[Provisional translation : Original text is in Japanese]

Interim Summary of the Guidelines on the Investments in Forest, Forestry, and Wood Industry in Japan that Contribute to Achieving Carbon Neutrality, etc.

June, 2022
Study Group on Proper Investments in
Forest/Forestry/Wood Industry in Japan

Table of Contents

I. Expected Role of Forests in Response to Climate Change

1. Positioning of Forest's CO_2 Absorption/Storage Function of Forests in the World and Japan

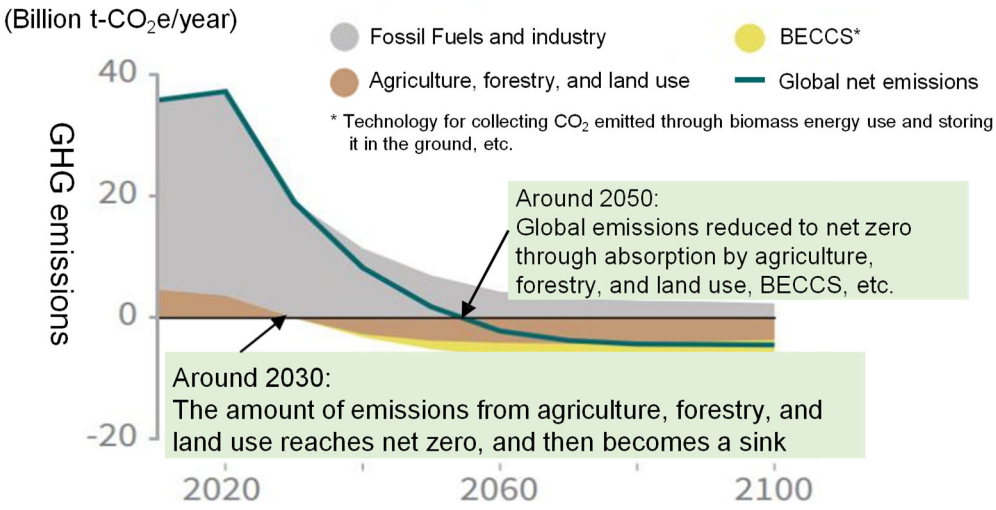
(1) Positioning in the World

Efforts to achieve carbon neutrality by 2050 are becoming increasingly important, as the Glasgow Climate Pact was adopted at the COP26 in the UK in 2021, which set forth the efforts to limit the global average temperature increase to 1.5°C above pre-industrial levels.

As you can see from the fact that the Glasgow Climate Pact clarifies and focuses on the importance of forests as CO_2 sinks and storehouses, it is essential to not only reduce GHG emissions but also absorb CO_2 in the agricultural/forestry industry and land use sector in order to achieve carbon neutrality.

Figure 1 shows how GHG emissions should be reduced globally in order to limit the temperature increase to 1.5°C as presented by the Intergovernmental Panel on Climate Change (IPCC[1]). In this scenario, emissions in the agricultural/forestry industry and land use sector will be net-zero by around 2030, and after that this sector will be a CO_2 absorber. On the other hand, emissions in the fossil fuel/industrial sectors will maintain carbon positive status. By 2050, global emissions, including emissions from fossil fuel / industrial sectors, are expected to reach net zero, because of increased absorption in the agriculture/forestry industry and land use sector and the advancement of BECCS[2] technology.

Figure 1: IPCC's scenario on how global GHG emissions should be reduced in order to limit the temperature increase to 1.5°C



* Prepared based on IPCC (2018) "Global Warming of 1.5° C"; and Makino Yamanoshita and Chisa Umemiya from Institute for Global Environmental Strategies "Global Trends on Climate Change and Forests - Reports of COP26" [*"Somamichi"* December 2021, No. 63]

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[1] An organization established by the United Nations Environment Programme (UNEP) and World Meteorological Organization (WMO) in 1988 in order to provide a comprehensive assessment on man-made climate change, its effects, and how to adapt to or mitigate it from a scientific, technical, and socioeconomic standpoint

[2] Abbreviation of "Bioenergy with Carbon Capture and Storage", which is technology for collecting CO_2 emitted when biomass fuel is used and storing it underground.

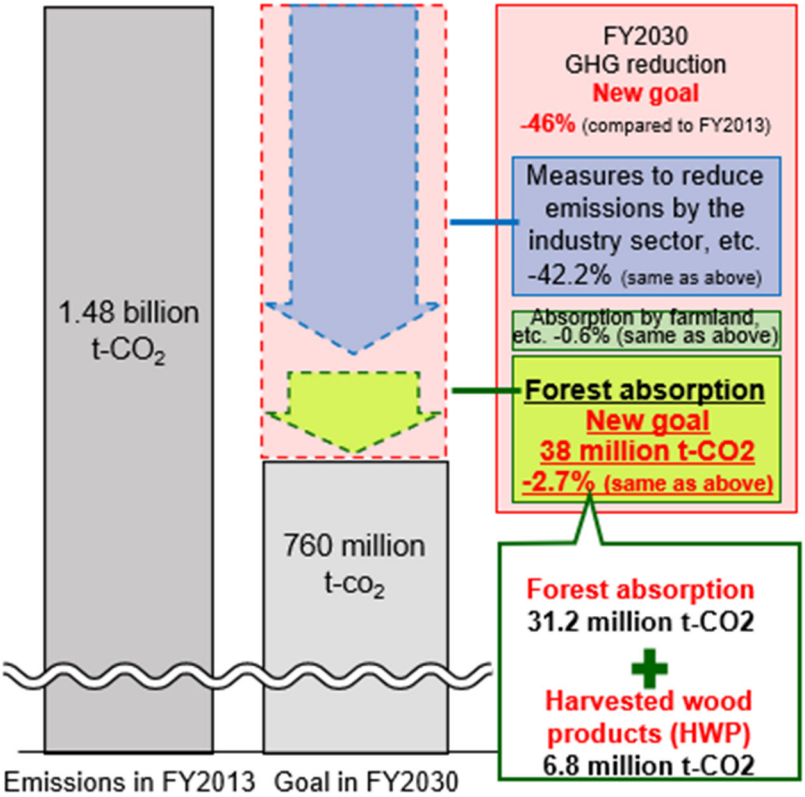
Emissions from the fossil fuel / industrial sectors are expected to further decrease, but it is difficult to achieve zero GHG emissions. Therefore, in order to achieve net zero (carbon neutrality), it is necessary to focus on the CO_2 absorption/storage functions of forests and wood and to make effective use of them. The more forests grow, the more they absorb CO_2, and it takes decades. Therefore, we must take actions now in order to increase the amount of CO_2 that forests will absorb.

(2) Positioning in Japan

The Basic Plan for Forest and Forestry (decided by the Cabinet in June 2021) espouses appropriate thinning, cyclic use of resources through "Harvesting, Utilizing, and Replanting" trees, and expansion of wood use. Through these efforts, the government of Japan (the GOJ) aims to manage forests appropriately, promote sustainable use of forest resources, transform forestry into a growth industry, and achieve green growth that contributes to carbon neutrality by 2050.

In addition, the Plan for Global Warming Countermeasures (decided by the Cabinet in October 2021) set a new target of reducing GHG emissions by 46% by FY2030 compared to FY2013. Forest absorption (consisting of the amount absorbed by forests and amount stored in harvested wood products (HWP)) will have to account for 2.7% (38 million t-CO_2) of this reduction percentage (Figure 2).

Figure 2: New targets for reduction of GHG emissions and absorption by forests (FY2030)



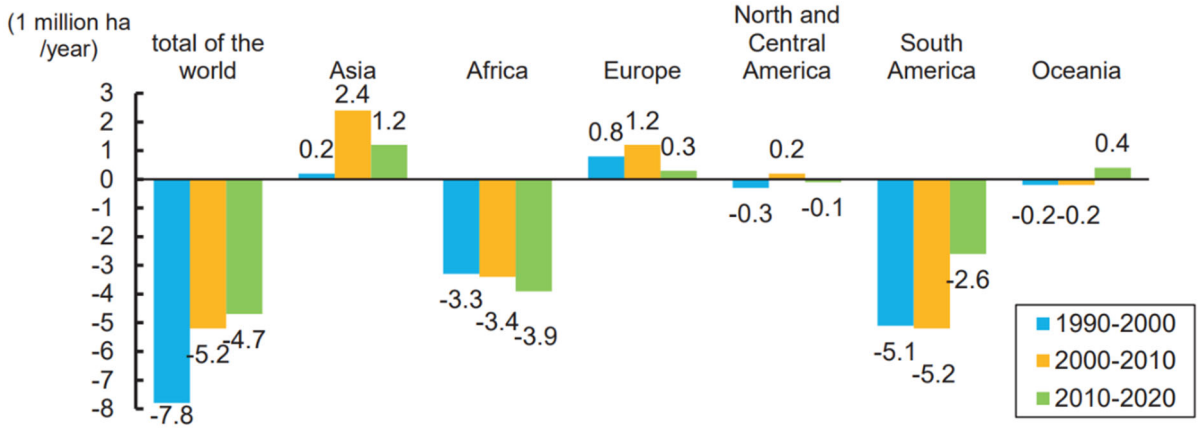
2. The Current State of the World's Forests and Investment in Forests from the Perspective of Climate Change

(1) Current situation of forests and COP26's responses

The global forest area in 2020 was approx. 4.1 billion hectares in 2020, accounting for 31% of the global land area. Although regional forest growth has been observed in Asia, Europe, and Oceania due to planting and natural expansion of forests, the global forest area has been on a declining trend. Rainforests in South America and Africa are rapidly disappearing because of conversion to agricultural land and forest fires. While the decline in forest area in the decade from 2010 to 2020 was slower than in the previous 20 years, the global forest area has been reduced by an average of 4.7 million hectares (approx. one-fifth of Japan's forest area) per year (Figure 3).

Amid these circumstances, over 140 countries, including Japan, signed the Glasgow Leaders' Declaration on Forests and Land Use in the "Action on Forests and Land Use" event held under the auspices of the United Kingdom in line with the COP26. The declaration aims to strengthen efforts to conserve forests and promote their recovery in order to prevent deforestation and improve the situation by 2030, and to promote trade and development policies that do not cause deforestation. The world is paying attention to these measures for preventing deforestation and degradation.

Figure 3: Change in global forest area



Source: Prepared by the Forestry Agency based on Global Forest Resources Assessment 2020(FAO)

(2) Efforts for investments in forests

The NYDF[3] Assessment Partners[4] published the report "Taking stock of national climate action for forests" in 2021, in which it evaluated how forest management should be funded from the perspective of preventing climate change. According to the report, current international and domestic funding of on average USD 2.4 billion per year for forest-related

[3] Abbreviation of "The New York Declaration on Forests", which was adopted at the 2014 UN Climate Action Summit.

[4] NYDF Assessment Partners was founded in 2015 as an independent civil and social organization initiative to monitor progress toward NYDF goals.

climate mitigation by worldwide governments only covers a fraction of what is needed to protect, restore, and sustainably manage forests: 0.5–5 percent. The Glasgow Leaders' Declaration on Forests and Land Use also stated the commitments to "increase finance and investments from a wide variety of public and private sources, and to enable sustainable forest management, forest conservation, and restoration". It is therefore considered that further funding is needed to take measures against climate change in forests.

Under these circumstances, it is recognized that investing in forests is characterized by the fact that trees grow steadily every year and timber volume will increase, that they become a stable source of income in the long term if there are no natural disasters, and that they are less affected by financial crises because they are less correlated with traditional financial sectors such as stocks and bonds. For these reasons, institutional investors in the United States and other countries regard forests as attractive targets for building portfolios to diversify risk.

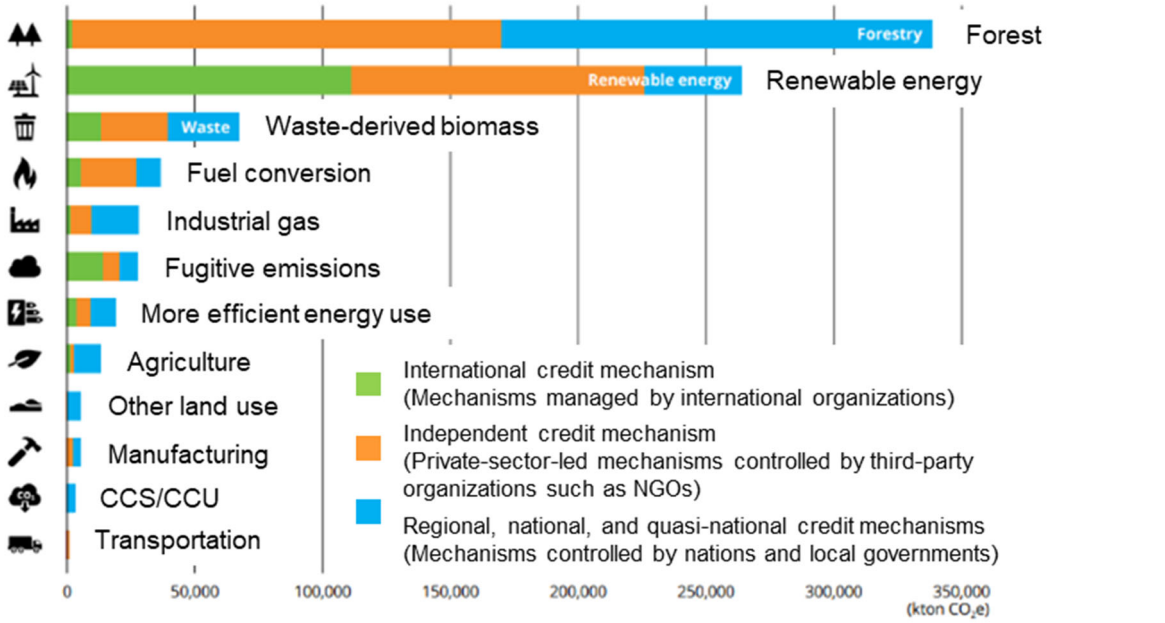
The forests in the United States and other neighboring countries have efficient forestry conditions, such as flat topography, developed forest road systems, and resource management information. Furthermore, these forests are congregated in one place.

In these forests, where returns on investment can be expected, forest investment management has been developed, for example in the form of TIMO[5], in which costs required for managing the forests are covered by funds and investments from the private sector, which gives work instructions for forestry contractors to efficiently and appropriately manage forests, and the companies give returns to investors from the profits. The global market size of forest funds is estimated to have increased five times from approx. $20 billion (2.2 trillion yen) in 2000 to approx. $100 billion (9.8 trillion yen) in 2013, and have increased gradually since then.

Although different from a direct investment in forests, carbon credit systems, which focus on reducing CO_2 emissions and increasing CO_2 absorption, include systems where the CO_2 absorption effects in forest management projects such as thinning are converted into monetary value. Looking at global carbon credits issued between 2015 and 2019 by sector, the forest sector has the highest amount of carbon credits issued, accounting for 42% of the total (Figure 4). This is possibly because the forests' multiple functions are highly evaluated, including contribution to preventing climate change, conservation of biodiversity, watershed protection, and other benefits. Investment activities for forest management are not only conducted from the viewpoint of profitability, but also from the viewpoint of the impact of investment projects on society and the environment.

[5] Abbreviation of "Timberland Investment Management Organization".

Figure 4: Amount of carbon credits issued by sector and mechanism in 2015-2019



Source: World Bank Group "State and Trends of Carbon Pricing 2020"

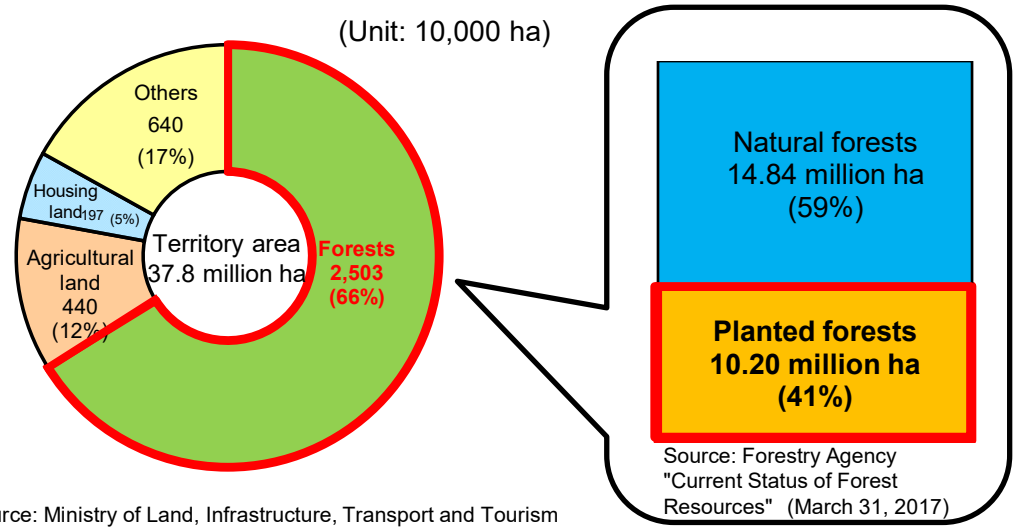
3. Current State of Forests and Related Challenges in Japan

(1) Current condition of forests in Japan and how to increase CO_2 absorption

The forest area in Japan is 25.03 million hectares, remaining almost constant for decades. The total land area of Japan is 37.8 million hectares, and approx. two thirds of the land is covered by forests (Figure 5). Approx. 40% (10.2 million hectares) of Japan's forests are planted forests, and most of them were created in cutover areas immediately after the war or during the period of high economic growth. As the planted forests have grown, more than half of them are over 50 years old and generally suitable to be logged, so further use of the forests is required (Figure 6).

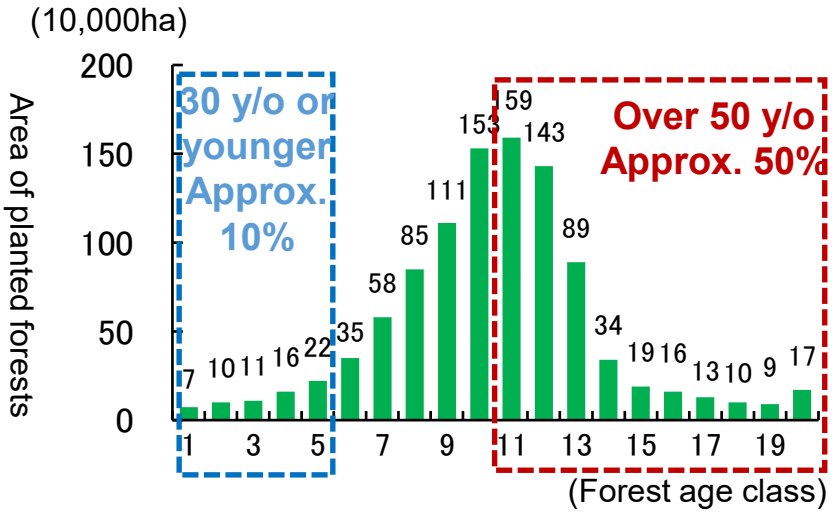
Currently, forest resources, especially planted forests, have grown by approx. 60 million cubic meters annually. The growing stock of planted forests as of 2020 is approx. 3.4 billion cubic meters, which is six times higher than the approx. 5,600 million cubic meters in 1966, and the total growing stock of planted and natural forests is approx. 5.43 billion cubic meters (Figure 7).

Figure 5: Breakdown of land area of Japan



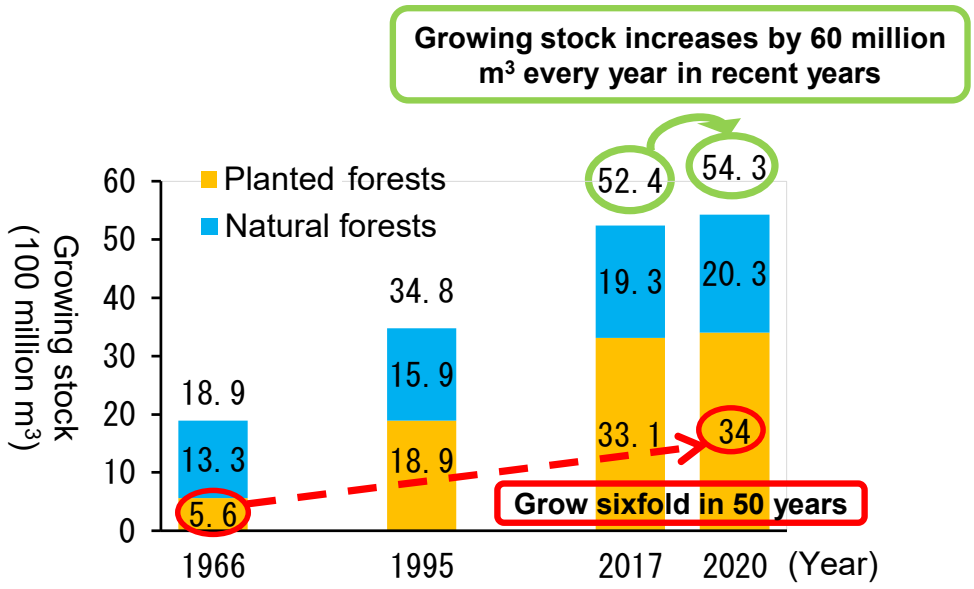
Source: Ministry of Land, Infrastructure, Transport and Tourism
"FY2021 White Paper on Land"
(The territory area is the value as of 2019)
Note 1: The total numbers are not the same because fractions are rounded off.
Note 2: The survey methods and time for forest areas are different from ones specified in Forestry Agency's "Current Status of Forest Resources".

Figure 6: Area of planted forests by age class in Japan



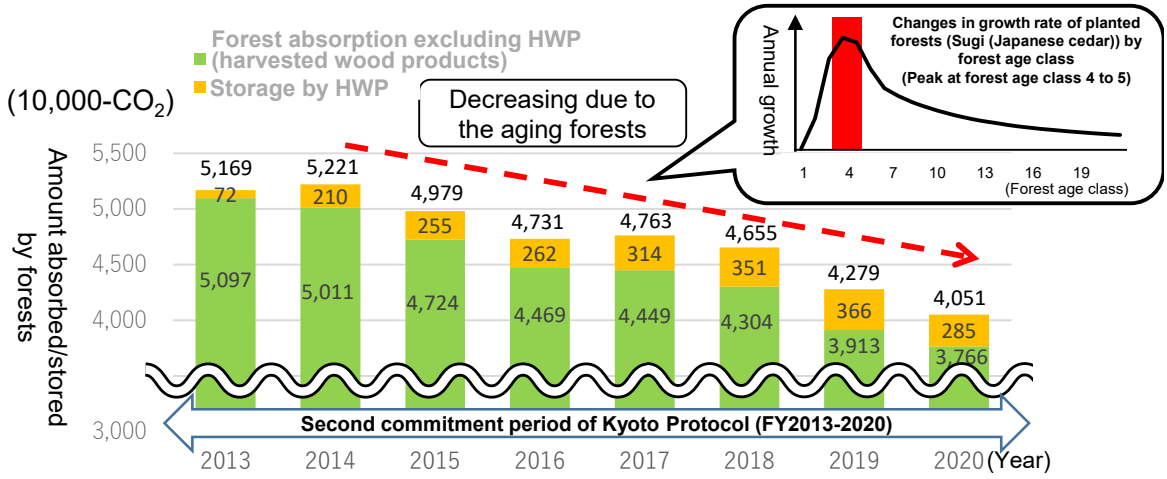
Source: Forestry Agency “Status of Forest Resources” (March 31, 2017)

Figure 7: Changes in growing stock in Japan



On the other hand, the growth of planted forests is said to decline from the peak of forest age class 4 to 5 (forest age 16 to 25), and the amount of CO_2 absorbed by Japan's forests has been decreasing due to the aging of the planted forests (Figure 8).

Figure 8: Changes in absorption by Japan's forests



In order to achieve carbon neutrality by 2050, 3,800 million t-CO_2 must be absorbed in FY2030. However, considering that Japan is densely populated and the use of land is advancing, there is little room for afforestation, so it is necessary to establish the cycle of "Harvesting, Utilizing, and Replanting" trees for managing Japan's forests, especially planted forests appropriate for forestry management. In other words, it is important to develop young forests with strong growth potential and to achieve the desired form of

forest, in which forests consisting of various growth stages are arranged in a balanced manner.

In order to secure and strengthen the amount of CO_2 absorbed by Japan's forests, it is necessary to appropriately cut down planted forests which have reached their usage period, and to replant and grow trees in the cutover areas (Figure 9). Choosing reforestation by planting Sugi (Japanese cedar) or similar trees as the method of renewal after logging will increase annual growth and the CO_2 absorption effect more than choosing natural regeneration (Figure 10).

Figure 9: Cyclical use for ensuring forest absorption

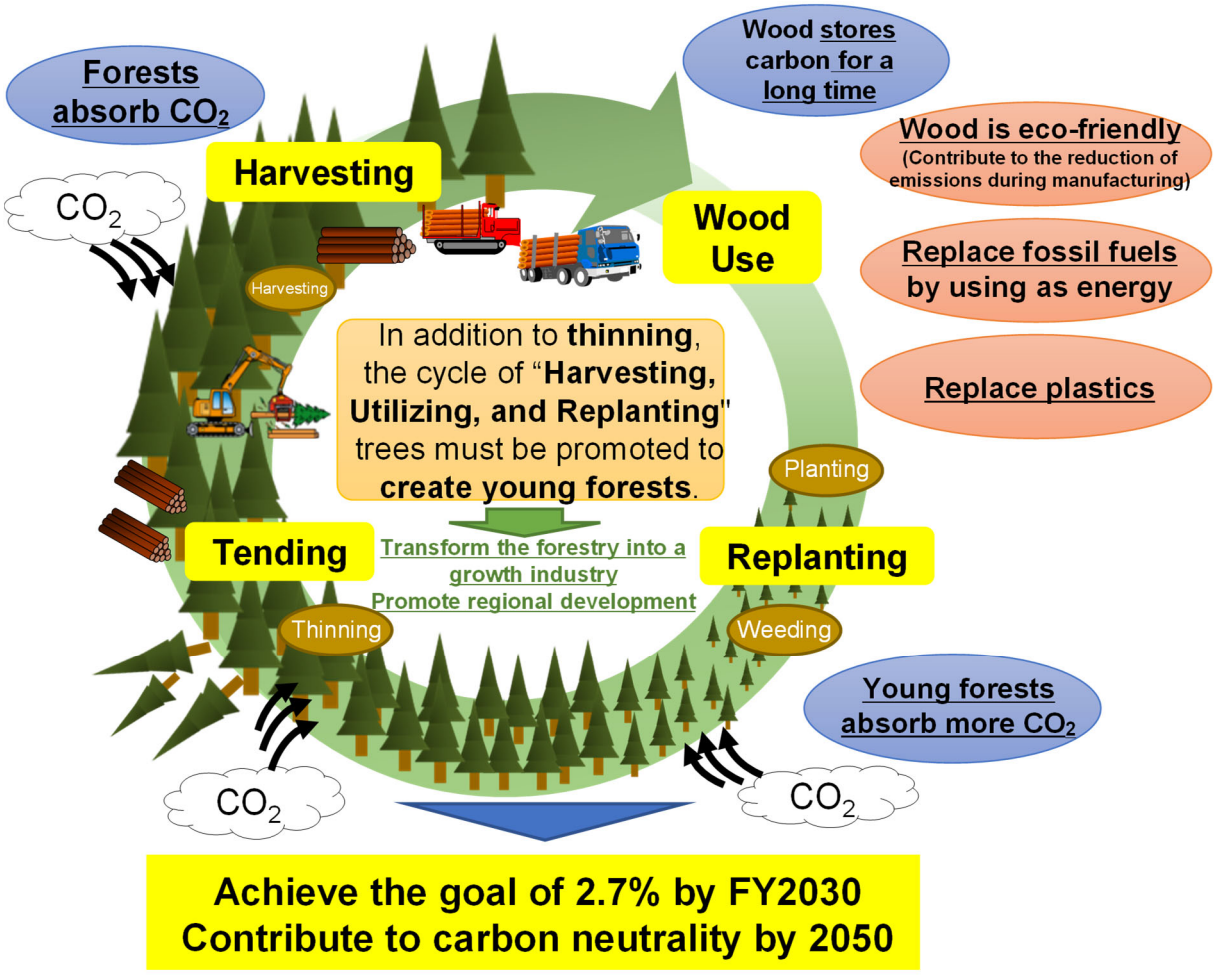
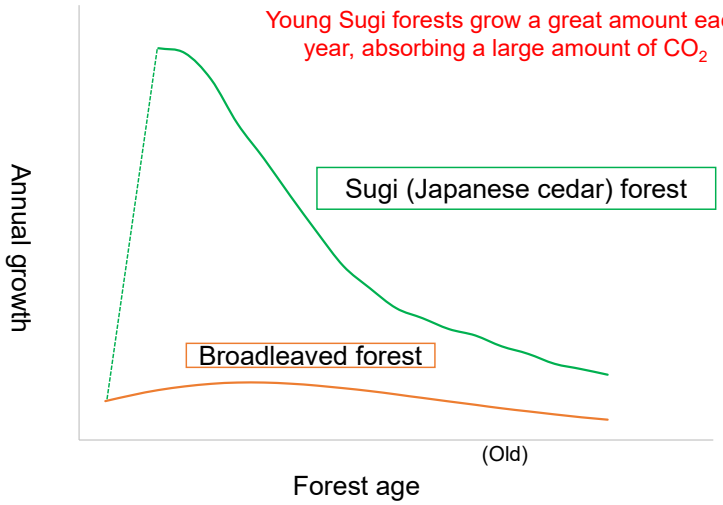


Figure 10: Difference in annual growth by tree species (yield table by Gifu Prefecture)



* Created on the basis of "yield table for broad-leaved forest" and "General area (areas with less than 1 m of deepest snow depth), stand density management diagrams, yield table for Sugi (Japanese cedar) forest" by the Forestry Policy Division of Gifu Prefecture.

As carbon is stored in wood, it is effective to use logged wood for building materials appropriately and re-use wood from demolished building for particle boards and furniture (Figure 11).

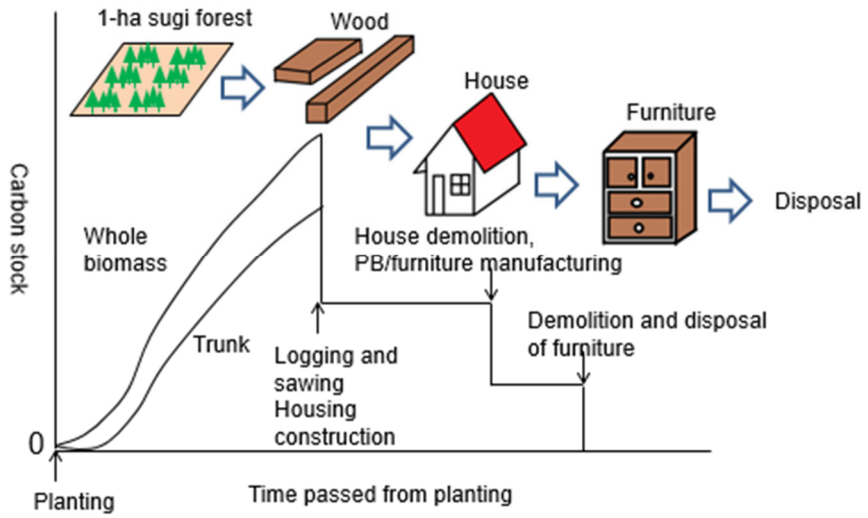
A temple carpenter named Tsunekazu Nishioka said in his book "The building of Horyu-ji: the technique and wood that made it possible[6]" that trees finish their lives when they are felled but live a second life as lumber for building materials to support buildings. This concept is similar to CO_2 storage by wood use.

Furthermore, wood is a material that consumes relatively little energy during manufacturing, and woody biomass replaces fossil fuels. Therefore, using it contributes more to the reduction of CO_2 emissions than the use of other materials.

Strategy for Sustainable Food Systems, which was formulated by the Ministry of Agriculture, Forestry and Fisheries in 2021, stipulates that Japan aims to increase the use of fast growing seedlings, such as the “elite trees”, to 30% and 90% of forestry seedlings by 2030 and 2050, respectively, to establish high-rise wood building technology and maximize CO_2 stored by wood by 2040.

[6] Tsunekazu Nishioka, Jiro Kohara (2019) The building of Horyu-ji : the technique and wood that made it possible. NHK Books (pp 56-57)

Figure 11: Carbon stock in wood use



Note 1: This figure shows that Sugi (Japanese cedar) planted in 1 hectare of forest area absorbs CO_2 from the atmosphere and fixes it as carbon inside, and keeps the carbon inside even after it is logged and used for houses or furniture for a certain period of time.

2: This does not take into account continuing absorption in forest areas as a result of reforestation.

Source: Motoaki Okuma (2012) *Sanrin*, No.1541 (pp 2-9)

(2) Current state of investments in forests in Japan

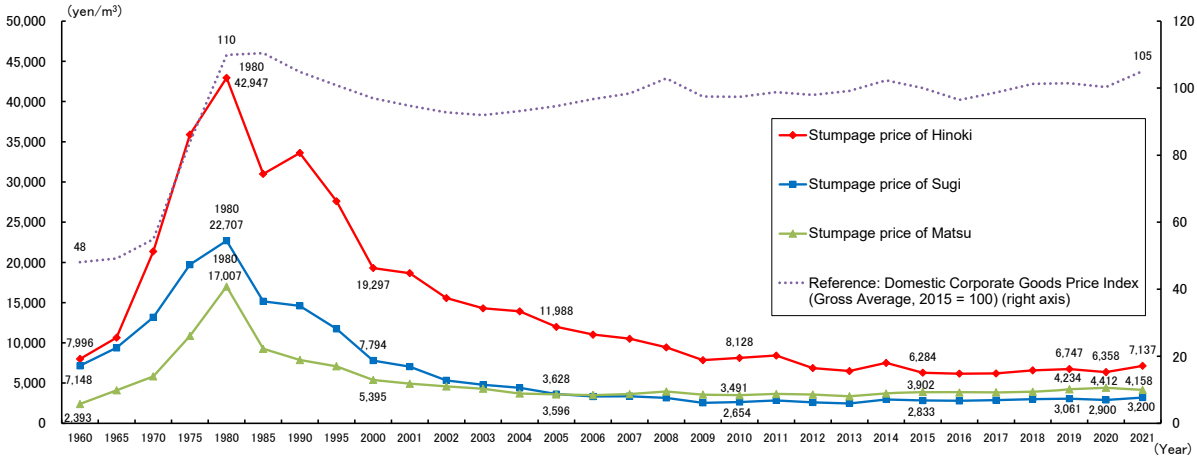
Japan's forestry experiences difficulty in improving efficiency because of the steep terrain unlike the forests in the United States. The management efficiency of Japan's forestry is also poor, because forestry road systems have not been developed well, resulting in high transportation costs; resource management information, such as information on boundaries and owners, has not been shared appropriately; and private forests are generally owned by small and micro entities.

Furthermore, due to the long-term slump in stumpage prices (Figure 12), the change of generations of forest owners, and an increase in non-resident forest owners, owners are becoming less interested in their forests. As the amount of harvestable forest resources is limited and technology such as forestry machines has not been developed well, efforts to improve productivity are still insufficient.

Forests and Forestry generally take a long time from planting to logging, and looking at each forest, there are only three cash inflows in approx. half a century, including thinning. Therefore, when taking into consideration Japan's small and micro forests that provide lower efficiency, investment returns from Japan's forests cannot be expected as much as those overseas.

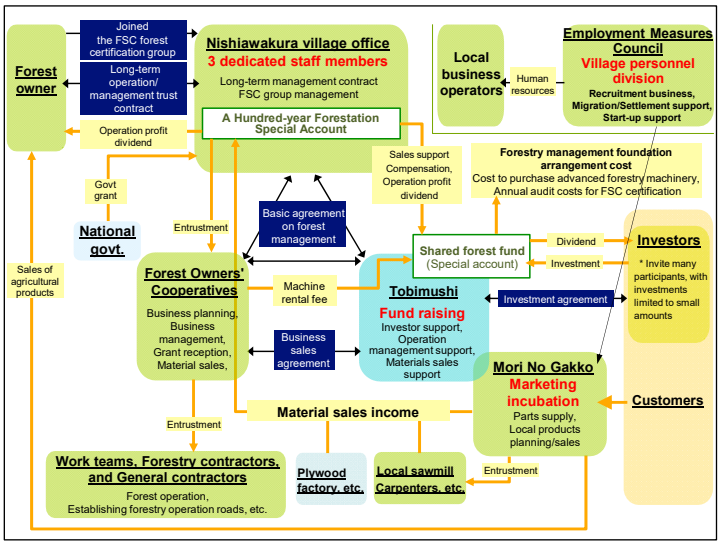
For these reasons, Japan's forests are different from those of other countries, and have been regarded as difficult to invest in. The actual cases of forestry investment are limited to the cases in Nishiawakura Village, Okayama Prefecture and Uchiko Town, Ehime Prefecture involving Tobimushi Inc. which the Study Group interviewed (Figure 13).

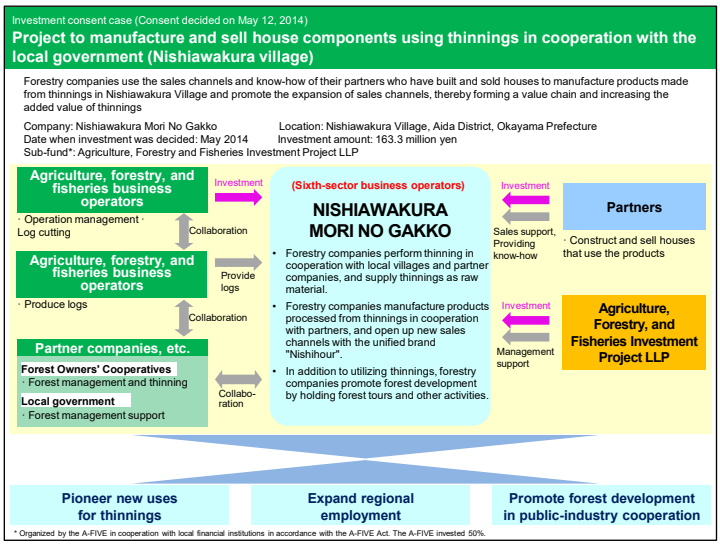
Figure 12: Changes in the national average stumpage price

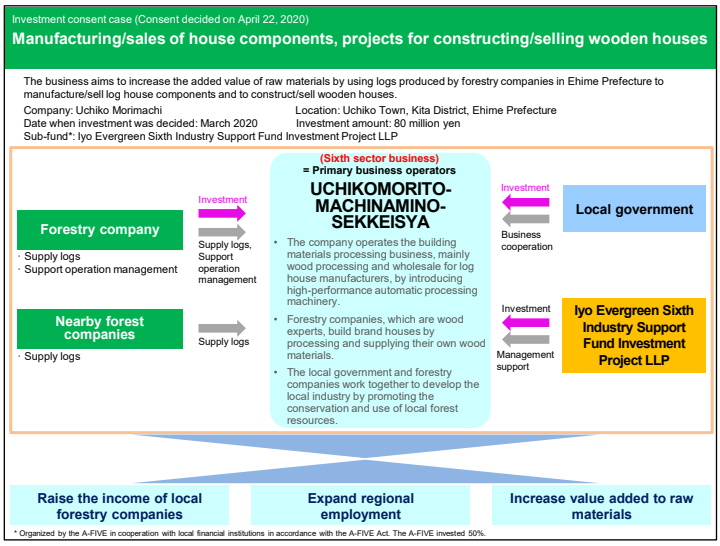


Note: “Stumpage price of Matsu” shows prices of Todomatsu, Ezomatsu, and Karamatsu in Hokkaido.
Source: Japan Real Estate Institute "Survey of Mountain forest base & stumpage price"; Bank of Japan "Corporate Goods Price Index (BOJ Time-Series Data Search)"

(Figure 13) Example of Investment in Nishiawakura Village, Okayama Prefecture and Uchiko Town, Ehime Prefecture involving Tobimushi Inc.





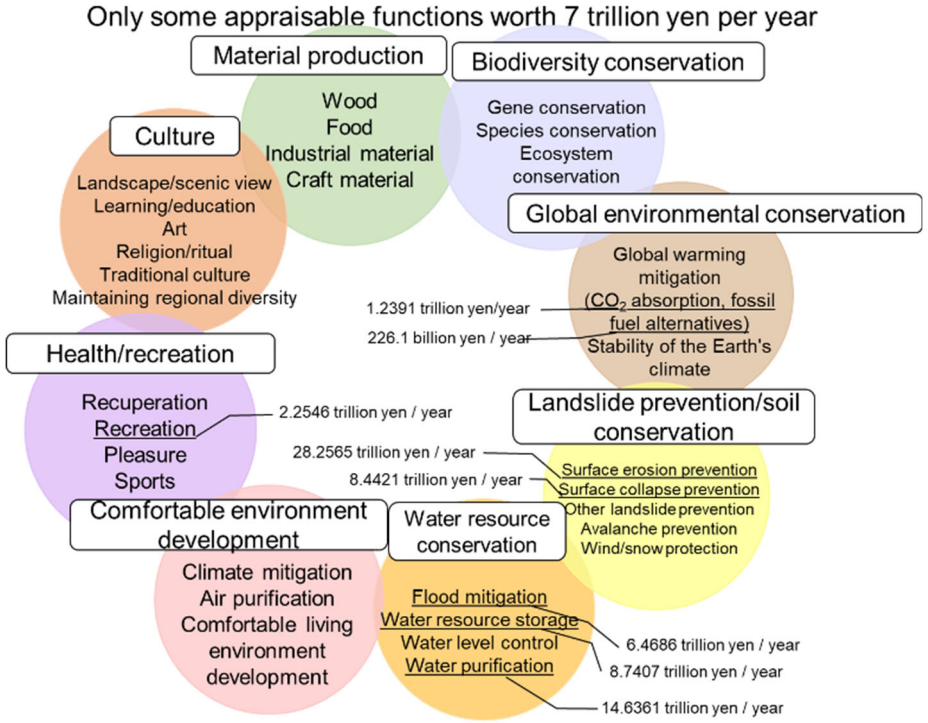


* Created on the basis of the materials presented by Tobimushi Inc. at the first study group meeting

(3) Forest management to date and future development

Japan's forests contribute to the stability of people's lives and the sound development of the national economy through their various functions such as land conservation, watershed protection, and global warming prevention. These are the multiple functions of forests. The multiple functions of forests include functions for public interest, such as land conservation, and functions for producing wood. The total estimated value of appraisable functions for public interest is 7 trillion yen per year (Figure 14). The multiple functions of forests are characterized by the fact that one of the functions is not demonstrated independently but several functions are demonstrated at the same time. For this reason, even the planted forests developed for wood production demonstrate functions for public interest, such as land conservation.

Figure 14: Appraisal of functions of forests for public interest



* Created based on Science Council of Japan "Appraisal of the Multiple Functions of Agriculture and Forests in Relation to Global Environment and Human Life" and attachments to the document (November 2001).
* The amount is for appraisable functions out of the multiple functions of forests, mainly physical ones. All appraisals use values within a certain assumptive range, and should be applied with caution.

In order to ensure that functions of forests for public interest will be fully demonstrated in the future, the GOJ has promoted forest management and maintenance/demonstration of functions for public interest by means of subsidies (such as public works) for forest owners and forest management entities, with a certain amount paid by them.

In addition, in line with the start of the forest management system in FY2019, in which municipalities are entrusted to manage forests under poor management, a forest environment transfer tax started to be transferred to prefectures and municipalities as a new source of funding for forest management and other measures to combat global warming and prevent disasters.

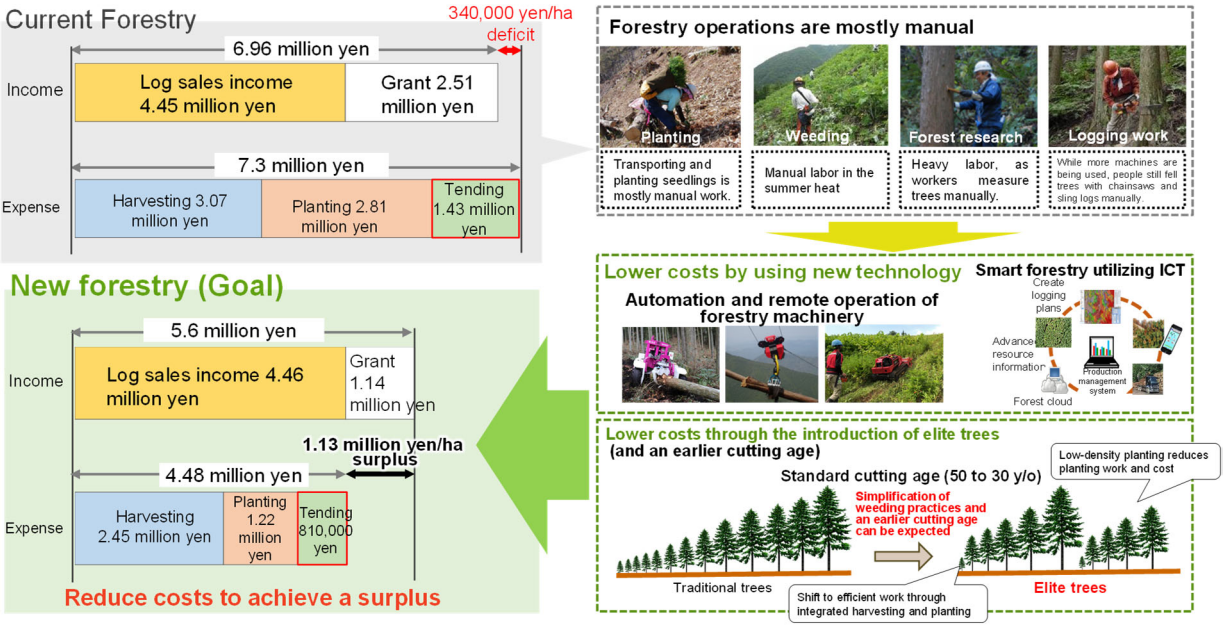
Many forests are in the stage of tending and thinning, and forest management has been promoted with support from public funds from the viewpoint of the functions for public interest. While many forests are at the stage of utilizing and are progressing to being harvested, reforestation after harvesting is not performed often because of high burden on forest owners. In other words, because of forestry's management structures, where costs for tending trees, such as planting and weeding, are high compared to income from timber sales (Figure 15), the reforested area is limited (Figure 16). Therefore, in light of the current state of Japan's forests, in order to steadily advance reforestation and achieve carbon neutrality, it is necessary to make the structure of forestry management profitable. For this reason, technological innovation and funds to support it are necessary to achieve efficient forestry management.

The Basic Plan for Forest and Forestry specifies and estimates the promotion of activities to achieve the "New Forestry" that makes logging, reforestation, and tending profitable by transporting seedlings with drones and forestry machines, cutting down the number of seedlings through low density planting, reducing reforestation work and costs by planting "elite trees" and reducing weeding work, and improving productivity of logging work by developing forestry road systems and introducing advanced forestry machinery (Figure 15). In order to develop "new forestry" like this and introduce new technology such as smart digital technologies, external investments are necessary for areas that lack public funds.

Therefore, in order to achieve carbon neutrality, it is necessary to consider promoting forest management by gaining help from funds including private capital as well as subsidies (public projects, etc.) while advancing efforts to improve income and expenditure of forestry production, such as coordinating and consolidating forestry practices, reducing reforestation costs and forest management costs, and improving productivity.

If forest management achieves high productivity and profitability through the use of these private funds, the employment environment, such as the salaries of forestry workers, will be improved, and it is expected to secure more workers.

Figure 15 How forestry management should be in "New Forestry"



Source: Prepared based on Forestry Agency "Outlook of Forestry Management and Structure 2" (Forest Policy Council (November 16, 2020) Data 3). The value is estimated in units of 1 ha of operation area.

Figure 16 Changes in harvesting area and planting reforestation area