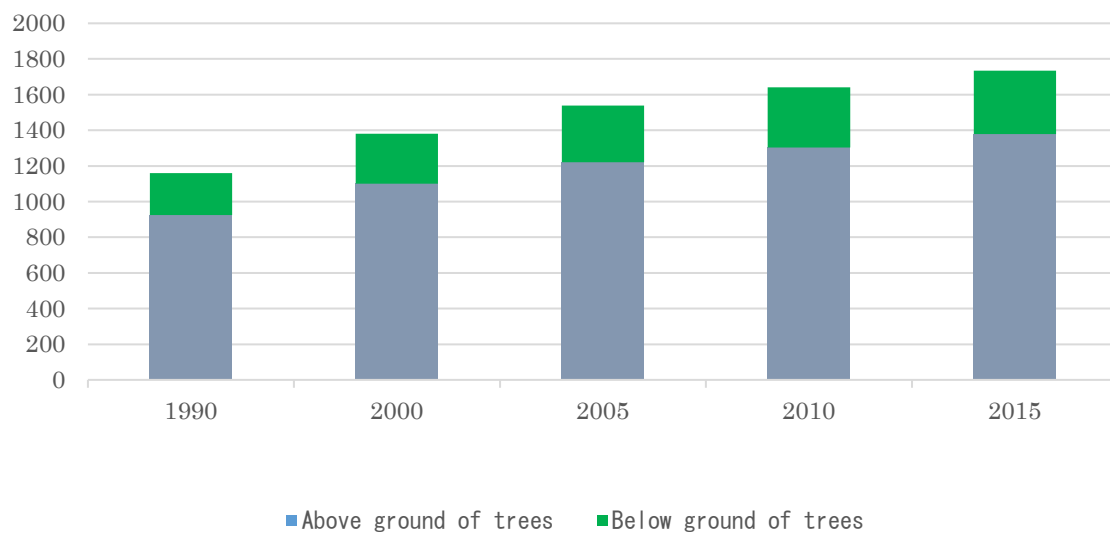
This indicator provides information about the total amount of carbon stored in forest ecosystems. It also describes changes, fluxes or flows in carbon between forests and the atmosphere. A better understanding of these processes will aid the development of appropriate responses to the effects of climate 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<sup>26</sup> and the rest is stored in their below ground<sup>27</sup>.

Regarding the carbon flux, it is estimated that Japan's forests absorbed approximately 16.55 million tons of carbon (approximately 60.7 million CO<sub>2</sub> tons) from the atmosphere in 2016.

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



Source: Forestry Agency

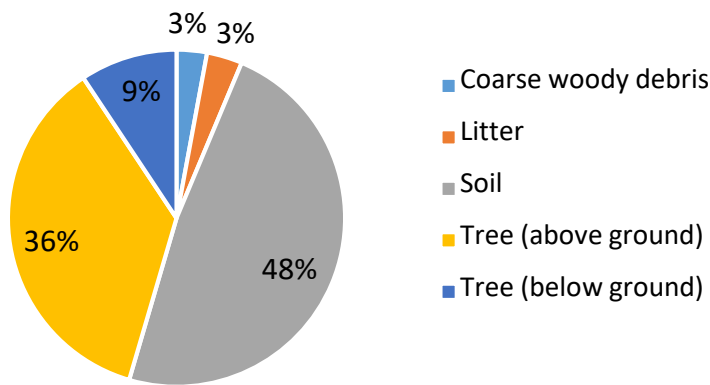
The amount of carbon stored in the forest ecosystem other than trees is shown in the results of the

<sup>26</sup> **Above ground part** includes stems, bark, branches and leaves.

<sup>27</sup> **Below ground part** includes living roots.

survey conducted during the period from 2006 to 2010.<sup>28</sup> 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.<sup>29</sup>

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



Source: Forestry Agency

<sup>28</sup> 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

<sup>29</sup> 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

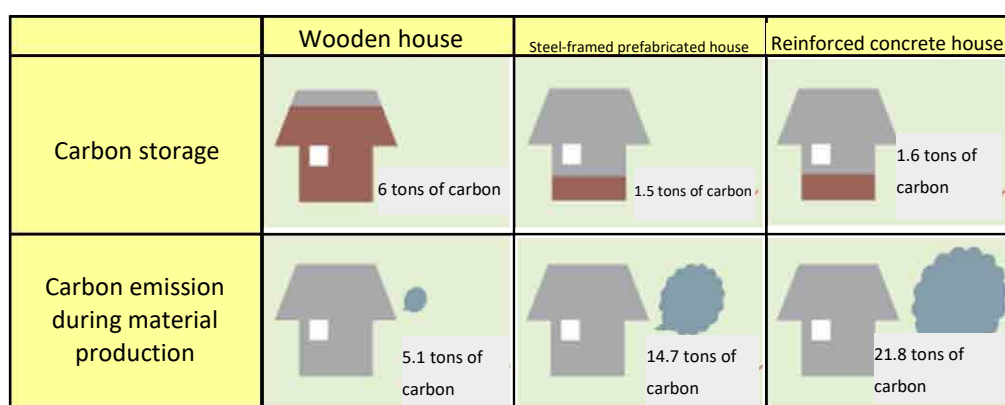
### Rationale

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<sub>2</sub> 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<sub>2</sub> 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.<sup>30</sup> 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<sub>2</sub> emissions and removals by harvested wood products as shown in the following table.

**Table 7: Changes in CO<sub>2</sub> emissions and removals from HWPs (kt-Co<sub>2</sub> 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

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<sup>30</sup> 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,<sup>31</sup> 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.

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<sup>31</sup> 2018 Energy White Paper

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

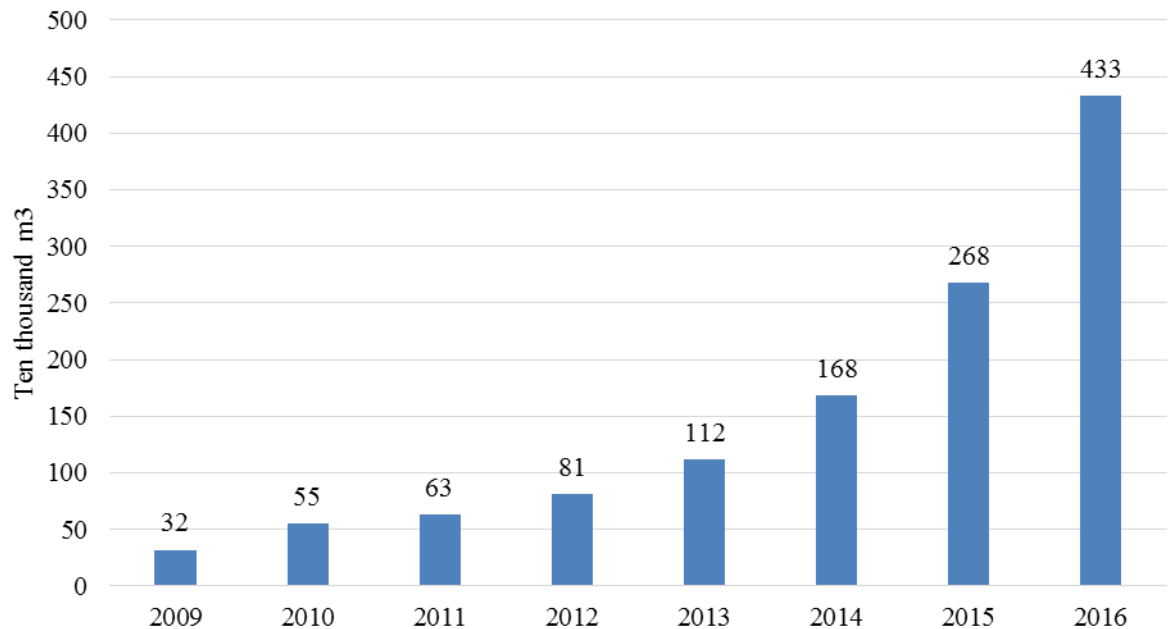
Ownership of the equipment	Woody biomass used in the establishment				
	Wood chips	Woody pellets	Firewood	Wood meal (sawdust)	Other woody biomass
	ADW/ thousand tons	thousand tons	thousand tons	thousand tons	thousand tons
Total	7,734	214	50	323	559
Only the generator is owned	3,969	166	-	61	79
Only the 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<sup>3</sup>. The Basic Plan for Biomass Usage Promotion revised in September 2016 sets the goal to increase the utilization rate of forest scraps<sup>32</sup> from about 9% of the current annual generation of about 8 million tons to about 30% by 2025.

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<sup>32</sup> 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**

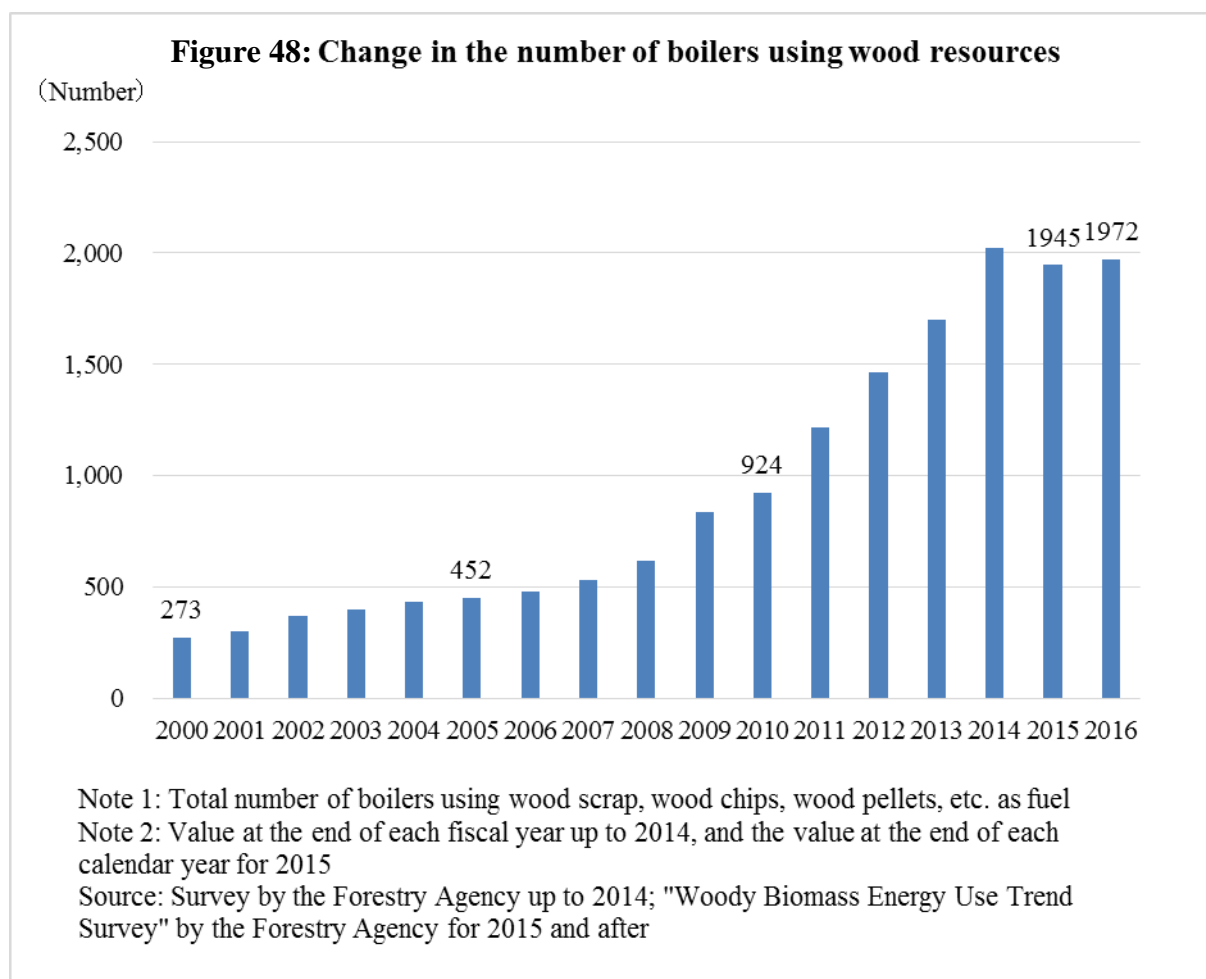


Note: The quantity of thinned wood, forest scraps, etc. used for wood chips and pellets is converted to volume using conversion factors (2.2m<sup>3</sup>/ton for wood chip)

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

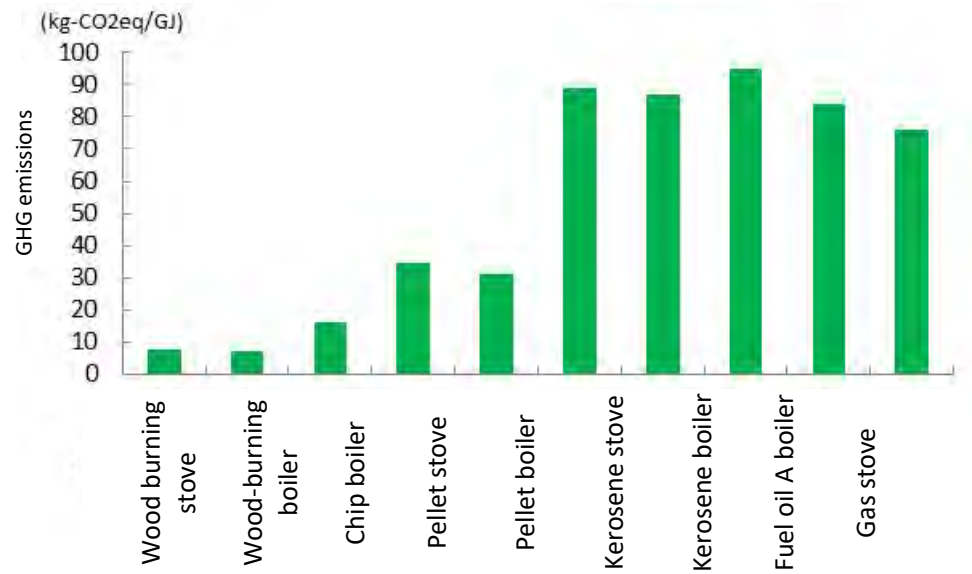
As regards power generation facilities mainly using biomass derived from thinned wood, 38 facilities with outputs over 2,000kw and 15 facilities with outputs below 2,000kw are selling electric power under the feed-in tariff scheme for renewable energy as of September 2017. The total generation capacity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



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.

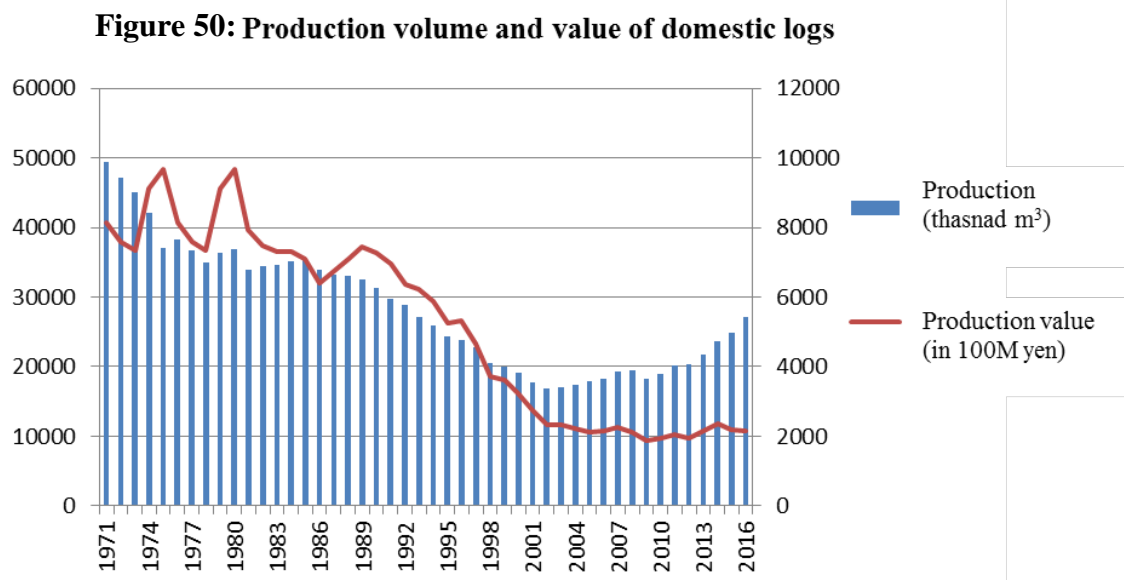
## INDICATOR 6.1.a Value and volume of production of wood and wood products, including primary and secondary processing

### 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.

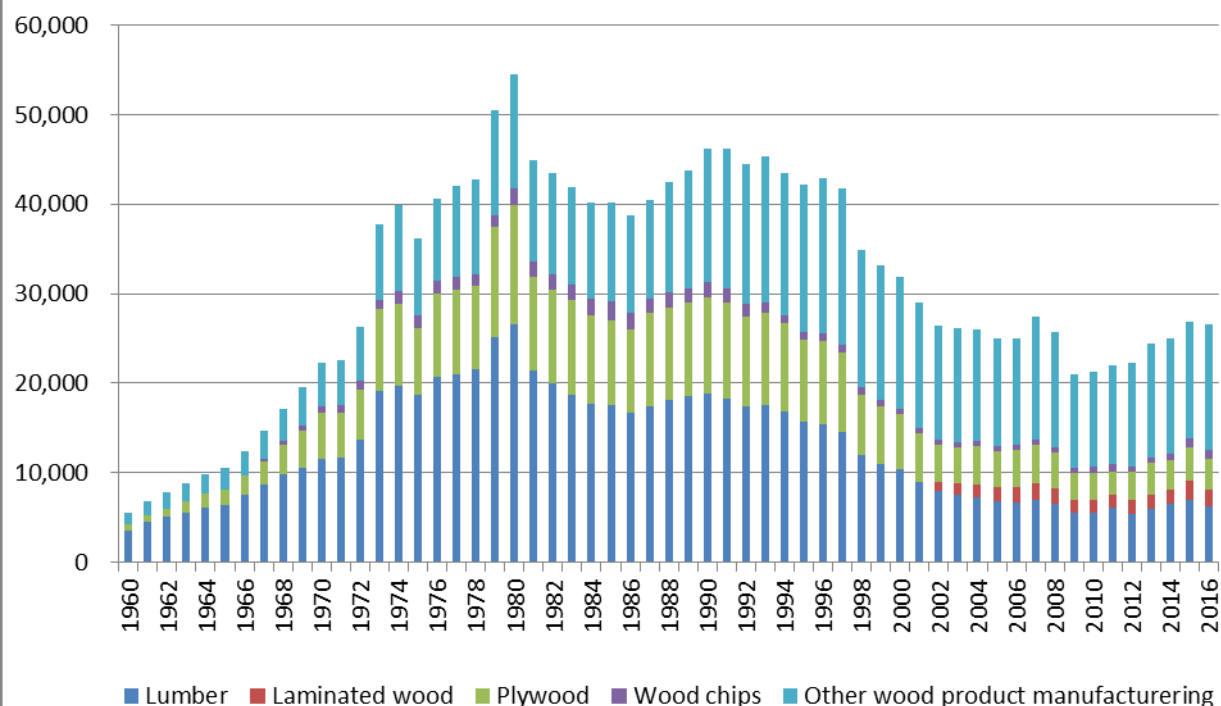


Source: Forestry Agency, Wood Demand and Supply Chart

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)**



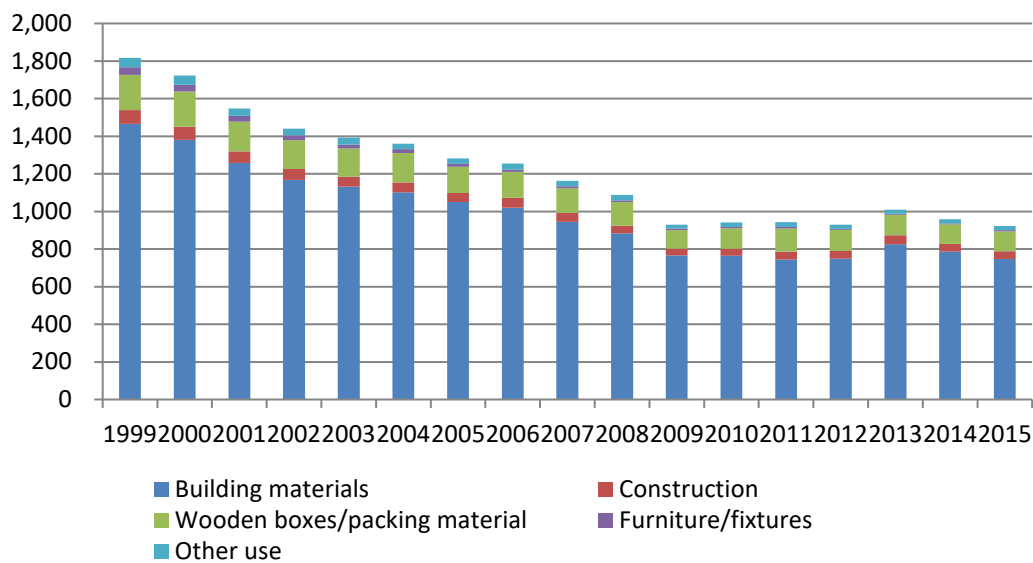
Note 1: Statistics of businesses with more than four employees

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 m<sup>3</sup>. The breakdown of lumber shipments by use in 2015 was 7.48 million m<sup>3</sup> (81% of the total shipment) for building materials, 410,000 m<sup>3</sup> (4%) for construction materials, 1.05 million m<sup>3</sup> (11%) for wooden boxes/packing materials, 60,000 m<sup>3</sup> (1%) for furniture/fixtures, and 230,000 m<sup>3</sup> (2%) for other use.

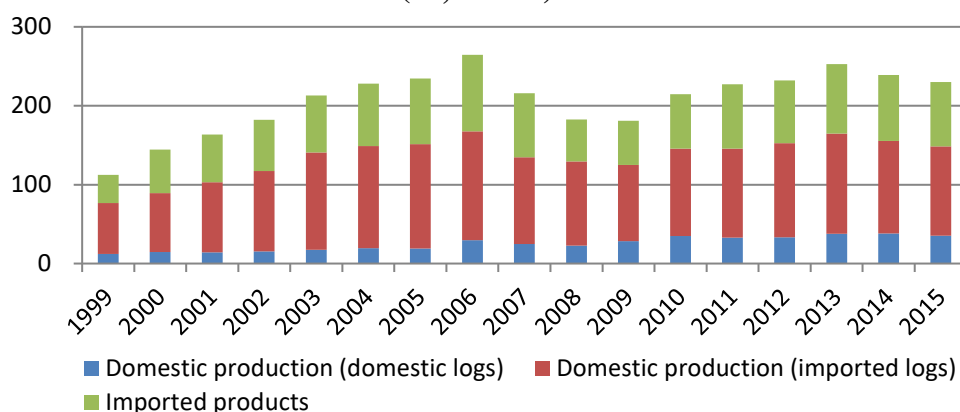
**Figure 52: Changes in lumber shipment (by use) (10,000 m<sup>3</sup>)**



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<sup>3</sup> 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<sup>3</sup> in recent years. In 2015 the volume of imports of laminated wood products was 0.82 million m<sup>3</sup> or about 36% of the total supply of laminated wood.

**Figure 53: Change in supply of laminated wood (10,000 m<sup>3</sup>)**



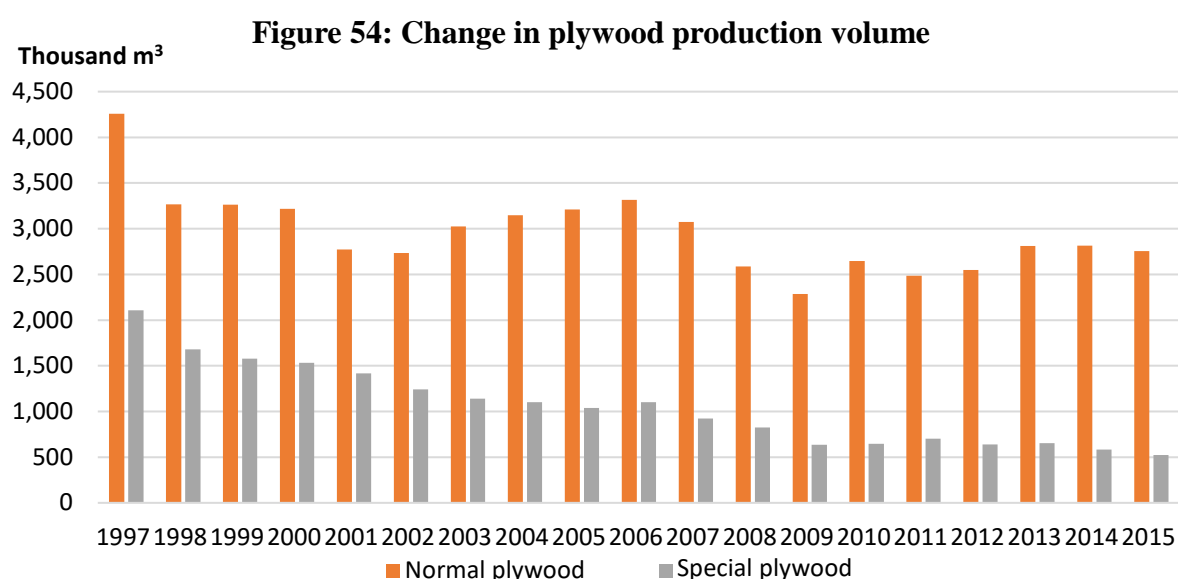
Note 1: Values of domestic production (imported logs) and domestic production (domestic logs) are calculated based on the use ratio by tree species of the laminated wood material.

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<sup>3</sup> for normal plywood and around 0.5 million m<sup>3</sup> for special plywood<sup>33</sup> in recent years.

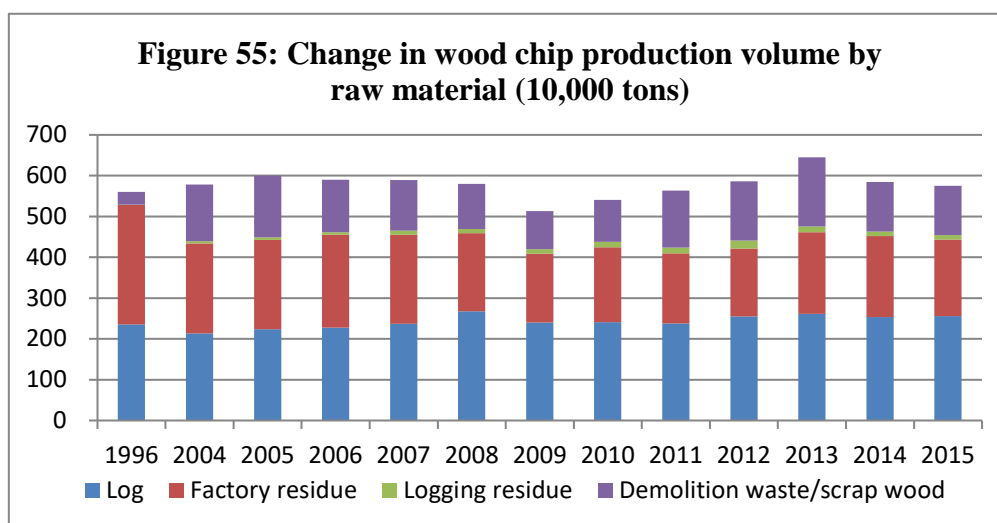


Source: Ministry of Agriculture, Forestry and Fisheries. Report on wood supply-demand

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.

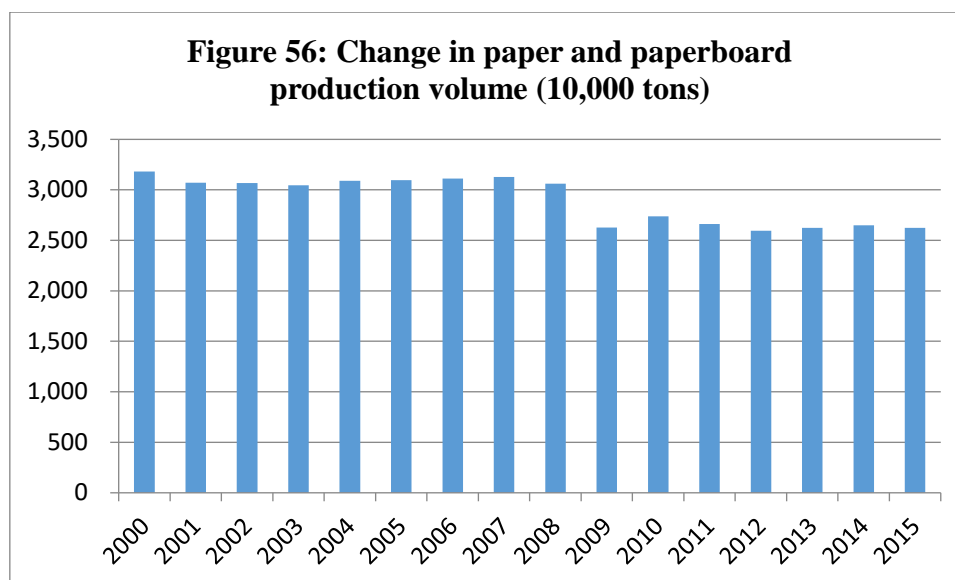
<sup>33</sup> Special plywood: plywood with surface finishing such as overlays for beauty, sliced sheets of selected natural wood, papers of wood grain or abstract patterns, synthetic resin, or other coating



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

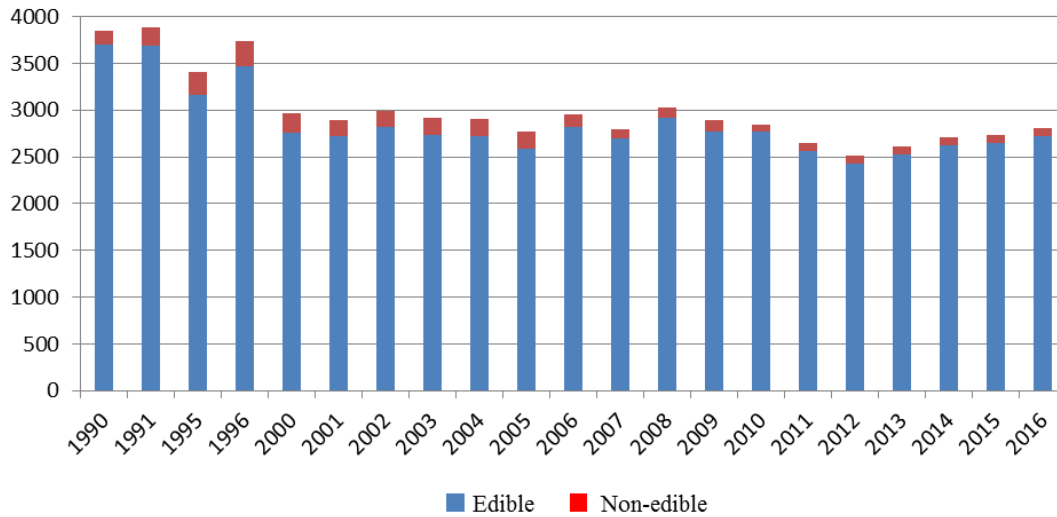
The production value of Japan's edible and non-edible non-wood forest products<sup>34</sup> has been 250 to 300 billion yen since the 2000s. Edible non-wood forest products account for more than 90% of the value.

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.

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<sup>34</sup> "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*,<sup>35</sup> 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.

<sup>35</sup> 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.

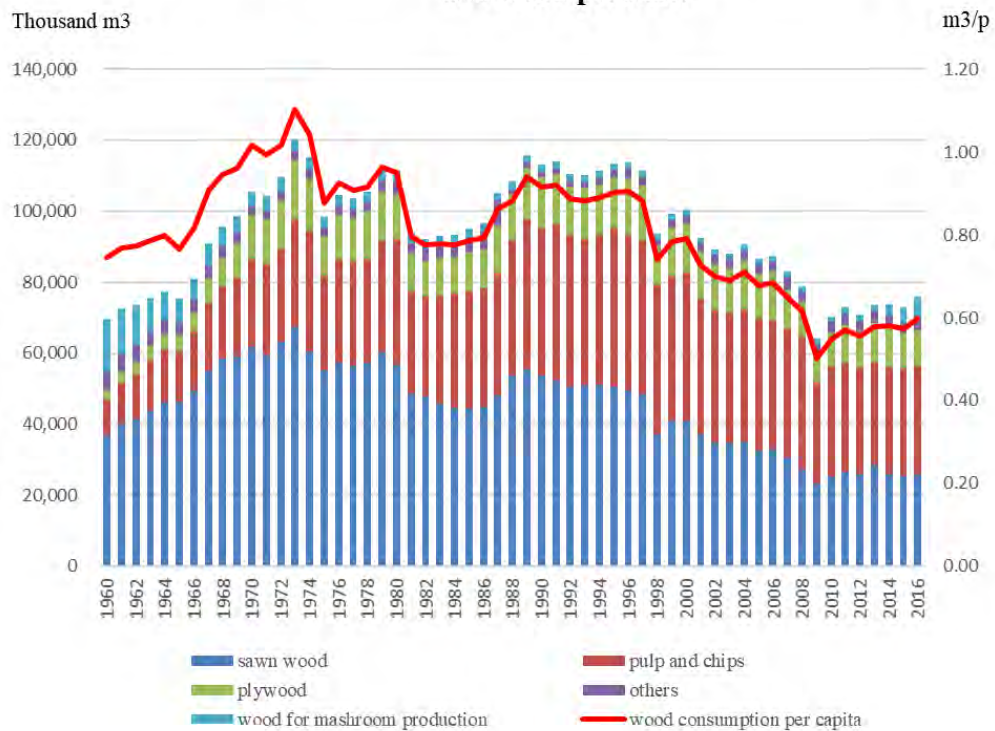
### **Current State and Trends**

About 76 million m<sup>3</sup> 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<sup>3</sup> in 2009. It was the first time in the 46 years since 1963 that the consumption fell below the 70 million m<sup>3</sup> level. Since then, consumption has been between 70 million and 76 million m<sup>3</sup>.

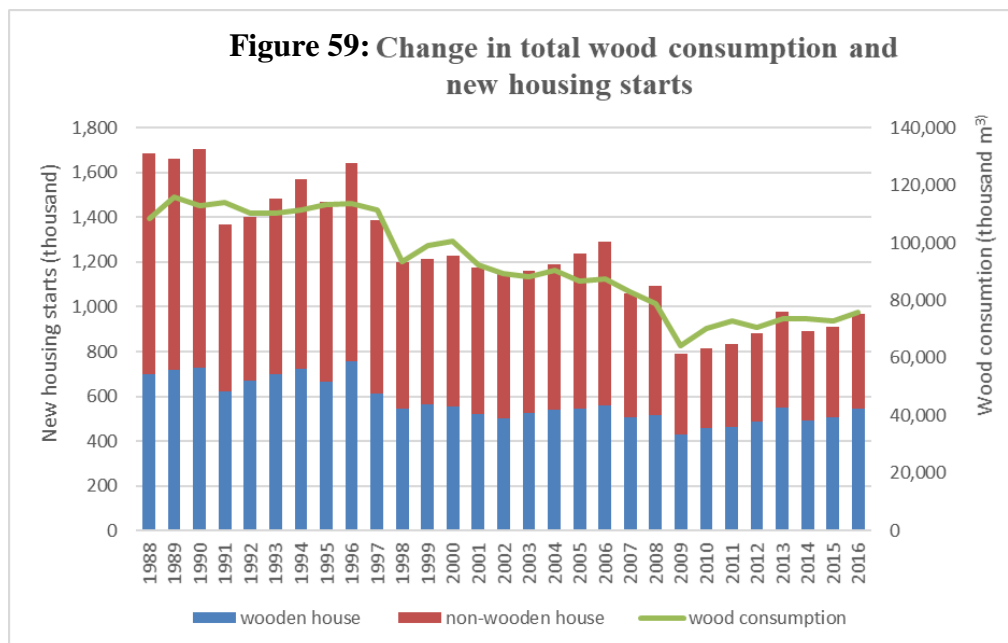
As is the case with total consumption, the consumption of wood and wood products per capita dropped to a minimum of 0.5m<sup>3</sup> in 2009 and has been between 0.55m<sup>3</sup> and 0.60 m<sup>3</sup> since then.

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



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

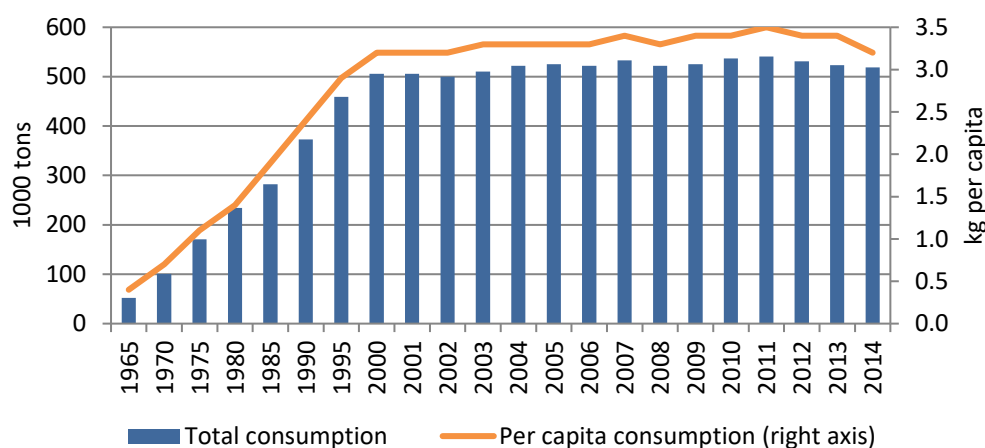
This indicator provides information on the consumption of non-wood forest products. The quantity consumed illustrates the dependence of the people on forests as a source of these products.

### Current State and Trends

Since 2000, more than 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.

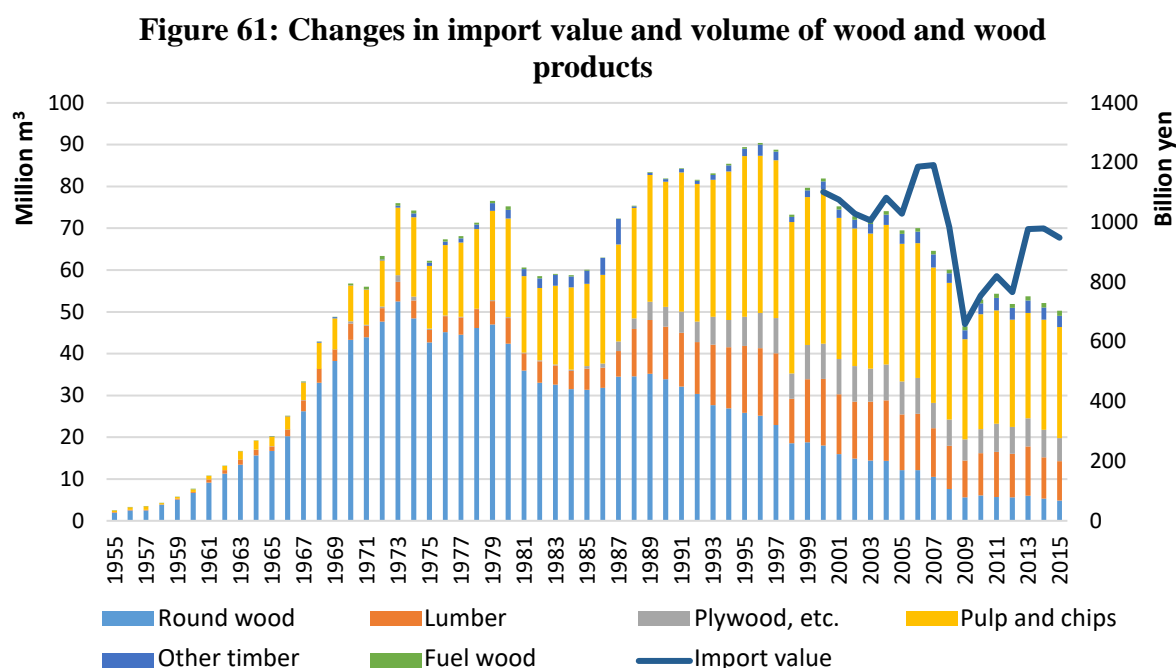
## INDICATOR 6.1.f Value and volume in round wood equivalents of exports and imports of wood products

### 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.

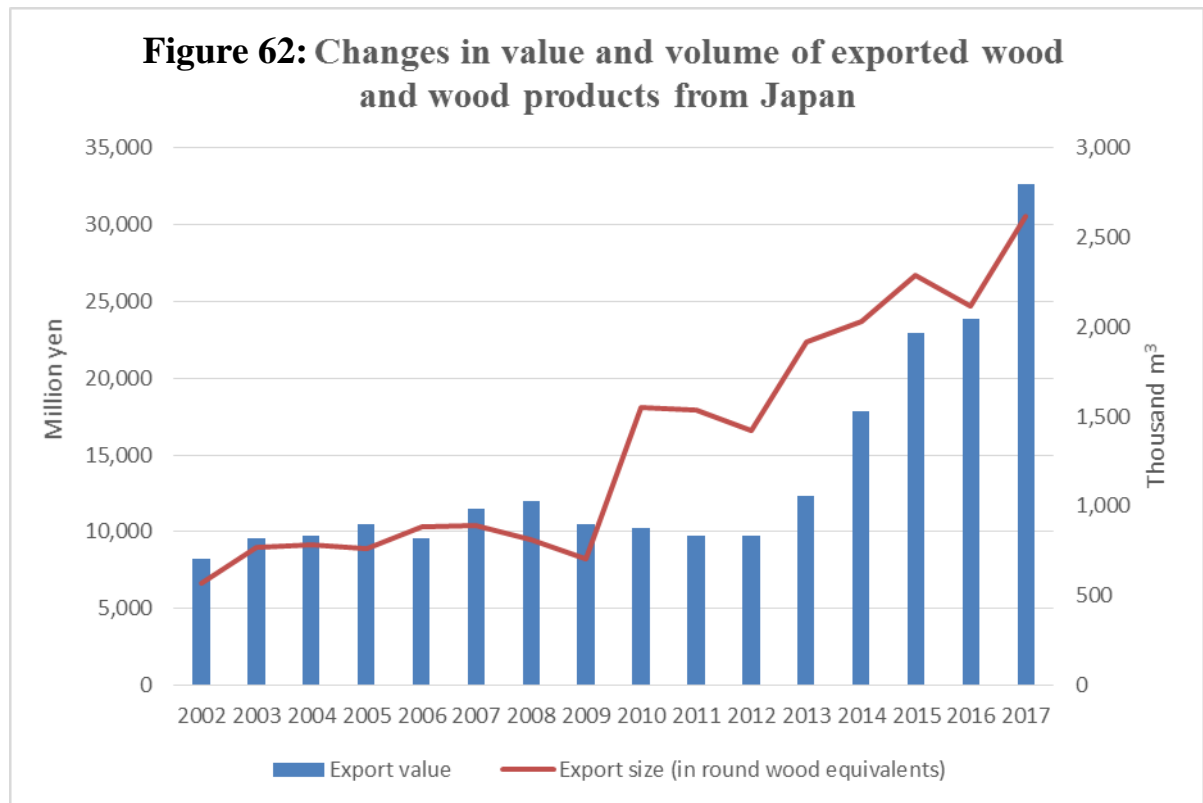
### Current State and Trends

The value of Japan's wood imports has been on a declining trend from the peak of 90 million m<sup>3</sup> (in round wood equivalents) in 1996, and fell to 51 million m<sup>3</sup> 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.



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.



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**

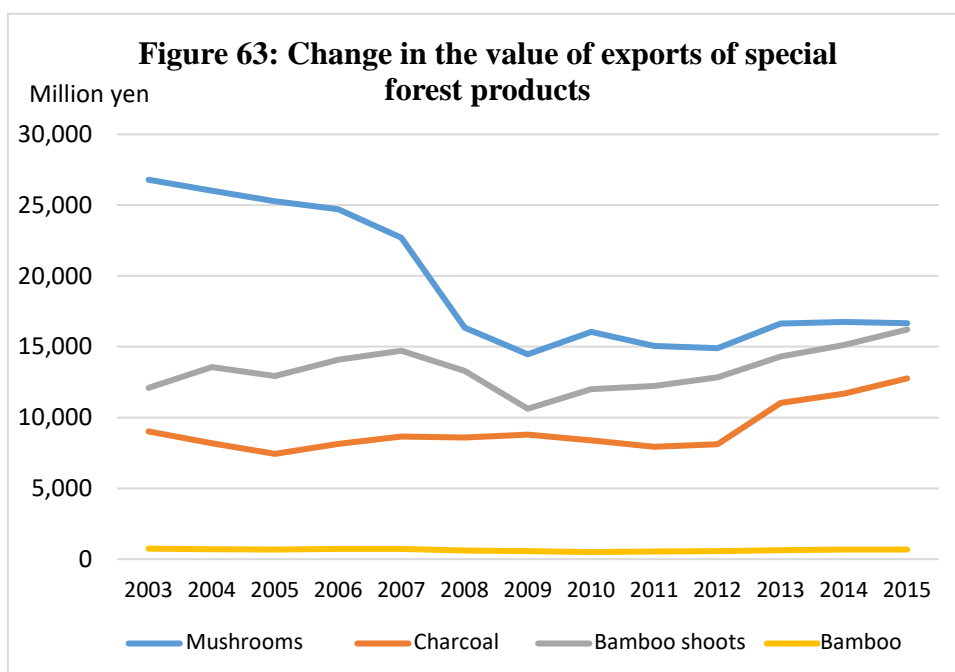
The total import value of non-wood forest products into Japan was about 46 billion yen in 2015. Mushrooms account for the largest part of import value of non-wood forest products and have been at the same level in recent years, while the import value of bamboo shoots has been increasing and was about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

The value of charcoal imports is also increasing.<sup>36</sup> 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.

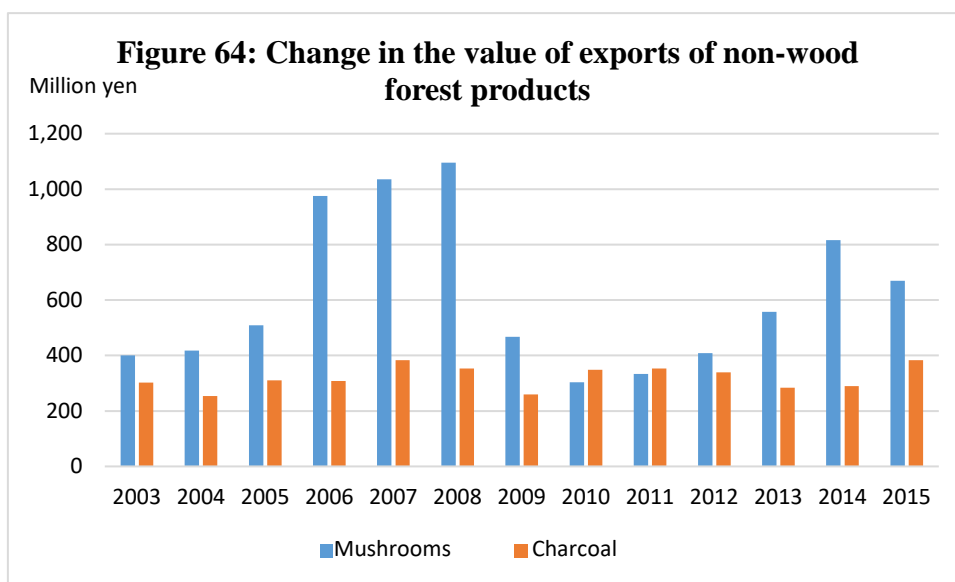
The export value of non-wood forest products is small compared with the import amount. It is around one billion Japanese yen annually.

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<sup>36</sup> 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)

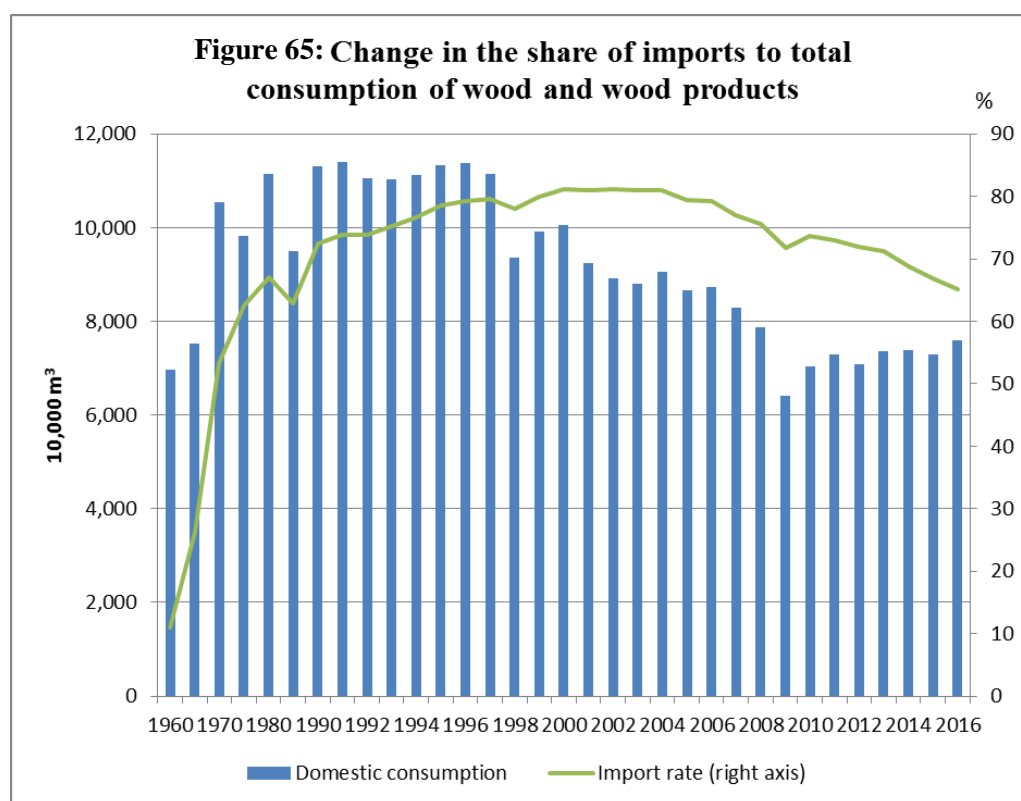
## INDICATOR 6.1.h Exports as a share of wood and wood products production, and imports as a share of wood and wood products consumption

### 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.

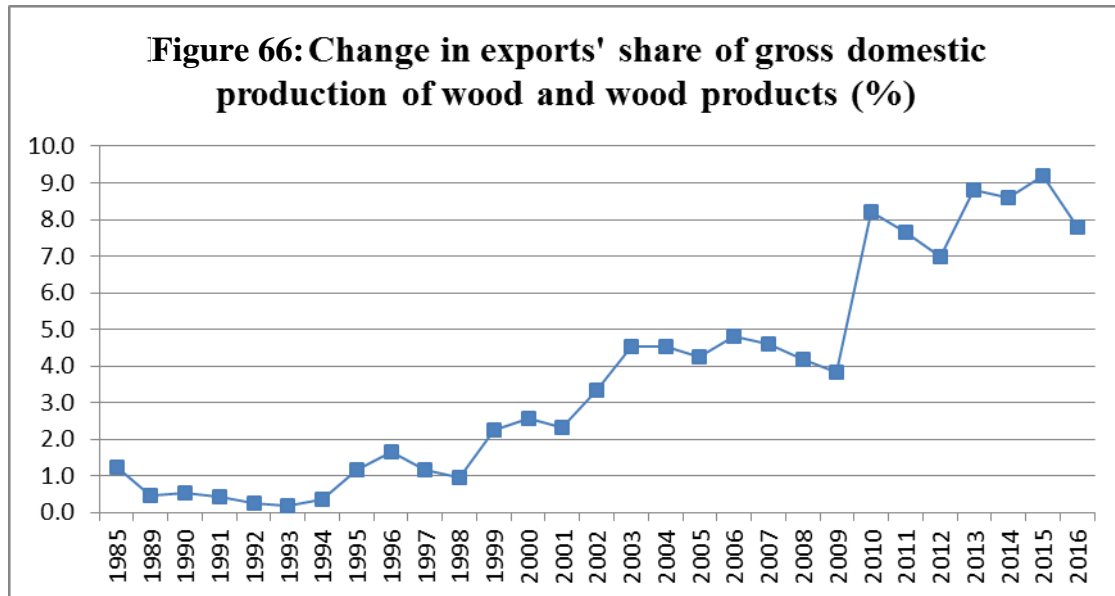
### Current State and Trends

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.



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.

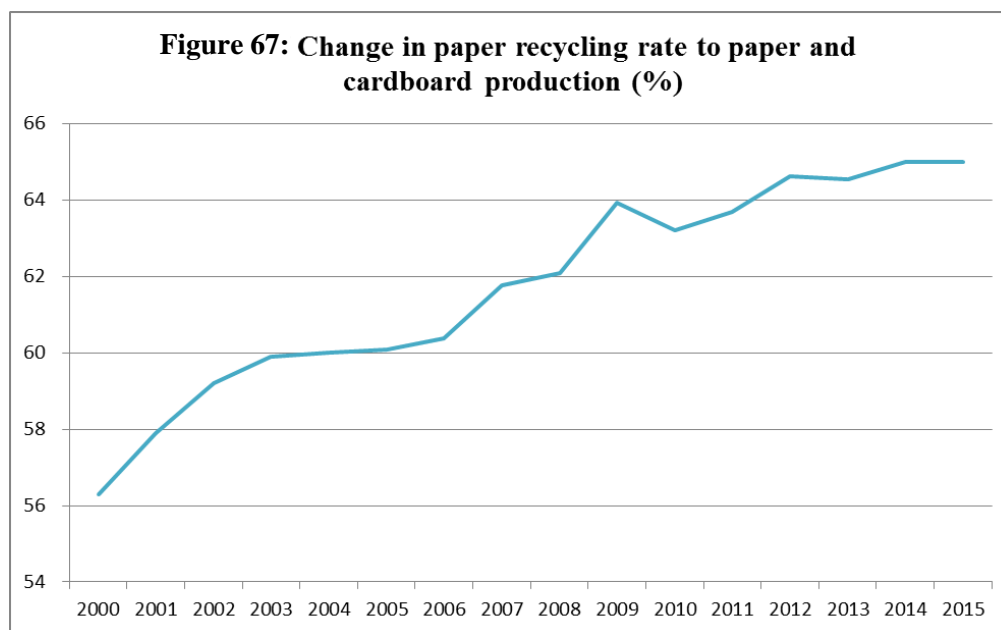
About 97% of sawmill residue is recycled for wood board, paper, energy, and other purposes. The percentage is considered to have reached the current recovery limit. For wood derived from construction, the Basic Principle based on the Construction Material Recycling Act and the Construction Material Recycling 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

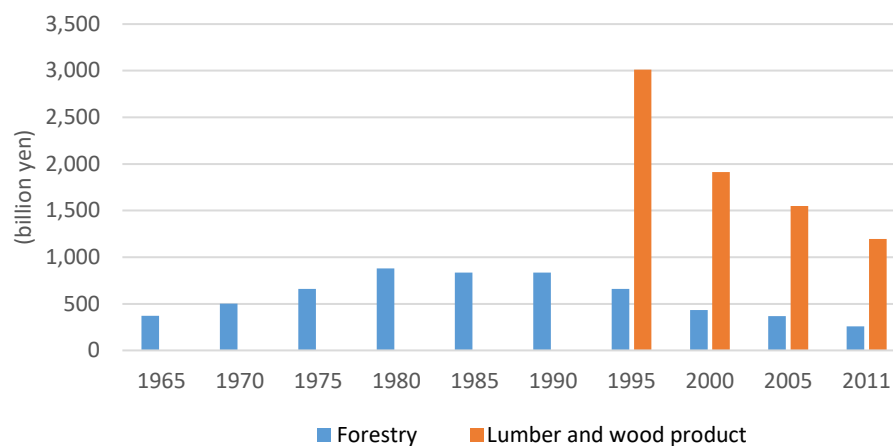
### Rationale

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<sup>37</sup> in the forestry<sup>38</sup> and the wood industry<sup>39</sup> 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

<sup>37</sup> Total of the intermediate inputs of the endogenous sector

<sup>38</sup> Corresponds to silviculture (column sector classification code: 0151), logging (0152) and non-wood forest products (0153)

<sup>39</sup> Corresponds to lumber (column sector classification code: 1611) and other wood product (1619).

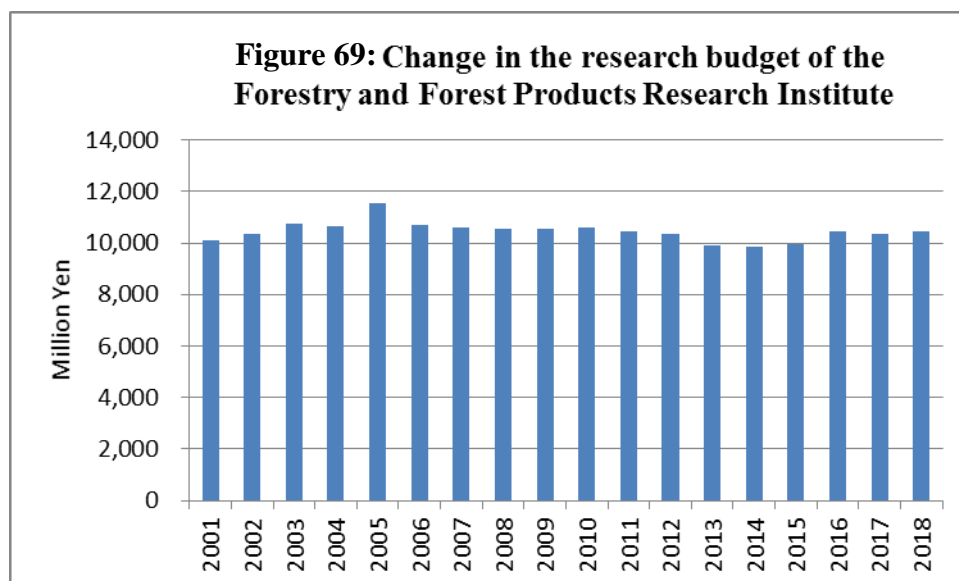
## INDICATOR 6.2.b Annual investment and expenditure in forest-related research, extension and development, and education

### 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

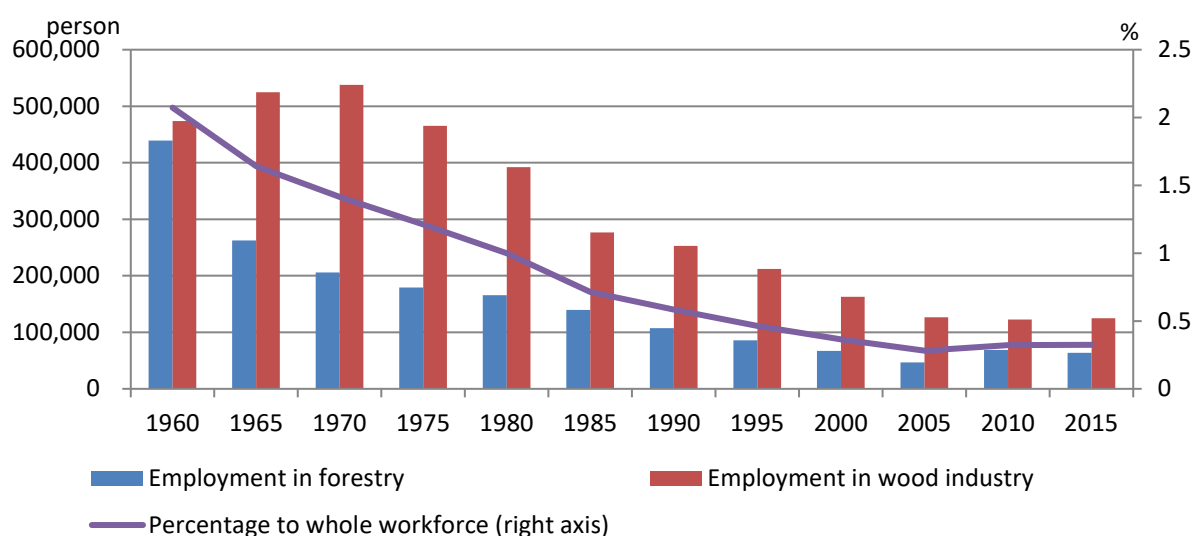
### Rationale

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<sup>40</sup> 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).

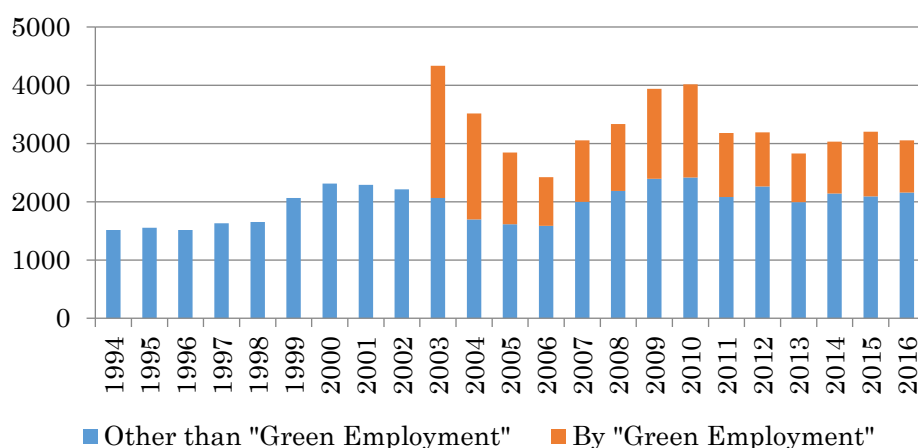
Source: Ministry of Internal Affairs and Communications, National Census

<sup>40</sup> 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

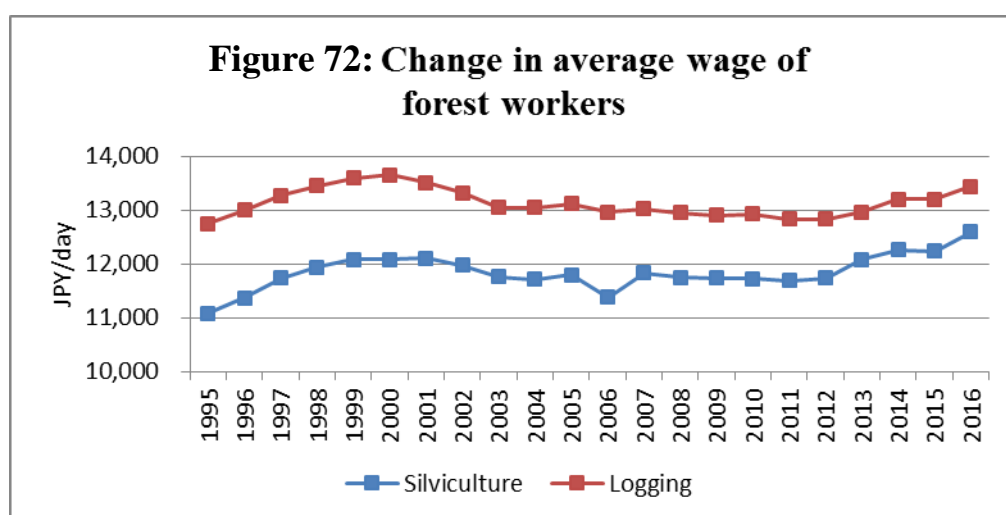
## INDICATOR 6.3.b Average wage rates, annual average income, and annual injury rates in major forest employment categories

### 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.

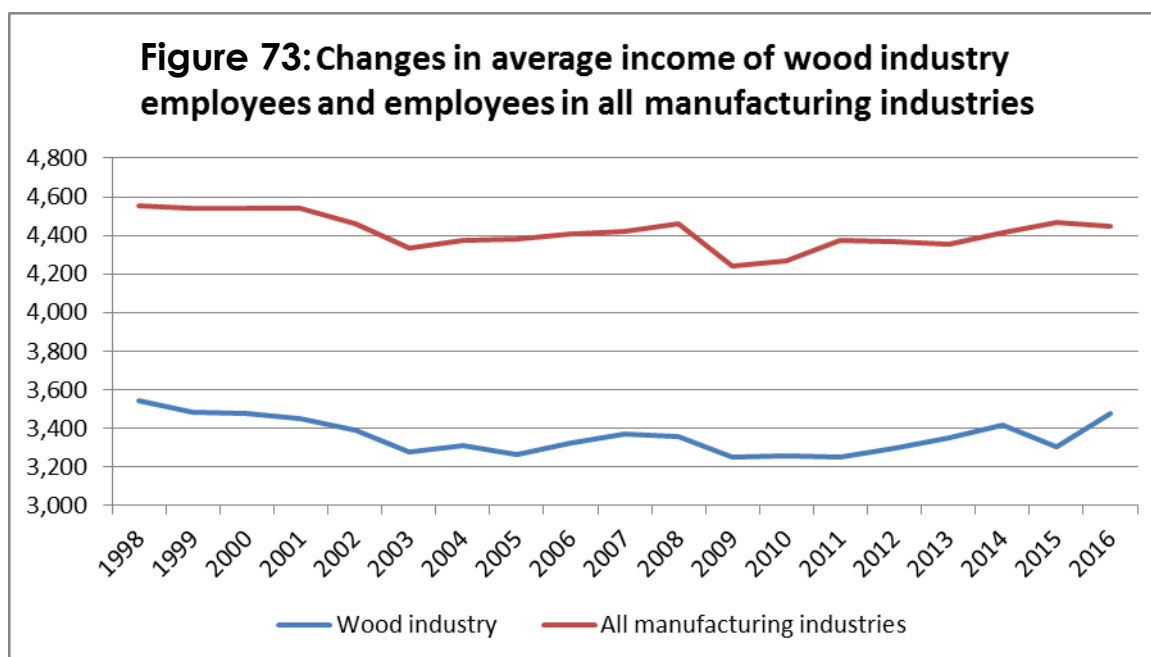
### Current State and Trends

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.



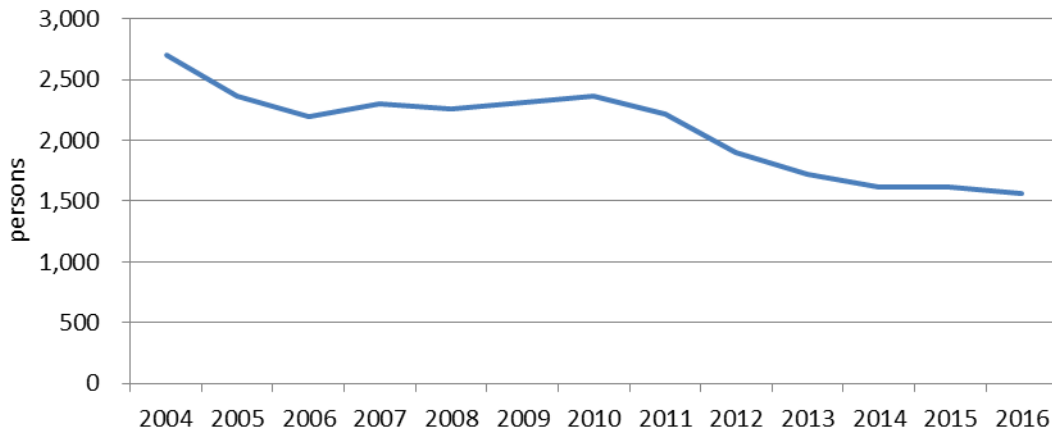
Sources: Ministry of Economy, Trade and Industry. Statistics of Industry

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*<sup>41</sup> 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.

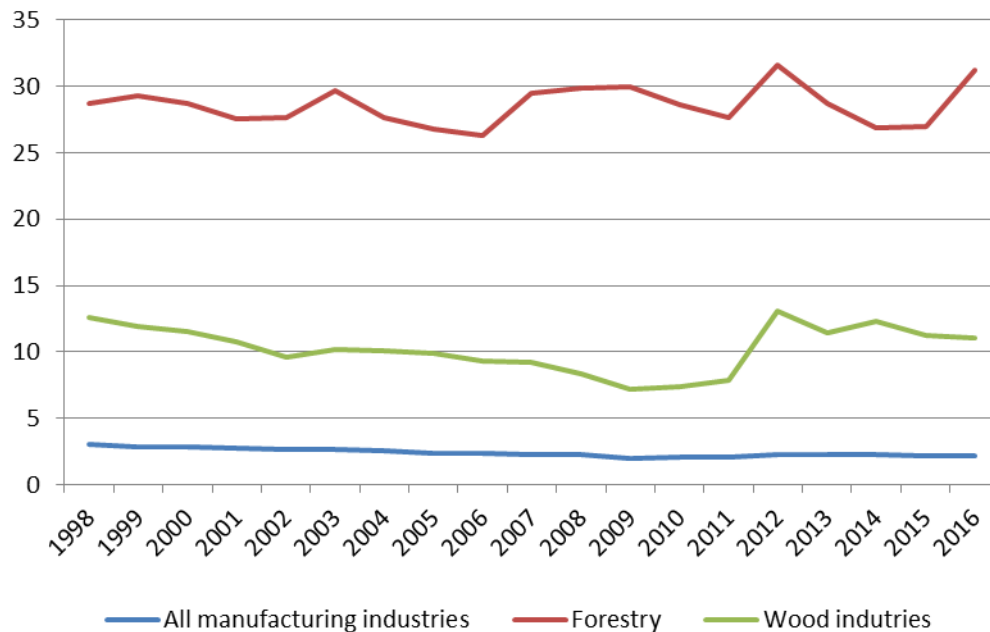
<sup>41</sup> Annual accident *rate per 1000 workers* is the annual number of fatalities and injuries requiring an *absence* of four days or more due to an occupational accident per thousand workers.

**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

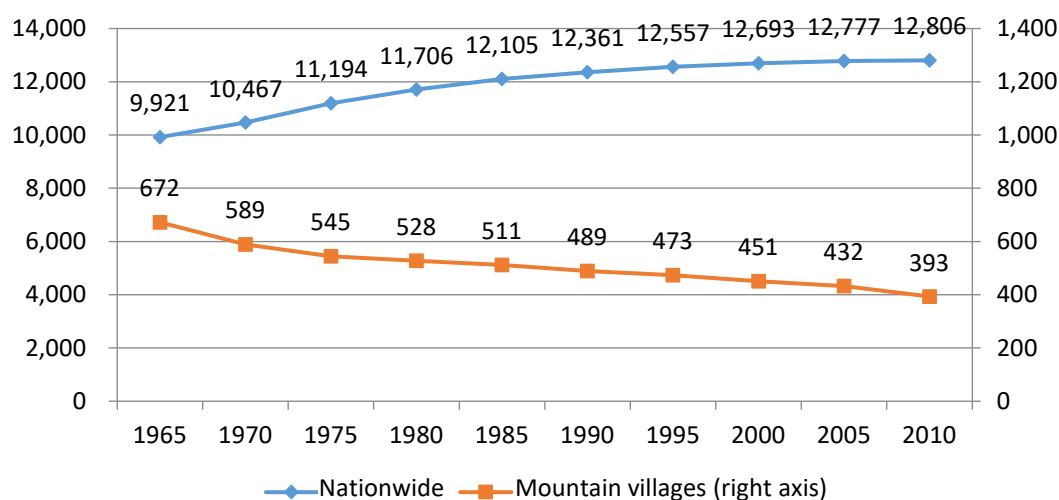
This indicator provides information on the extent to which communities dependent on forests for their wellbeing, livelihoods, subsistence, quality of life, or cultural identity are able to respond and adapt to social and economic change.

### 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<sup>42</sup> 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**

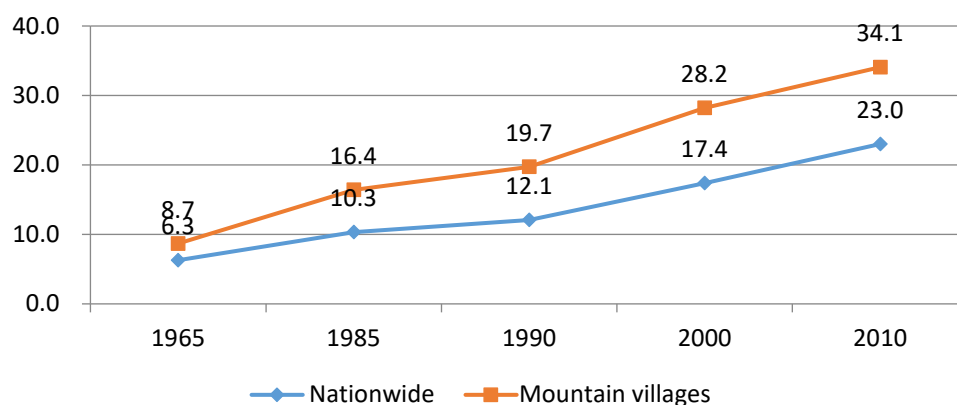


Note: Population and the number of the elderly in mountain village areas are estimated by MAFF Rural Development Bureau

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

<sup>42</sup> 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.

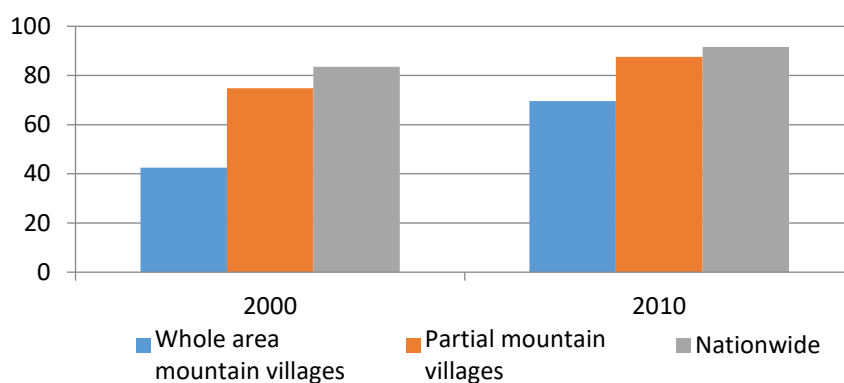
**Figure 77: Change in the rate of aging (proportion (%) of the population aged 65 or older)**



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

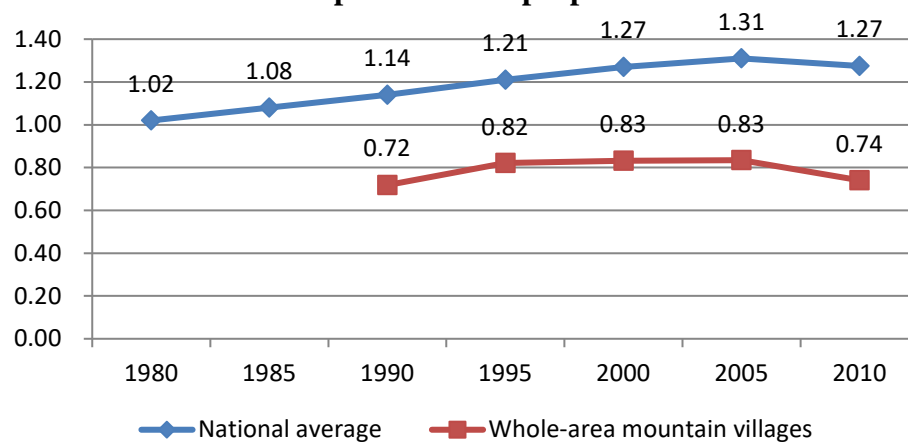
**Figure 78: Comparison of the rate of flush laboratories (%)**



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.

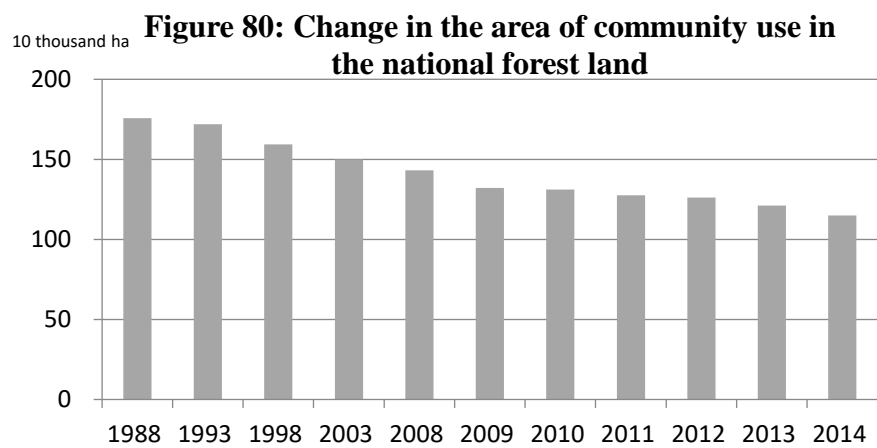
The Act on Advancement of Modernization of Rights in Relation to Forests Subject to Common Rights was enacted in 1966. Considering that rights in common forests such as village mountains jointly used by village communities were mainly customary common rights and rights to use based on old customs before 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.<sup>43</sup>

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.

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<sup>43</sup> Source: Forestry Agency, Survey on Forest Owners' Cooperative



Source: National Forest Management Statistics

## INDICATOR 6.3.e Distribution of revenues derived from forest management

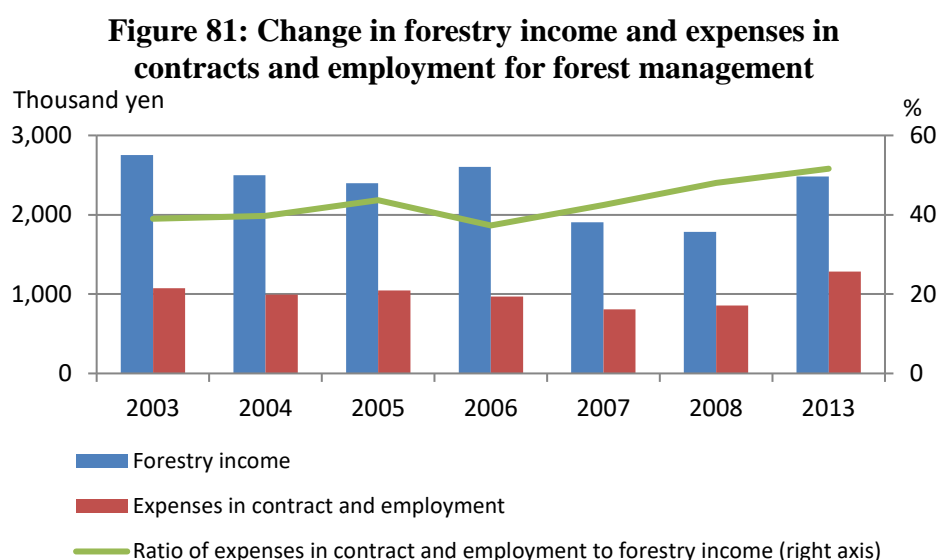
### Rationale

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<sup>44</sup> 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.



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

<sup>44</sup> 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

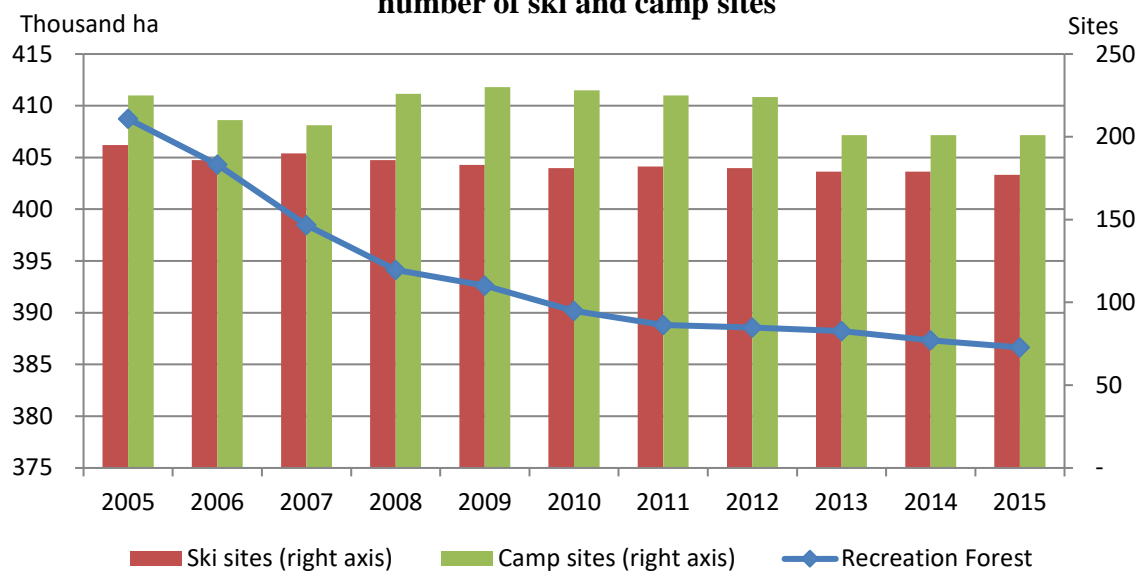
Note 1: The number of sites and areas are values as of April 1, 2016. The numbers of visitors are references from FY2015.

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.

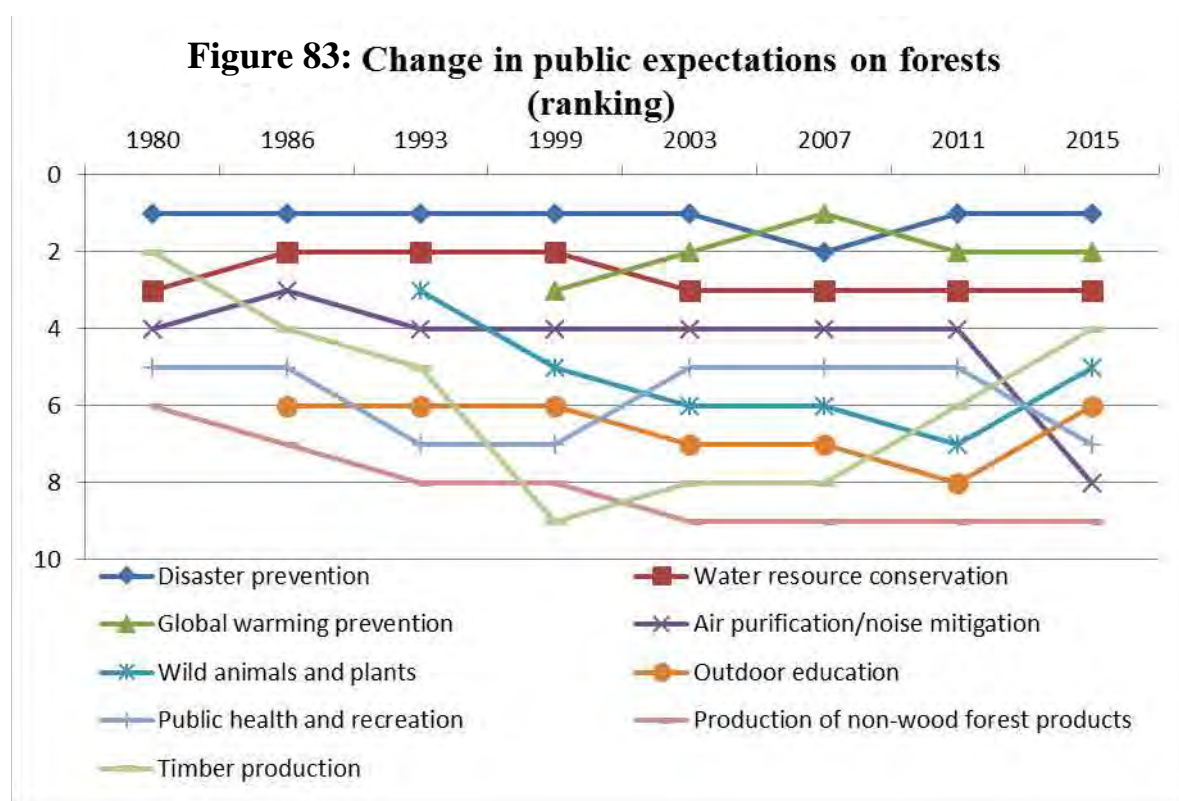
## INDICATOR 6.5.b The importance of forests to people

### 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<sup>45</sup> 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.

<sup>45</sup> "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

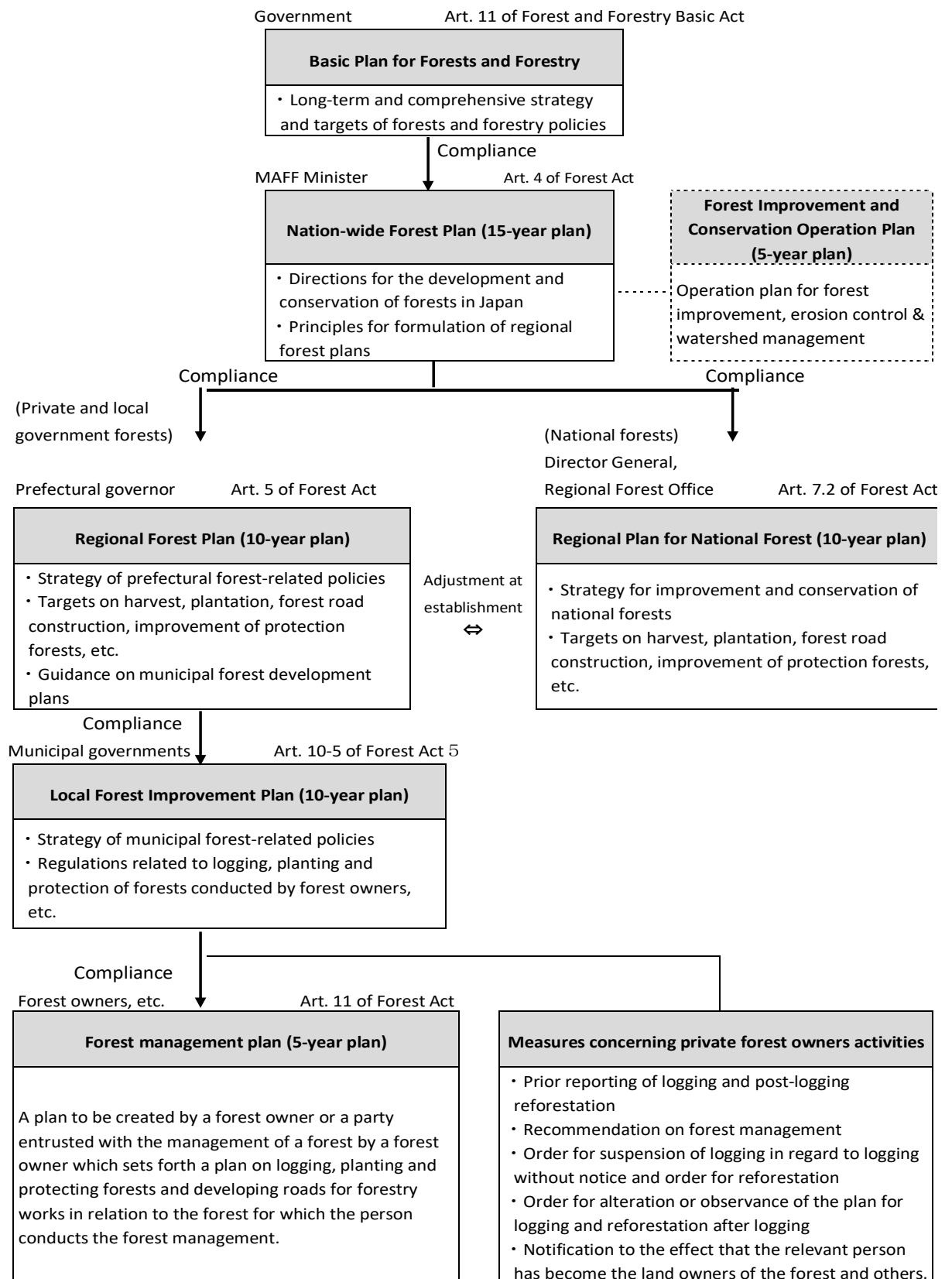
management and conservation of forests, designed volume of harvest and re-planting, and criteria for forestry practices, etc.

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<sup>46</sup>. 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

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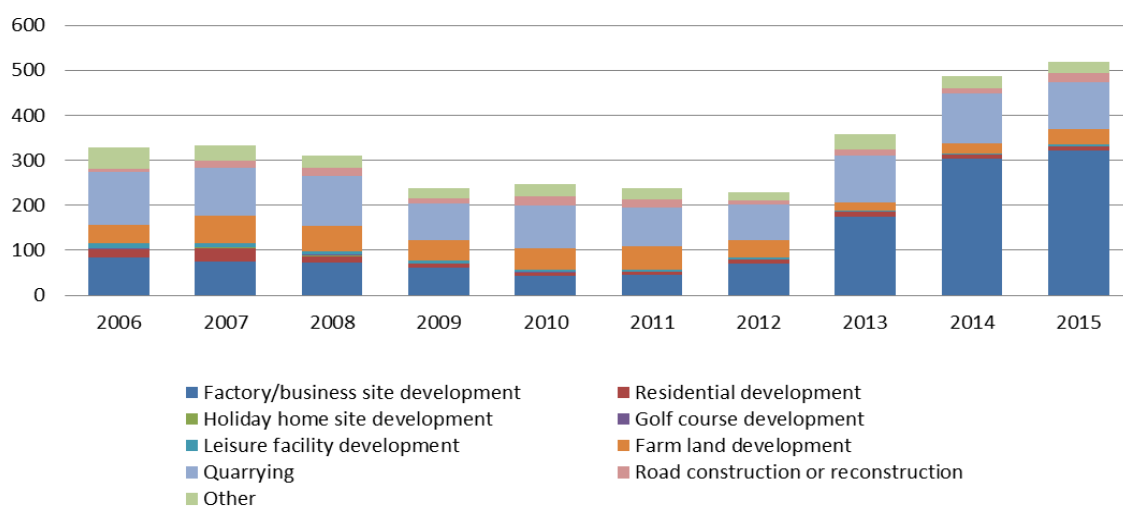
<sup>46</sup> Ministry of Internal Affairs and Communication, the Survey on local government quota management

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

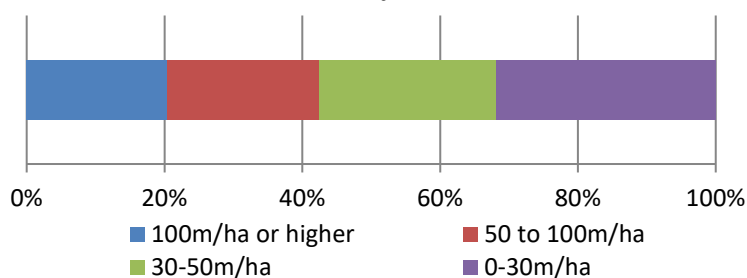
This indicator provides information on the ability of the government and private organizations to provide programs and services necessary to support the sustainable management of forests, maintain and develop infrastructure, and access financial and human resources.

### 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**



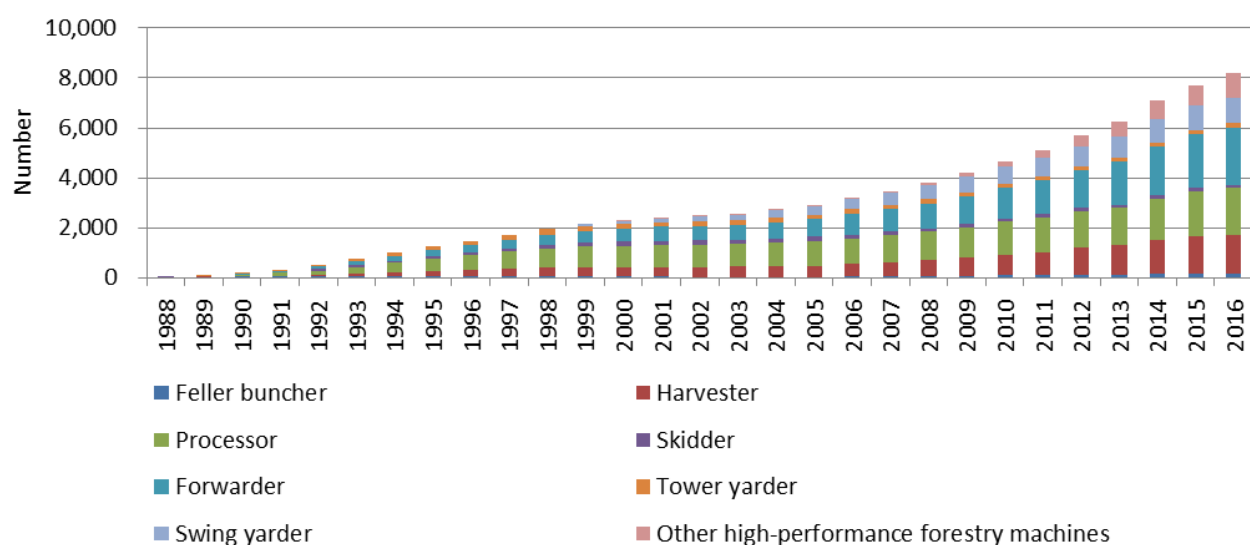
Note 1: Result of a survey of forest worker monitors

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 renovation, 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**

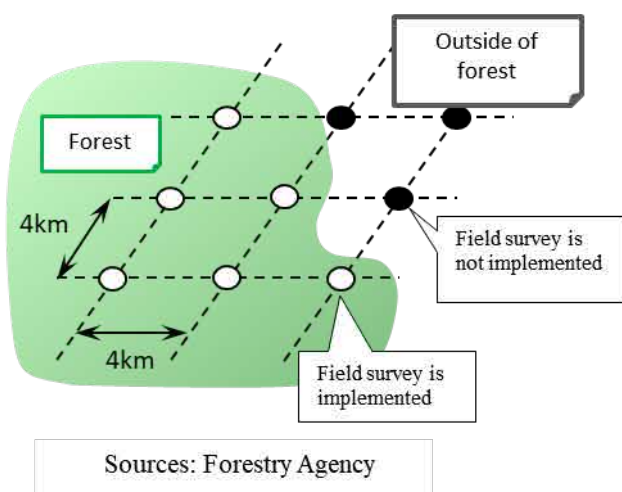
Regarding forest resource information, a forest plan is established for each of the 158 river basins in Japan. Every five years, prefectural governors establish regional forest plans for private forests, while Director Generals of Regional Forest Offices create a Regional Plan for National Forest for 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**



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.

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