Transition to Sustainable Forestry Management and Rehabilitation in Japan

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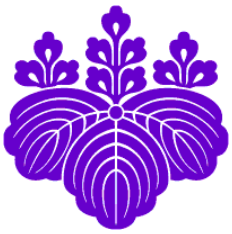

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CHAPTER 1 BACKGROUND

1.1 Brief profile of Japan

1.1.1 Geography and climate

Japan is an island country in East Asia. It has a total geographical area of 37 795 500 ha, which is the 60th largest in the world (Statistics Bureau 2013a). Approximately 73% of the total land area is mountainous (Statistics Bureau 2013b). Japan has a varied climate. The northernmost parts of Japan have a subarctic climate and the southernmost parts have a subtropical climate. However, most of Japan has a temperate climate with four seasons. Another characteristic of the Japanese climate is the difference between the area along the Sea of Japan and that along the Pacific Ocean, which is caused by mountain ranges located between the two regions. In winter, the mountains block the cold, wet wind blowing from the northwest, which causes heavy snow on the Japan Sea side and sends cold, dry air to the Pacific side. On the other hand, in summer, the southeasterly wind makes the Pacific side hot and humid (Nature Conservation Bureau Environment Agency 1982).

1.1.2 Flora and fauna

Although Japan is a small country, there are more than 30 000 species of wildlife. Most of the country's territory is covered with forests. Japanese forests vary with the change of temperature from evergreen broad-leaved to deciduous broad-leaved and evergreen coniferous forests, and are generally distributed by forest zone. Popular classification places evergreen broad-leaved forests in the warm temperate forest zone or the evergreen oak (*Cyclobalanopsis* spp.) zone, deciduous broad-leaved forests in the cool temperate forest zone or the beech (*Fagus crenata*) zone, and evergreen coniferous forests in the boreal forest zone or the *Abies sachalinensis*/*A. veichii* zone (*ibid.*).

Japanese fauna has a high affinity to the Eurasian continent as Japan was connected to this continent in the glacial age. Reflecting this historical background, the types of fauna found on Yakushima and Tanegashima Islands is different from that found on Amami Oshima Island. The border for these differences is called Watase's Line; to the north of Watase's Line, a high affinity to the Eurasian continent is observed, but to the south of Watase's Line, a high affinity to Taiwan and Southeast Asia is observed.

Endemic species are observed on the islands of Okinawa, Amami and Ogasawara, alpine belts such as Taisetsuzan and the Japanese Alps, and other geographically isolated areas. The ratio of endemic species to other wildlife is high: 40% of terrestrial mammals, 60% of reptiles, and 80% of amphibians are endemic species in Japan (Ministry of the Environment 2008).

1.1.3 Governance

Japan is a constitutional country, which is governed by the Japanese Constitution. It is a country in which administration and judiciary are performed in accordance with the constitution and the laws stipulated by the Diet. The Constitution of Japan expresses sovereignty of the people. The government of Japan constitutes legislative, administrative, and judiciary branches, each of which is independent from the others. The Cabinet, Diet and courts have respective powers. The Diet is the highest body of state power and its sole law-making body. The Diet consists of two houses, the House of Representatives (the Lower House) and the House of Councilors (the Upper House). The parliamentary system is based on cooperation between the Diet and the Cabinet.

Autonomy of local governments is expressed in the Constitution of Japan. The local government system in Japan consists of two tiers: prefectural and municipal. Prefectural and municipal governments are considered to be of equal status, and cooperate in local administration according to shared duties. There are 47 prefectures.

1.1.4 Economy by sector

Current changes in GDP and GDP per capita in Japan are shown in Figure 1.1. The GDP in 2011 was US$5.9 trillion and the GDP per capita in 2011 was US$46 135. These were ranked as 3rd and 21th largest in the world, respectively.

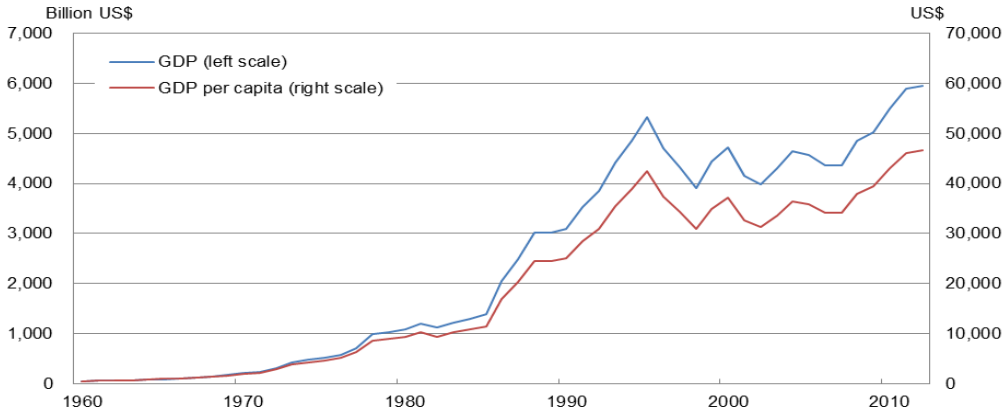


Figure 1.1. Gross domestic product overall and per capita for 1980–2013 (current rates).
Source: World Bank (2013a, 2013b)

Changes in GDP since the 1980s are shown in Figure 1.2. The manufacturing sector has dominated for the last 20 years, followed by the service, wholesale and retail trade, and real estate sectors. The agriculture, forestry and fishery sector has occupied a small portion of the GDP, and has been decreasing.

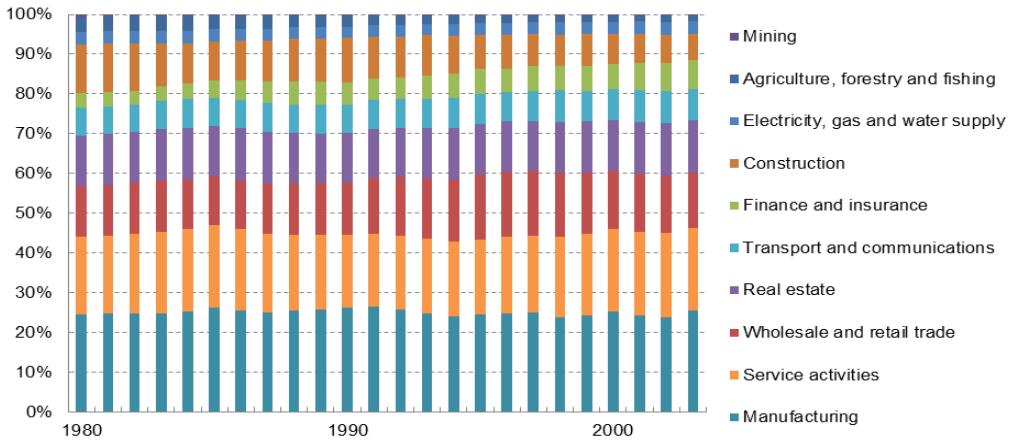


Figure 1.2. Gross domestic product classified by economic activities.
Source: Statistics Bureau (2013c)

Japan was extensively damaged during World War II. During the occupation by the General Headquarters, the Supreme Commander for the Allied Powers, democratization of the economy was implemented through land reform, dissolution of great financial conglomerates (*Zaibatsu*), and creation of labor associations. The Japanese government applied a “priority production system,” through which the government intensively supported prioritized industries. Under this system coal and steel industries were actively developed.

Very high inflation rates occurred after the war. To cope with this, a restrictive fiscal policy called the “Dodge Line” policy was introduced. In addition, a fixed exchange rate, in which one US dollar was equal to 360 yen, was applied. Then, an economic boom caused by special procurement during the Korean War (1950–1953) became the trigger for economic reconstruction.

From 1955 to the early 1970s, fast economic growth continued. There were four periods of high economic growth: the *Jinmu* boom (1955–1957), the *Iwato* boom (1958–1961), the Olympic boom (1963–1964), and the *Izanagi* boom (1965–1970). In particular, the *Jinmu* boom, which was pushed by increased private consumption represented by home electronics such as TVs, refrigerators and washing machines, drove economic development in the 1950s.

In 1973, the existing fixed exchange rate system was changed to the floating rate system due to the Nixon Shock. Japan experienced rapid appreciation of the yen, which slowed down exports and resulted in the stagnation of economic growth. Then, the oil crisis of the 1970s led to the end of the period of high economic growth. The Plaza Accord, with which developed countries started a coordinated intervention to induce depreciation of the US dollar, was signed in 1985. As a result, the Japanese economy fell into a high-yen recession in 1985. To cope with this recession, the Bank of Japan lowered its policy interest rate to half (i.e. 2.5%), which induced a significant increase of barrowing from banks. This led to a significant increase of investment or speculation for land and assets. From 1986 to 1991, Japan experienced the Bubble boom.

The bubble economy burst in the early 1990s. Asset prices, which had overly elevated during the Bubble boom, fell rapidly. This caused a series of corporate bankruptcies. Since the collapse of the economic bubble, Japan's economy has been experiencing low economic growth (Yoshikawa and Miyakawa 2009).

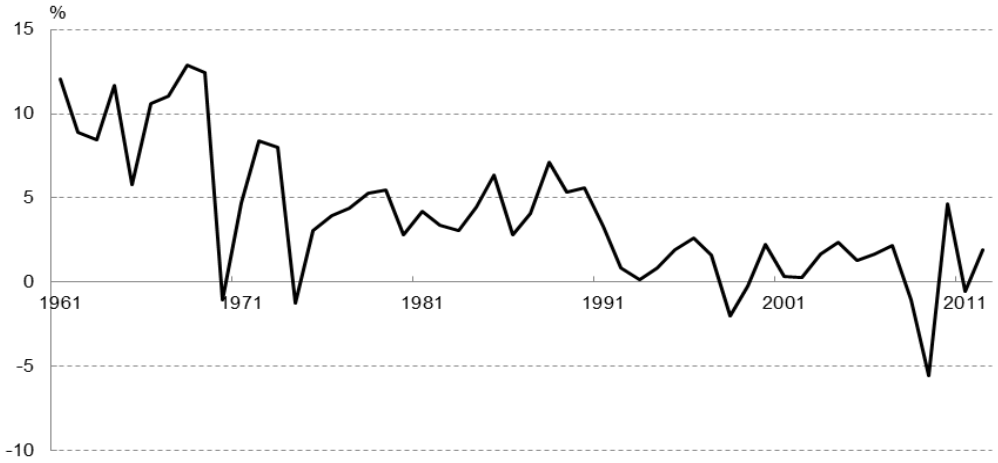


Figure 1.3. GDP growth (annual %).
Note: Annual growth rate (%) of GDP at market prices is based on constant local currency. Aggregates are based on constant 2005 U.S. Dollars.
Source: World Bank (2013c)

1.1.5 Population by area

According to the population census in 2010, the 2010 population in Japan was 128.1 million, 10th largest in the world. Population density was 343 persons/sq km, 7th in the world.

The total population of Japan has been growing continuously since the 1870s (Figure 1.4); however, the annual growth rate of the population has declined since the latter half of the 1970s. From 2005 to 2010, the population of Japan remained stable with an increase of 0.2% in five years (0.05% per year), which is the lowest since the population census system started in 1920. Japan has, in recent years, entered a period of population diminution (Statistics Bureau 2013d).

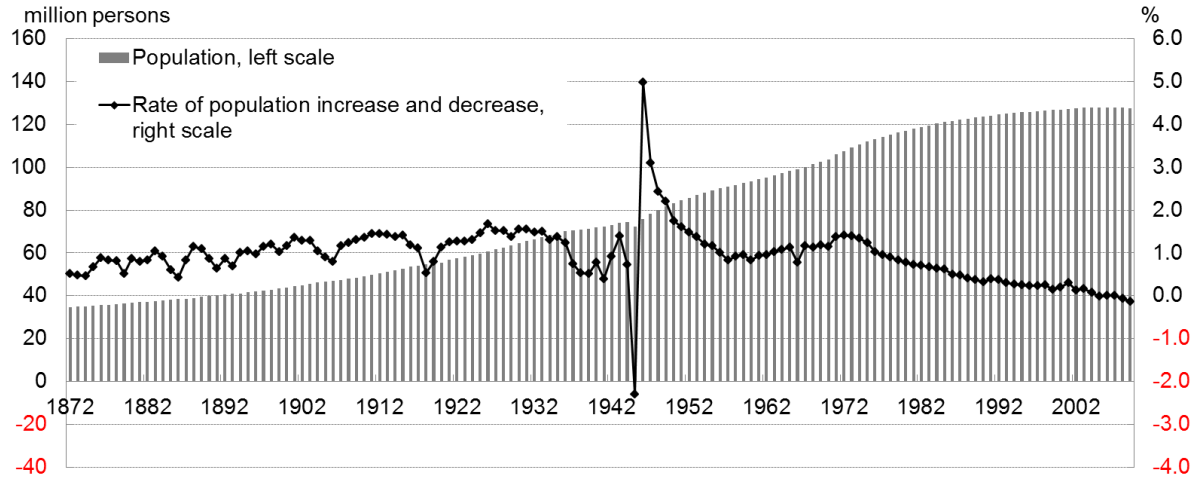


Figure 1.4. Population and population growth rate from 1872 to 2009.
Source: Statistics Bureau (2013e)

Notes:
(1) The period from 1945 to 1970 excludes the prefecture of Okinawa.
(2) Until 2004, all Japanese migrants whose period of intended stay in a foreign country was up to 90 days (as estimated by transients) were included in the estimation of migrational change.
1) From 1872 to 1920, the de facto *naichi* (within Japan proper) Japanese population was estimated by the Cabinet Bureau of Statistics as of 1 January of each year. Military personnel and military civilians stationed outside *naichi* were regarded as *naichi* and included therein. Beginning in 1920, de facto (or de jure, from 1950) population counts based on census information or estimated population counts based on census data as of 1 October of each year beginning in 1945, included areas under Japanese jurisdiction.
a) The population in 1872 was as of 29 January of the lunar calendar (8 March on the solar calendar).
b) Rate of population increase and decrease in 1872 was from the end of January to 2 December of the lunar calendar. 3 December 1872 of the lunar calendar became 1 January 1873 of the solar calendar due to a change in the calendar system.
c) Population counts for the years 1925, 1930, 1935, 1950, 1955, 1960, 1965, 1970, 1975, 1980, 1985, 1990, 1995, 2000 and 2005 were based on census data.
d) The population count for 1940 was adjusted by deducting 1 181 321 (1 178 660 males, 2 661 females) military personnel and military civilians, who were outside *naichi*, from the total population of 73 114 308 (36 566 010 males, 36 548 298 females) recorded by the census.
e) The population count for 1945 was adjusted by adding 149 187 (estimated) military personnel and aliens, not including Koreans and Taiwanese, who were *naichi*, to the total population of 71,998,104 recorded by the census as of 1 November.
f) The population count for 1947 was based on an extraordinary census.
g) The population count for 1952 included 2 968 (1 449 males, 1 519 females) persons from Toshima Village in the district of Oshima, Kagoshima Prefecture, which reverted to Japan's control in December 1951.
h) The population count for 1954 included 201 132 (93 269 males, 107 863 females) persons from the Amami Islands, which reverted to Japan's control in December 1953.
j) The population count for 1968 included 173 (94 males, 79 females) persons from the Ogasawara Islands, which reverted to Japan's control in June 1968.

Among the 47 prefectures in Japan, Tokyo had the largest population with 13.159 million, followed by Kanagawa (9.048 million), Osaka (8.865 million), Aichi (7.411 million), Saitama (7.195 million), Chiba (6.216 million), Hyogo (5.588 million), Hokkaido (5.506 million), Fukuoka (5.072 million) and Shizuoka (3.765 million). Tokyo also ranked at the top for population increase rates with 4.6%, followed by Kanagawa (2.9%), and Chiba (2.6%). Nine prefectures experienced population increases from 2005 to

2010. Conversely, Akita had the highest population decrease rate of 5.2%, followed by Aomori (4.4%), and Kochi (4.0%). Populations were reduced in 38 prefectures from 2005 to 2010 (Statistics Bureau 2013b).

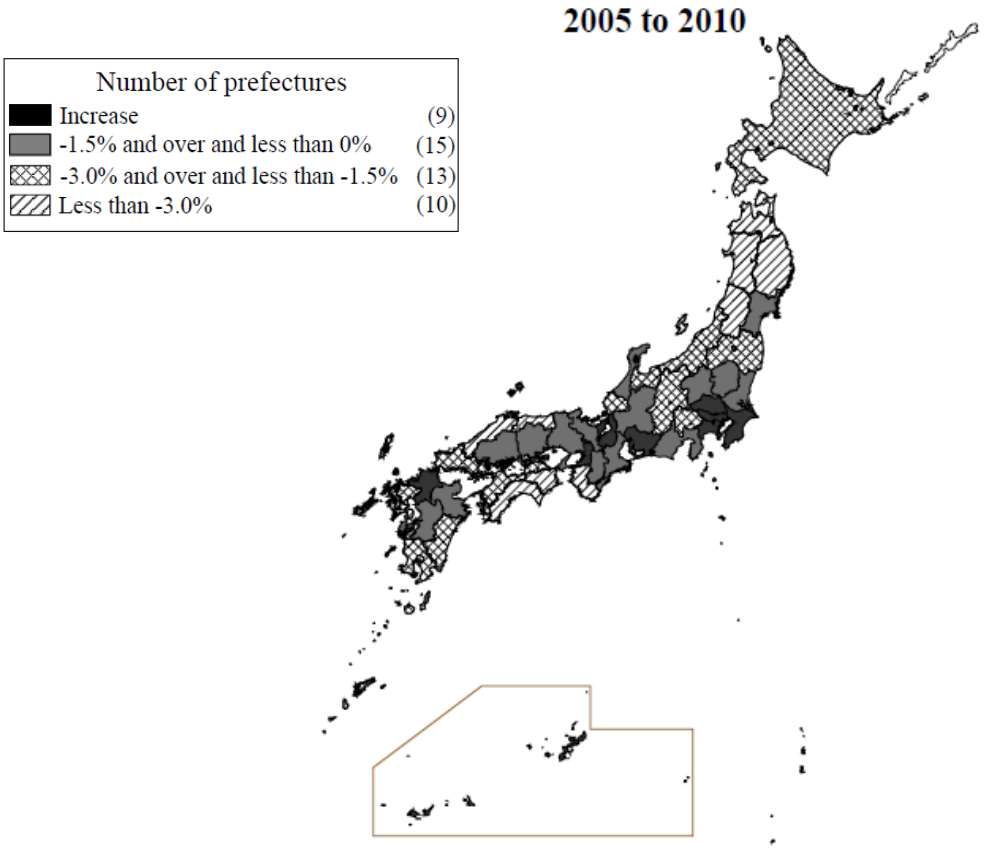


Figure 1.5. Population change rate by prefecture from 2005 to 2010.
Source: Statistics Bureau (2013d)

1.1.6 Major environmental concerns

The history of environmental issues in Japan can be divided into several periods as follows:

- *Worsening of pollution and mining pollution caused by progress of industrialization (1901–1964)*

At the end of the 19th century, the Meiji era began, and government actively promoted industrialization. Initially, key industries such as mining, railways and communication utilities were nationalized, and, subsequently, textile factories, textile mills, cement factories and ironwork factories were established and operated by the government.

By the beginning of the 20th century, mining pollution had become a major problem. Though mining pollution had been reported during the Edo era, activation of the refinement business and the scaling up of business and production after the Meiji era raised the environmental load. To reduce mining pollution, the government established the “Mining Industry Regulation” (1890), the “Mine Act” (1905) and the “Factory Act” (1911). In particular, the “Factory Act” was the first written rule for the control of pollution.

Additionally, air pollution caused by smoke and soot exhausted from factories became a serious problem. Local governments established many rules to prevent air pollution. However, with increased industrialization and chronic shortages of coal, especially good quality coal, more air pollution was observed after the outbreak of World War II.

After the end of the World War II, Japan entered a period of high economic growth. Rapid industrial

development caused pollution throughout Japan. Diseases caused by pollution became a serious problem, and those that afflicted many individuals are called the “four major diseases caused by pollution”:

- Minamata disease - Minamata disease occurred in the Gulf of Minamata, Kumamoto, in 1956. The organic mercury output from factories caused water pollution and sediment contamination. People consumed organic mercury through the food chain, and this led to health problems.
- Niigata Minamata disease (the second Minamata disease) - Niigata Minamata disease occurred in the Agano river basin, Niigata, in 1964. The organic mercury output from factories caused water pollution and sediment contamination. People consumed organic mercury through the food chain, and this led to health problems.
- Yokkaichi asthma - Yokkaichi asthma occurred in Yokkaichi, Mie, between 1960 and 1972. Air pollution attributed to sulfurous acid in its gaseous form was the main cause.
- Itai-itai disease - Itai-itai disease occurred in the Jintsu river basin, Toyama, from the 1910s to the beginning of the 1970s. Cadmium polluted the water and damaged people’s bones. People ingested cadmium through polluted rice.

- *The “Pollution Diet” and development of pollution-related law (1965–1971)*

In response to the serious above-mentioned pollution-related diseases, the government adopted a serious stance on pollution control. First, the Environmental Pollution Control Service Corporation was established in 1965. Active discussions among ministries, the Association of Prefectural Governors, the Association of Mayors, the Japan Federation of Economic Organizations, and other stakeholders were held and resulted in the enactment of the Basic Law for Environmental Pollution Control in 1967. The Extraordinary Diet of 1970 is called the “Pollution Diet” because 14 laws related pollution were enacted and legal systems related to pollution were developed. Furthermore, the Environment Agency (now the Ministry of Environment) was established, and pollution-related administration, which had previously been overseen by several ministries, was integrated.

- *Shift from pollution to environmental problems (1972–1986)*

During this period, both government and private-sector initiatives to prevent pollution were promoted. The private sector made a substantial investment in pollution prevention. An industry-academia-government framework to overcome pollution was developed during this period. Contemporaneously, global environmental issues began surfacing. At the UN Conference on the Human Environment, a presentation by the Club of Rome triggered many initiatives toward solving global environmental problems.

- *Global environmental problems and establishment of a sound material-cycle society (1987–)*

A series of international conferences with the theme of “sustainable development” called for greater recognition of the necessity of changes in energy and resource-saving development and technology in accord with nature. Additionally, industries began to be required to establish environmental management systems. During this period, problems of waste surfaced, and the government enacted the “Law for the Promotion of Utilization of Recycled Resources,” acts for promoting the use of recycled resources such as the “Act for Recycling of Specified Home Appliances,” and the “Basic Law for the Promotion of a Recycling-oriented Society.” Action towards the development of a material-cycle society based on the 3Rs (reduce, reuse, and recycle) was implemented (The Japan Environmental Management Association for Industry 2002).

Current major environmental concerns are carbon dioxide emissions and radiation contamination caused by nuclear power station accidents. Figure 1.6 shows trends in the relationship between GDP per capita and carbon dioxide emissions by country. Greater inclinations of the lines represent greater emissions of carbon dioxide against economic growth. In Japan, carbon dioxide emissions showed a tendency toward slight increases until 2007; however, overall, Japan has been controlling carbon dioxide emissions relatively well even in times of economic expansion or improvement.

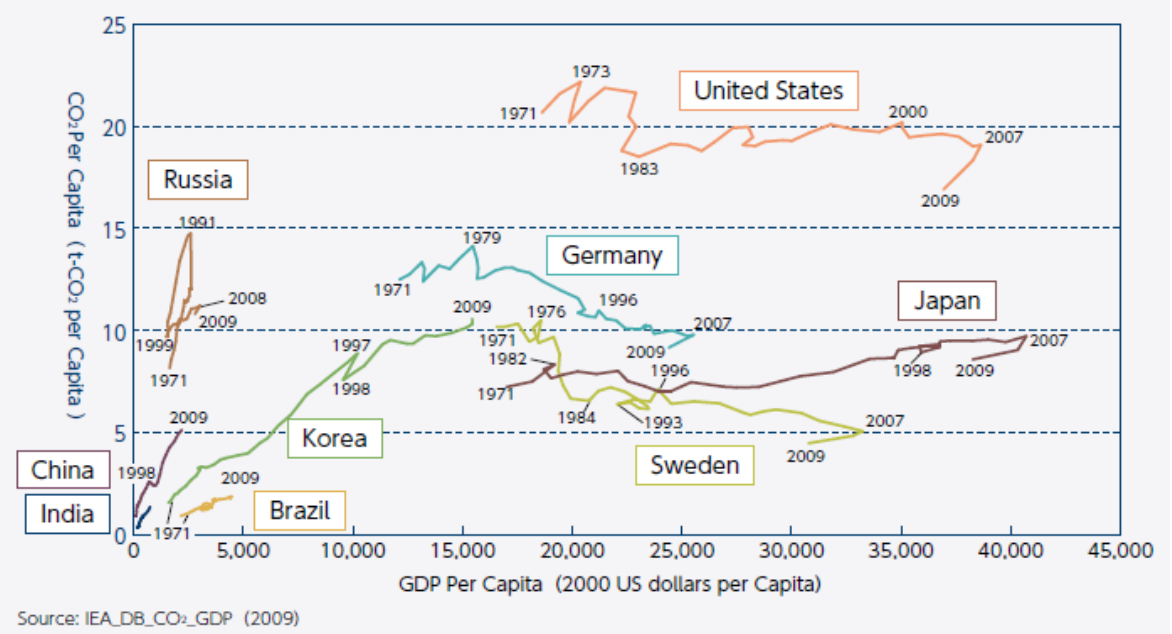


Figure 1.6. The relationship between GDP per capita and carbon dioxide emissions by country. Source: Ministry of the Environment 2012

On 11 March 2011, a massive magnitude 9.0 earthquake (the Great East Japan earthquake) struck the Tohoku and Kanto regions, triggering a giant tsunami that inundated the Pacific Coast of Japan. In the severe accident that occurred at the Tokyo Electric Power Company (TEPCO) Fukushima Daiichi Nuclear Power Station (NPS) following the earthquake, a vast amount of radioactive material was discharged into the environment.

Massive amounts of radioactive materials were released into the environment as a result of the accident that occurred at the TEPCO Fukushima Daiichi NPS, and on 12 April 2011, this severe accident was temporarily evaluated as a Level 7 by the central government according to the International Nuclear Event Scale (INES). The large-scale environmental contamination brought about by radioactive materials discharged into the environment following the accident is a cause for major concern, not only for the Japanese homeland, but also for countries around the world (Ministry of the Environment 2012).

1.2 Land use change and its drivers

1.2.1 Land use and its changes

Figure 1.7 shows historical changes in the area of private land by category between 1880 and 2010. Private ownership of land increased by 6.8 mil ha between 1880, when it was 10.6 mil ha, and the beginning of the 1940s, when it was 17.4 mil ha because the Japanese government disposed of nationally owned land to the private sector throughout the Meiji era, the Taisho era and the beginning of the Showa Era. In particular, inefficient tracts of national forests were disposed of to non-national sectors such as individuals, companies and local autonomous entities.

The area of private forests (non-national forests) increased from around 7 mil ha at the end of the 19th century to 8.9 mil ha during the first half of the 1940s. During this period, paddy fields increased from 260 thousand ha to 297 thousand ha, and other crop fields from 183 thousand ha to 291 thousand ha. Landowners with private forests conducted tree planting on their pastures and grasslands. The overall area of annual planting ranged from 84 thousand ha in 1920 to 339 thousand ha in 1942 (Figure 3.9), and the overall area of forested land has been increasing slowly since the 1950s.

In the 1940s and first half of 1950s there are some missing values as shown in Figure 1.8. After World War II, the total area of privately owned land decreased; however, it increased from 15.4 mil ha to 16.3 mil ha in 1990, and has remained stable since then. Land for building had been expanding steadily since the latter half of the 1940s, whereas paddy fields showed a tendency to decrease. The area of paddy fields declined from 3.1 mil ha in 1968 to 2.7 mil ha in 2010. Furthermore, the area of pastures and grassland had a decreasing trend from the 1960s.

The area of private forest has increased gradually since the latter half of the 1950s: 7.2 mil ha in 1960, 7.6 mil ha in 1980, 7.8 mil ha in 2000 and 7.9 mil ha in 2010. Some national forests have been disposed by sale to the private sector under the budget constraints.

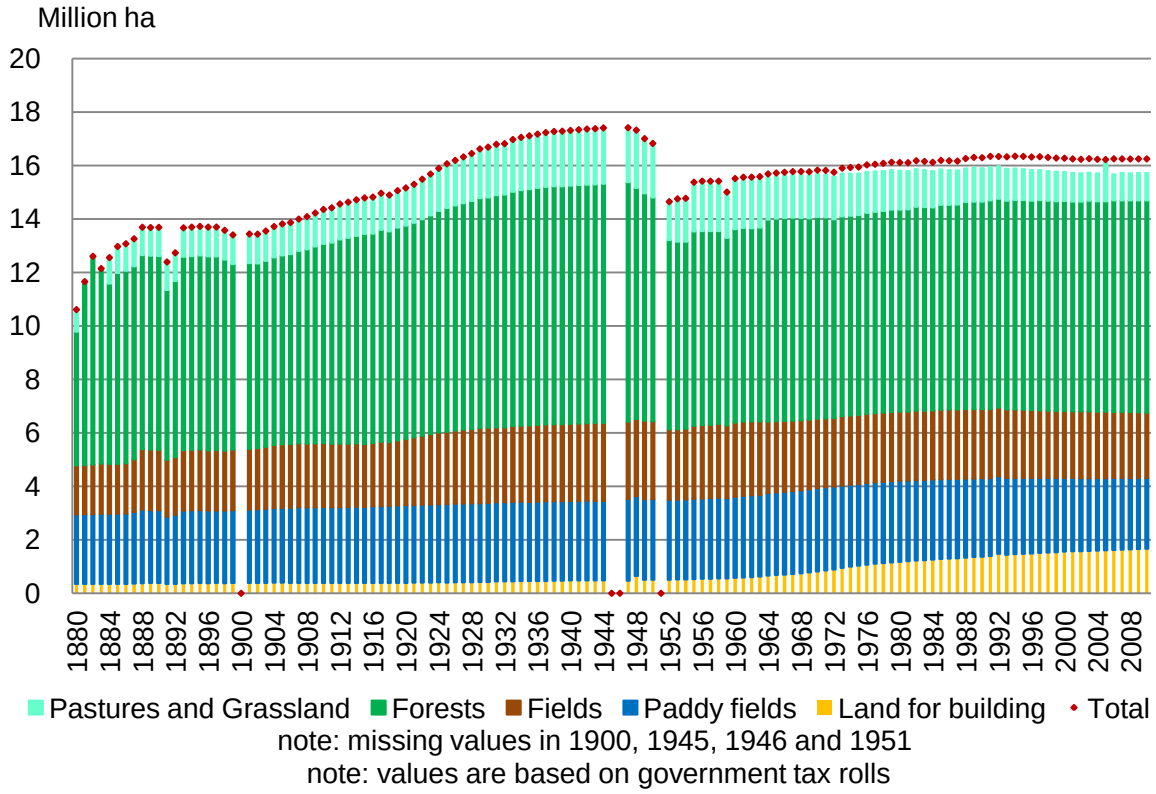
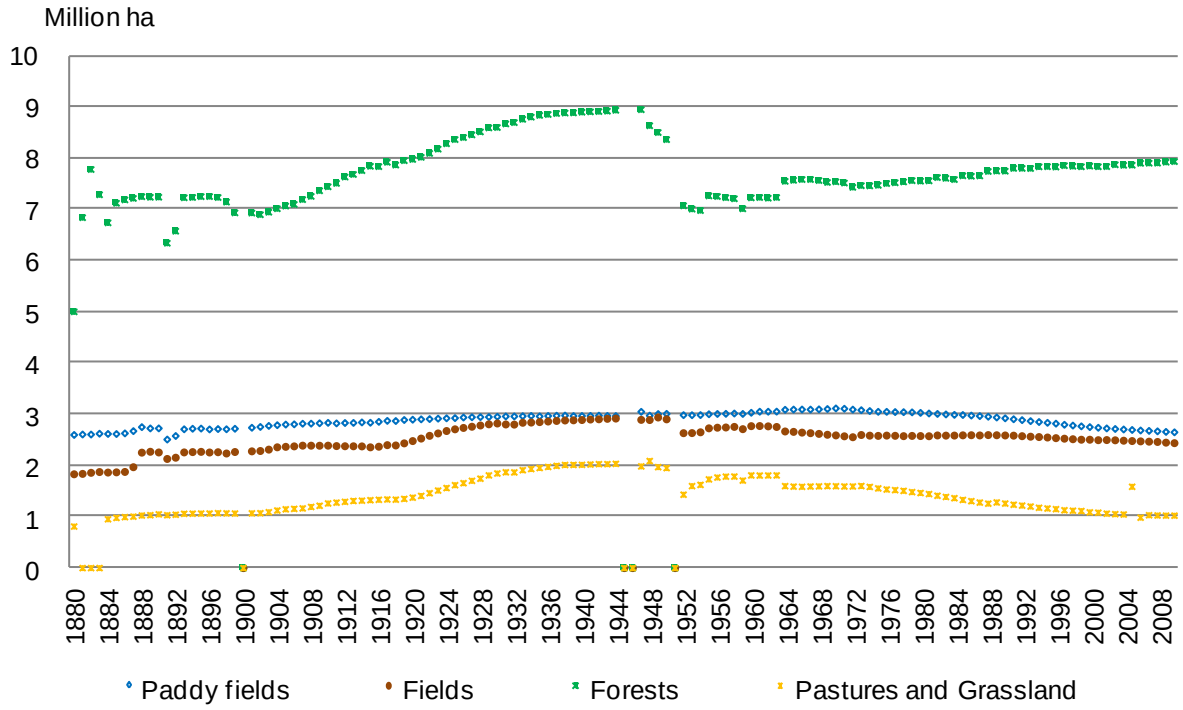


Figure 1.7. Historical changes in private land area by land category: 1880–2010.
Source: Statistics Bureau



note: missing values in 1900, 1945, 1946 and 1951

Figure 1.8. Historical changes in private land area by land category: 1880–2010.
Source: Statistics Bureau

1.2.2 Major drivers of land use change

According to Yorimitsu (1984), the relationship between forest transition and socio-economic factors is divided into four periods (Figure 1.9).

During the 11th and 12th centuries, the population of Japan was more than 10 million people, and the pressure of the population on the forest resources increased gradually. The conversion of grassland into farmland expanded between the 12th century and the begging of the 21st century. At the begging of the 17th century, the Edo era, the population increased to more than 30 million people. The increased wood demand for building materials and fuel was followed by urbanization, and led to the decline of primary forests during the Edo era. Furthermore, a river transportation system for harvesting operations expanded significantly during this period. Under this system, the efficiency of harvesting operations increased dramatically and production volume increased. We can say that such harvesting operations had a negative impact on forest resources.

In the latter half of the 19th century, Japanese society saw the development of capitalism and a high population growth rate. In regards to forestry, a forest railroad system was introduced and afforestation in undeveloped woodland near populated areas (*satoyama*) developed. Forested areas gradually increased at the end of the 19th century. Subsequently, forested areas decreased continuously up to the beginning of the 20th century. After World War II, in the latter half of the 20th century, the population of Japan reached 100 million people. The development of forest utilization for purposes such as building materials, pulpwood, tourism, and water conservation, increased with capitalism and urbanization.

Based upon this study and historical socio-economic data in Kumasaki (1967), we can posit that population growth and agriculture and forestry production are determinants of forest transition.

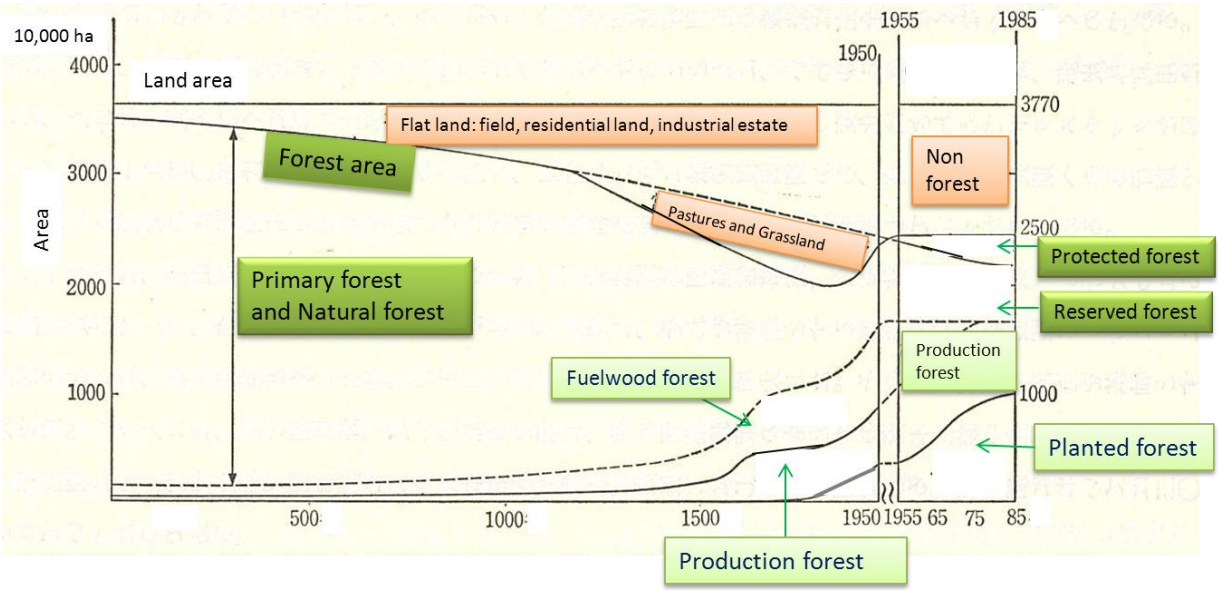


Figure 1.9. Forest transition model for Japan.
Source: Yorimitsu (1984)

CHAPTER 2 FORESTS AND FORESTRY IN JAPAN

2.1 Historical review of changes in forest cover

2.1.1 Definition of forest

1) *Definition of forest according to the Forest Law*

According to the Forest Law (No. 249 of 1951), forest is defined as follows in Japan.

- Land where wood or bamboo grows collectively or the wood or bamboo per se existing on such land.
- Other than the land specified above, land designated to serve for the collective growth of wood or bamboo. Provided, however, that agricultural or residential land, or any land designated to serve such purposes, and the wood or bamboo per se existing on such land are excluded.

2) *Definition of forest based on resolution 16/CMP.1 of the Kyoto Protocol from the first meeting of the Conference of the Parties*

Based on resolution 16/CMP.1 of the Kyoto Protocol from the first meeting of the Conference of the Parties (COP/MOP1), the definition of forest in Japan is as follows.

- Smallest area 0.3 ha
- Smallest canopy cover 30%
- Minimum tree height 5 m
- Smallest forest width 20 m

These values for smallest area, smallest canopy cover, and smallest forest width coincide with target parameters of the forest planning system.

Table 2.1. Forest category and definition used for FAO report.

Category	Definition
Forest	Land larger than 0.3 ha where wood or bamboo grows collectively or which is designated to serve for the collective growth of wood or bamboo, or the wood or bamboo per se existing on such land. Provided, however, that agricultural or residential land, or any land designated to serve such purposes, and the wood or bamboo per se existing on such land are excluded.
Treed land	A forest stand where the forest canopy is greater than 0.3 ha.
Treeless land	A forest stand other than treed land and bamboo forest.
Bamboo forest	A forest stand where bamboo grows, but treed land is excluded.

Source: Ministry of the Environment (2013).

2.1.2 Quantitative aspects of forests

The total area of forested land in Japan is about 25 mil ha, and has been stable since the 1960s. However, the composition ratio of natural forest and planted forest has changed (Figure 2.1).

Due to the large quantity of wood that was required in order to secure necessary supplies during wartime and postwar revival, large-scale forest exploitation occurred. To rehabilitate degraded land after exploitation, reforestation was promoted. From the middle of the 1950s to the middle of the 1970s, more than 300,000 ha of land were reforested every year. As a result, planted forests increased from the 1960s to the 1980s, while natural forests decreased.

From the middle of 1950s, fuel switched from firewood and charcoal to oil and gas as economic growth increased. Firewood and charcoal demand decreased, and the demand for building materials increased. In response to such demands, "expansive afforestation," intended to switch natural forests such as those used for firewood, to planted forests was pushed forward.

From the viewpoint of land conservation, degraded land should be reforested as soon as possible. Therefore, rapidly growing needle-leaved tree species such as *Cryptomeria japonica* and *Chamaecyparis obtuse* were chosen as planting trees. The high economic value of these trees was also a factor in the choice (Forestry Agency 2013a).

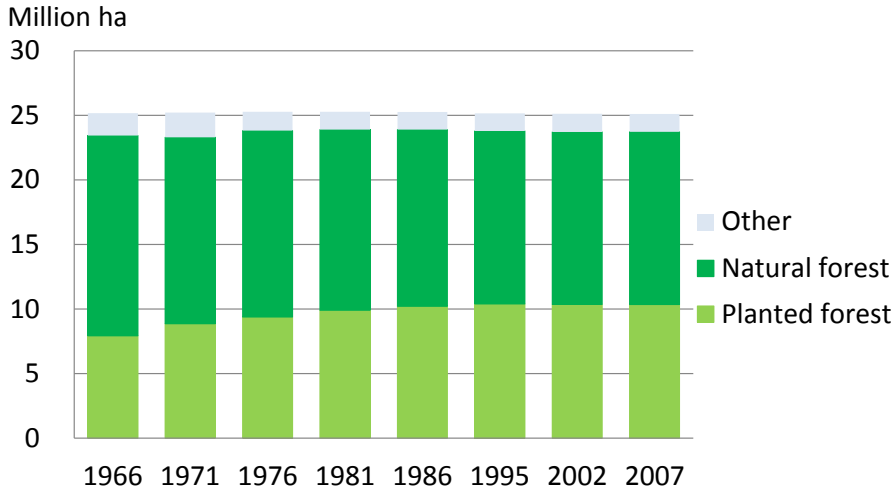


Figure 2.1. Changes in forested area.
Source: Forestry Agency

Forest stock in Japan has been growing continuously since the 1960s. Though forest stock from natural forests has been stable, forest stock from planted forests has been increasing significantly since the 1970s. This is the result of the conversion from natural forests to planted forests since the 1950s.

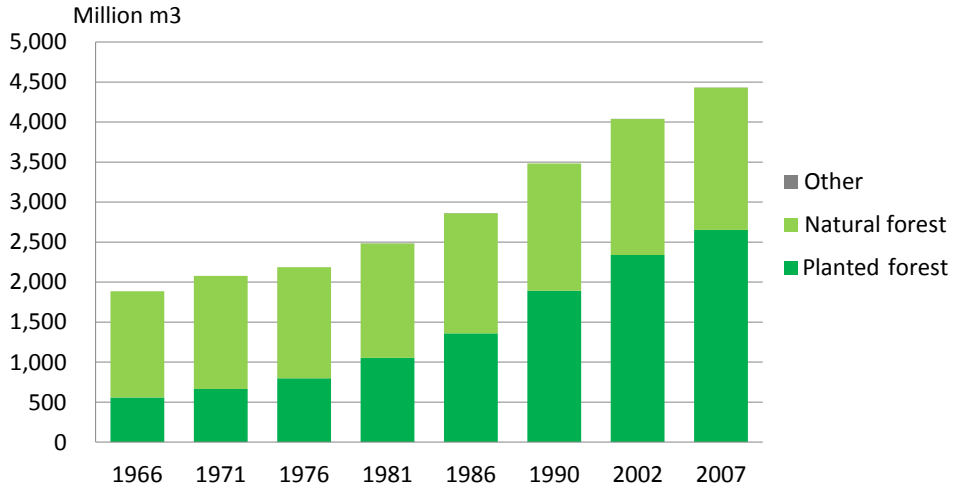


Figure 2.2. Change of forest stock by forest type.
Source: Forestry Agency

2.1.3 Qualitative aspects of forests

The age structures of natural forests and planted forests are shown in Figure 2.3. Disproportionate age class distribution can be observed. A high proportion of natural forest falls in the age classes 10–12 (46–60 years). A high proportion of planted forests fall into the age classes 8–10 (36–50 years). Planted forests of harvesting age (older than 50 years) increase while most planted forests are still in the age classes that require tending. On the other hand, the area of young forests is very small due to the slump in forestry production activities of recent years.

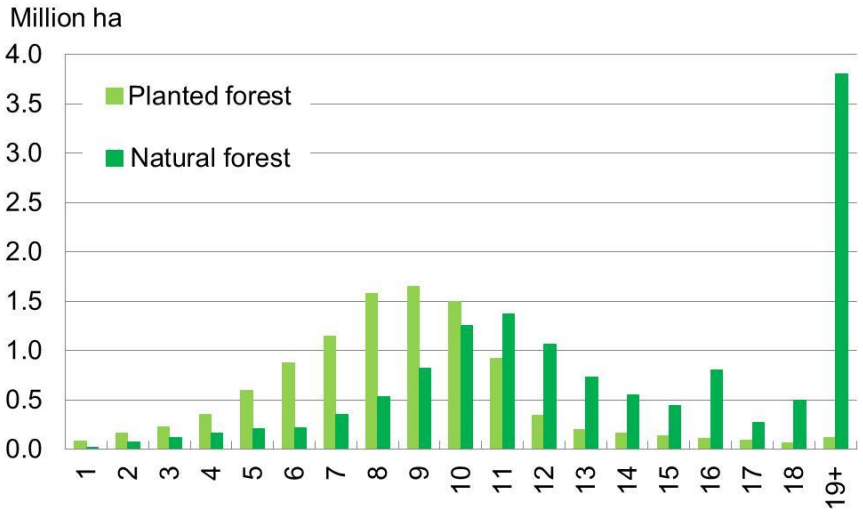


Figure 2.3. Age structures of natural forests and planted forests by age class in 2007.
Source: Forestry Agency (2012b)

To focus on age structure by tree species, all species have an uneven distribution of age class. This is a result of expansive afforestation (Figure 2.4).

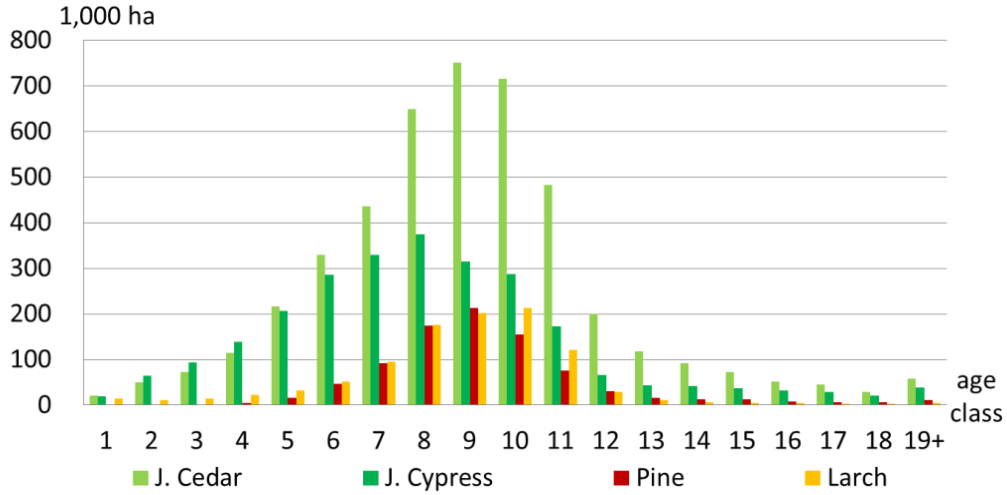


Figure 2.4. Age structure by tree species and age class in 2007.
Source: Forestry Agency (2012b)

The current state of forest cover is not dissimilar to that of 1850. From 1850 to 1990, broad-leaved forests were converted to agricultural land. However, unlike after the 1960s, residential land did not increase. By the end of World War II, forest resources had been extensively depleted (Table 2.2).

Table 2.2. Land use around 1980 and 1900.

	Agricultural land	Wasteland	Forests					Residential land	Other
			Broad-leaved	Coniferous	Mixed	Bamboo	Forests total		
Around 1850	14.9	11.1	30.2	11.8	25.5	1.5	**69.0**	1.7	3.3
Around 1900	16.8	10.7	26.5	11.9	26.3	0.8	**65.5**	1.7	5.3

Source: Nishikawa and Himiyama (1992)

2.1.4 Variation among regions

Prefectures whose forest covers are above 60% are colored with green in Figure 2.5. Most prefectures have forestation rates greater than 60%. Only urban areas such as the regions around Tokyo, Osaka, Fukuoka and Sendai have forestation rates lower than 60% (gray).

Figure 2.5. Prefectures where the percentage of forests to the total geographical area is above 60%.

2.1.5 U-shape hypothesis of forest resources

The U-shape hypothesis of forest resources was put forward by Nagata *et al*. (1994). In their article, the U-shape hypothesis was described as, "forest resources decrease in the early stage of economic development and increase in the later stage: if we take forest resources as a vertical axis and some measure of economic development as horizontal axis, the development would give a U-shaped locus." Generally, human history can be divided into four stages based on forest resources utility.

Stage 1: Hunting and gathering stage
Stage 2: Agricultural stage (agricultural revolution)
Stage 3: Industrialization stage (Industrial Revolution)
Stage 4: Post industrialization stage

The makeup of forests gradually changes from "primary forest and natural forest" to "secondary forest and planted forest" through time. Primary forests remain stable and forest cover increases gradually following an expansion of planted forests from point A (Figure 2.6).

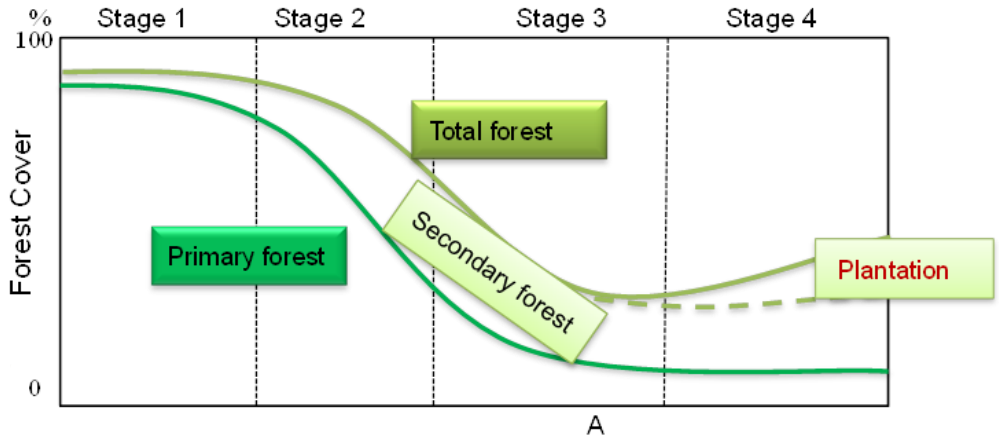


Figure 2.6. Historical changes in forest resources.
Source: Inoue (1992)

2.2 Forestry regulation and administration

2.2.1 Forest ownership

Demarcation between national and private forest ownership in Japan

In 1868, the feudal system characteristic of the Shogunate (*Bakufu*) was terminated and the Meiji Government was established. The Meiji Government fostered a national policy of promoting industry and strengthening military power, advancing the move to convert Japan into a modern state. As one of the measures to promote the fostering of industry, the Meiji Government started the land-tax reform in 1873. The land-tax reform aimed to increase revenue from tax via a land taxation reform. In the beginning of the Meiji era, the main source of revenue was rice paid by farmers. However, revenue collected by this tax system was unstable since harvests varied from year to year.

Therefore, the government delivered land ownership to private sector and admitted them to own property rights privately. There were three main points to the land taxation reform: 1) the tax payment system was changed from pay in kind (rice) to pay in cash, 2) the amount of tax was determined by land value not by yield, and 3) tax was paid by owners at a determined rate of 3% of the land's value.

As part of the land-tax reform, demarcation between national and private forest ownership was implemented from 1873. Before demarcation, forest owners in Japan could be classified into the following 3 types.

1) Shogunate and feudal clans (*han*): In general, farmers were forbidden to use these forests
2) Villages: Communal forests
3) Individuals

Forests owned by the Shogunate and feudal clans and forests owned by shrines and temples were returned to the Imperial Court in 1869 and 1970, respectively. They were classed as national forests.

Communal forests that satisfied the following conditions were demarcated as private forests:

1) The forest was registered in a '*kenchi-chyou*' (a cadastre in which the results of '*kenchi*' (land surveys) are recorded by lords and the Shogunate)
2) There was fact of customary use
3) The forest was the subject of plantation or shifting cultivation

This meant that communal forests without records for buying and selling or without proof of certain activities such as planting or agriculture were classified as national forests. To prove these was difficult for the people, and, consequently, many communal forests were classified as national forests. Moreover, the government classified communal forests owned by farmers who wanted to avoid tax payment as national forests. Therefore the proportion of national forests to total forests in the Kinki region, where the commodity economy was well developed, was smaller than that in other areas.

As the result, the area of national forests increased from 31% of total forest area in 1880 to 53% in 1890. Through this process of demarcation between national and private forest ownership, the basis for forest ownership in Japan was laid (Endo 2012). In 2010, the total forested area in Japan was around 25.0 mil ha, and was composed of national forests (29%), private forests (55%), public forests (14%) and forests owned by the Japan Green Resources Corporation (3%) (Figure 2.7). This composition has not changed significantly since the 1960s.

The ratio of national forest area to total forest area varies by region. While more than 30% of forests belong to the nation in the Hokkaido and Tohoku regions, less than 10% in the Kinki region do. Most national forests are located in the Ohu Mountains in the Tohoku region and other reservoir areas. Therefore, national forests play an important role in the enhancement of public interest in areas such as land conservation, watershed protection, and nature conservation.

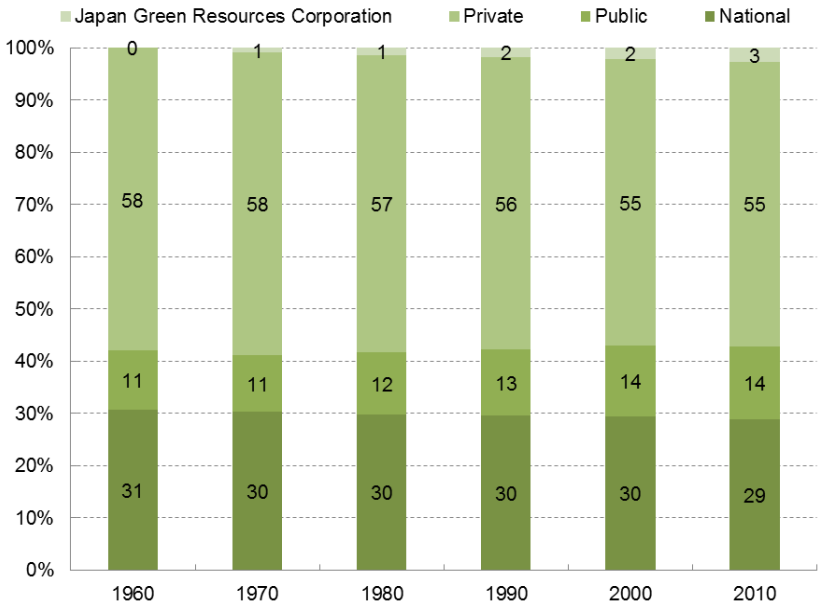


Figure 2.7. Forest area by ownership.
Source: Statistics Bureau (2013f)

The Forestry Agency categorizes each forest into one of three functional types according to its primary function: “land and water conservation forests,” “forest-human co-existence forests” and “sustainable resource use forests.” To focus on the functions of forests in 2007, 70%, 13% and 17% of total forest areas were categorized as “land and water conservation forests,” “forest-human co-existence forests” and “sustainable resource use forests,” respectively. Most “land and water conservation forests” and “sustainable resource use forests” were made up of public and private forests, while national forests accounted for a large proportion of “forest-human co-existence forests.”

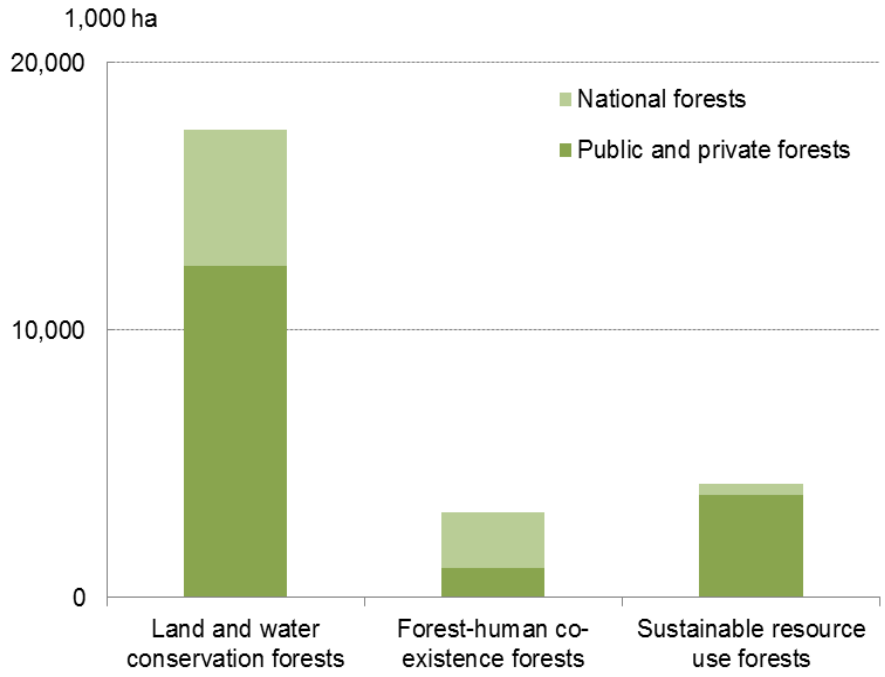


Figure 2.8. Area of forests by three major functions in 2007.
Source: Forestry Agency (2012a)

2.2.2 Forestry administration

Japanese forest administration is differentiated by forest classification. National forests are administered directly by the Forestry Agency, public forests by the local government, and private forests by the forest owner.

"Forest and Forestry Basic Plan," which is the fundamental national policy on forests and forestry in Japan, was established based on the "Forest and Forestry Basic Law." In this plan, the roles of government, Ministry of Agriculture, Forestry and Fisheries (MAFF), prefecture, municipality and forest owner are delineated as shown in Figure 2.9.

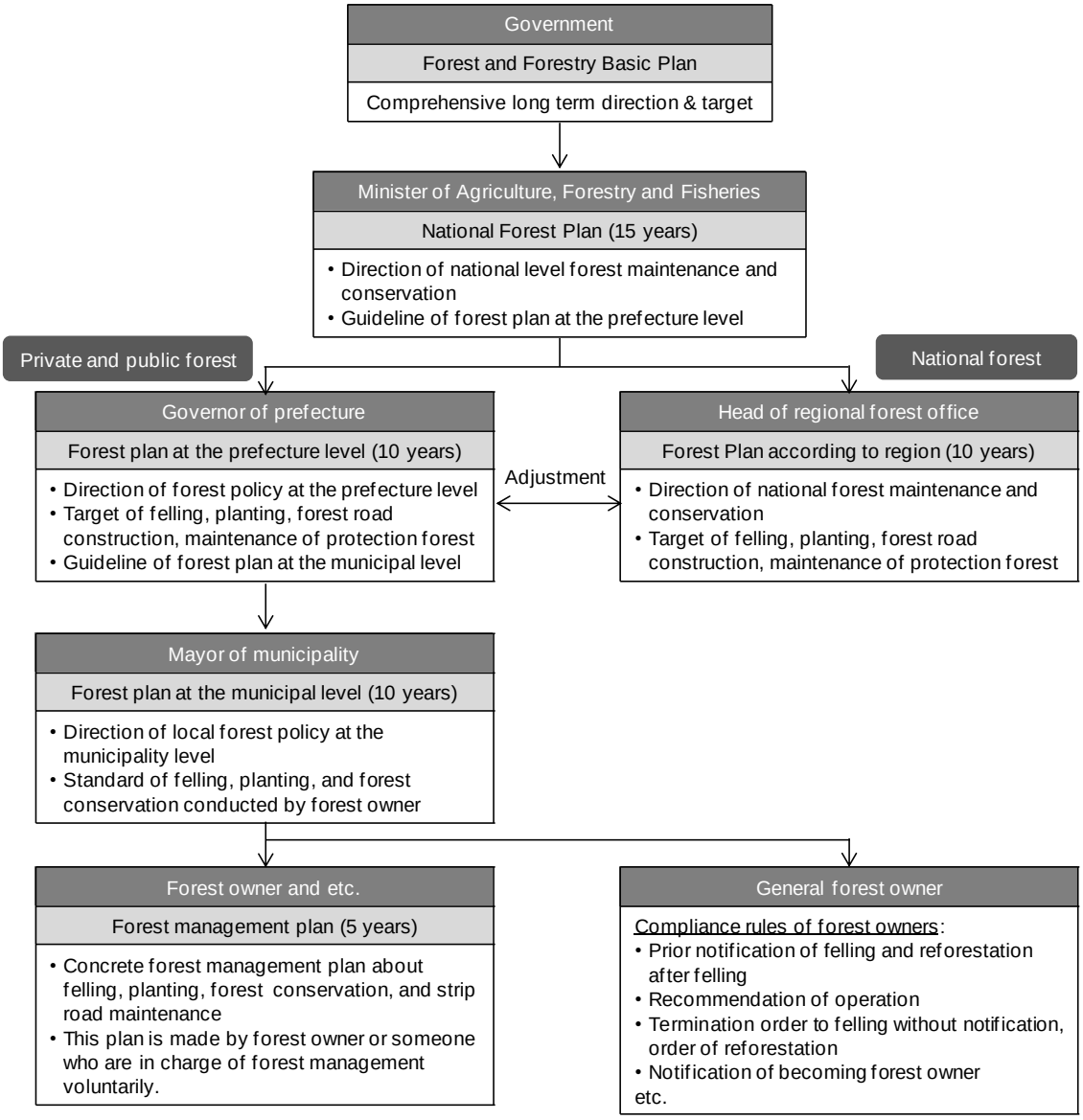


Figure 2.9. System of the Forest and Forestry Basic Plan.
Source: Forestry Agency (2013b), Shiraishi (2012)

2.2.3 Forest management.

Basic framework of forest management in Japan

The "Forest and Forestry Basic Law" was established in 2001 as an alternative to the "Forest Basic Law" established in 1964. The "Forest Basic Law" had been established to develop forestry in correspondence with timber demand during high economic growth periods. However, in recent years, the demand for forest resources was varied, and Japan faced a decline in its timber self-sufficiency rate. In response to such changes, the "Forest and Forestry Basic Law" was established. The basic

principle of the "Forest and Forestry Basic Law" is to integrate multiple functions of forests, such as watershed protection, land conservation, prevention of global warming, etc.

The "Forest and Forestry Basic Plan" is the fundamental national policy on forests and forestry in Japan, while the "National Forest Plan" provides national guidelines for forest management. In the "Forest and Forestry Basic Plan," forests are categorized into three functional types according to their primary function: "land and water conservation forests," "forest-human co-existence forests," and "sustainable resource use forests."

Policy Revision for Revitalization of Forests and Forestry

In 2011, as the "first year of the revitalization of forest and forestry," the MAFF reviewed forest policies and revised the "Forest Law," introduced the "Forest Management and Environmental Conservation Direct Support System," and developed the new "Forest and Forestry Basic Plan" and "National Forest Plan."

In April 2011, the "Forest Law" was revised to introduce 1) the assurance system of proper forest management of forests whose owners are unknown, 2) the administrative order system to halt logging without permission and oblige such loggers to replant, and 3) the "Forest Management Plan" system to promote coordination and consolidation of forestry practices among groups of small-forest owners.

The "Forest Management and Environmental Conservation Direct Support System" is a subsidy program, which supports the costs of forest management, including thinning and construction of forestry roads, in combination with forest management activities (Forestry Agency 2012a).

2.2.4 Forest Owners' Cooperative Association (FOCA)

FOCA was established in 1908 in compliance with the Forest Law of 1907. The present-day FOCA was established based on the Forestry Cooperative Law (1978) with the following purposes.

- To improve the socio-economic status of its members
- To improve forest productivity
- To preserve and maintain forests

While FOCA is obligated to maintain and manage forests, it is able to discretionally conduct business.

FOCA consists of three tiers: municipal level, prefectural level and national level (Figure 2.10). It is financed with investments by forest owners. In 2010, there were 679 FOCA branches with a total number of members of approximately 15.7 million, and FOCA members owned two-thirds of privately owned forests in Japan (Table 2.3).

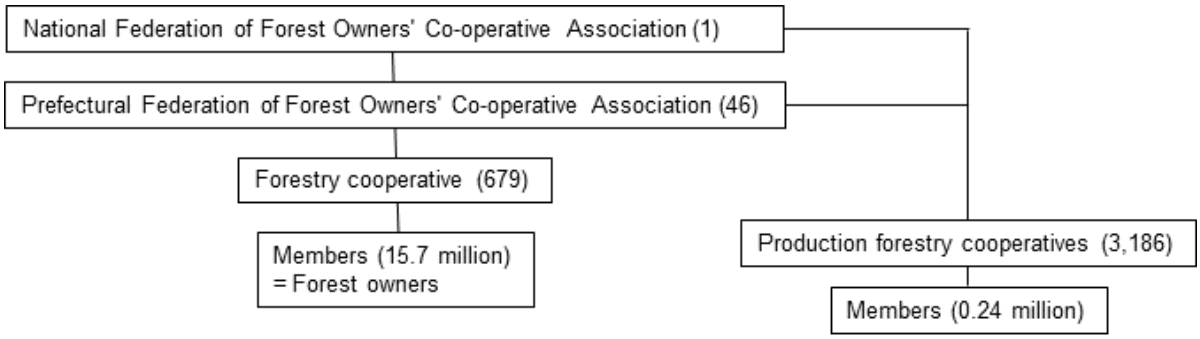


Figure 2.10. Structure of FOCA in 2010.
Source: Forestry Agency (2013c)

Table 2.3. General condition of FOCA in 2010.

	Nationally	**Per FOCA branch**
Number of FOCA branches*	679	-
Number of members**	15.7million	2,328
Area of private forest in operation area**	15.9 mil ha	23,461 ha
Area of forests owned by members**	11.0 mil ha	16,201 ha
% of forest area owned by members**	69%	69%
Paid-up investments**	53 billion yen	78.4 million yen
Number of full-time executives**	484	0.7
Number of full-time staff**	7,190	10.6

Source: Forestry Agency (2013c)
Note: This table was made based on the results of a questionnaire survey to FOCA.
*Number of FOCA branches is the number of branches approved by the prefectural governor.
**Data from questionnaires submitted by 676 FOCA branches.

The FOCA undertakes commissioned work such as planting, weeding, thinning, and timber production. The FOCA also provides consultation services to forest owners and undertakes forestry operations such as creating forest management plans, selling forest products, providing loans, etc. (Figure 2.11).

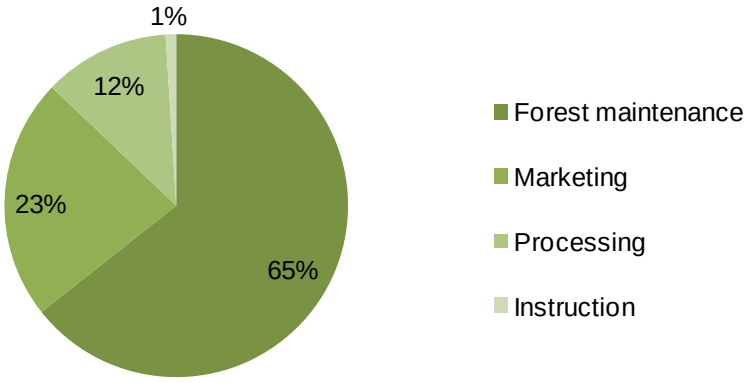


Figure 2.11. Composition of FOCA business in 2009 (billing base).
Source: Forestry Agency (2012a)

Most commissioned work such as planting (58%), weeding (55%), thinning (52%) and timber production (10%), was undertaken by the FOCA, and it can be said that the FOCA is the main entity of forestry operations in Japan (Figure 2.12).

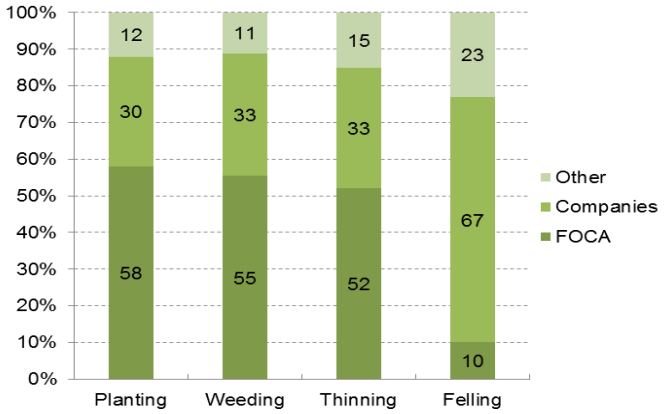


Figure 2.12. FOCA share of forest operations in Japan (2010).
Source: Forestry Agency (2012a)

FOCA undertakes planting, tending and timber production; however, since 1995, land dedicated to planting has decreased while timber production has expanded (Figure 2.13).

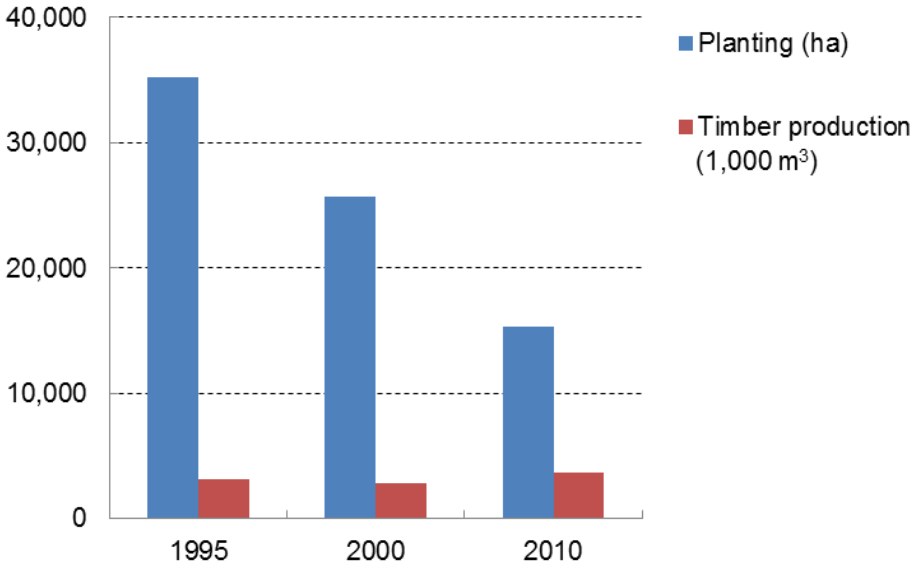


Figure 2.13. Distribution of FOCA planting and felling operations in Japan.
Source: Forestry Agency (2013a)

2.2.5 Forest utilization

- Utilization of timber

Total domestic production of timber was 18.9 mil cu m in 2010. Of the total production, 10.6 mil cu m were used for lumber, 4.8 mil cu m for pulp and chip, 2.5 mil cu m for plywood, 379 000 cu m for other uses, 532 000 cu m to grow shiitake mushrooms, and 155 000 cu m for firewood (Figure 2.14).

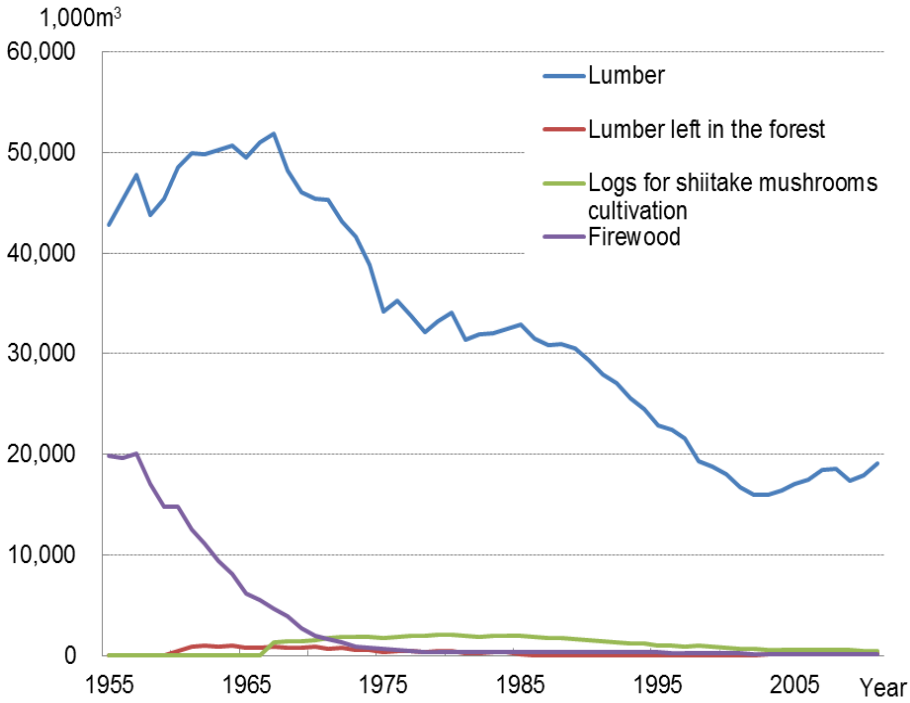


Figure 2.14. Changes in timber production by usage from 1955 to 2011.
Source: MAFF (2013a)

- Non-wood forest products

The Forestry Agency has a forest product category that is called "*Tokuyo rinsanbutsu*." This category is defined as follows: "Forest products other than timber that are produced naturally or artificially. These have economic value and contribute to local livelihood." In this section, we refer to items included in this category as non-wood forest products (NWFP).

NWFP can be divided into food and non-food products. Mushrooms, chestnuts, walnuts, ginkgo nuts, bamboo shoots and green horseradish are categorized as food NWFP. Production of mushrooms has been increasing continuously. Bamboo shoots and chestnuts were produced actively during the 1970s–1990s; however, their production has decreased since the 1990s (Figure 2.15).

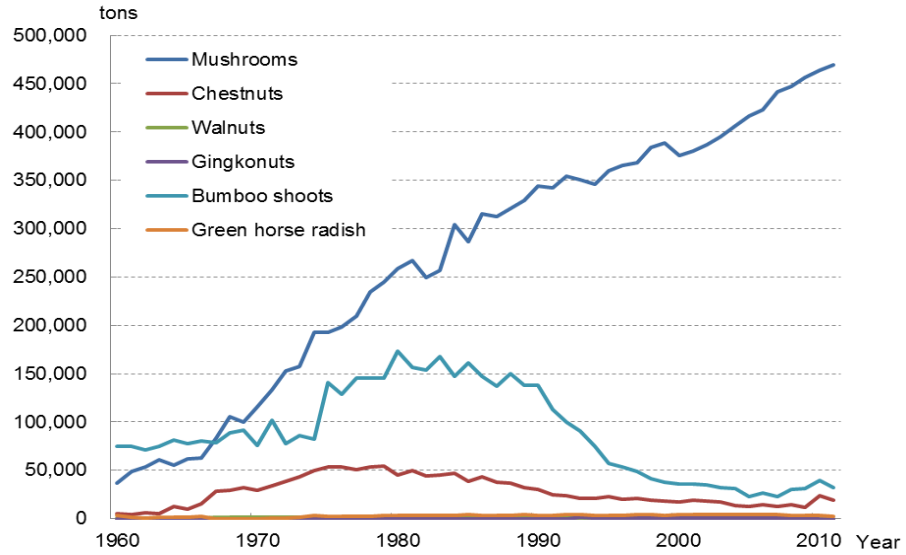


Figure 2.15. Changes in non-wood forest products (food) production from 1960 to 2011.
Source: MAFF (2013a)

Japanese lacquer, bamboo, *paulownia* wood (for furniture), charcoal and woody pellets are produced as non-food NTFP. Though charcoal was produced in large quantities, its production has been decreasing with changes in fuel resources. *Paulownia* wood and Japanese lacquer are used for traditional furniture and traditional crafts; however, their production is decreasing as the demand for such products declines. Conversely, in the middle of the 2000s, woody pellets began drawing attention and their production has been increasing (Figure 2.16).

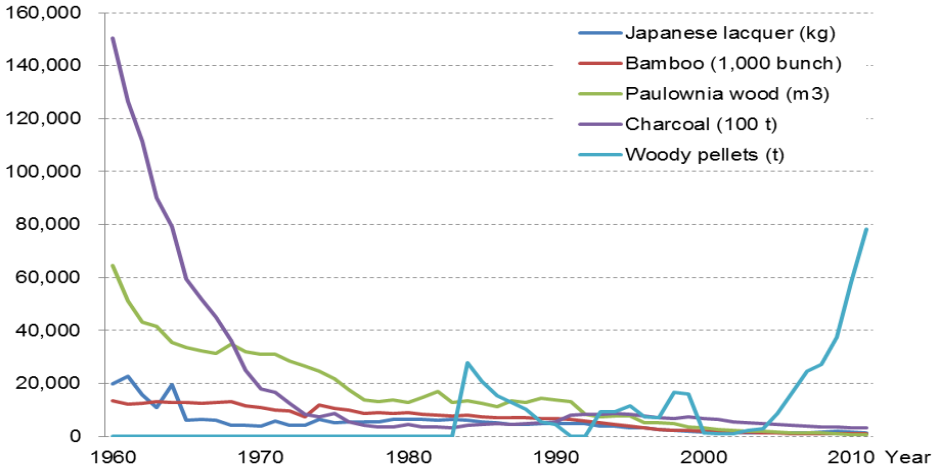


Figure 2.16 Changes in non-wood forest products (non-food) production from 1960 to 2011.
Source: MAFF (2013a)

- Forests for recreation

Besides industrial timber production, forests in Japan are also used for nature conservation, environmental education, recreation, and cultural conservation. The Forestry Agency provides access to its national forests to the public. The Forestry Agency designated national forests, including mountains or lakes and national forests that are suitable for sports, as “recreation forests.” Based on forest characteristics and utilization, recreation forests are classified into six categories as follows (Forestry Agency 2013g):

(1) Nature resort forests - These forests contain significantly beautiful landscapes and are suitable for natural resorts. People are able to enjoy exploring areas of beauty, climbing, hiking and camping.

(2) Natural observation and education forests - Various natural conditions can be observed in these forests. People are able to observe wildlife and learn about the functions of forests.

(3) Landscape forests - Landscape forests are part of picturesque scenery that includes historic sites such as temples, places where historic events occurred, etc. People are able to enjoy extensive prospects of forest and feel the history of the area.

(4) Forests for sports - Such forests are suitable for outdoor sports such as camping and cycling.

(5) Areas for outdoor sports - Such areas contain ski resorts and accommodations.

(6) Sightseeing forests - Sightseeing forests include outstanding natural scenic areas, and consist of recuperation facilities, lakes, canyons and forests. People are able to enjoy many tree species and natural beauty.

In 2012, 1,093 locations were designated as recreation forests, with a total area of 388 ha (Table 2.4).

Table 2.4. Number of locations and area of recreation forests by category.

Category	Number of locations	Area (ha)
(1) Nature resort forests	89	104
(2) Natural observation and education forests	165	32
(3) Landscape forests	482	179
(4) Forests for sports	56	7
(5) Areas for outdoor sports	193	46
(6) Sightseeing forests	107	20
Total	1,093	388

Source: Forestry Agency (2013d)

Overall land area devoted to recreation forests has been comparatively stable, but the number of individual locations has been decreasing since 2005 (Figure 2.17 and Figure 2.18).

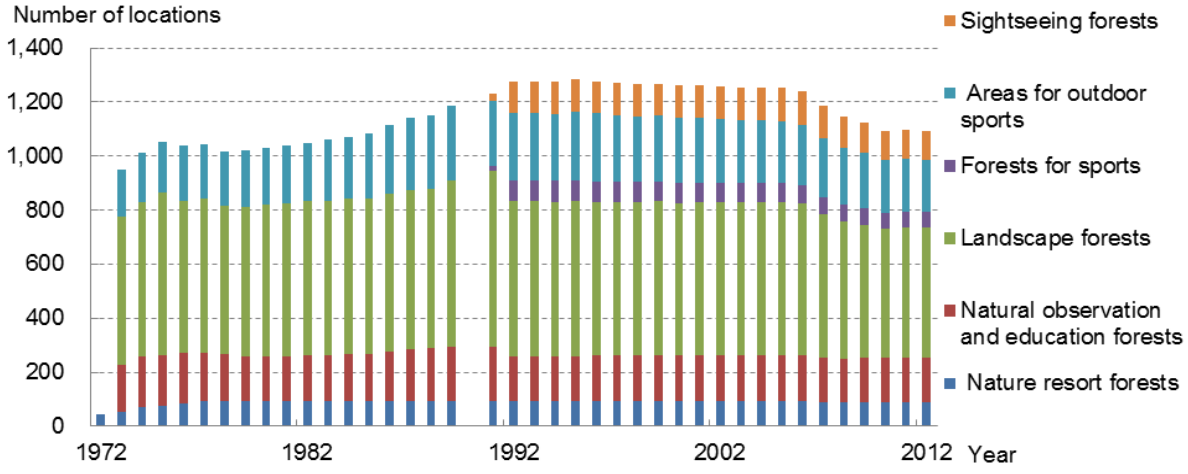


Figure 2.17. Changes in the number of recreation forests (Note: Data for 1990 is missing).

Source: Forestry Agency (2013d, 2013e), Statistics Bureau (2013g)

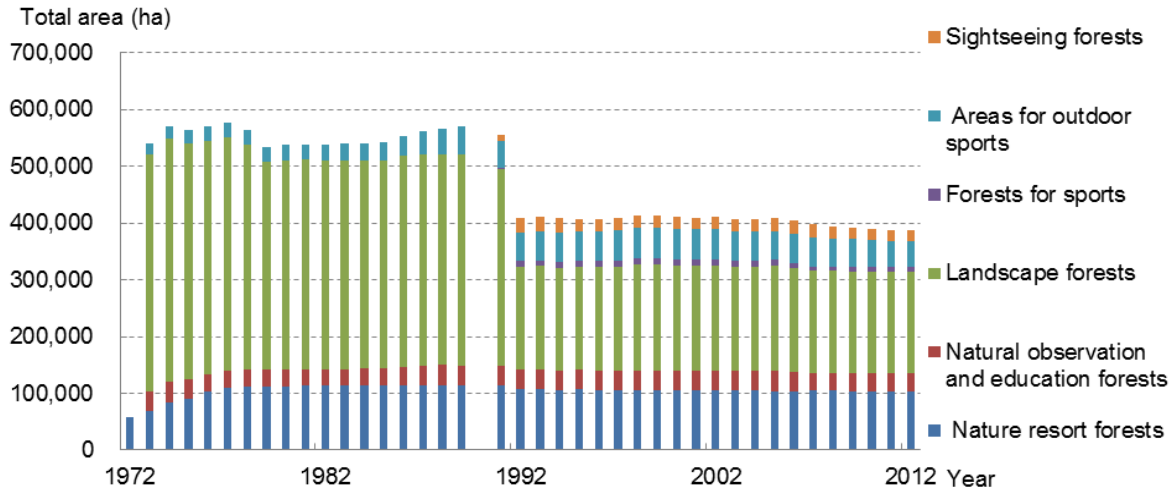


Figure 2.18. Changes in area of recreation forests (Note: Data for 1990 is missing).
Source: Forestry Agency (2013d, 2013e), Statistics Bureau (2013g)

2.3 Economic, social and environmental contributions of forests

2.3.1 Employment

The number of employees in the forestry sector dipped after peaking in the 1950s. It was about 69 thousand people in 2010 (Figure 2.19).

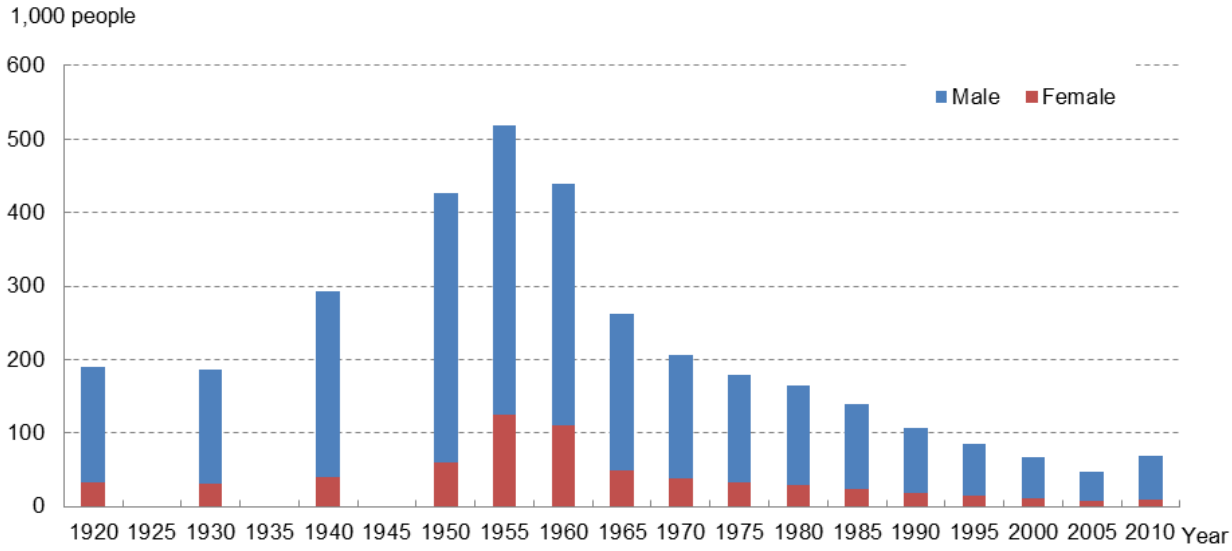


Figure 2.19. Changes in the number of employees 15 years of age and over.
Source: Statistics Bureau (2013h, 2013i, 2013j)

Notes:

1) 1920, 1930 Employees of all ages
2) 1940 Number of employees not including foreigners. However, employees from Korea, Taiwan, Karafuto and the South Sea Islands are included.
3) 1950 Employees over 13 years of age. Japanese living in Okinawa Prefecture and foreigners are excluded.
4) 1955 Regarding Okinawa prefecture, number of employees older than 13 years as a result of 5% extraction count is included.
5) 1955, 1960 Okinawa prefecture is excluded.
6) The category of this industry was changed in 2005.

The forestry sector was rapidly aging. Employee aging-rates and the rate of employees over 65 years of age have been higher in the forestry sector than in all other industrial sectors. The rate of employees over 65 years of age increased until 2005 and subsequently decreased in 2010 (Figure 2.20). This drop in the employee aging-rate after 2005 may be the result of the Green Employment Policy.

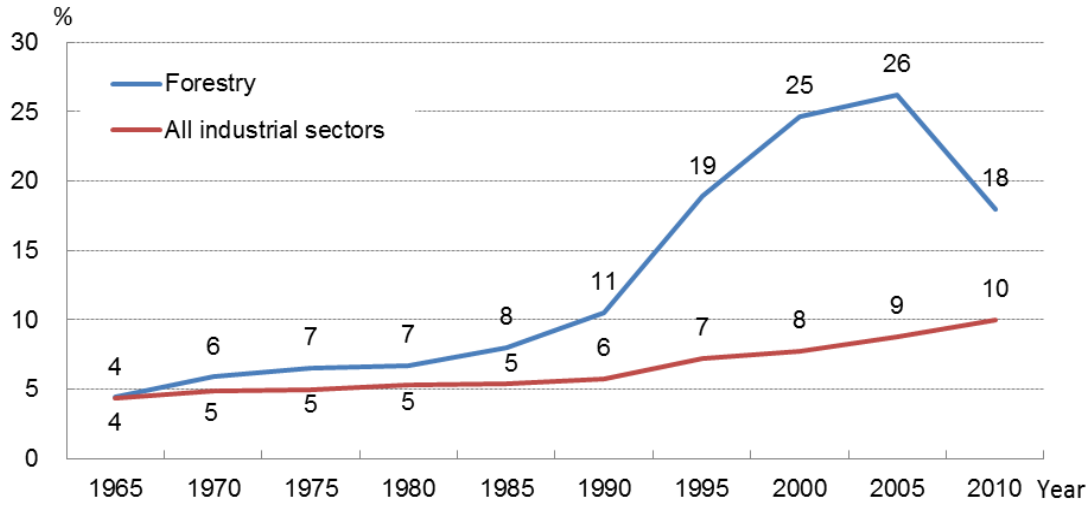


Figure 2.20. Employee aging rate in the forestry sector.
Source: Forestry Agency (2013a)

To measure the rapid increase in the average age of employees in forestry, the recruitment and development of human resources with a focus on young people is necessary. For this reason, the Forestry Agency launched the “Green Employment Policy” in 2003. The policy provides learning and skills acquisition support for young people with a willingness to work in the forestry sector. Before the introduction of this policy, approximately 2 000 people were newly employed in the forestry sector per year (Figure 2.21). However, after its introduction, this number increased to 3 400 people per year (Forestry Agency 2013a).

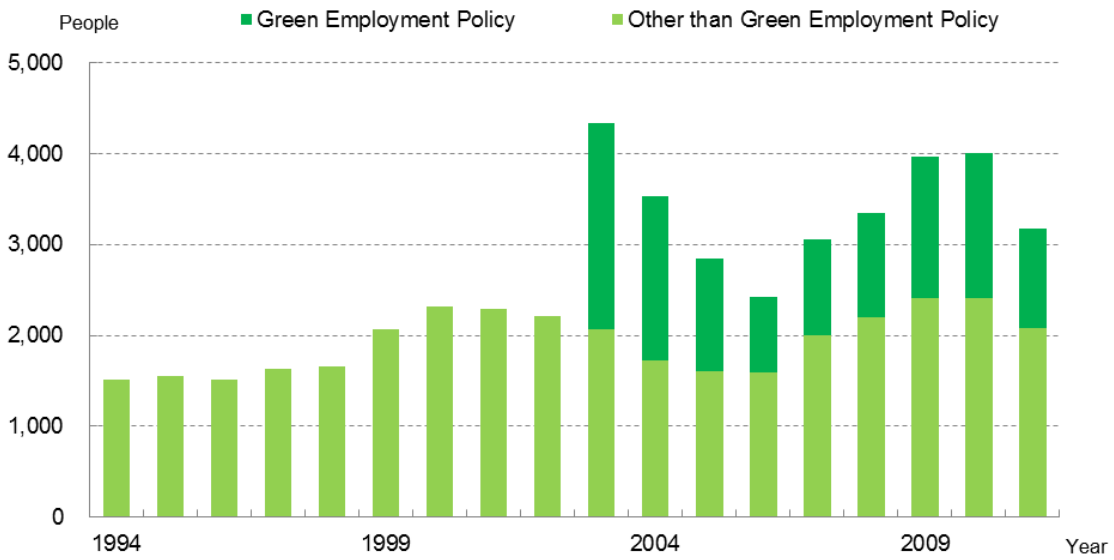


Figure 2.21. People newly employed in the forestry sector.
Source: Forestry Agency (2013a)

2.3.2 Timber extraction

Changes in the area of cutover forests for national and non-national forests are shown in Figure 2.22. This area decreased continuously. However, it has been rising since 2005.

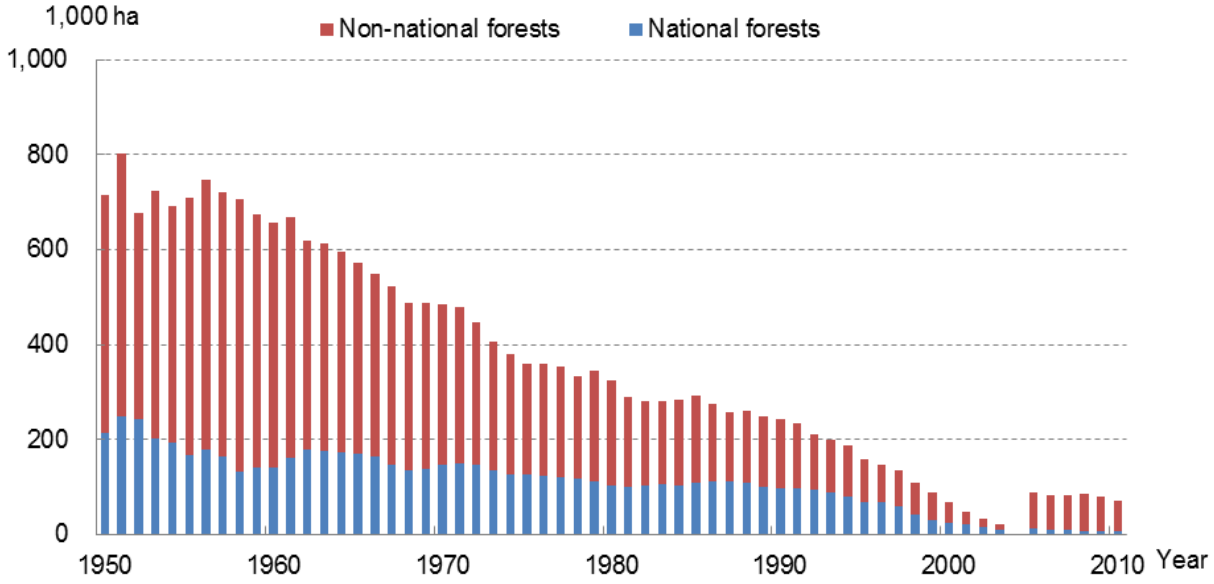


Figure 2.22. Cutover area of national and non-national forests.
Source: Statistics Bureau (2013k), Forestry Agency (2012b)

Notes:
1) Figures for both national forests and non-national forests represent areas of regeneration cutting.
2) Figures for non-national forests are estimated values.
3) Data for 2004 is missing.

Changes in domestic timber production by purpose are shown in Figure 2.23. This production decreased continuously. However, it has been rising since 2002.

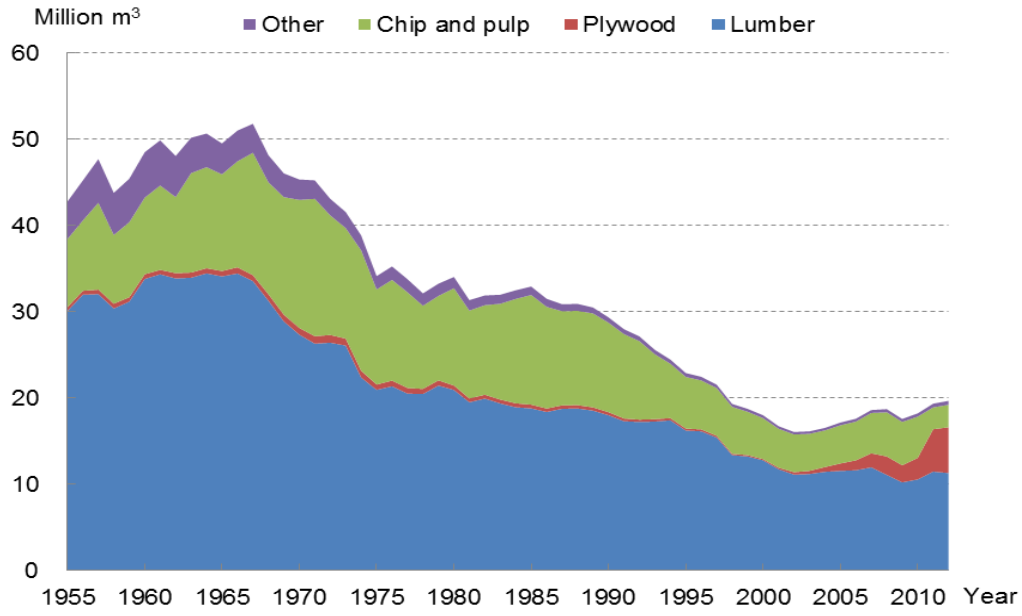


Figure 2.23. Domestic timber production by purpose.
Source: MAFF (1956–2011, 2012, 2013b)

2.3.3 Environmental benefits of forests

Forests have many economic and environmental functions, most of which are classified into contributing environmental benefits, as follows:

(1) Biodiversity conservation
(2) Environmental conservation
(3) Sediment disaster prevention/soil conservation
(4) Water conservation
(5) Comfortable environment formation
(6) Health and recreation
(7) Culture
(8) Material production

The Science Council of Japan (2001) summarized the monetary valuation of multiple functions of forests as shown in Table 2.5.

Table 2.5. Monetary valuation of multiple functions of forests.

Function	Monetary valuation (JPY)
Carbon dioxide absorption	1.2 trillion/year
Substitute for fossil fuels	0.2 trillion/year
Prevention of surface erosion	28.3 trillion/year
Prevention of shallow landslides	8.4 trillion/year
Flood mitigation	6.5 trillion/year
Water resource storage	8.7 trillion/year
Water clarification	14.6 trillion/year
Health and recreation	2.3 trillion/year

Source: The Science Council of Japan (2001)

2.3.4 Wood products market

- Timber supply

As mentioned in a previous section, planted forests in Japan are mature. It is time to shift from planting and tending to harvesting. The supply of domestic timber in Japan remained in a downward trend after peaking in 1967. However, it has been rising since 2002 (Figure 2.24).

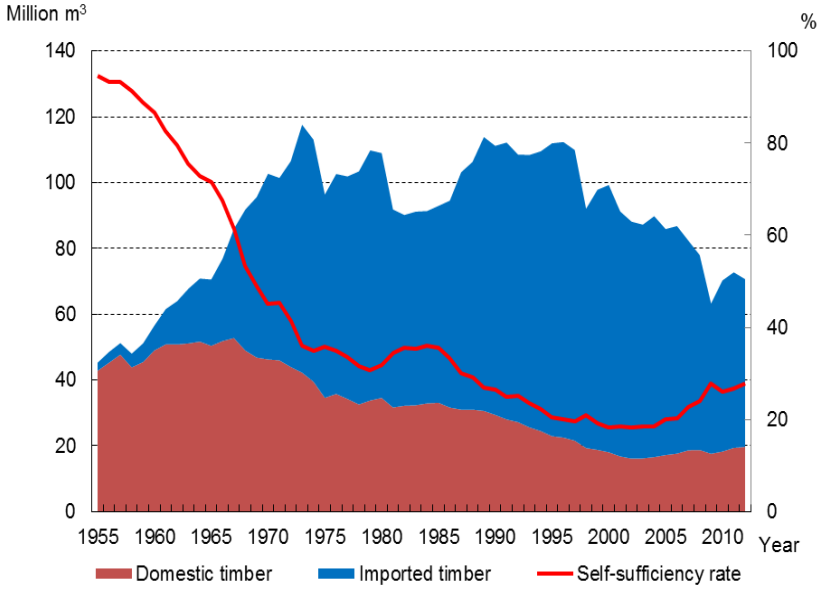


Figure 2.24. Changes in timber supply and self-sufficiency rate.
Source: MAFF (1956–2011, 2012, 2013b)

Timber imports decreased after 1996. This was the result of decreased demands for domestic timber and resource constraints in timber-exporting countries. Timber imports in 2009 dropped due to the global financial crisis and raised tariffs on roundwood from Russia. A total of 50.9 mil cu m of timber was imported in 2012, of which 5.6 mil cu m (11.1%) was roundwood, 10.4 mil cu m (20.4%) was lumber, 25.7 mil cu m (50.4%) was pulp and chip, 6.5 mil cu m (12.7%) was plywood, and 2.8 mil cu m (5.5%) was other. In recent years, timber has been imported as various products, such as pulp and chip, plywood and lumber, rather than as roundwood: 90% of timber was imported as various products (Figure 2.25). Though the timber self-sufficiency rate was lowest in 2002 (18.2%), it increased to 27.9% in 2012 with the above-mentioned conditions of the supply of imported and domestic timber.

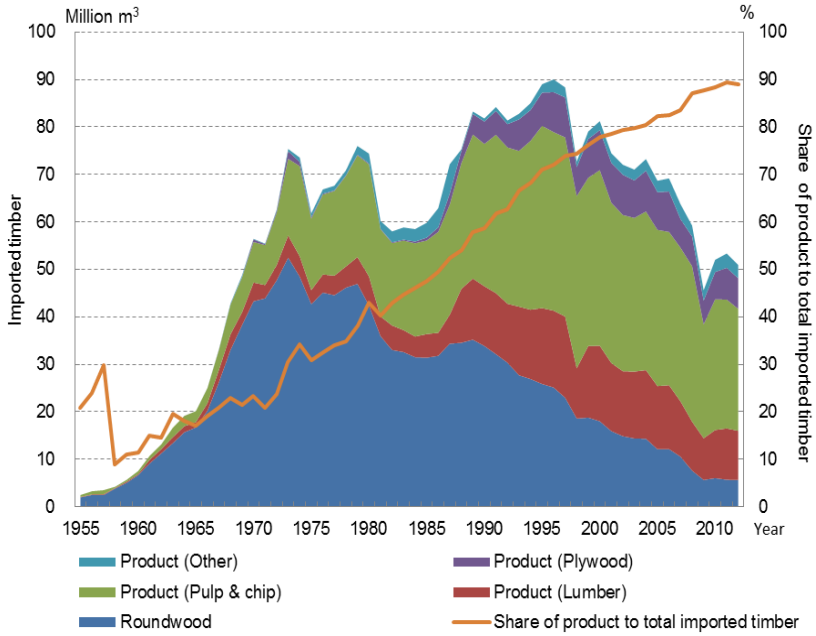


Figure 2.25. Changes in the amount of imported timber by product.
Source: MAFF (1956–2011, 2012, 2013b)

- Timber demand

The timber demand in Japan increased along with economic development during the postwar revival period and the period of high economic growth. In 1973 it reached its peak at 117.6 mil cu m. However, the first oil crisis in 1973 and the second oil crisis in 1979 affected the market, and demand repeatedly rose and fell. After 1987, demand remained generally stable at around 100 mil cu m. However, the collapse of the bubble economy in 1991 and the later economic recession caused a decrease in timber demand. Particularly, the rapid economic aggravation in 2008 caused a sharp decline in timber demand (Figure 2.26).

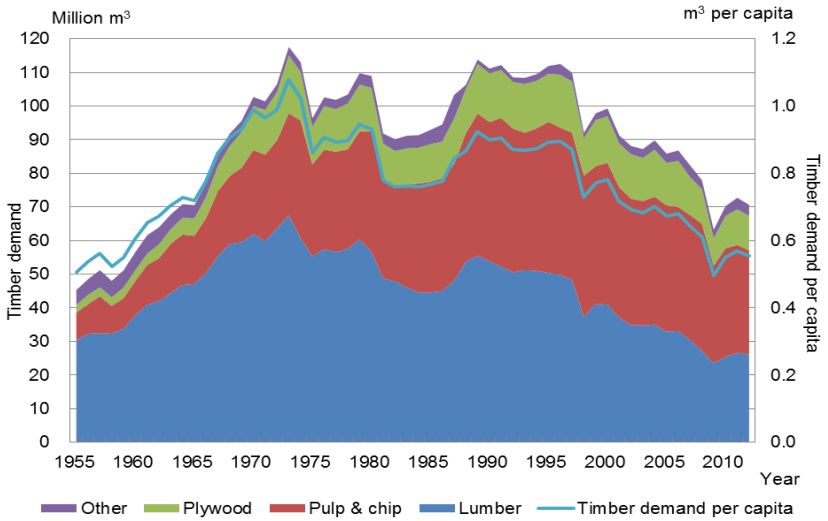


Figure 2.26. Timber demand by use.
Source: MAFF (1956–2011, 2012, 2013b)

- Timber demand for the lumber industry

Changes in the supply of timber for the lumber industry are shown in Figure 2.27. The supply of timber for the lumber industry increased and reached its highest at 63.7 mil cu m in 1973. After 1973, the supply volume decreased until 1975 when it began to increase again. However, since 1979 it has continued to decrease. This decrease in the demand for timber for the lumber industry is a result of the decreased number of new housing in Japan: 80% of lumber products are used for construction, and timber demand for the lumber industry has a strong relationship with the number of new wooden houses built (Forestry Agency, 2013a).

The total supply of timber for the lumber industry was approximately 16.2 mil cu m in 2012. Of this, domestic timber made up 11.3 cu m (69.7%), South-sea timber made up 0.09 mil cu m (0.6%), American timber made up 3.5 mil cu m (21.6%), North-sea timber made up 0.4 mil cu m (2.3%), New Zealand timber made up 0.8 mil cu m (4.8%), and other sources made up 0.2 mil cu m (1.1%). The ratio of domestic timber to total supply increased from the 1990s and reached 69.7% in 2012.

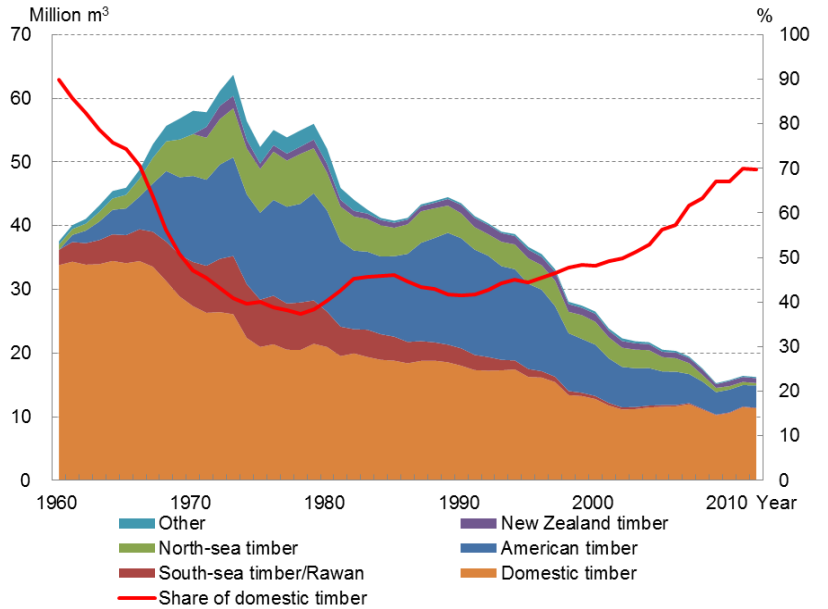


Figure 2.27. Demand for timber for the lumber industry by supply source.
Source: MAFF (1961–2011, 2012, 2013b)

- Timber demand for the plywood industry

Changes in the timber supply for the plywood industry are shown in Figure 2.28. The supply of timber for the plywood industry increased until 1973, reaching its highest at 15.6 mil cu m in 1973. From 1974 to 1989, the volume repeatedly rose and fell. Since 1990, it has continued to decrease, and the decline in 2008 was especially sharp.

By the end of the 1980s, most of timber for plywood was hardwood imported from Southeast Asia. This situation changed when log exports were banned in Indonesia in 1985 and Saba of Malaysia in 1993. Imports of timber products increased and domestic plywood makers changed their materials from hardwood produced in Southeast Asia to softwood (North-sea timber) mainly produced in Russia. Recently, the supply of domestic timber used for plywood production has been rapidly increasing since 2000s followed by new plywood products made by Japanese cedar and Japanese larch, and the share of domestic timber reached 67.8% in 2012.

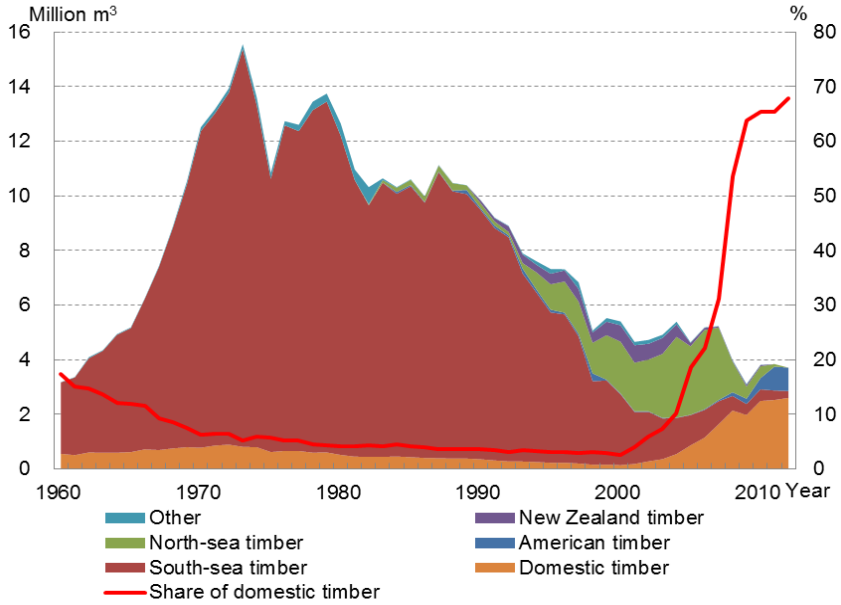


Figure 2.28. Demand for timber for the plywood production by supply source.
Source: MAFF (1961–2011, 2012, 2013b)

The total supply of timber for the plywood industry was approximately 3.8 mil cu m in 2012. Of this, a share of domestic timber supply reaches around two third, South-sea timber made up 0.3 mil cu m (6.5%) and American timber made 0.9 mil cu m (22.3%).

- Timber demand for the chip industry

The share of domestic timber in the material input for domestic chip mills was 99.7% in 2012. Changes in the supply of timber for the chip industry are shown in Figure 2.29. The timber supply for the chip industry rapidly increased until 1971, and reached its highest at 11.2 mil cu m in 1985. It decreased drastically between 1985 and 1994, and has been decreasing at a slow rate since then. The foreign investment of Japanese paper companies had a significant impact on the decrease. From the latter half of 1980s, Japanese paper companies started investing into some foreign countries such as Australia, Chili, New Zealand and South Africa in order to establish plantation forest and procure wood chip from the forest.

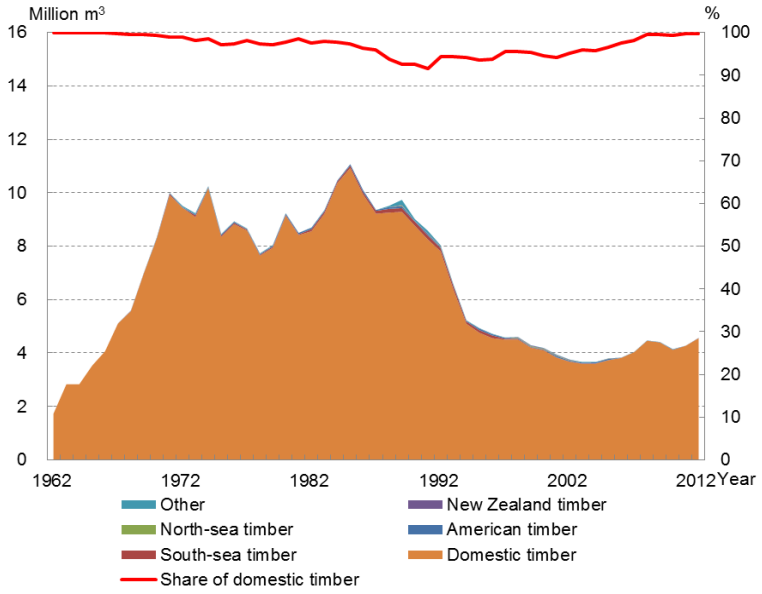


Figure 2.29. Demand for timber for chip production by supply source.
Source: MAFF (1961–2011, 2012, 2013b)

The total supply of timber for the chip industry was around 4.57 mil cu m in 2012. Of this, domestic timber made up 4.56 mil cu m (99.7%), South-sea timber made up 0.006 mil cu m (0.1%), and American timber made up 0.009 mil cu m (0.2%). The domestic share of the overall timber supply has remained stable.

2.3.5 Wood manufacturing industry

- Lumber industry

The current number of sawmills in Japan is 5,927. Of these, 82.4% of sawmills are small- to middle-scale outputs of less than 150 kW. They produce lumber less than 10 thousand cu m annually. The number of sawmills overall has continuously decreased since the 1970s, and, in particular, the number of small- and middle-scale sawmills has decreased drastically (Figure 2.30).

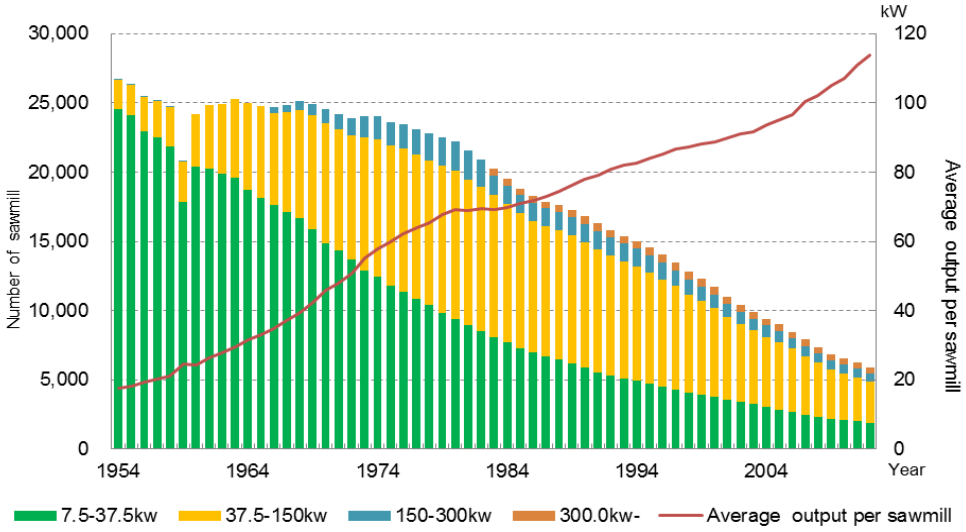


Figure 2.30. Number of sawmills by output and average output per sawmill.
Source: MAFF(1955–2011, 2012, 2013b)

Changes in shipping volume for lumber products are shown in Figure 2.31. The shipping volume of lumber products increased until 1973, and reached its highest at 45 mil cu m in 1973. Since 1973, it has continued to decrease, reaching approximately 9.3 mil cu m in 2012. Of the total shipping volume,

lumber for building material made up 7.5 mil cu m (80.5%), lumber for construction made up 0.4 mil cu m (4.6%), wood for packing made up 1.1 cu m (11.9%), lumber for furniture made up 0.06 cu m (0.6%), and lumber for other purposes made up 0.2 cu m (2.4%).

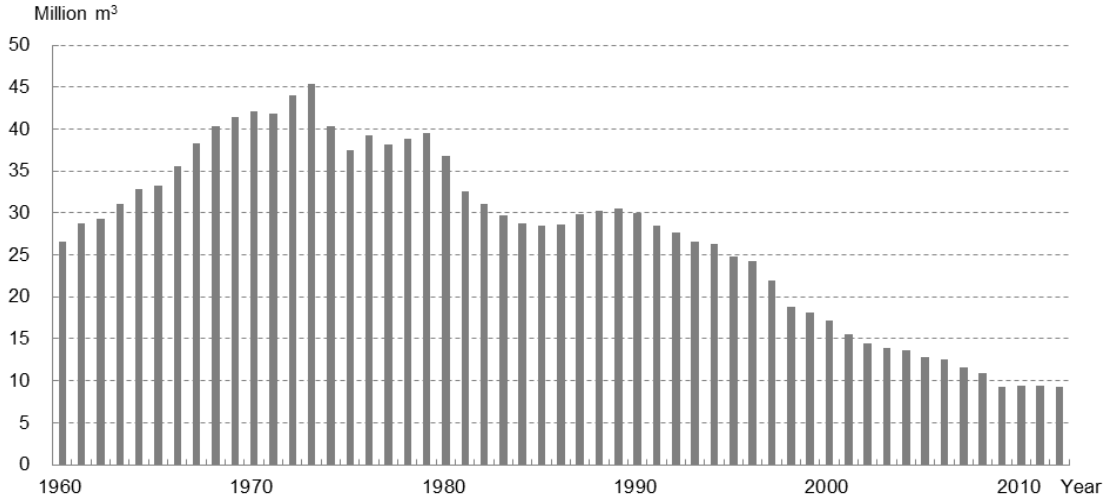


Figure 2.31. Changes in shipping volume of lumber products.
Source: MAFF (1961–2011, 2012, 2013b)

- Chip industry

The number of chip mills increased until 1971, but has since decreased continuously: there were 1,536 mills in 2012 (Figure 2.32). Of these, 389 mills (25.3%) specialized in producing chips, and the remaining 1,147 mills (74.7%) produced both chips and plywood (MAFF, 2013b).

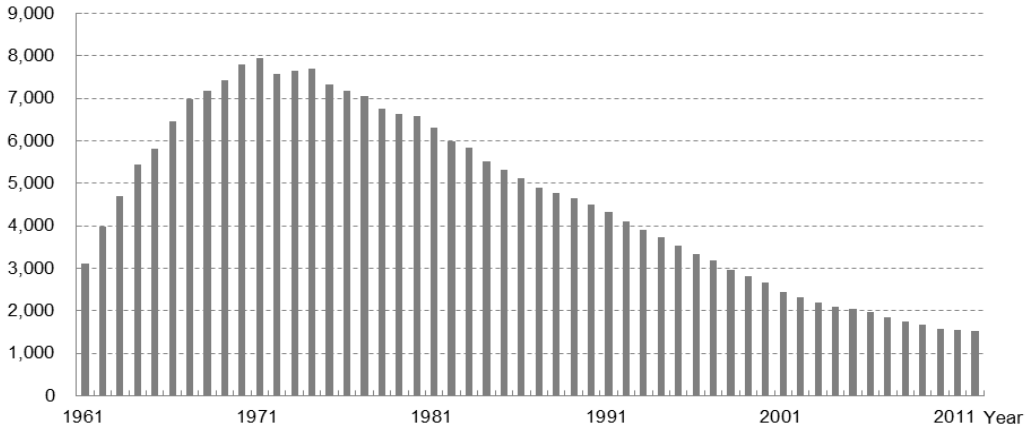


Figure 2.32. Changes in the number of chip mills.
Source: MAFF (1962–2011, 2012, 2013b)

The total volume of chipped wood production increased until the 1970s. From 1974 to 1991, the volume repeatedly rose and fell. Since 1991, it has decreased, and in 2003 declined very sharply. It has been increasing since 2009 (Figure 2.33).

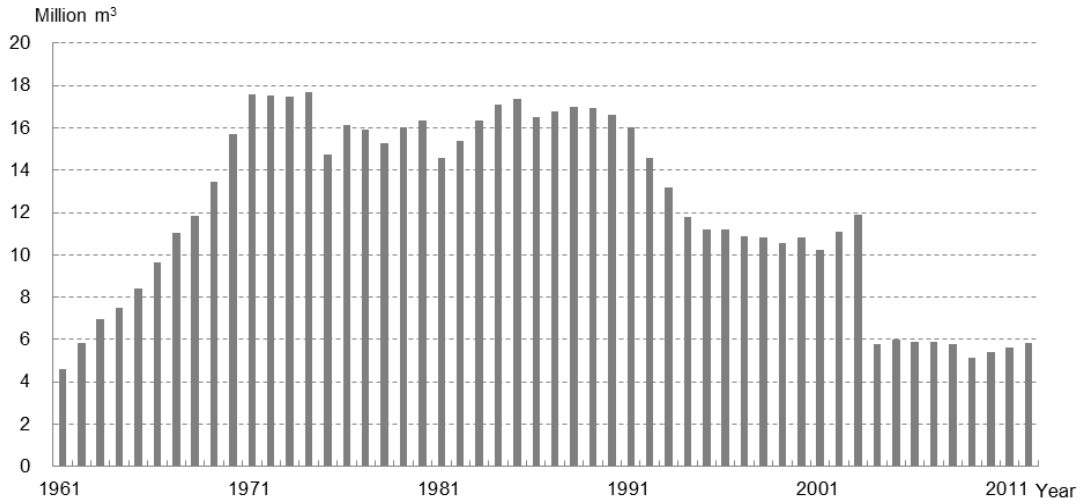


Figure 2.33. Changes in chip production.
Source: MAFF (1962–2011, 2012, 2013b)

2.3.6 Wood products trade and welfare

Though timber in Japan had been exported for shipbuilding and furniture, timber export values have declined since the 1970s because of resource constraints and elevated labor costs. Timber export values had begun to increase in 2001, but have been decreasing since 2008 because of the global financial crisis (Figure 2.34). China is the largest importer from Japan, followed by the Philippines, the USA and Korea. Besides timber, wood pulp is exported mainly to China. The export value of wood pulp in 2011 was 20.6 billion yen (Forestry Agency, 2013a).

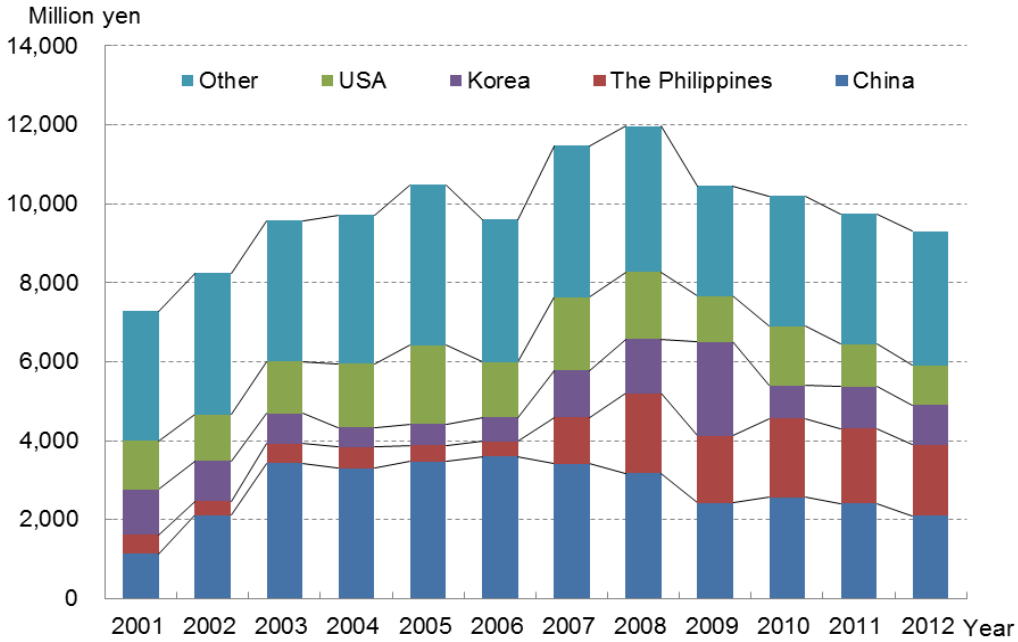


Figure 2.34. Timber export value by export destination.
Source: Ministry of Finance (2002–2013)

CHAPTER 3 MAJOR FORCES DRIVING FOREST TRANSITION

3.1 Drivers of forest cover changes

3.1.1 Political aspects

Japanese modernization progressed with the establishment of laws during the Edo era. As we described above, we can identify the establishment of the Forest Law in 1897 and the outbreak of wars as major forces driving pre-World War II forest transitions. Under the Forest Law, the Protected Forest System and the control of crimes against forest resources encouraged the prevention of forest decline and degradation. It can be said that the demand for timber, and thus timber production, increased during periods of war, which had a negative impact on forest cover change.

After World War II, Land Development Plans under the Comprehensive National Land Development Law were formulated and revised several times by the Central Government. The Forest and Forestry Basic Plan was also formulated after the Land Development Plan and it has made a significant contribution to forest management, as stated above. The promotion of 'expansive afforestation' from the 1950s to 1970s is a good example of this. High rates of urbanization and industrialization have caused the transformation of rural areas and changed rural-urban relations since the latter half of the 1950s. In particular, depopulation of rural areas since the latter half of the 1950s has lead to a reduced number of forest workers and demand for timber.

3.1.2 Economic aspects

Before World War II, Japan's economy developed and its population increased as mentioned above, whereas globalization in terms of trade was limited. The expansion of agricultural land resulting from population increase and economic development resulted in forest cover decline. Urbanization and industrialization demanded large quantities of timber and, thus, increased timber production. These factors had negative impacts on changes in forest cover.

The 1950s and 1960s were a period of rapid economic growth, and the popular demand for timber increased rapidly until the first oil crisis followed by increase in housing construction. In response, the Japanese Government promoted the liberalization of timber imports from foreign countries during the latter half of the 1950s and the first half of the 1960s. It can be said that this measure had a significant impact on forest management and changes in forest cover after World War II. The shift in rural energy sources from firewood to fossil fuels expanded dramatically after World War II in Japan, especially between the mid-1950s and the 1960s. This has also been an important factor in reducing the demand for wood, and has had a positive influence on changes in forest cover.

3.1.3 Social aspects

- Changes in forest-service needs according to opinion polls

The cabinet office has been conducting opinion polls on forests and lifestyle since 1980. In Figure 3.1 changes the public's needs for forest services in 2003, 2007 and 2011 are shown. Disaster prevention has maintained a high percentage and became the top priority in 2003 and 2011. Prevention of global warming came in second in 2003 and 2011. It was the top priority once, in 2007, but dropped back into second place in 2011. The third, fourth and fifth places were water conservation, mitigation of air pollution, and recreation and relaxation, respectively, and their order did not change. Wildlife habitat, education, production of wood and production of NTFPs placed sixth, seventh, eighth and ninth, respectively, in 2003 and 2007. However, production of wood advanced in rank in 2011 and placed sixth.

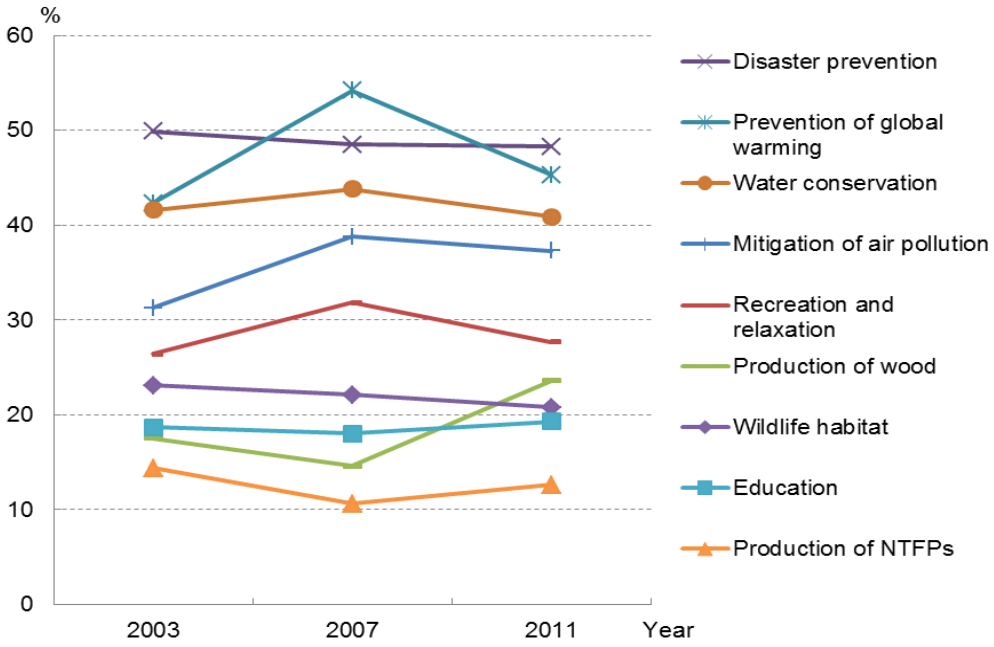


Figure 3.1. Changes the public's needs for forest services.
Source: Cabinet Office (2013)

- Public opinion on forest maintenance

Figure 3.2 shows changes in the public's opinions regarding forest maintenance between 1996 and 2011. In 1996, approximately 80% of citizens thought that forests should be maintained even if their economic efficiency was low. However, the percentage supporting that opinion gradually decreased. Conversely, the percentage of people with the opinion that "forest maintenance should be conducted based on economic efficiency as a top priority" increased, doubling in 15 years.

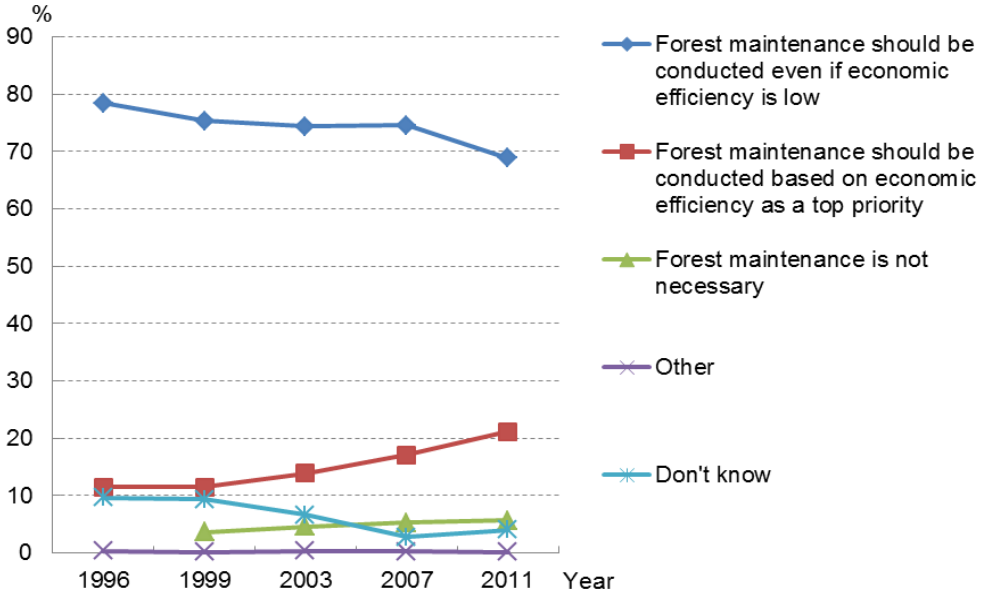


Figure 3.2. Public needs for forest maintenance.
Source: Cabinet Office (2013)

The above-mentioned tendency indicates that citizens understood the importance of forest maintenance, but gave more weight to the economic efficiency of forests in comparison with the past.

- Public willingness to participate in forest activities as volunteers

Figure 3.3 shows changes in the public's willingness to participate in forest activities as volunteers between 2003 and 2011. The total percentage of "I want to participate" and "I somewhat want to participate" was 40.7% and the total percentage of "I somewhat do not want to participate" and "I don't want to participate" was 53.1% in 2003. However, these percentages were 54.8% and 43.4%, respectively, in 2007 and 50.7% and 46.8%, respectively, in 2011. This tendency indicates that the public's willingness to participate in forest activities as volunteers has increased gradually.

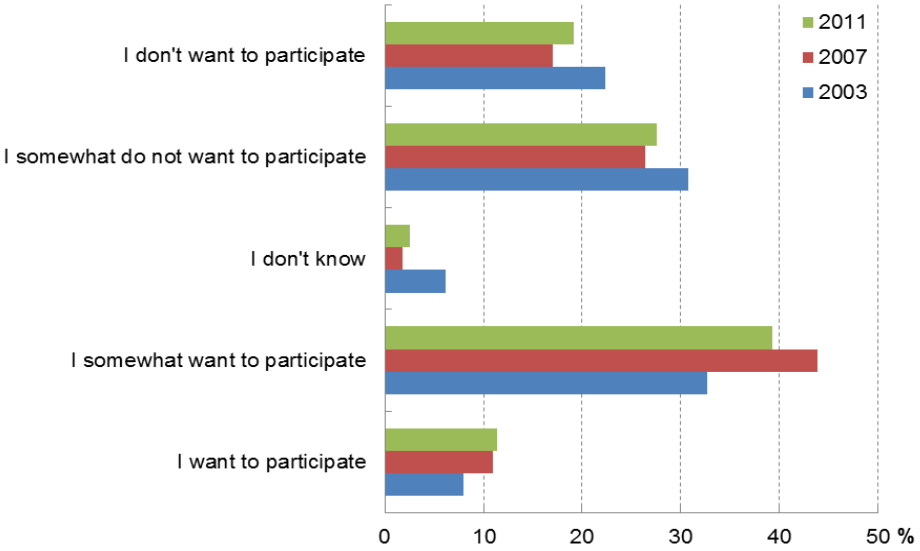


Figure 3.3. Changes in the public's willingness to participate in forest activities as volunteers.
Source: Cabinet Office (2013)

Figure 3.4 shows the public's preferences for various types of participation in volunteer forest activities between 2003 and 2011. In every poll year, approximately 50% of citizens preferred to participate in volunteer forest activities conducted by their workplace or a local public entity. The second preference was participation in activities conducted by a voluntary body. The percentage of citizens who preferred to "act on one's own accord" remained at approximately 10%, indicating that it is difficult for people to act independently and that opportunity to participate in volunteer forest activities should be provided by the workplace, a local public entity or a voluntary body.

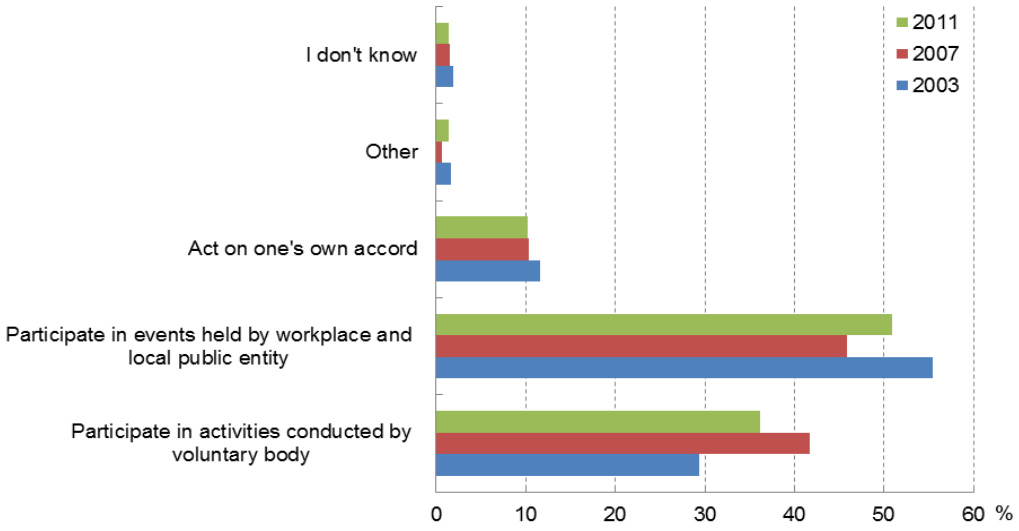


Figure 3.4. Types of participation in volunteer forest activities.
Source: Cabinet Office (2013)

- Public opinion on forests and forestry policy

The public's opinions in regards to forests and forestry policy between 2003 and 2011 are shown in Figure 3.5. Citizens gave top priority to "forest maintenance to prevent disaster." Second and third places were occupied by "forest maintenance to conserve water, land and nature, and to prevent global warming" and "nature conservation."

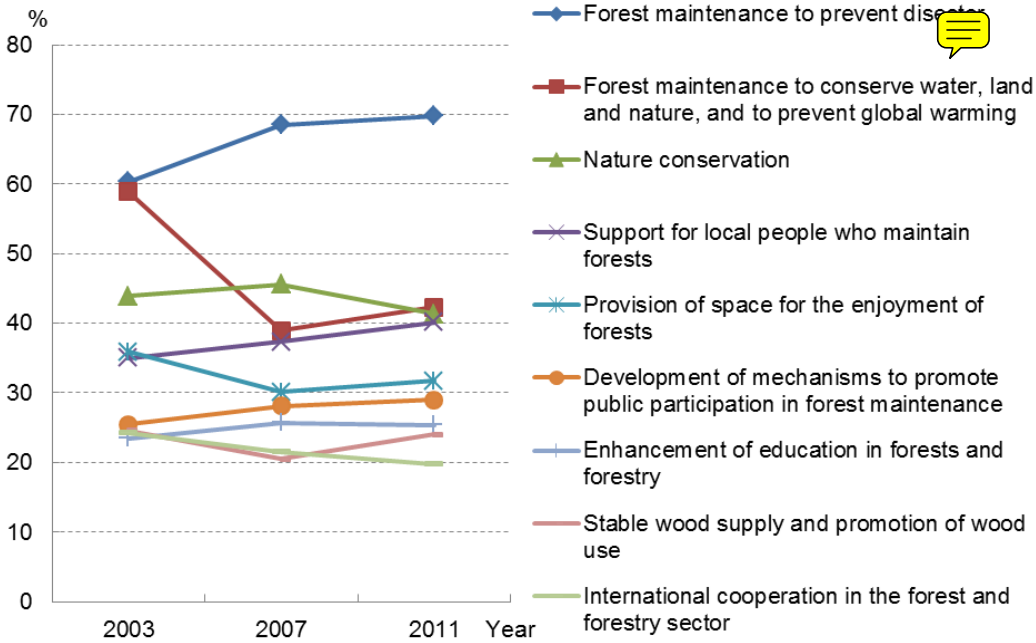


Figure 3.5. Public opinion on forests and forestry policy.
Source: Cabinet Office (2013)

3.1.4 Environmental aspects

- Maintenance of forests to prevent global warming

Citizens' opinions from 2003 to 2011 on who should be responsible for maintaining forests to prevent global warming are shown in Figure 3.6. Most people responded that national and local public entities should take a role in maintaining forests to prevent global warming.

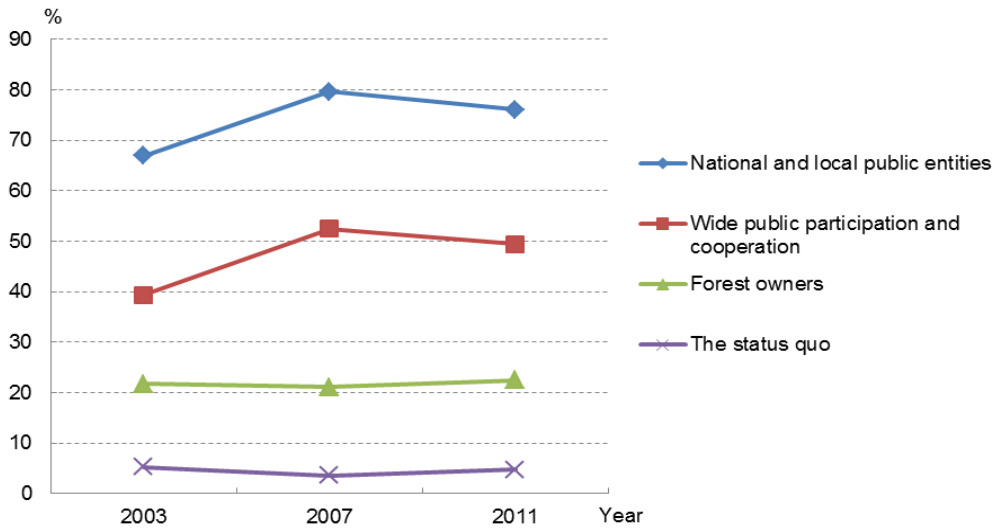


Figure 3.6. Public opinion on the main party responsible for maintaining forests to prevent global warming.
Source: Cabinet Office (2013)

- Burden of expense for forest maintenance to prevent global warming

From 2003 to 2011, the percentage of citizens who believed that the burden of expense for forest maintenance should be assumed by the "entire nation" and "citizens and companies who emit Greenhouse Gases (GHG)" was high. The percentage of citizens who believed that the expense burden should be assumed by fundraising and volunteer activities was low.

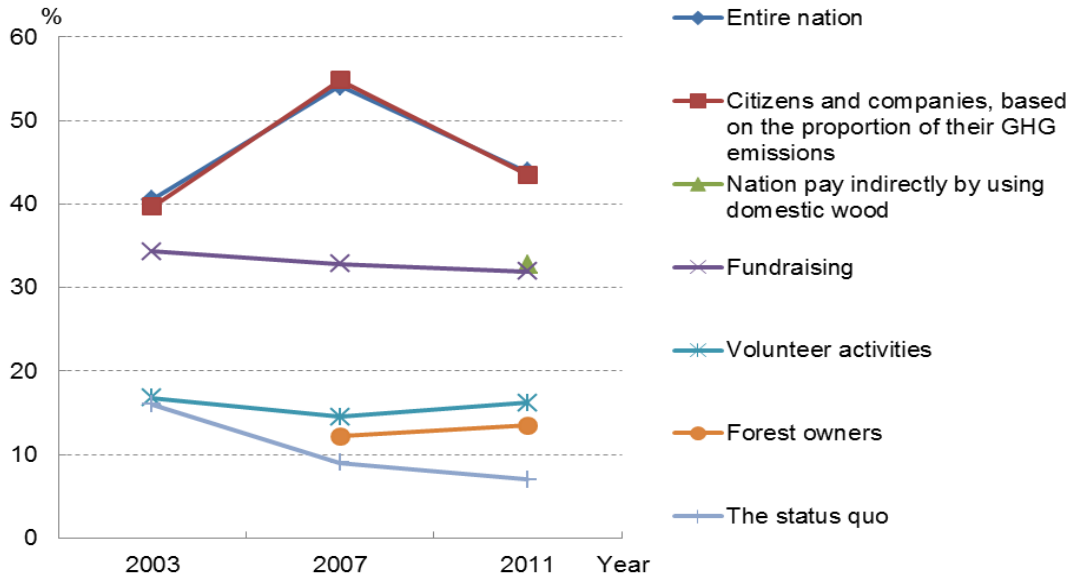


Figure 3.7. Public opinion on the burden of expense for forest maintenance.
Source: Cabinet Office (2013)

3.2 Key legal and policy milestones

3.2.1 Policies related to forests and forestry

Policies related to forests and forestry are shown in Table 3.1. From the next section, the contents of key policies are described.

Table 3.1. Policies related to forests and forestry.

	Forest administration	General/international trend
1869		• Return of the *han* (domain) to the Meiji Emperor
1873		• Land tax reform
1876		• Enactment of the Temporary Ordinance on Survey of Government Forests
1881	• Establishment of Ministry of Agriculture and Commerce (Establishment of national forests)	
1886	• Hokkaido national forest separated from other national forests, coming under the jurisdiction of the Ministry of Home Affairs	
1889	• Imperial forest separated from other national forests, coming under the Imperial Property Bureau, the Ministry of the Imperial Household	
1896	• Enactment of the River Act	
1897	• Enactment of the Forest Law and the Sand Control Law	
1899	• Enactment of the National Forest Land Law; National Forest Business Management began	
1904		• Outbreak of the Russo-Japanese War
1907	• Amendment of the Forest Law	

1914		• Outbreak of World War I
1920	• Enactment of the Government Reforestation on Public Forest Land Law	
1937	• Enactment of the Forest Fire National Insurance Law	
1939	• Amendment of the Forest Law • Enactment of the Forestry Seeds and Seedlings Law	• Outbreak of World War II
1941	• Enactment of the Timber Control Law	
1945		• End of World War II
1947	• Unification of forest administration (Enactment of the National Forest Management Special Account Law)	
1950	• Enactment of the Afforestation Temporary Measures Law • Enactment of the Forest Pests and Disease Control Law	
1951	• Amendment of the Forest Law (Introduction of the forest planning system and the cutting permission system)	
1954	• Enactment of the Temporary Measures Law for the Development of Protected Forests	
1956	• Enactment of the Japan Forest Development Corporation Law (Establishment of Japan Forest Development Corporation)	
1957	• Establishment of the Productivity Increase Plan for National Forests • Amendment of the Forest Law (Change in cutting permission system for broad-leaved trees in ordinary forests, etc.)	
1958	• Enactment of the Law of Shared Forests (Promotion of reforestation by profit-sharing)	
1959		• Typhoon Vera
1960	• Enactment of the Soil Conservation and Flood Control Emergency Measures Law	• Establishment of the Income-Doubling Plan
1961	• Establishment of the Timber Production Increase Plan for National Forests • Amendment of the Japan Forest Development Corporation Law	
1962	• Amendment of the Forest Law	
1963	• Enactment of the Promotion of Mergers of Forestry Cooperatives Law	
1964	• Enactment of the Forestry Basic Law	
1965	• Report of the Central Forest Council	• Enactment of the Mountain Villages Development Law
1966	• Enactment of the Law on Advancement of Modernization of Rights in Relation to Forests Subject to Rights of Common • Establishment of the Basic Plan for Forest Resources	
1968	• Amendment of the Forest Law	
1971	• Enactment of the Law on Utilization of National Forests	
1972	• Report of the Central Forest Council	• United Nations Conference on the Human Environment
1973	• Revision of the Basic Plan for Forest Resources	• Shift to the floating rate system • First oil crisis
1974	• Amendment of the Forest Law	
1976	• Enactment of the Forestry Improvement Loan Furtherance Law	
1977	• Enactment of the Special Measures Law for Pine Sawyers Prevention	
1978	• Enactment of the Forestry Cooperative Law • Enactment of the National Forest Service Improvement Special Measures Law • Establishment of the Improvement Plan for National	

	Forest Service	
1979	• Enactment of the Law on Temporary Measures concerning Funding for Promotion of Forestry, etc.	• Second oil crisis
1980	• Revision of the Basic Plan for Forest Resources	
1983	• Amendment of the Forest Law • Amendment of the Law of Shared Forests	
1984	• Amendment of the Temporary Measures Law for the Development of Protected Forests • Amendment of the National Forest Land Law • Amendment of the National Forest Service Improvement Special Measures Law • Establishment of the Improvement Plan for National Forest Service in 1984	
1985		• Plaza Accord
1986		• Establishment of International Tropical Timber Organization
1987	• Amendment of the National Forest Service Improvement Special Measures Law • Establishment of the Improvement Plan for National Forest Service in 1987 • Revision of the Basic Plan for Forest Resources	
1990	• Report of Forest Administration Council	
1991	• Amendment of the Forest Law • Amendment of the National Forest Service Improvement Special Measures Law • Establishment of the Improvement Plan for National Forest Service in 1991	
1992		• United Nations Conference on Environment and Development
1995	• Enactment of the Law on Advancement of Forest Maintenance Backed by Green Fund	• Great Hanshin Awaji Earthquake
1996	• Amendment of the Law on Temporary Measures concerning the Fund for Improvement of Forestry Management Framework • Enactment of the Law concerning the Security of the Forestry Workforce • Enactment of the Law on Special Measures concerning the Assurance of Stable Supply of Timber • Revision of the Basic Plan for Forest Resources	• Administrative reform program
1997	• Report of Forest Administration Council • Enactment of the Law for Partial Amendment to the Promotion of Merger of Forestry Cooperatives Law • Revision of the Forest Pests and Disease Control Law	• Third Session of the Conference of the Parties to the United Nations Framework Convention on Climate Change
1998	• Enactment of the Law on Special Measures concerning Reform of National Forest Business Management • Enactment of the Law on Development concerning Reform of National Forest Business Management • Amendment of the Forest Law	• Enactment of the Law Concerning the Promotion of Measures to Cope with Global Warming • Establishment of the Outline for Promotion Effects to Prevent Global Warming • Amendment of the Building Standards Law
1999	• Establishment of the Japan Green Resources Corporation • Report of the Central Forest Council	• Enactment of the Housing Quality Assurance Law
2000	• Summary of Forest Administration Council with a new dimension of forest administration • Publication of the Outline of Forest Administration Reform and the Program for Forest Administration Reform	• "Hours for comprehensive studies" embedded in the education curriculum • Enactment of the Law on Promotion of Procurement of Eco-Friendly Goods and Services by the State and Other Entities
2001	• Transformation of the Forestry and Forest Products Research Institute and the Forest Tree Breeding Center into independent administrative institutions • Amendment of the Forest and Forestry Basic Law • Amendment of the Forest Law	Seventh Session of the Conference of the Parties to the United Nations Framework Convention on Climate Change

	• Amendment of the Law on Temporary Measures concerning the Fund for Improvement of Forestry Management Framework • Introduction of the Basic Plan for Forest and Forestry	
2002	• Establishment of the Ten-year Forest Sink Measures to Prevent Global Warming	• Revision of the Outline for Promotion Effects to Prevent Global Warming • Conclusion of the Kyoto Protocol • World Summit on Sustainable Development • Enactment of the Law on the Promotion of Nature Restoration
2003	• Amendment of the Forestry Improvement Loan Furtherance Law • Establishment of the Japan Green Resources Agency (Independent administrative institution) • Amendment of the Forest Law • Revision of the Basic Plan for National Forest Management	• Third World Water Forum • Enactment of the Law on Enhancing Motivation on Environmental Conservation and Promotion of Environmental Education
2004	• Amendment of the Forest Law • Organizational restructuring of the National Forest Service	
2005	• Amendment of the Forestry Cooperative Law • Revision of the Ten-year Forest Sink Measures to Prevent Global Warming	• Enforcement of the Kyoto Protocol • Establishment of the Kyoto Protocol Target Achievement Plan
2006	• Establishment of the Basic Plan for Forest and Forestry	• Enactment of the Law on Promotion of Administrative Reform for the Realization of a Small and Efficient Government
2007	• National campaign to promote the establishment of beautiful forests • Unification of the Forestry and Forest Products Research Institute and the Forest Tree Breeding Center	• Amendment of the Building Standards Law
2008	• Enactment of the Law on Special Measures concerning Advancement of Implementation of Forest Thinning, etc.	
2009	• Publication of the Forest and Forestry Revitalization Plan	
2010	• Enactment of the Law for Promoting Timber Use in Public Buildings, etc.	
2011	• Amendment of the Forest Law	• Great East Japan Earthquake
2012	• Amendment of acts such as the Law Concerning Utilization of National Forest Land	

Source: Forestry Agency (2013f)

3.2.2 Forest Law 1897: Forest Protection System

The Japanese government recognized forest conservation and afforestation as important actions against natural disasters. It promoted these actions by establishing laws such as the Forest Law in 1897; this law was accompanied by the Protected Forest System for promoting the public functions of forests such as headwater conservation, soil run-off prevention, landslide prevention and so on, and the control of crimes targeting forest resources. The area of Protected Forests remained stable at around 2 mil ha in the first half of the 20th century and has increased significantly since the 1950s, as shown in Figure 3.8.

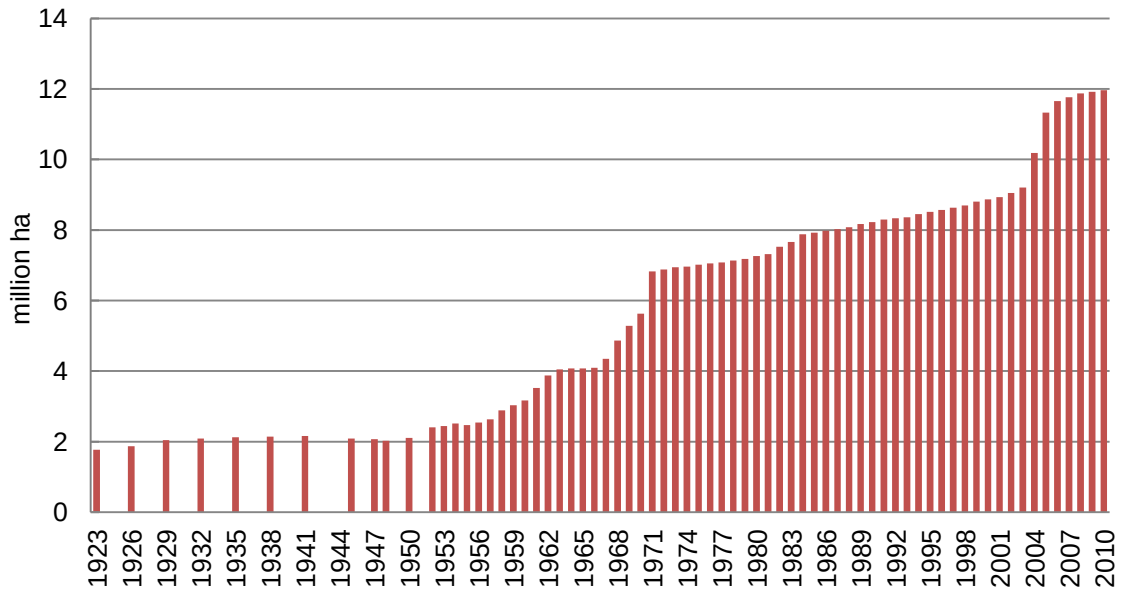


Figure 3.8. Area of protected forests.
Source: Forestry Agency

3.2.3 Forest Law 1951: Forest Planning System

Japan's forest management scheme was changed due to the revised Forest Law in 1951. The Forestry Planning System and Forest Owners' Cooperatives System introduced under the revised Forest Law in 1951 had significant influence on the promotion of forest management and the expansion of forested areas. As explained in section 2.2.3, the Forest Owners' Cooperative has played an important role in forestry practices since then.

The expansive afforestation measure, which aimed to replace broad-leaved forests with expanding coniferous tree plantations, was implemented by the Forestry Agency mainly from the 1950s to the 1970s. This measure deserves special mention in terms of forest expansion: annually, 40 to 90 thousand ha were subjected to the planting of coniferous trees for future use as industrial wood. The Forestry Agency encouraged Japanese cedar, Japanese Cypress, Japanese Larch, Sakhalin Fir and Japanese Red Pine for new planting, even introducing subsidies for this purpose, because of their fast-growing characteristics and straightness. However, depopulation of rural areas has been occurring since the latter half of the 1950s, and the overall aging of the population has been apparent since the 1980s. In rural areas, these factors have had a negative influence on forest management.

3.2.4 Expansive afforestation policy

The area of final felling exceeded the area of forestation in the 1930s and 1940s. In the 1940s and 1950s, timber demand increased with rebuilding efforts after the war. However, due to exploitation and natural disasters during the war, the timber supply could not fulfill demand and timber prices increased. Since the end of the 1950s, areas of final felling and forestation have decreased markedly (Figure 3.9).

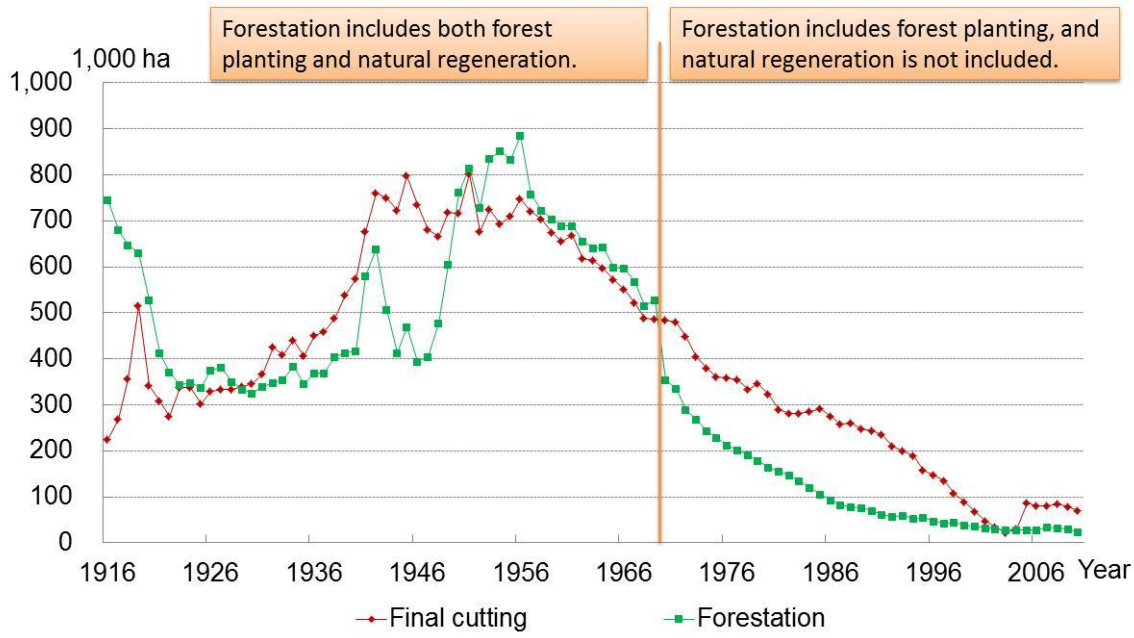


Figure 3.9. Relationship between final cutting and forestation in Japan.
Source: Forestry Agency

It was under these circumstances that the government introduced the "Expansive Afforestation Policy." The purpose of expansive afforestation was to replant conifer trees after broad-leaved trees had been felled. The shift from broad-leaved tree forests to conifer forests progressed rapidly. Moreover, the shift in energy resources also affected this movement. Previously, household fuel was firewood, but around 1950–1960, it changed to electricity, gas and petroleum. Therefore people did not need forests consisting of broad-leaved trees, and, thus, broad-leaved forests were converted into conifer forests, which had a high economic value.

Although during World War II forest planting decreased temporary, forest planting activities, especially the expansive afforestation policy, played a significant role in Japan's forests from the 1950s to the first half of the 1980s (Figure 3.10).

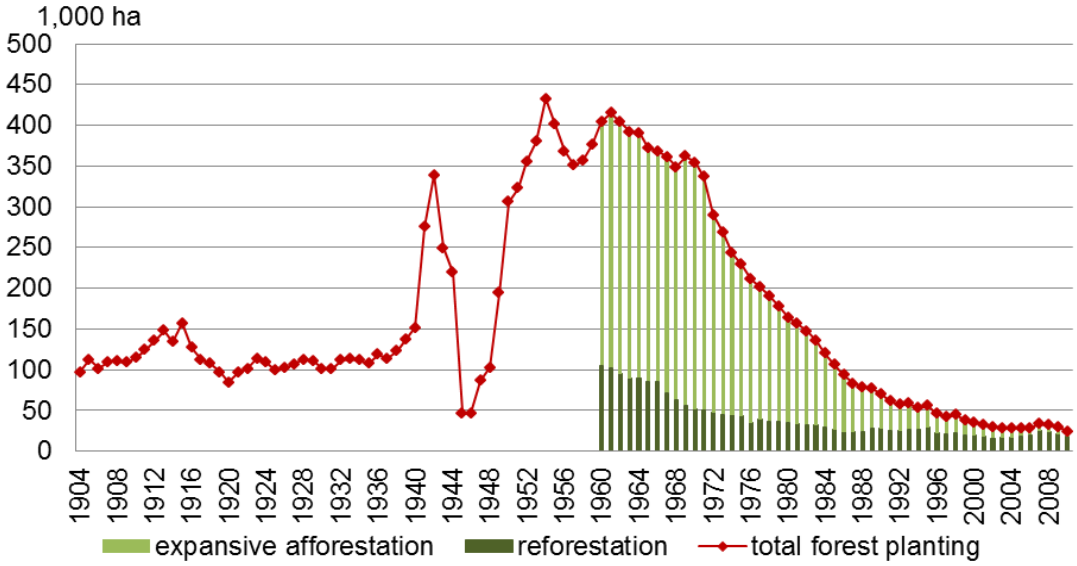


Figure 3.10. Historical changes in planting area in Japan.
Source: Forestry Agency

3.2.5 Liberalizing the timber market

After World War II, the timber trade in Japan was controlled with the Foreign Exchange Allocation System determined by the "Import Trade Control Order." However, in 1960, the government announced the General Rules on Trade and Exchange Liberalization Plan, abolished import control and turned the timber trade into a liberalized system. Wood and wood products had been traded under the Foreign Exchange Allocation System, but they were categorized as items treated under the Automatic Approval System in 1964.

In the 1980s, exportation of information technology products and cars to the USA increased and created a trade surplus. The USA sought to redress the trade imbalance and requested market liberalization. Regarding forest products, Japan reduced the duty on plywood and scantling and made efforts to eliminate the non-tariff barrier on wood products. These actions induced an increase in the ratio of imported wood products to all imported wood. As a result, the wood industry faced heavy competition for access to the consumer market as compared to the era of roundwood-based imports (Handa *et al*.1990).

3.2.6 Forestry Basic Law 1964

The Forestry Basic Law (Law No. 161 of 9 July 1964) was established in 1964. It was established to promote forestry as an industry, and thus it focused on forestry development as an industry and on improvements to the socio-economic status of forestry workers. It consisted of both production and structural policies. In Article 1, the purpose of this act was specified as to improve the socio-economic status of forestry workers along with the development of the national economy and improvement of social life in consideration of the important mission of forestry and forestry workers in the national economy. In Article 2, the production policy was set out. The outline of the production policy was to ensure the stable development of forestry with an aim to increasing production and productivity to close the gap with other industries. Improvement in the socio-economic status of forestry workers due increased income was determined as the structural policy (Endo 2012).

To carry out the purposes of this act, several measures were taken. The main measure was the Forestry Structure Improvement Projects described in Article 15. The purposes of these projects were to group forestland, mechanize forestry operations, expand the scale of management, rationalize forest ownership, and modernize forestry management. Forestry Structure Improvement Projects have been repeatedly implemented since 1964.

3.2.7 Forest and Forestry Basic Law 2001

Japan's forestry industry has been facing severe management conditions. Due to the decline of wood prices and increasing management costs, the profitability of forestry has been on the decline since the 1980s. In response to this, the "Forest and Forestry Basic Law" was put into force in 2001, followed by a variety of policy measures, including the promotion of thinning, coordination and consolidation of forestry practices among groups of small-forest owners, recruiting and training of forestry workers, and developing the manufacturing and distribution system for domestic wood products. As a result, the supply of domestic wood began to increase, reaching 18.7 mil cu m by 2008.

3.2.8 Forest and Forestry Revitalization Plan

Recently, Japan's planted forests have begun to reach maturity and are ready for harvest. However, the productivity of domestic forestry is still very low because of the widespread small-scale forest ownership and because new forest owners are reluctant to invest in active forest management after inheriting forest property. As a result, domestic forest resources are not fully utilized, and some forests are at risk of losing their potential to provide multiple environmental functions because of the lack of proper forest management. Given this situation, the government of Japan decided to further strengthen and accelerate policy measures under the Basic Law for the revitalization of forests and forestry, focusing on the coordination and consolidation of forestry practices, construction of a forest road

system, and human resource development. Accordingly, the “Public Buildings Wood Use Promotion Law” was introduced in 2010, the “Forest Law” was amended in 2011, the “Forest and Forestry Basic Plan” based upon the Basic Law was amended in July of 2011, and the “National Forest Management Law” was amended in 2012. Major programs for the Forest and Forestry Revitalization plan include revision of the forest planning system, assurance of proper forest management, and efficient and stable forestry management and human resource development (Forestry Agency 2013a).

3.3 Basic Plan for Forests and Forestry 2011

3.3.1 Forest resources

The “Basic Plan for Forest and Forestry” is the basic national policy on forests and forestry, while the “National Forest Plan” is the national guideline on forest management. According to the Forest and Forestry Basic Law, the government is obliged to establish a basic plan (hereinafter referred to as the "basic plan") for forests and forestry for the promotion of a comprehensive and systematic implementation of the policies on forests and forestry. The basic plan sets forth the following matters:

Chapter 1: Basic direction of the policies on forests and forestry
Chapter 2: Targets for the fulfillment of multifunctional roles of forests and for the supply and use of forest products.
Chapter 3: Policies that the Government shall implement comprehensively and systematically for forests and forestry.
Chapter 4: In addition to what is listed in the preceding three items, matters required for the promotion of the comprehensive and systematic implementation of the policies on forests and forestry.

The first basic plan was established in 2006 and is revised every 5 years. The latest revision occurred in 2011. The contents of the latest basic plan are as follows:

Chapter 1: Basic direction of the policies on forests and forestry

(1) Promotion of the “Forest and Forestry Revitalization Plan”
- Clarification of goals and necessary measures for realization of the “Forest and Forestry Revitalization Plan”
- Review of the forest planning system, assurance of proper forest management, acceleration of forest road system development, development of forestry contractors and human resources, expansion of domestic wood demand, establishment of a manufacturing/distribution system for domestic wood.
- Fulfillment of multifunctional roles of forests, revitalization of rural mountain communities through provision of employment opportunities, realization of a low-carbon society.

(2) Mitigation of Global Warming and Biodiversity Conservation
- Promotion of carbon sequestration through forest management and emission reduction for realization of a low carbon society, as well as achievement of the Kyoto Protocol targets.
- Clarification policy for biodiversity conservation in forests.

(3) Response to Domestic/International Wood Markets
- Promotion of wooden structures for public buildings and woody biomass use, as well as demand expansion in the housing sector.
- Promotion of wood-product exports.

(4) Contribution to Recovery of Domestic Economy and Revitalization of Rural Mountain Communities
- Provision of employment opportunities in rural mountain communities and contribution to the recovery of the domestic economy through revitalization of forests and forestry as a major industry in rural areas.

(5) Reconstruction after the Great East Japan Earthquake
- Contribution towards the development of new communities with low environmental impacts which make use of forest resources through the revitalization of forests and forestry. (Forestry Agency 2012a)

In one of the items of Chapter 2, the maintenance of single-layered planted forests is promoted because of the expectation of productivity. Conversely, a shift from single-layered planted forests to multilayered planted forests is promoted in order to achieve the public functions of forests (Table 3.2).

Table 3.2. Target forest conditions for achieving public functions.

	2010 (present condition)	Target forest condition			Directed condition (reference)
		2015	2020	2030	
Forest area (1,000 ha)					
Single-layered planted forest	1,030	1,030	1,020	1,000	660
Multilayered planted forest	100	120	140	200	680
Natural forest	1,380	1,360	1,350	1,310	1,170
Total	2,510	2,510	2,510	2,510	2,510
Total growing stock (mil cu m)	4,690	4,930	5,200	5,380	5,450
Growing stock per ha (cu m/ha)	187	196	207	214	217
Total increment (mil cu m/year)	74	68	61	55	54
Increment per ha (mil cu m/ha/year)	2.9	2.7	2.4	2.2	2.1

Source: Forestry Agency, 2011a

3.3.2 Wood demand and supply

The target utilization volume and estimations of demand for timber by usage are shown in Table 3.3. In 2020, timber demand is estimated to be 78 mil cu m. Target supply and utilization volume for domestic timber is 39 mil cu m (Table 3.4). The new basic plan sets the self-sufficiency rate for domestic wood supply at 50% in ten years (Forestry Agency, 2011a).

Table 3.3. Target utilization volume for domestic timber and estimation of demand for timber by usage (mil cu m).

Usage	Utilization volume of domestic timber			Total demand		
	2009 (actual achievement)	2015 (target)	2020 (target)	2009 (actual achievement)	2015 (target)	2020 (target)
Lumber products	11	14	19	26	27	30
Pulp & chip	5	9	15	29	36	37
Plywood	2	4	5	8	8	9
Other	1	1	1	2	2	2
Total	18	28	39	65	72	78

Source: Forestry Agency (2011a)

Table 3.4. Target for timber supply (mil cu m).

	2009 (actual achievement)	2015 (target)	2020 (target)	2030 (projection)
Timber supply	18	28	39	50

Source: Forestry Agency (2011a)

3.4 Divers of Sustainable Forest Management

3.4.1 Behaviours of forest owners

Individual forest owners, such as farmers, have been declining markedly since the 1980s: from 1.14 million owners in 1980 to 1.06 million owners in 1990 and 0.92 million owners in 2005. Many smaller-forest owners, especially those with an area of less than 20 ha, have left forest management for over the past two decades. Furthermore, the rate absentee landownership has increased since the1980s, recently reaching 25%. Under these conditions, the percentage of forest owners who conduct tree planting on their own land dropped from 50% in 1960 to 5% in 2000. This means that the interest of forest owners, especially small-forest owners, in forest management has been diminishing over the past several decades. Conversely, some financial conglomerates and paper producing companies have expanded the area of their forests by buying more forested land.

Some small-forest owners have been reluctant to undertake forest management due to low roundwood prices and urbanization. As shown in Figure 3.11, real stumpage and roundwood prices for Japanese cedar have been declining since the 1980s. Since the latter half of the 1990s, some owners have given up the replanting of trees after clear cutting. These trends will likely be intensified in succeeding generations. This behavior by small-forest owners has a negative impact on changes in forest area.

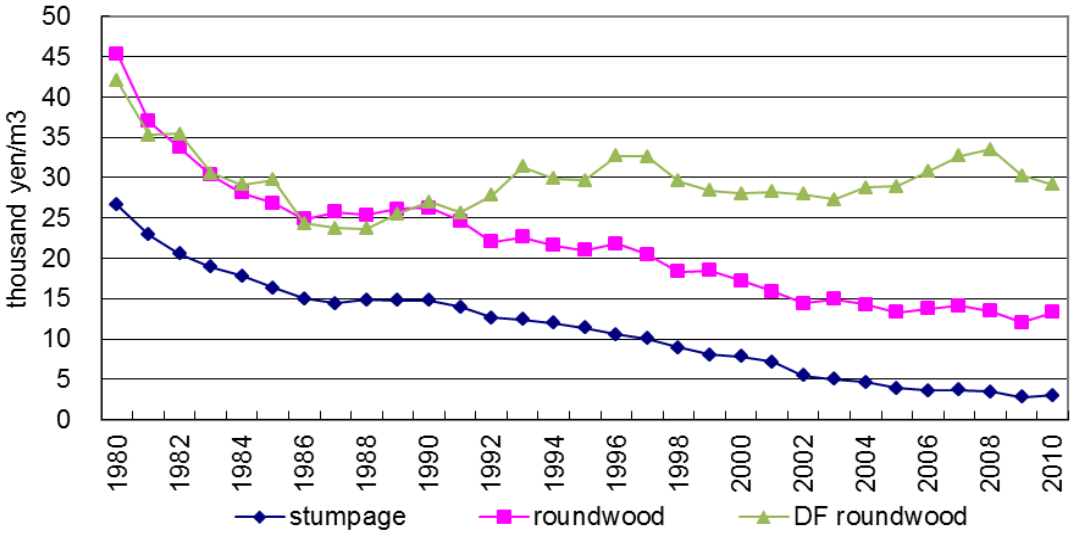


Figure 3.11. Real price of J cedar in calendar year 2000.
Source: MAFF (2013c)

3.4.2 Public awareness

As mentioned in Sections 3.1.3 and 3.1.2, citizens understand the importance of forest maintenance, but have given greater priority to the economic efficiency of forests in comparison with the past.

3.4.3 Forestry practices and costs

The cost of maintaining forests in Japan is shown in Figure 3.12. The initial cost is high: approximately 1 million yen/ha. The total management cost up to age 50 is 2.5 million yen/ha. The average cost by harvest time is approximately 6,000–8,000 yen/cu m.

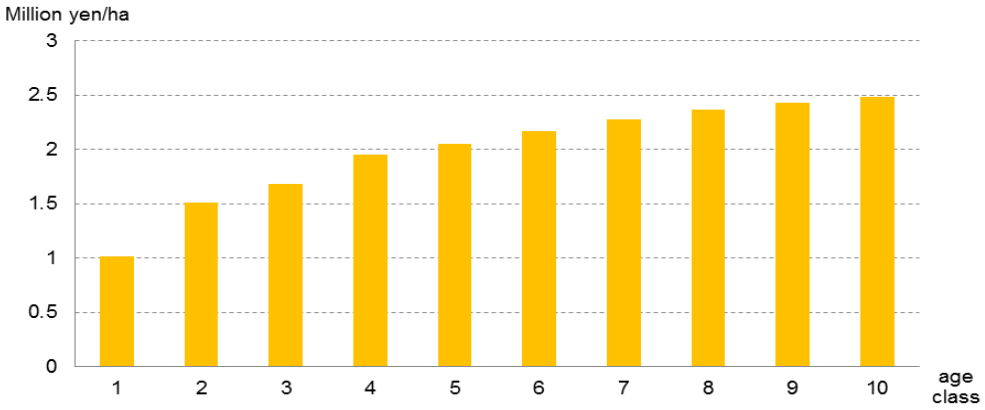


Figure 3.12. Cost of maintaining forests.
Source: Forestry Agency (2011b)

3.4.4 Wood utilization and innovation

In the 1990s, Japan's plywood manufacturing industry developed a new technology for structural plywood in cooperation with the Forest and Forest Products Research Institute. This new structural plywood made of Japanese larch and Japanese cedar is lightweight and attractive to carpenters. Recently, it has gained a solid market and demand has reaches more than 2 mil cu m. This new technology is contributing to the expansion of wood utilization, and provides some incentive to forest owners.

As mentioned above, due to the small-scale, dispersed, and multi-layered system of log harvesting, distribution and wood manufacturing, Japan's forestry and wood manufacturing industry has been slow to develop a reliable distribution system with low production costs and assured quality and performance. The Forestry Agency has supported model projects for the reformation of the forestry and wood products industry: the "New Wood Products Distribution and Processing Projects" for the laminated lumber and plywood sectors since fiscal year 2004, and the "New Wood Production Projects" for the lumber sector since fiscal year 2006. The Forestry Agency has also been supporting local projects for the stable supply and efficient manufacturing/distribution of domestic wood through the "Fund for the Acceleration of Forest Management and Forestry Revitalization" since fiscal year 2009. The Forestry Agency is also promoting increased wood use in wooden public buildings, energy produced from woody biomass, wood exports, and promotional activities to the general public (Forestry Agency 2013a).

CHAPTER 4 REFLECTIONS AND POLICY RECOMMENDATIONS

As we discussed in sections 3.1 and 3.2, there are some key factors that have positive and negative impacts on forestry. We summarize the relationship of these factors, dividing them into two periods, before and after World War II, as shown in Figure 4.1 and Figure 4.2.

We identify some key features that influence the Japanese forest transition. Firstly, referring to opinion polls conducted by the Cabinet Office, an increase in environmental concerns related to forest services, including wood utilization, is evident among young generations. Recently, some members of the public have experienced forestry practices and volunteer activities in rural areas; such experiences may have contributed to this trend in public opinion. Secondly, and conversely, some forest owners have been reluctant to undertake forest management due to low roundwood prices and urbanization. Since the latter half of the 1990s, some have given up the replanting of trees after clear cutting. These trends will likely intensify in succeeding generations. Thirdly, total wood consumption has declined: per-capita wood consumption dropped from around 0.9 cu m in the 1990s to 0.5 cu m at the end of the 2000s. This fact implies that the recent impact of population changes on wood consumption and forest resources is quite small. Finally, in the last several years, the utilization by major companies of wood for large construction projects and in businesses has been encouraged under the Japanese government's measures to promote wood utilization as an action against climate change. Such action may have an impact on the timber market and forest management.

We summarize the socio-economic factors to have influenced forest transitions in Japan as follows:

(1) Policy: The Forest Law of 1897, the Forestry Law of 1951 accompanied by the Forestry Planning System, and expansive afforestation measures from the 1950s to the 1970s had significantly positive influences.
(2) Social issues: Population increase has had a negative impact overall, and the depopulation of rural areas has influenced forest management negatively.
(3) Land utilization: Agricultural land use has had a significant negative impact. Urbanization may have had an impact to a certain extent.
(4) Economic issues: Timber imports have had a positive impact.
(5) Energy: The consumption of wood for fuel has had a negative impact.

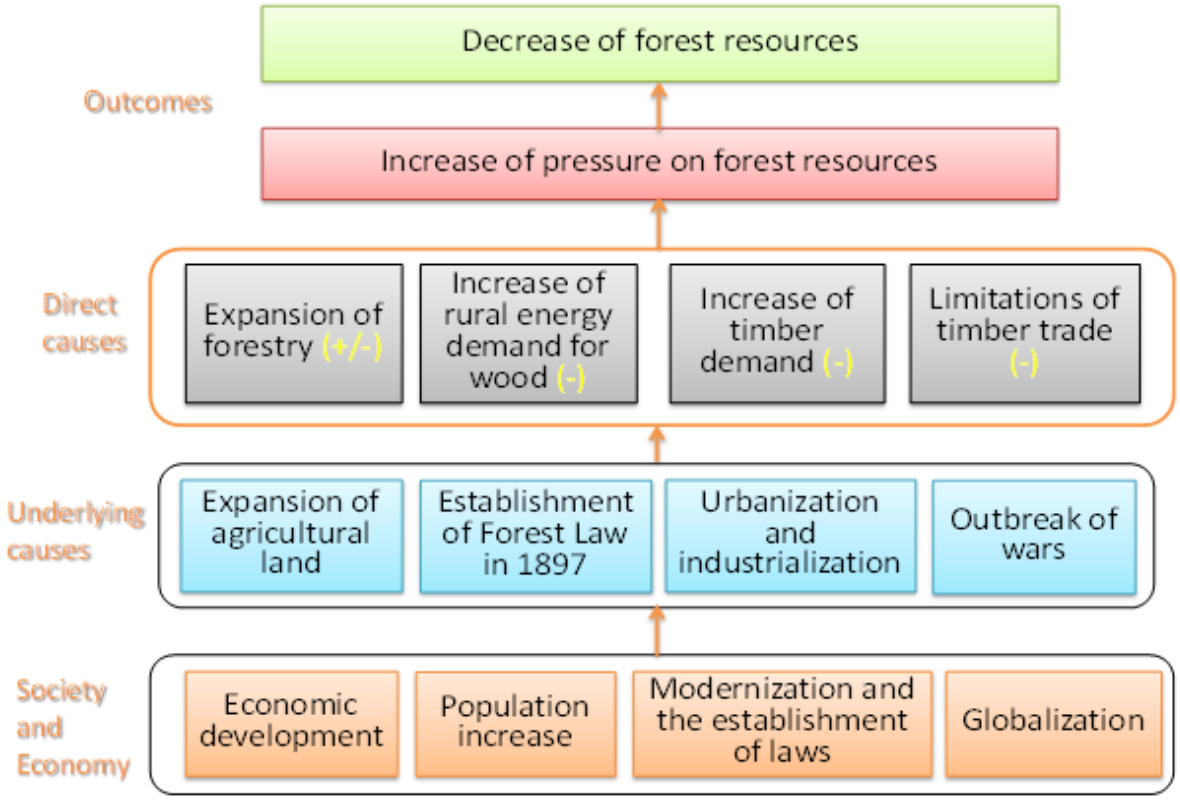


Figure 4.1. Direct and underlying causes of changes in forest resources before WWII.

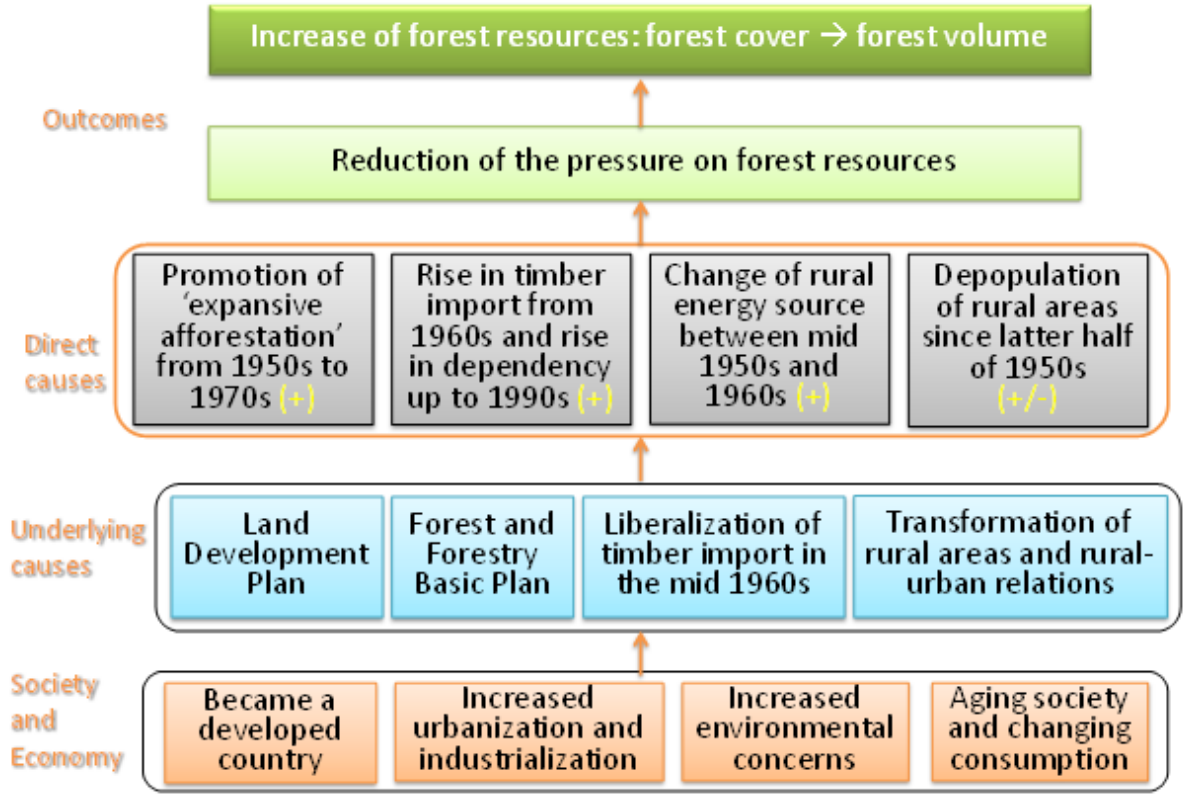


Figure 4.2. Direct and underlying causes of changes in forest resources after WWII.

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