

**ASIA-PACIFIC FORESTRY SECTOR OUTLOOK STUDY
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Japan - In-Depth Country Study

by

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TABLE OF CONTENTS

INFORMATION NOTE ON ASIA-PACIFIC FORESTRY SECTOR OUTLOOK STUDY.....	i
1. OVERVIEW OF SOCIAL ECONOMY OF THE COUNTRY	1
1.1 Location.....	1
1.2 Climate.....	1
1.3 Population.....	1
1.4 Land use.....	1
1.5 Industries.....	1
1.6 The Economy.....	2
1.7 Energy supply.....	2
2. THE ROLE OF FOREST AND FORESTRY	2
2.1 State of Forestry in Japan.....	2
2.2 Rise in Expectations Toward Forest Functions for Public Benefit.....	3
3. CONTRIBUTION OF JAPAN TO SUSTAINABLE FOREST MANAGEMENT.....	4
4. FOREST RESOURCES.....	5
4.1 Present status of forest resources	5
4.2 Forest damage	6
4.2.1 Forest diseases and harmful insects.....	6
4.2.2 Fire and weather disasters	6
5. PRESENT STATUS OF PARKS, PROTECTED FORESTS AND WILDLIFE SANCTUARIES.....	7
5.1 Protection forests	7
5.2 Protected forests	8
5.3 Nature conservation areas	8
5.4 Natural parks	9
5.5 Wildlife protection areas.....	10
6. SUPPLY AND DEMAND OF WOOD AND WOOD INDUSTRY.....	10
6.1 Trend of wood supply and demand	10
6.2 Trend of wood industry.....	11
6.3 Present status of wood supply and demand.....	12
6.3.1 Demand for wood.....	12
6.3.2 Supply of wood.....	13
7. PRESENT STATUS OF NON-WOOD FOREST PRODUCTS	14
8. PRESENT STATUS OF PROMOTING MULTIPLE USE OF FORESTS	14
8.1 Private forest.....	15
8.1.1 Promotion of utilization and forest improvement corresponding with multiple use.....	15
8.1.2 Instructor training of and information provision for promoting multiple use of forests.....	15
8.2 National Forest.....	16

9. POLICY AND INSTITUTIONS	16
9.1 Forest Planning System	16
9.2 Forest-land Development Permission System.....	19
9.3 Forest Owners' Association System	19
9.3.1 Mandatory operations	19
9.3.2 Optional operations.....	20
10. BASIC PLAN ON FOREST RESOURCES.....	20
10.1 Basic Concepts on Improving Forest Resources	20
10.1.1 Improvement of forest resources toward qualitative substantiality	20
10.1.2 Improvement of forest resources corresponding to multiple use.....	21
10.2 Targets for Improvement of Forest Resources.....	22
10.2.1 Targets for Improvement of Forest Functions.....	22
10.2.2 Targets for Improvement of Forest Resources	23
10.3 Measures to Reach the Targets.....	24
10.3.1 Guidelines for Promoting Forest Improvement.....	25
10.3.2 Forest Management.....	27
10.3.3 Improvement of Forests Widely Accessible to the Public.....	27
10.3.4 Construction of Forest Roads, etc.	28
10.4 Issues Relevant to Attaining These Targets.....	29
10.4.1 Promotion of Quality Improvement of Forests.....	29
10.4.2 Promotion of Multiple Use of Forests.....	29
10.4.3 Securing Self-reliance of Forestry Management	30
10.4.4 Securing Forestry Labour Force.....	30
10.4.5 Establishment of Stable Timber Supply System and Enhancement of Its Utilization	30
10.4.6 Promotion of Development for Rural Communities.....	31
10.4.7 Improvement of Forest-related Data	32
10.4.8 Promotion of Research and Development, Extension and Education	32
10.4.9 Promotion of International Forestry and Forestry Cooperation	32
11 LONG RANGE DEMAND AND SUPPLY PROJECTION FOR IMPORTANT FOREST PRODUCTS	33
11.1 The Demand and Supply Projection for Important Forest Products.....	33
11.1.1 Projection Methods	33
11.1.2 Basic Direction of Demand and Supply of Forest Products.....	33
11.2 Issues Concerning Demand and Supply of Forest Products in the Future	36
11.2.1 Measures for Securing Sustainability.....	36
11.2.2 Intensification of Forest Management Foundation and Securing Stable Timber Supply System.....	37
11.2.3 Enhancement of Timber Utilization.....	37
11.2.4 Promotion of Effective Timber Utilization	37
11.2.5 Measures for Appropriate Timber Trade	38

INFORMATION NOTE ON ASIA-PACIFIC FORESTRY SECTOR OUTLOOK STUDY

At its sixteenth session held in Yangon, Myanmar, in January 1996, the Asia-Pacific Forestry Commission, which has membership open to all governments in the Asia-Pacific region, decided to carry out an outlook study for forestry with horizon year 2010. The study is being coordinated by FAO through its regional office in Bangkok and its Headquarters in Rome, but is being implemented in close partnership with governments, many of which have nominated national focal points.

The scope of the study is to look at the main external and sectoral developments in policies, programmes and institutions that will affect the forestry sector and to assess from this the likely direction of its evolution and to present its likely situation in 2010. The study involves assessment of current status but also of trends from the past and the main forces which are shaping those trends and then builds on this to explore future prospects.

Working papers have been contributed or commissioned on a wide range of topics. They fall under the following categories: country profiles, selected in-depth country or sub-regional studies and thematic studies. Working papers are prepared by individual authors or groups of authors on their own professional responsibility; therefore, the opinions expressed in them do not necessarily reflect the views of their employers, the governments of the Asia-Pacific Forestry Commission or of the Food and Agriculture Organization. In preparing the substantive report to be presented at the next session of the Asia-Pacific Forestry Commission early in 1998, material from these working papers will be an important element but will be blended and interpreted alongside a lot of other material.

Working papers are being produced and issued as they arrive. Some effort at uniformity of presentation is being attempted but the contents are only minimally edited for style or clarity. This particular contribution by the Government of Japan is not a working paper in the normal sense but a statement of intentions under consideration which provide an insight in possible future development.

FAO welcomes from readers any information which they feel would be useful to the study on the subject of any of the working papers or on any other subject that has importance for the Asia-Pacific forestry sector. Such material can be mailed to the contacts given below from whom further copies of these working papers, as well as more information on the Asia-Pacific Forestry Sector Study, can be obtained:

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1. OVERVIEW OF SOCIAL ECONOMY OF THE COUNTRY

1.1 Location

Japan is located at the eastern edge of Eurasia, between latitudes of 20⁰25' N to 45⁰33' N and longitudes of 122⁰55' E to 153⁰59' E. It belongs to the Circum-Pacific Orogenic Belt and many fold-mountain ranges, volcanic zones and fault lines complicate its land structure. It is an archipelago of more than three thousand islands of which the four main islands are called Hokkaido, Honshu, Shikoku and Kyushu from north to south. Japan has a land area of 377,800 square kilometres.

1.2 Climate

The climate of Japan ranges from the sub-frigid zone in Hokkaido to the sub-tropical in Okinawa islands. It is strongly affected by monsoons and there is plenty of rain between June and August due to the south-eastern monsoon. During the winter, between November and March, northern Japan becomes severely cold and along the Japan Sea, there is plenty of snow caused by north-western monsoons from the Eurasian continent.

1.3 Population

According to the census of 1995, population in Japan is 125.86 million as of October 1995, and population density is extremely high at 337 square kilometre. Population growth rate is merely 0.27 %, and total fertility rate is merely 1.42. These factors have led to ageing of the population and a falling birth-rate. The number of households has increased but the average number of family members has a downward trend and now averages 2.82.

1.4 Land use

Of Japan's 37.78 million ha of land area, 25.14 million ha is forest, which covered 66.5% of land area. Agricultural land is 13.6% at 5.13 million ha, housing land including industrial land covers 4.5% at 1.70 million ha, water bodies cover 3.5% at 1.32 million ha and roads 3.2% at 1.21 million ha while wastelands cover 0.7%.

1.5 Industries

As of 1995, the average working population was 66.66 million (53% of total population), and the unemployment rate was about 3.2%. Of the total employment, 6.1% was in primary industries, 31.4% in secondary industries and 61.9% for tertiary industries; the share of the latter has been increasing for eight years in succession. Besides forestry, the share of total employment in overall industry had decreased from 1.2% in 1950 to 0.1% in 1995 consistently.

1.6 The Economy

The Japanese economy's transition after World War II can be divided into 5 phases: the reconstruction period after the war started 1945 through 1955, followed by the high growth period until two oil crises occurred in 1973 and 1978. The low growth period started from mid 1970 and was encouraged by appreciation of the yen in the mid 1980s. The domestic-economy oriented growth period started from 1987 onward; currently the Japanese economy has stagnated since the "bubble economy" burst in 1990. The annual growth in real terms between 1992 and 1994 remained at levels of no more than 1%.

The gross domestic product (GDP) in the last four years has continued to grow, but slowly; yen 475 trillion in 1993, 479 trillion in 1994, 483 trillion in 1995 and 503 trillion in 1996 respectively. Corresponding growth rates are 0.9% in 1993, 0.8% in both 1994 and 1995, 3.0% in 1996. The GDP share for forestry production in the same years was yen 516 billion in 1993 (0.11%), 470 billion in 1994 and 437 billion in 1995 (0.09%) and growth rates in each year are -12.2% in 1993, -8.9% in 1994 and -7.0% in 1995.

As regards the international trade, in 1994 the total export value was yen 41.5 trillion (US\$ 395.6 billion) and the total imports yen 31.5 trillion (US\$ 274.7 billion), both of which show an increasing trend. The trade of wood was worth yen 943.7 billion (US\$ 9.74 billion) as imports (3.5% of total imports).

1.7 Energy supply

The energy supply as of 1995 is 5,439 trillion kcal, of which 94.0% was imported. In response to experience of the past two oil crises in the 1970s', alternative energy sources to petroleum (such as nuclear or LNG) have been developed and promoted. As the result of that, reliance on petroleum decreased from 71.9% in 1970 to 55.8% in 1995; nuclear power increased from 0.3% to 12.0% and LNG from 1.2% to 12.8%. In 1995, water power was 3.5% of total supply but firewood and charcoal were so low as to be included in the miscellaneous 1%.

2. THE ROLE OF FOREST AND FORESTRY

2.1 State of Forestry in Japan

Japan's forest resources have been improved on the basis that the diverse functions of forests should all be discharged to a high degree taking into consideration the needs of the public and natural, social and economic conditions.

As a result, more than 10 million ha of planted forest have been established and growing stock has been increasing steadily. However, most of the forest needs tending and thinning. Although growth will slow down as planted forests which are now in a stage of vigorous growth gradually reach maturity, it is anticipated that the growing stock will continue in an upward direction and

the capacity to supply timber will increase. Accordingly, predicting that there will be a global shortage in timber over the long term, it appears that the importance of a stable supply of timber will continue to increase, taking into consideration fulfilment of the public functions of the forest.

Unfortunately, the forestry and wood industries to improve and utilize Japan's forest resources, are now in a difficult situation due to declining profitability of forest due to lower prices of timber. As a result, there is lower motivation level of forest owners, such as forestry households and delays in tending and thinning. There is also a decrease in forestry labour, an ageing society, deterioration in the profitability of processing and distributing sectors, and change in timber demand structure. The stagnation in the activities of forestry production is contributing to a lower level of vitality in rural communities where the degree of economic dependency on timber-related industries is high and depopulation in such communities is advanced.

Under these circumstances, forests where appropriate management has not been carried out and forests owned by absentee landowners have been increasing. Therefore there is apprehension over whether these circumstances will interfere with not only the effective utilization of timber resources but also the role of the public functions played by the forest.

Accordingly, it is necessary to establish effective and profitable forestry management by considering changes in the timber demand structure brought on by the diversification of architectural methods and types of materials used for housing structures, through the promotion of investments, the integration of forestry operations via contracts and the reduction of labour and other costs for production. It is also necessary to adapt implementation of various types of management to their objectives and to each forest's natural and social characteristics.

In addition to such measures, in order to support the steady improvement of forest resources when there is stagnation of activities in forestry production, it is necessary to promote forest resources improvement by the cooperation of between upper and lower stream people, and to strengthen measures to promote public participation in forest resources improvement schemes and involvement of public organizations.

2.2 Rise in Expectations Toward Forest Functions for Public Benefit

Since time immemorial, it was recognized that due to Japan's steep topography and high precipitation, the decrease or devastation of forests increases the frequency of disasters such as erosion and floods. Forests also play an important role in the supply of irrigation water for rice paddies, nutrient, and in increase of fish production. Consequently, in some specified forests felling has been prohibited. Moreover, forests for headwater conservation have been created by planting seedlings in the upper reaches of watersheds in the mountains. Improvement of forest planning and protection systems have been playing a great role, which is enabling the country to meet a rise in the demand for protecting and tending forests from disorderly utilization, which could pose a public threat.

Furthermore, due to recent natural disasters and water shortages, public expectations on the role of forests, which aid in the prevention of disasters, and provide a stable supply of good

quality water, have been increasing. Accordingly, it is necessary to improve forests in order to prevent disasters in mountains such as land slides, erosion or avalanches. At the same time, it is necessary to improve forests in order to promote headwater conservation for the alleviation of water shortages and floods by stabilizing stream flow. In such cases, by taking into consideration the great effect that has on lower stream areas, it is important to promote further improvement based on river basins.

Recent changes in lifestyle stress mental, spiritual and cultural values rather than material well being. As a result, expectations toward contact with forests and conservation of biological diversity have been increasing. In keeping with this, the importance of roles discharged by forests including those in the suburbs of cities on the aspects of health, culture and education have been increasing. Furthermore, in line with the progress of urbanization, demands for the environmental functions of the forest, such as air purification and prevention of noise, have been increasing.

Consequently, regardless of whether forests they are planted or natural, whether they are forests where felling, planting and weeding are done, forests where the ecology of wildlife can be observed, where the beauty of the four-seasons can be enjoyed, where the environment can be preserved by preventing the effects of noise and wind, or where it is possible to carry out activities for promoting health by utilizing biologically active substances, it is important to secure diverse forests suitable for the various needs and improve these forests in an appropriate manner.

The above-mentioned benefits from the various functions of forests are accorded great importance by and have a wide influence on the public, irrespective of region either rural or urban. Accordingly, it is important to secure these functions in an appropriate manner and with public consensus.

3. CONTRIBUTION OF JAPAN TO SUSTAINABLE FOREST MANAGEMENT

Ever since the criteria and indicators for establishing a standard for sustainable forest management have been actively discussed internationally since UNCED, Japan has been participating. Japan has been an active and positive partner in the Montreal Process. Based on such activities, Japan has been considering what forest management should be like for putting into effect sustainable forest management (SFM); it has been and implementing various studies to develop and evaluate methods for measurement of each indicator domestically.

Furthermore, to support the discussion at Intergovernmental Panel on Forests (IPF), The International Workshop on Integrated Application of Sustainable Forest Management Practices was organized in cooperation with Canada, Malaysia and others at Kouchi prefecture, Japan in 1996. Regarding the Intergovernmental Forum on Forests (IFF), Japan will also participate positively in the discussions and the consensus building on promoting methods for implementing of recommended action of IPF, international mechanism such as Forest Convention and so on.

Besides, as one of the countries that have superior technology in forestry sector in terms of reforestation, forest management and so on, Japan has promoted technical cooperation,

development survey, development cooperation, etc. It started with an afforestation project in Philippines in 1976 and has since involved various international forest/forestry cooperation projects in various places of the world including Asia, Africa, Latin America. Technical cooperation and activities under grant aid have been implemented by the Japan International Cooperation Agency (JICA) while loans are have been provided through the Overseas Economic Cooperation Fund (OECF).

Among these schemes, a major activity is a project type technical cooperation that is implemented in the form of work plan comprising dispatch of experts, reception of trainees and provision of equipment. As of January 1997, Japan was carrying out 25 projects in 16 countries including 2 on-site verification surveys. Project type technical cooperation extends to cover a wide area encompassing afforestation and protection, social forestry, natural forests management, forest products research, erosion control, tree breeding, etc. In recent years, the focus of cooperation has tended to be on the support for training/extension for the promotion of social forestry, management of natural forests, etc. in addition to technical cooperation on afforestation.

4. FOREST RESOURCES

4.1 Present status of forest resources

There are various vegetation types in Japan due to latitudinal differences ranging from sub-tropical forests, warm temperate forests, cool temperate forests to sub-frigid forests respectively due to variety of climatic conditions.

Fig trees (*Ficus microcarpa*, *Ficus superba*), and Fan Palm (*Livistona chinensis*) are distributed in sub-tropic forests located south of Tokara Islands. Warm temperate forests are located from the western pacific coast to Kyushu island, which is dominated by *Heaceae* family, *Persea thunbergii*, *Castanopsis cuspidata* and some kind of Evergreen Oaks (*Quercus gilva*, *Quercus myrsinaefolia* etc.). Cool temperate forests are located from the middle to north-east and dominated by Beech (*Fugus crenata*), Chestnut (*Aesculus turbinata*), Katsura tree (*Cercidiphyllum jaopnicum*), Deciduous Oaks (*Quercus mongolica*, etc.), Larch (*Larix leptolepis*), Firs (*Abies firma*, *Abies homolepis*), Hemlock (*Tsuga sieboldii*), Cedar (*Cryptomeria japonica*), Cypress (*Chamaecyparis obtusa*), Hiba (*Thujopsis dolabrata*), etc. Sub-frigid forests are located mainly in Hokkaido island and consist of Northern Fir (*Abies sachalinensis*) Northern Spruce (*Picea jezoensis*), Silver Fir (*Abies veitchii*), Northern Hemlock (*Tsuga diversifolia*), Birches (*Betula maximowicziana* etc.), Linden (*Tilia japonica*), Manchurian ash (*Fraxinus mandshurica*), etc. Major plantation species are Cedar, Cypress and Pine in most parts of Japan, however, Northern Fir and Northern Spruce are major species in Hokkaido.

As of the end of March 1995, total area of forests of Japan was 25,146 thousand ha (or 67% of the total land area of the country), of which artificial forests occupied 10,398 thousand ha, natural forests 13,382 thousand ha, and others 1,366 thousand ha¹. Total growing stock was

¹ The various types of forest as a share of total forest cover in 1995 were: 41% plantations/artificial, 53% natural forests and the balance other types. Of the total area, nearly 58% were privately owned.

3.5 billion m³, and it is growing annually by 70 million m³ without extraction, mainly in artificial forests established after the war.

The artificial forests are gradually reaching the age of utilization, south-western forests in particular, but 70% of the total artificial forests are younger than 35 years, which still need tending and thinning.

In terms of ownership of forests, 14,572 thousand ha are private forests, 2,730 thousand ha are public forests and 7,844 thousand ha are the national forests, of which 7,647 thousand ha of the national forests is managed by an independent special account.

4.2 Forest damage

4.2.1 Forest diseases and harmful insects

Pine forests in Japan are precious, some for tidewater control and others as landscape forest; but they are suffering great damage by pine nematode (*Bursaphelenchus japonicus*) which disturbs normal growth and the pine trees die eventually. The nematode is spread by the Japanese pine sawyer (*Monochamus alternatus*).

As a result of implementation of various protection operations (including extermination by cut and burn, spraying pesticide from the ground and from helicopters), the volume of damage by nematodes peaked in 1979 and has since declined with 920 thousand m³ of damage in 1996. However, the damage has not yet been contained completely, with total damage still high; furthermore, where damage has been suppressed down to the minimum forests may suffer further severe damage again due to weather factors or otherwise. Therefore, measures have been taken to deal in a holistic manner with any kind of forest disease and harmful insect correctly, including pine nematode as only one of many.

Meanwhile, measures have also been taken to deal with increased damage by wild animals, deer in particular.

4.2.2 Fire and weather disasters

Snow damage, wind damage and drought damage occur in Japan. Although the areas affected vary significantly by year, Table 1 shows the damaged areas in private forests in the last five years.

It is clear that with regard to forest fire, it is necessary to promote enlightening of the people.

Table 1: The damaged areas by fire and weather disasters 1991-1995 (ha)

Year	Damage (by type of weather disaster)								Fire damage
	Total	Wind	Flood	Snow	Drought	Freeze	Stormy tide	Others	

1991	78,773	70,444	292	5,886	231	335	1,585	-	2,739
1992	5,831	1,759	118	2,956	712	283	3	-	2,323
1993	17,503	12,162	914	3,275	416	702	34	-	3,260
1994	17,821	251	40	732	16,046	752	-	0	2,776
1995	5,874	1,142	389	1,757	2,234	352	-	-	2,016

Note: National forest is not included in weather disaster statistics.

5. PRESENT STATUS OF PARKS, PROTECTED FORESTS AND WILDLIFE SANCTUARIES

5.1 Protection forests

Protection forest system is regulated by the Forest Law. This system intends to achieve public objectives by maintenance and enhancement of forest functions through designation, conservation and proper management of forests as protection forests that need to perform functions for the public benefit such as headwater conservation and disaster control. As of March 1996, the total area of protection forests reached 9,125 thousand ha. Table 2 shows the areas of various protection forests.

In protection forests, logging and land exploitation are prohibited unless these activities are approved by the prefectural governor. Tree re-planting is obligatory at logged-over protection forests. In cases that violate restrictions, such as logging and land exploitation without permission or ignoring tree re-planting, the activity is stopped and remedial works including tree replanting must be carried out and those responsible must be fined.

Protection forests are promoted under the "Protection Forest Improvement Plan", and the "Fifth Protection Forest Improvement Programme" has been implemented since 1993.

Table 2: Areas of Protection Forest by types, 1996 ('000 ha)

Type of Protection Forest*	Area
Headwater conservation forest	6,203
Soil conservation forest	2,026
Erosion control forest	47
Sand movement control forest	16
Windbreak, flood control, tide damage/drought damage/snow damage prevention and mist mitigation forest	168
Avalanche/stone crumbling prevention forest	21
Firebreak forest	0.4
Fish trap forest	29
Navigation target forest	1
Public health provision forest	587
Historical and scenic site prevention forest	27

*Note: There is some duplication among the types.

In order to attain the objectives of this system, remedial works for degraded lands and forest management for watershed conservation are also implemented as public works by State and prefectural governments in the forests that require attention.

5.2 *Protected forests*

In addition to the above system of “protection forests” (applied to both national and non-national forest), there is an independent system of protected forest in national forest that preserves natural environment, that play an important role for protection of precious plants and animals and academic researches. Table 3 shows that as of April 1997, seven types of protected forests totalling 488 thousand ha have been designated and maintained for their respective purposes.

5.3 *Nature conservation areas*

Areas with original natural conditions undisturbed by human intervention and other areas where superior natural environment has been maintained have been designated as “wilderness area”, “nature conservation area”, or “prefectural nature conservation area” for conservation of natural environment. In the wilderness area, any activities that might influence the natural ecosystem are in principle prohibited, and access may be restricted if considered necessary for particular reasons.

Table 3: Areas of Protected Forest by types, 1997 (ha)

Type of protected forest	No of sites	Ha
Forest biosphere reserves	26	320,039
Forest bio-genetic resources preservation forest	7	24,423
Forest tree-genetic resources preservation forest	333	9,340
Plant community protected forest	342	90,344
Specific animal habitat protected forest	27	11,970
Specific topography protected forest	32	30,074
Hometown forest	31	2,300

Note: Forest biosphere reserve is the reserved forest that designated in national forest for conservation of precious natural ecosystem which should be preserved without any treatment in principle. Hometown forest is reserved area that designated by the request of the local government.

In the nature conservation area and the prefectural nature conservation area, only selected activities that meet certain standards may be allowed with required approval in special zone. In ordinary zone, designated activities, which may entail adverse effects on its ecosystems, should be notified.

Table 4: Nature Conservation Areas, 1997

Type of nature conservation area	No of sites	Ha
Wilderness area	5	5,631
Nature conservation area	10	21,593
Prefectural nature conservation area	517	73,452

5.4 Natural parks

Areas that are representative of superior natural scenery of Japan are designated as “national park” and the “quasi-national park”, and areas that are representative of superior natural scenery in a prefecture are designated as “prefectural natural park”. As of January 1997, there were 28 national parks with 2,047 thousand ha, 55 quasi-national parks with 1,339 ha and 304 prefectural natural parks with 1,949 ha.

Each park has a park plan comprising a conservation and a utilization aspect: the conservation plan comprises a conservation programme that divides the area into “special protection zone”, “class I, II and III special zone” and “ordinary zone” according to the characteristics of scenery and views, necessity of environmental conservation in terms of utilization of the park, and a conservation facilities programme concerning the facilities necessary to secure protection of scenery and safety of utilization.

The utilization plan comprises a utilization regulation programme that restricts or prohibits certain activities in order to secure appropriate use of the park, and a utilization facilities programme for systematic improvement of facilities for the utilization of Natural Park.

5.5 Wildlife protection areas

There are more than 600 species of wildlife in Japan. Hunting and capturing are strictly regulated and thus birds and mammals that can be hunted are only 29 species and 18 species respectively. Hunting is subject to a license and open seasons and places are restricted.

There are 3,709 wildlife protection areas throughout the country for protection and propagation of wildlife with a total 3,441 thousand ha, of which 616 areas with a total 256 thousand ha are designated as “wildlife special protection areas”. In the wildlife protection areas, capturing of wildlife is prohibited and in the special protection areas, even such activities like installation of any construction or cutting of trees is subject to approval.

6. SUPPLY AND DEMAND OF WOOD AND WOOD INDUSTRY

6.1 Trend of wood supply and demand

The total wood demand (in the form of logs), which has continuously increased ever since the end of the second world war, peaked in 1973 at 120 million m³, followed by a declining trend thereafter. Demand stayed at a level of less than 95 million m³ during 1981-1986 but in 1987, wood demand turned upwards again due to rapid increase the number of houses newly built by the domestic economy stimulation measures and increase in demand for paper through careless use of paper by the development of office automation. In 1987, the demand reached the level of over 100 million m³ for the first time in 7 years, and in 1989 demand reached a second record in history at 113.85 million m³. Although the demand thereafter slightly declined due to recession of economy, recovery in paper and paperboard demand pushed it back again to 111.93 million m³ in 1995.

On the supply side, domestic wood recorded over 50 million m³ during 1961-1967. Since then, imported wood increased its share steadily because it has advantages in terms of price, quantity of resources and distribution systems. Domestic wood supply eventually decreased to 22.92 million m³, which is only one fifth of the total wood supply in 1995 due to limitation of domestic forest resources and decrease in supply capacity caused by delay in the development of infrastructure of wood production. Since 1986, domestic wood continuously decreased due to lowering of supply capacity and imported wood increased steadily from year to year due to further yen appreciation. In particular, the shift from domestic broad-leaved tree chips to imported chips since the early 1990s' accelerated this declining trend.

The imported wood share rose from more than 50% of total supply in 1969 to approximately 70% in 1979. Since 1981 imported wood supply decreased due to stagnation of wood demand but resumed an increasing trend in 1986 again when yen appreciation advanced. During this period the ratio of imported wood in total wood supply stayed roughly at two thirds.

In 1992, Japan became the biggest log importing country in the world with approximately 40% of logs in international trade.

6.2 *Trend of wood industry*

The number of sawmills in Japan had been declining since 1974, and it became 14,565 in 1995. However, since 1986, large scale sawmills with processing capacity of 300 kW² or over increased in number (though slightly), indicating a shift of production to large-scale producers. Factory output of wood products also showed a declining trend whereby in 1995 saw a 45% decrease at 25 million m³ compared to the peak of 45 million m³ of 1973. Although factory input of domestic logs has been declining because domestic wood speciality sawmills were traditionally small scaled, the recent upward trend of large-scale domestic wood speciality sawmills helped the factory input to stabilize since 1990. On the other hand, at imported-wood speciality sawmills, arrival of logs has been decreasing since 1990 due to increase in imports of already processed wood and roundwood restrictions or shortage of the resources in the producing countries. As the trend of importing processed products is expected to advance further in the future, it is important for domestic industries to achieve reduction in processing costs and high value added as well as promotion of supply of products that meet the needs of users such as dried products, etc.

Plywood industry is the second most important wood industry after sawmilling, but has been suffering from a structural recession since the first oil crisis. Particularly since 1985, the change of resources situation and restrictions of log export in the tropical countries in Southeast Asia coupled with their policy to promote processed products export with an aim to industrialize have greatly reduced Japan's plywood industry. Indonesia, now the largest exporter of plywood in the world, has 40% of the ordinary plywood market of Japan. On top of that, since January 1995, GATT Uruguay Round reductions of tariffs on wood products have started in stages following five year intervals, which make it urgently necessary for the plywood industry to reorganize, improve production systems, and match it to the supply of raw materials, reduce processing cost further, and promote high value added products, etc.

As regards the wood chips industry, as a result of positive promotion of import of chips by paper and pulp industry, dependence on imported chips intensified greatly; the industry faced great difficulty in securing domestic materials due to decrease in domestic resources and rise in cost. That situation has made the competition between domestic chips and imported chips ever more severe. In recent years particularly, imported chips increased even more because of yen appreciation, driving the wood chip industry into a tougher situation by pressing the price down. Number of domestic chip factories in 1995 was 3,535 or down to 46% of the peak year of 1974.

Paper and pulp industry has substantial production, with 29,663 thousand tons of paper and paperboard production in 1995 or 11% of the world's production. This was the second largest production only next to the USA, and Japan was fourth in the world in pulp production with 6% of output. Domestic paper supply can meet paper demand approximately, but supply of approximately 20 % of pulp and 60% of pulpwood must be imported, thus making the steady procurement of raw materials a crucial issue for the industry.

² In Japan, the capacity of sawmills is traditionally reported in kilowatts; 300KW is equivalent to about 10,000 cubic metres or more annual input of logs.

As regards laminated timber industry, both number of factories and volume of production are on an increasing trend recently. In 1995, there were 293 factories and 582 thousand m³ of production. However, as the majority of enterprises are small-scaled, modernization of management remains a future issue.

Production of LVL (Laminated Veneer Lumber) is growing steadily in general, though production per factory in 1995 was down slightly. Number of factories in 1995 was 14, and 1 domestic LVL reprocessing factory and 1 imported LVL processing factory. Production of 1995 was 120 thousand m³.

Particleboard industry is experiencing in general smooth growth in production since it started mass production in early 1950's, and its production reached 1,252 thousand m³ in 1995. There are 15 companies with 16 factories, and many are also engaged in plywood or paper/pulp business at the same time.

Fibreboard industry is also growing generally smoothly like particleboard industry, having nine factories with production of 1,079 thousand m³ in 1995. Production of hard fibreboard is on a downtrend in recent years, and production of medium density fibreboard and low density fibreboard are on the rise. Production technology has attained stability but further reduction of absolute cost remains as an important issue.

6.3 Present status of wood supply and demand

Demand for wood (excluding pulp/paper) in 1995 is 50.38 million m³ in terms of wood for sawntimber due to the number of houses newly built, which has the biggest influence to demand for sawntimber is 1.47 million houses and 14.31 million m³ in terms of wood for plywood. Demand of wood for pulp and chips is 44.93 million m³.

Supply of domestic wood declined by 6.4% to 22.92 million m³ compared with the previous year, whereas those of imported wood increased by 4.7% to 89.02 million m³.

6.3.1 Demand for wood

6.3.1.1 Demand for sawlogs

Sawlog input into factories was 36.67 million m³ in 1995 of which domestic wood was 16.25 million m³ (44%) and imported wood 20.42 million m³. Of the imported wood, 4 million m³ (about 20%) of imports was from Russian federation (so called North-Sea Wood in Japan), 1.37 million m³ (nearly 7%) from New Zealand, 13.38 million m³ (nearly 66%) are from USA and Canada (so called North American Wood, which regularly occupied approximately 70% of imported wood) and 1.25 million m³ (6%) from Tropical Asian countries (so called South-Sea Wood).

The breakdown of factory output of sawntimber by end-uses shows that the 1995 volume was 24.77 million m³ of which 80% was for construction, 9% for packing box/pallet, 3% for furniture, etc.

6.3.1.2 Demand for wood for plywood

Production of ordinary plywood in Japan was 442 thousand m³ in 1995 due to increase of imported plywood and production decline because of a slump in the market. Factory input of wood for veneer was 7.32 million m³, of which 230 thousand m³ was domestic and 7.09 million m³ foreign.

Recently, increase of coniferous wood as material for plywood is remarkable, including North-sea Larch and Radiata Pine of New Zealand, which reached approximately 20% in 1995.

6.3.1.3 Demand for pulpwood

According to the “Yearbook of paper and pulp statistics” issued by Ministry International Trade and Industry, demand for pulpwood (logs and chips) in 1995 was 37.20 million m³ with 29,659 thousand tones of production of paper and paperboard.

On the other hand, paper and pulp industry has already been promoting paper recycling from the point of view of effective use of resources and reduction of cost and the recycling ratio has reached an exceedingly high level by international standards. Ratio of recycling in 1995 was 53.4%, however, in the industry, “56% recycle of used paper in the year 2000” has been set as a target.

In recent years, with enhancement of environmental concern in the society on a global scale, hence, paper recycling is expected to be improved further for effective use of forest resources and solution of waste management.

6.3.2 Supply of wood

The breakdown of supply of wood for sawing shows the North American wood leading at 37.9%, followed by domestic wood with 20.5%, South-Sea wood with 14.3% and others.

6.3.2.1 Supply of domestic wood

Supply of domestic wood in 1995 was 22.92 million m³ (excluding bed-logs for shiitake mushroom cultivation and fuelwood). Of this, logs are 22.90 million m³. The breakdown by uses of this supply of logs shows that sawlogs are 16.25 million m³, pulp/chiplogs are 5.97 million m³, plywood logs are 230 thousand m³, and others are 450 thousand m³ respectively.

By major species of domestic trees, Japanese cedar supplied 9 million m³, Japanese cypress supplied 2.9 million m³ and broad-leaved trees supplied 4.8 million m³.

6.3.2.2 Supply of imported wood

With respect to the supply of imported wood in 1995, total supply of imported wood is 89.02 million m³, of which, logs were 25.87 million m³ (29%), sawntimber is 15.98 million m³ (18%), veneer and plywood 6.99 million m³ (nearly 8%) chips 26.41 million m³ (nearly 30%) pulp 11.99 million m³ (about 13%) and others 1.77 million m³ (some 2%).

7. PRESENT STATUS OF NON-WOOD FOREST PRODUCTS³

Non-timber forest products cover a large number of products including various kinds of mushrooms such as “shiitake mushroom (black mushroom)”, “enoki mushroom”, “hiratake mushroom (abalone mushroom)”, raw materials for traditional handicrafts such as bamboo, Paulownia timber, Japanese wax, wood fuel such as charcoal, various nuts, edible wild plants, etc. Production of these non-wood forest products is important from viewpoint of promoting compound forestry management as well as is becoming an important industry that earns cash for mountain region where depopulation and ageing of society being developed. Production of non-timber forest products in 1995 was yen 341.1 billion.

Based on healthy and nature oriented trends among consumers, the annual consumption of mushroom per capita is going up. This circumstance indicates that it is important to promote improvement of production, processing and distribution system corresponding with actual condition of each producing district. It is also necessary to deal with planning and developing commercial products as regional special commodities, and to attempt to expand demand for such products through diffusion and enlightenment on advantages of mushrooms as health foods.

8. PRESENT STATUS OF PROMOTING MULTIPLE USE OF FORESTS

Regarding multiple use of forests, the “Basic Plan on Forest Resources” makes the following clear statement: “forest resources should be developed so that nearby forest space can be utilized in various ways as a place for providing easily accessible forest, a place for forest bathing, a place for healthy activities, a place for cultivating spiritual affluence, a place where volunteers can participate in forestry activities and a place for urban and rural exchange.” The present situation in promoting multiple use of forests is as follows.

³ Although the term used is “non-wood” forest products, the category includes fuelwood, charcoal and even *Paulownia* wood. This is historically the categorisation in Japan.

8.1 *Private forest*

8.1.1 Promotion of utilization and forest improvement corresponding with multiple use

Given the global prominence of environmental issues, it is essential for the forestry sector to have people understand sufficiently that it is important to maintain and use forest resources effectively for attaining sustainable forest management. In order to understand sufficiently forest ecosystems and the way of their management, Japan uses actual practice through both action programmes and manuals by fully experienced instructors. Projects are being implemented for corresponding with people's needs with each project having a software programme (which provides programme development and necessary manuals, training for instructor, diffusion and education) and at the same time, a hardware programme that provides improvement of forests and facilities. The projects underway include:

- Project for promoting urban and rural exchange through activities in forests;
- Project for establishing places in order to maintain and strengthen a public health through utilization of forests;
- Project for establishing places which can participate directly to forestry activities for urban people such as volunteer groups.

Besides, in order to stimulate better public awareness of coexistence between forests and human beings as well as promoting better forest management, there are projects which involve people in forest management from the planning phase and aim to use forests as a place for practical learning on forest environment.

8.1.2 Instructor training of and information provision for promoting multiple use of forests

Training for instructors and provision of various information suitable for activities of instructors are available in order to promote multiple use of forests.

- Training for instructors

Qualification and certification examinations for Forest Instructors (the person who can guide and instruct outdoor activities in forests as well as provide proper information to people who use forests) are administered by Japan Forest Recreation Association authorized by the Minister of Agriculture, Forestry and Fisheries. Additionally, the projects for human resource development for instruction of forest use and planning events suitable for multiple use of forests are also being implemented.

- Provide information

Various information is now available through internet on forests available for multiple use and information on various events in forests is provided by The Federation of Forest Owner's Cooperative Associations subsidized by Forestry Agency.

8.2 National Forest

National forest is managed for performing functions for public benefit, for planned and sustainable production of forest products and for contribution to regional development of mountain regions; these are the main objectives of its management.

In national forest management, the following are among various services including establishment of forests for recreation or designating of forest as a Forest for Rest (this has been under implementation since around 1970 to provide a place for relaxing for people):

- Service which selects forest areas with a excellent scenery or suitable for field athletics and makes them available as places for recreation, at the same time implementing improvement of forests and facilities such as promenades and sign boards.
- Service for provision of places that provides opportunities for families to stay or spend their leisure time in such widely accessible forests.
- Service which implements forest improvement and total area improvement such as places for field athletics, recreation, etc. with private sector.
- Service which develops bases for outdoor educational facilities such as outdoor school, forest for actual experience, etc. with private sector.
- Service for instruction of outdoor activities and provision of information on forest and forestry in various national forest by staff who grasp situations of forests including front-line rangers working on their management.
- Service for provision of information on forest and forestry or various events implemented in national forest through internet and various publications.

9. POLICY AND INSTITUTIONS

9.1 Forest Planning System

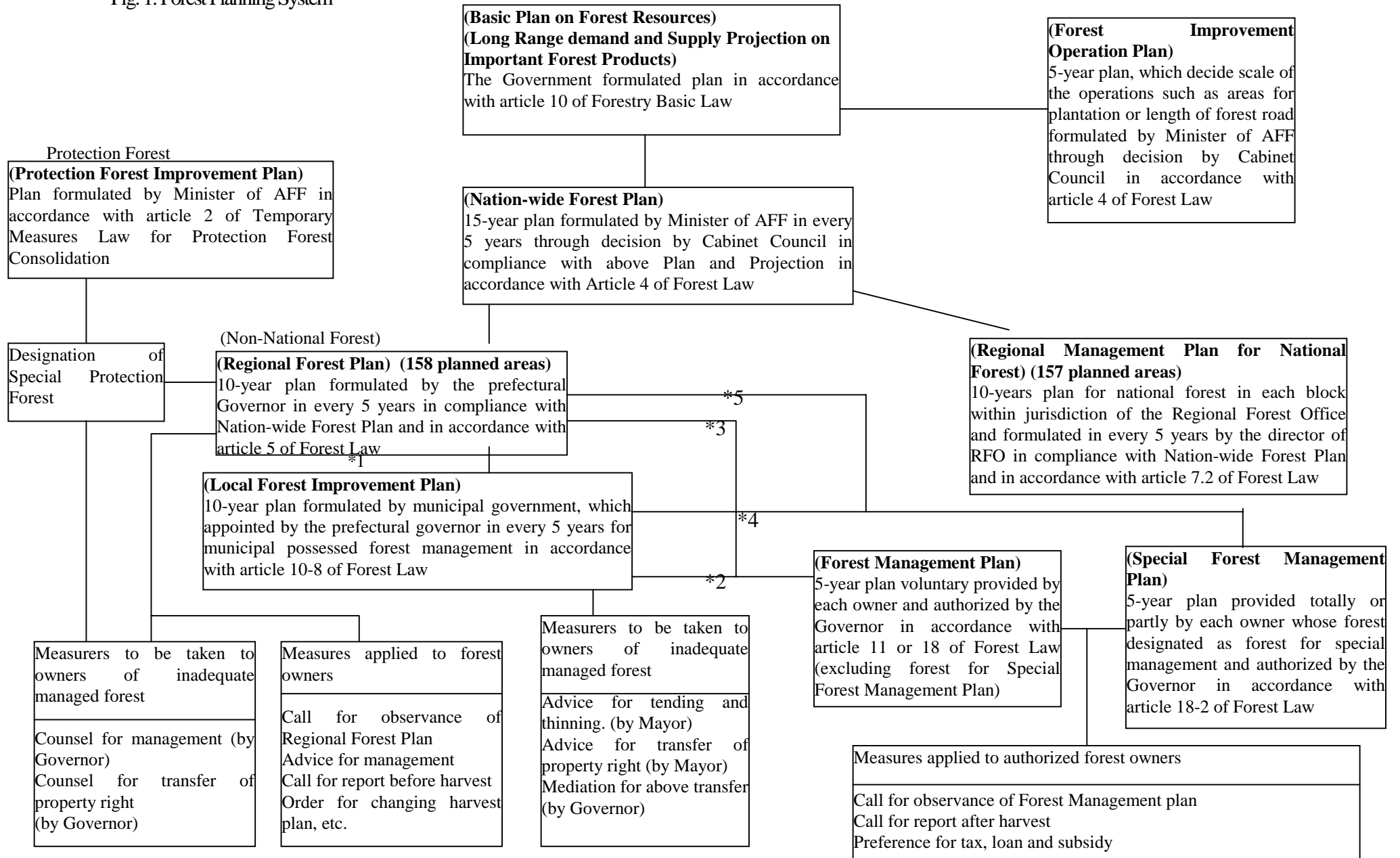
Forest planning system is intended to ensure stable demand and supply of forest products and advanced performance of forest functions for public benefit taking into account the long growth period of forest and through promotion of sustainable forest cultivation and forest productivity enhancement. It makes policy implementation effective by showing the basic direction of government policy on forest and forestry, and at the same time provides direction for forest management to forest owners.

In order to promote various improvement of the forests, forest planning units are instituted in both national and non-national forests based on river basin as a basic unit for management.

The planning system promotes collaborative improvement through planning at the same time for the same period and covering similar contents in both national and non-national forest plans. The following are the major forest plans in Japan:

- **Basic Plan on Forest Resources and Long Range demand and Supply Projection on Important Forest Products** - The Plan which is formulated by the government in accordance with Forestry Basic Law.
- **Nation-wide Forest Plan** - The 15-year plan which is produced every five years in accordance with Forest Law. It is formulated by the Minister of Agriculture, Forestry and Fisheries through decision by Cabinet Council in compliance with the “Basic plan and projection”.
- **Regional Forest Plan** - The 10-year plan drawn up every five years in accordance with Forest Law. It is formulated by prefectural governors for non-national forests and by director of regional forest office for national forest in compliance with the Nation-wide Forest Plan.
- **Forest Management Plan** - The five-year plan which is voluntarily prepared by each forest owner for their forests and authorized by the prefectural governor in compliance with the Regional Forest Plan.
- **Local Forest Improvement Plan** - The 10-year plan which is prepared every five years in accordance with Forest Law. It is formulated by municipal government appointed by the prefectural governor, about municipal forest management.

Fig. 1: Forest Planning System



Note:

*1; Local Forest Improvement Plan should conform to Regional Forest Plan (Article 10-8, clause 4)

*2; It must be ensured that Forest Management Plan is in compliance with Local Forest Improvement Plan (Article 11 clause 5 number 3)

*3; It must be ensured that Forest Management Plan is in compliance with Regional Forest Plan (Article 11 clause 5 number 2)

*4; It must be ensured that Special Forest Management Plan is in compliance with Local Forest Improvement Plan (Article 18-2 clause 3 number 5)

*5; It must be ensured that Special Forest Management Plan is in compliance with Regional Forest Plan (Article 18-2 clause 3 number 4)

9.2 *Forest-land Development Permission System*

The Forest-land Development Permission System is designed to ensure that forest-land development activities do not lead to negative implications for various forest functions which have significant roles for local communities as well the life of the nation.

This system applies to non-national forests and forests other than protection forests. Under it, any development activity which exceeds one hectare and may change the features of land such as collection of rocks or tree roots, cultivation and so on requires the prefectural Governor's permission. In reviewing an application for permission, the Governor needs to assure himself/herself that the proposed development activities will not lead to or increase risk of:

- Disasters such as soil erosion or landslide in surrounding areas.
- Floods in downstream areas.
- Severe problems of water supply.
- Other severe environmental damage in surrounding areas.

9.3 *Forest Owners' Association System*

Forest Owners' Cooperative Associations, Production Forest Owners' Cooperative Associations and the Federation of Forest Owners' Cooperative Associations are collective organizations of forest owners that have been established by forest owners according to the cooperative principles based on the Forest Owners' Cooperative Association Law (1978 Law #36) with the aim of improving and fostering forests and increasing the productivity of forests, thereby contributing to the development of the national economy. The activities of these associations for their members are as follows:

9.3.1 *Mandatory operations*

- Guidance on forest management for members
- Acceptance of consignment of work such as logging, planting and weeding from the members
- Acceptance of trust with the objective of member's forest management
- Protection activities such as control of forest blights and prevention of forest fires

9.3.2 Optional operations

- Lending of funds and providing of materials that are necessary for forestry and forest-related industries or for other living expenses
- Shipment, processing, storage and selling of commodities including forest products produced by members
- Building of forest roads and facilities that can be utilized collectively by the members such as collective sales shops and lumber factories.
- Provision of Forest Management Plan for the forests owned by the members.

There are 1,455 associations as of 31 March 1995, and have total 1,718 thousand members. The area of forest held by the members is approximately 10 million ha, which represents 73% of non-national forest (other than prefectural forests).

10. BASIC PLAN ON FOREST RESOURCES

10.1 Basic Concepts on Improving Forest Resources

10.1.1 Improvement of forest resources toward qualitative substantiality

The creation of planted forests was once promoted for the purpose of restoring forest land devastated from over felling during and after the World War and from disasters, and to encourage a response to the increase in timber demand as a result of economic growth. Today, the establishment of planted forests has almost attained the goal, with some of these forests having reached maturity and being harvested. Moreover, to respond to rising public expectations toward the role performed by forests, from the viewpoint of recognizing forests as an ecosystem, it is necessary to promote the improvement of diverse forest resources.

Accordingly, it can be said that the improvement of Japan's forest resources has shifted from a stage of the establishment to a stage of quality improvement, including managing forests into good and reusable condition.

Under such circumstances, it is important to promote forest improvement from the following viewpoints:

- a) forests expected to achieve high productivity: should be vigorously improved but remain in harmony with the performance of public functions. Appropriate tending and thinning should be implemented taking into consideration the importance of effective utilization and reutilization of timber resources;
- b) forests which place a high premium on functions for public benefit or forests where various timber production is possible: these should be developed into a multi-storied condition with rich diversification by appropriately combining human intervention and natural functions, such as the utilization of natural functions within planted forests;
- c) forests where the function of the public benefit or production (such as timber) can be secured by promoting the utilization of primarily natural functions: should be

appropriately preserved and controlled by such as improving scenic attractions if necessary.

Accordingly, when improving forest resources in the future, instead of the conventional classification and management concepts based on whether the forest is planted or not, forests should be classified by the degree of human intervention for tending and forest stratification, such as single or multi-storied forests, namely:

- a) single-storied forests, forests tended and controlled in a positive manner as forests in a single-storied condition;
- b) multi-storied forests, forests tended and controlled in a positive manner as forests in a multi-storied condition;
- c) natural forests, forests appropriately preserved and controlled by making the most of mainly natural functions.

Consequently, the improvement of forest resources in order to promote better quality will be developed.

Furthermore, in order to promote appropriate forest improvement in accordance with the functions and characteristics of each, it is necessary to clearly demonstrate the direction of improvement in a simple manner, and with the understanding and participation of the public.

10.1.2 Improvement of forest resources corresponding to multiple use

In keeping with the increase in leisure time, the progress of ageing and introduction of the five-day school system, the needs of the public toward the utilization of forests for health, culture and educational purposes will become more diversified and advanced.

Therefore, forest resources should be developed so that nearby forest space can be utilized in various ways as a place for providing easily accessible forest, a place for forest bathing, a place for healthy activities, a place for cultivating spiritual affluence, a place where volunteers can participate in forestry activities, and a place for urban and rural exchange.

In such a case, since it is important to secure forests where constant utilization is possible and with wide public access, the improvement of forests, including establishment in forests of facilities, is to be promoted in harmony with neighbouring scenery, while forest roads and other facilities that promote forest utilization are being arranged over certain extensive areas.

On the other hand, in mountainous regions vitality has been dropping due to depopulation and ageing, so that there are some cases that have difficulties in maintaining and controlling forests in a sound manner. Therefore, it is necessary to introduce the vitality of urban cities to rural communities so that appropriate improvement of forests through their multiple use can be promoted taking into account the various needs of urban and rural people.

With such multiple use it is important to stimulate better public awareness of the importance of coexistence between nature and human beings, and better understanding that wood as a forest product is a resource which can be used sustainably because the forestry is based on the productivity of the forest ecosystem.

10.2 Targets for Improvement of Forest Resources

Every forest contributes to the lives of the public through its diverse functions. In this sense, it is necessary to carry out improvement so that all types of forests can play the functions demanded of them to the highest degree.

Accordingly, targets for improvement of desirable forest functions from the natural, social and economic viewpoint and targets for improvement of forest resources through forest management which is the foundation for performing forest functions are established as set out below.

10.2.1 Targets for Improvement of Forest Functions

Of the diverse functions of the forest, with respect to each function such as timber production, water conservation, disaster prevention in mountainous regions, conservation of our living environment and provision of space for activities on health and culture, the desirable aspects of forest resources and calculated results based on various factors such as the natural, social and economic conditions of forest areas subject to the improvement of each function, are shown in Table 5.

It should be noted that in addition to performing the functions mentioned above, all the forests also contribute to securing biodiversity as habitat for various fauna and flora, and play an important role of carbon dioxide sequestration.

Table 5: Targets for improvement of forest functions (Unit: 10,000 ha)

Function	Desirable aspects of forest resources from the viewpoint of performing those functions	Areas subject to improvement
Timber production	Forests with soil suitable for the propagation of trees, with appropriate density, a large portion of growth consisting of timber with good quality, and forestry infrastructure such as forest roads, etc. are being appropriately improved.	1,490
Water conservation	Forest with a well-developed crumpled structure, porous soil, a well-developed root system, a high crown density, such as multi-storied and vigorous growth, and necessary forest conservation facilities, such as those for promoting infiltration.	1,467
Disaster prevention in mountainous regions	Forest with a deep and well-developed root system, where littered leaves are always supplied, where undergrowth vegetation is well developed due to an abundant supply of sunlight, and necessary forest conservation facilities, such as those for preventing erosion and landslides,	589
Conservation of our living environment	Forests with a high interception capacity, where tree height is high, lower branches are grown closely together to provide good shelter, trees have a high resistance to various damage, high absorption capacity and resistance against pollutants is exhibited, consisting of tree species with rich foliage.	432
Cultural and recreational activities	Forests consisting of various tree species are arranged at appropriate intervals. Forests create a prime natural beauty in harmony with lakes, valleys and so on. Forests consisting of various tree species provide a change in shade and colour. Forests create a natural spectacle as historical sites by incorporating historic and scenic locations. Forests with stable appearance of forest type mainly for local tree species. At the same time, forests with facilities suitable for recreational, cultural and educational activities are being improved. And forests with primeval natural environments with habitats for academically valuable fauna and flora.	582 (158)

(Notes)

1. Areas subject to improvement include forest areas needed especially for the displaying highly of each function by relatively evaluating and calculating the degree of its function based on certain evaluating factors from the social demands on a forest of which the degree is high.
2. Of areas subject to the improvement of health and cultural functions, numerical figures in parentheses show important forest areas from the viewpoint of maintenance and provision of habitat and creating a wildlife environment, and inclusive.
3. The total number of areas subject to improvement of each function overlap, and thus do not coincide with the total forest area shown in Table 6.

10.2.2 Targets for Improvement of Forest Resources

It is important that improving forest resources should be carried out in a steady manner from the long term viewpoint, taking into account the nature of forest such as the long growing period and that the harvesting time of timber is not always clear.

Consequently, if the state in which the diverse functions of the forest can be comprehensively and sufficiently fulfilled and area, growing stock and growth can be sufficiently secured and maintained by classification of managed single-storied forests, managed multi-storied forests and natural forests, which are regarded as “the directional state of forest resources”. The state

of forest resources in 2005, 2015 and 2025 is established as the “Target State of forest resources” as shown in Table 6.

Table 6: Targets for improvement of forest resources

Classification		Year 1995	Target state of forest resources			Ultimate state of forest resources
			Year 2005	Year 2015	Year 2025	
Area ('000 ha)	Managed single-storied forest	10,430	10,410	10,110	9,570	8,880
	Managed multi-storied forest	680	1,610	2,740	4,040	5,320
	Natural forest	14,090	13,200	12,370	11,610	11,020
	Total	25,200	25,220	25,220	25,220	25,220
Growing Stock	Total growing stock (1,000,000m ³)	3,483	3,970	3,970	4,440	4,630
	Growing stock per ha (m ³)	138	157	157	176	184
Growth	Total growth (1,000,000m ³ annually)	91	84	84	74	79
	Growth per ha (m ³ annually)	3.6	3.3	3.3	2.9	3.1

Notes

1. Shows the condition as of March 31 in each year based on 1995.
2. The area for the target state of forest resources is based on the targeted area of forests in 2005 by the “Third National Land Use Plan (nationwide plan)”.
3. The following management plans are implemented in order to tend to single-storied forests, multi-storied forests and natural forests.
 - a) When managing single-storied forests, a certain group of trees are clear-felled, then established and maintained forest consisting of a unitary crown layer by human intervention^{#1} (managed single-storied forest management)
 - b) When managing multi-storied forests, management by selective cutting^{#2} of trees to maintain an the forest consisting of multiple crown layers^{#3} (including forests which temporary become single-storied forests in relation to operations) (managed multi-storied forest management)
 - c) When managing natural forest, management mainly involves making the most of natural functions for the purpose of establishment and maintenance (Natural forest management). This management includes prohibition of felling for conservation of national land, natural environment and species.
 - i) “Human intervention” is general term for managing operations such as planting, assistance in regeneration (such as surface scarification for regeneration with natural species and brush cutting), bud pruning, weeding, clearing and thinning.
 - ii) “Selective cutting” refers to repeated cutting of mature trees in a forest (selective felling) in a planned manner periodically, i.e. every few years to several decades.
 - iii) “Multiple crown layers” are mapped according to variation of tree height due to the difference in age and species.

10.3 Measures to Reach the Targets

Targets for the improvement of forest functions and targets for improvement of forest resources from the long-term point of view are clarified by this plan. Therefore, in order to attain these targets, the following sections present the guidelines for promoting forest improvement to stimulate the performance of functions, forest management which forms the

foundation of improvement, the content of forest improvement in areas widely opened to the public, and the improvement of forest roads which are indispensable to all of these.

10.3.1 Guidelines for Promoting Forest Improvement

In Japan, a densely populated and mountainous nation where economic and cultural activities have been developed, there are many examples where the functions to be played exist together in one forest. Consequently, it is necessary to promote substantiality of each function by making adjustments between each function according to the natural conditions and local needs of individual forests and also by carrying out appropriate forest improvements. In such a case, to attain the targets stipulated for each function in Table 5: “Targets for Improvement of Forest Functions”, it is necessary to promote more effective improvement of forest resources by taking into consideration the structure of present forest resources, and by clarifying the guideline for the near future for forest improvement programmes in a manner easily understood.

Accordingly, by taking into consideration the similarity of management and today’s rise in expectations toward the role played by forests, “water and soil conservation”, “coexistence between forests and human beings” and “cyclic utilization of resources”⁴ are regarded as viewpoints to be stressed when demonstrating the concept or matters needing attention for each improvement.

For improving forest resources in the future, by taking these into consideration, appropriate forest management according to the local characteristics and improvement of forest roads, etc. necessary for management are to be promoted. At the same time, through the improvement of forest conservation facilities, etc. if necessary, the forest resources will be led to desirable conditions.

10.3.1.1 *Forest Improvement Emphasizing “Conservation of Water and Soil”*

Land subject to forest improvement, which emphasizes “water and soil conservation”, is approximately 12.6 million ha.

In order to create a base of national land resistant to disasters and to secure a stable supply of good quality water, forest improvement emphasizes “water and soil conservation” and attaches importance to functions for the prevention of disasters in mountainous regions and water yield. Consequently, while promoting appropriate tending and thinning, there will also be efforts to promote development of undergrowth and vigorous growth of trees considering the conservation of tree roots and topsoil; (1) in order to secure a sound water cycle, considering the characteristics of watersheds, planting on unstocked land, felling and regeneration through the range of forest spread and mosaic arrangement of forests, the reduction of any one felling area, extension of felling age, and improvement of forests in a multi-storied condition are to be promoted; (2) in order to secure a safe and comfortable foundation of life and national land, improvement of multi-storied forests in areas susceptible

⁴ “Cyclic utilization of resources” means forest resources are sustainably and effectively utilized for timber by smoothly rotating timber re-production cycle throughout a series of forest operations such as felling, planting and tending.

to disasters in mountainous regions and sites near dams is to be promoted in order to stabilize the forest floor.

10.3.1.2 Forest Improvements Emphasizing “Coexistence Between Forests and Human Being”

Land subject to forest improvement which emphasizes “coexistence between forests and human being” is approximately 5.6 million ha.

From the viewpoint of the conservation of biological diversity considering the importance of forests as an ecosystem, and promoting coexistence between forests and human beings through and providing widely accessible forests, forest improvement attaches an importance on the “coexistence between forests and human beings” in order to perform the functions of the conservation of living environment, health and culture. Therefore, while paying attention to the combination of protection, improvement and appropriate utilization: (1) in order to maintain and recover biological diversity in a forest ecosystem, by taking into consideration the breeding and feeding sites of wild animals, withered trees, overturned trees, areas adjacent to water, etc., appropriate protection of primeval forests and forests with academically valuable wildlife, and conservation of the surrounding forest is to be promoted in a positive manner. If necessary, restoration by human intervention and monitoring of vegetation, etc. is to be implemented.

Furthermore, from a large regional point of view, implementation for securing forest continuity, such as making corridors for wildlife, etc. is being maintained; (2) in order to conserve and create a comfortable forest environment and forest scenery, according to forest conditions and utilizing characteristics, planting of tree species with a high intercepting capacity that are resistant towards various types of damage, implementation of intense thinning or pruning, planting of flower trees and introduction of broad leaf trees, etc. which display changes in colour are to be promoted. At the same time, diversification of forest structures is to be promoted.

Especially, improvements of forests which located in suburbs and villages as a familiar nature and forest which making great scenery are to be positively promoted.

10.3.1.3 Forest Improvement Emphasizing “Cyclic Utilization of Resources”

Land subject to forest improvement which emphasizes “cyclic utilization of resources” is approximately 7 million ha.

From the viewpoint of supplying timber which is vital to the public and less of a burden on the environment in a stable and effective manner, forest improvement which emphasizes “cyclic utilization of resources” attaches an importance to the performance of the production function of timber and NWFP. Therefore, while securing sound forests through the promotion of tending and thinning, effective improvement through formation of groups for management and mechanization is to be promoted. Furthermore, Japan is endeavouring to increase growing stock for sequestration of carbon dioxide. At the same time, it is attempting sustainable and effective utilization of forests as a timber resource.

10.3.2 Forest Management

Forest management refers to a series of operations conducted within forests such as planting, tending, thinning, felling and logging and is the basis of improvement of forest resources for attaining multiple objectives. Forest management is also formulated in various ways according to differences in forest condition, management purpose and felling method and so on.

Corresponding to new forest classifications in this plan, forest management is classified into managed single-storied forest management, managed multi-storied forest management and natural forest management. Furthermore, in implementing this management, attention is given to guideline for promoting forest improvement.

10.3.2.1 Managed single-storied forest management

Managed single-storied forest management is carried out on forests with expectation of high productivity considering natural conditions such as topography, soil conditions and vegetation and forests suitable for planting necessary for playing functions for public benefit. The land subject to this management is 8.88 million ha.

Of this, from the viewpoint of playing public functions, in the future, the introduction of managed single-storied forest through new planting, such as the establishment of forests for water conservation, is 0.59 million ha. This will be achieved within approximately 40 years.

As for natural conditions and performing of functions for the public benefit, when implementing felling and regeneration, it is important to consider the range of forest spread and mosaic arrangement of forests.

10.3.2.2 Managed multi-storied forest management

Managed multi-storied forest management is carried out on forests with a high demand for fulfilling functions for the public benefit or timber production, and which are suitable for implementation of this management by taking into consideration improvement of forest roads, etc. The land subject to such management is 5.32 million ha..

Of this, the introduction of tended multi-storied forests in the future is expected to be 4.64 million ha, and will be achieved within approximately 40 years.

10.3.2.3 Natural forest management

Natural forest management is carried out on forests where the functions for public benefit or timber production function can be secured by utilizing mainly natural functions. The land subject to this type of management is 11.02 million ha.

One third (1/3) of this is to have restrictions on felling, and is to be reserved for conservation of national land, conservation of natural environment and conservation of species, etc.

10.3.3 Improvement of Forests Widely Accessible to the Public

Since the public need for providing accessible forest is expected to rise further, forest improvement is to be promoted so that within 20 years there is approximately twice as much forest open to the public, managed appropriately and facilitated with trails etc. as today (0.67 million ha as of the end of the fiscal year 1994).

Referring to improvement of facilities that contribute to forest utilization open to the public, sufficient consideration must be taken in order to facilitate structuring and arrangements to secure the safety of various users, such as senior citizens, the disabled and children, according to needs of users and local characteristics, such as natural conditions.

Furthermore, although the trails desirable for forest bathing and other activities differ depending on the forest conditions and type of utilization by considering comfort, stillness, sheltering effect and former examples, it is expected that approximately 50 to 100 m/ha of trails may be considered as an indicative standard at an average scale of forest.

10.3.4 Construction of Forest Roads, etc.

Forest roads are indispensable to the development of effective forestry management and the appropriate maintenance and control of forests. It is necessary to promote the improvement of forest roads because they play an important role in the promotion of comprehensive utilization of forests, improvement of our living environment in rural communities, and encouragement of local industries.

Based on this viewpoint, taking into consideration labour force conditions and systems of forestry technologies, the establishment of improvement targets for forest roads in order to carry out rational forestry management and forest control suitable to the development of careful forest management is given in Table 7.

Table 7: Target for Improvement of forest roads (Unit: 1,000 km)

	Present state (end fiscal 1994)	Improvement target
Improvement of forest roads	122	278

So that forest resources improvement can meet the diverse demands to the forests, the establishment of forest roads will be entirely completed within approximately 40 years.

Forest roads should be constructed by adoption of standards and structures suited to each purpose. At the same time, construction methods and route plans should be sensitive to conservation of natural environment, especially to ensuring high public benefit. Maintenance and control is to be continuously ensured.

Furthermore, in order to secure appropriate forest management, in addition to improvement of forest roads, the preparation of branch roads is to be promoted. Particularly in the case of managed multi-storied forest management, operations such as tending and thinning should be done at an appropriate time and in a careful, accurate and continuous manner and carrying these out makes it necessary to improve principal branch roads and integrate them with forest roads to ensure continuous utilization.

Approximately 30 m/ha may be considered as an indicative standard for principal branch roads needed by general forestry management. However, exact need differs according to the conditions of individual forests and the actual state of the region.

10.4 Issues Relevant to Attaining These Targets

In order to fulfil this plan under the extremely difficult conditions surrounding forests and forestry, it is necessary to develop comprehensive measures for a number of issues. Key elements are promoting forest improvement to meet local characteristics; obtaining the understanding and participation of the public in forests and forestry; and treating each watershed from its upper reaches to its down stream as a basic unit without division between private forests and national forests.

In such a case, even though the roles played by the national and local governments are great, the efforts of the forestry and wood industries on their own behalf are also important, and the wide range of mutual linkage with people concerned is also necessary.

10.4.1 Promotion of Quality Improvement of Forests

In order to carry out effective and stable forestry management while promoting functions for public benefit, it is necessary for forest management to combine human interventions and natural functions appropriately and to make the most of the attributes of each coniferous and broad-leaved tree which correspond to public needs. Consequently, it is necessary to promote forest quality improvement through further clarification of concrete ways of improvement and of securing the wide support of local people and the public in general by promoting extension and mainstream application of the guidelines for promoting forest improvement and management methods that enhance the diverse functions of the forest including through forest planning system etc. .

Furthermore, from the viewpoint of conserving watersheds and disaster prevention, it is necessary to provide a proper response, such as advice on management of forests where maintenance and control is not carried out appropriately. Forest improvement conducted by public organizations is also necessary to promote those kinds of forests.

10.4.2 Promotion of Multiple Use of Forests

In order to respond to the public need for recreation, culture and education, and to promote multiple use of forests, it is necessary to improve by stages forests that are to be always open to the public. At the same time, it is essential to promote utilisation of national and public forests and forest improvement by public organizations as well as to take steps to prevent forest fires which the increase in users may lead to.

In addition to this, the following should be improved, if necessary: the collection and distribution of information on multiple use; supporting systems such as training and utilization of forest instructors; control and operation systems for facilities used in forest utilization.

10.4.3 Securing Self-reliance of Forestry Management

In order to appropriately manage and control forests, the establishment of self-reliant forestry management is indispensable. Maintenance and control of forests owned by absentee landowners therefore becomes an important issue.

Accordingly, it is important to promote effective operations by expanding management scale and preventing subdivision of forest ownership and management through the acquisition of forest land and promoting unified management such as by commissioning of forest management jointly for several forests.

Furthermore, in order to secure self-reliance of forestry management, in addition to production of non-wood forest products such as mushrooms and edible wild plants, it is necessary to promote diverse management such as the expansion of business targets to include forest recreation or processing and sales of woodwork. In such a case, it is important to nurture forestry management bodies to become model forest owners in the community, from the technical and management aspects, by carrying out management themselves and to be able to shoulder local forestry production.

10.4.4 Securing Forestry Labour Force

In order to secure a forestry labour force, it is necessary to promote improvement of employment situations such as clarification of employment relationships, securing employment and working conditions at the same level as other industries. It is necessary to improve employment control systems and to rationalize business at forestry sectors which employ forestry workers in an integrated and comprehensive manner. At the same time, it is necessary to prepare its supporting system.

Furthermore, it is necessary to promote introduction and development of high-performance forestry machinery which can be effective even in conditions of difficult topography and which can contribute to effective implementation of forest management, to decrease of industrial accidents, and training its operator.

In such a case, it is essential for forestry to become an attractive working place. Consequently, it is necessary to improve the forestry structure such as improvement of the base for forestry production and, at the same time, advancement of a production system.

10.4.5 Establishment of Stable Timber Supply System and Enhancement of Its Utilization

It is important to carry out unified development of forestry and timber industries by promoting effective utilization of maturing forest resources as one way of ensuring improvement of forest resources in a planned manner.

Accordingly, through sawmill expansion and cooperation between specialized plants, it is necessary to establish a system where wood products of reliable quality can be supplied in a stable manner, at low cost and opportunely.

Furthermore, in order to promote timber utilization, it is necessary to create new demand according to consumers' needs, such as material for structural timber and interior-type wood suitable to the needs. This will partly require strengthening cooperation among a wide range of interested parties involved in the production, distribution and consumption levels. At the same time, it is necessary to carry out extension and education on the characteristics of timber as an environmentally-friendly material. It could be stressed, for example, that timber is benign to human life from a physiological and health point of view and it causes less burden to the environment because it does not require much energy for processing.

10.4.6 Promotion of Development for Rural Communities

In order to promote, maintain and expand the diverse functions of the forest, it is essential to urgently re-energize rural communities, which have been rapidly losing vitality, through an increase in incomes and employment opportunities in mountainous regions and improvement of their infrastructure.

Consequently, by promoting forestry, which is a major industry in mountainous regions, while strengthening its connection with agriculture, it is necessary to use forest resources which are located in the local community effectively and in a comprehensive manner.

Furthermore, it is necessary to improve the infrastructure in rural communities, such as the construction and asphalt-paving of forest roads. At the same time, it is important to promote the improvement of living conditions, such as facilities for water supply and household waste disposal. Moreover, while promoting exchange between urban and rural communities through multiple use of forests and smoothness of information distribution, it is necessary to train talent for local leadership.

10.4.7 Improvement of Forest-related Data

In order to better promote sustainable forest management while taking into consideration progress in the application of international criteria and indicators which can evaluate the progress towards sustainability of forests, it is essential to improve data on natural, social and economic dimensions including on rare species, water, soil and other aspects of forest. The improvement of such data is important to the appropriate maintenance and control of forests and leads to effective measures for conservation of river basins.

Furthermore, from the viewpoint of effective forestry management, it is important to have useful data related to management, such as fancy wood with high economic value, and medicinal herbs and plants which are expected to be utilized as ingredients.

10.4.8 Promotion of Research and Development, Extension and Education

In order to implement appropriate forest management which emphasizes ecosystems, it is necessary to investigate and shed light on diverse biological forest characteristics and on the causes of forest decline as well as to improve silvicultural techniques such as regeneration and tending technologies. At the same time, it is important to breed varieties suitable to diverse forest management and varieties resistant to diseases and insect damage.

It is necessary to promote publication and practical application of the results of technical development, improvement and research in each field positively, such as improvement of productivity in timber production, processing and distribution sectors, and development of new products. Furthermore, it is also necessary to carry out a wide range of public extension and education on new technologies and knowledge based on the results of this research and development.

10.4.9 Promotion of International Forestry and Forestry Cooperation

It is necessary to understand forests as a storehouse of biological diversity and a globally significant agent for sequestration of carbon dioxide. Accordingly, it is necessary to improve them appropriately and to utilize them wisely; in this connection, Japan's forests are considered as a part of a global resource.

At the same time, as the largest log importing country, it is necessary for Japan to promote international forestry and forestry cooperation including positive participation in bilateral and multilateral cooperation and support for NGOs in order to promote international afforestation and contribute to the achievement of sustainable forest management.

11 LONG RANGE DEMAND AND SUPPLY PROJECTION FOR IMPORTANT FOREST PRODUCTS

11.1 The Demand and Supply Projection for Important Forest Products

11.1.1 Projection Methods

Estimates for the year 2005 and year 2015 were established. For projection, products were classified from the demand perspective into sawn timber, timber for wood panels, timber for pulp and timber for other purposes. The supply was divided into domestic and imported volume.

For this projection, the demand volume and supply for sawn timber and timber for wood panels was estimated by utilizing a demand and supply balancing model based on the schematized and simplified market mechanisms. The model treats demand as a function of floor area of new housing and wages in actual manufacturing industries; for supply the model used treated it as a function of forest resource structure and expansion of forest road network.

For pulpwood and “timber for other purposes”, the demand volume was estimated by utilizing a demand structure formula obtained from indicators of real economic growth ratios and used paper utilization ratios. At the same time, the supply volume was estimated by taking into consideration domestic supply obtained from a demand and supply balancing model, etc.

Various effects such as reduction of round wood material production costs due to improvement of forest roads and mechanization, reduction of timber processing costs due to development of large-scale sawmills, promotion of timber utilization in the housing field, and effective utilization of thinned wood were incorporated into projection as numerical values wherever possible. Consequently, by taking into consideration the situation surrounding future timber demand and supply in a comprehensive manner, a basis was established for the projection of numerical values.

11.1.2 Basic Direction of Demand and Supply of Forest Products

The projections are given in Table 8 and Table 9, the latter being based on assumed continuation of current trends while the former takes into full account the significant potential developments explained in the “Basic Plan” and summarised briefly here.

11.1.2.1 Sawn timber

Demand volume has been generally decreasing since 1973, and there is a possibility that a similar trend will continue in the future. However, by promoting timber utilization in a positive manner, by providing lumber and laminated lumber suited to consumer needs, it is anticipated that this trend will continue at the same rate or slow down steadily.

Concerning supply volume, domestic timber has been in a downward trend, whereas exporting intentions in producer countries of foreign timber still remain high. Imported sawn timber has been in an upward trend and imported logs have been in a downward trend. Japan's forest resources have been maturing, accordingly, domestic supply timber is expected to increase gradually whereas foreign timber supply will decrease due to the improvement of competitive conditions of domestic timber against substitutes and foreign timber as, for example, a stable timber supplying system is established.

Under such circumstances, the self-sufficiency ratio of sawn timber, which already holds the top position in supply volume of domestic timber, is expected to rise to nearly 50% in about 20 years.

11.1.2.2 *Timber for wood panels*

Demand volume has been increasing steadily since 1975, and it is anticipated that this will increase steadily due to the increase in the consumption of coniferous plywood, medium-density fibre board and particle board in the future.

Concerning supply volume, it is anticipated that tropical hardwood timber, which holds the top position in timber for plywood, will decrease due to state of forest resources. Although the quantities of domestic timber are small, supply volume is expected to increase gradually due to the increase in utilization of coniferous plywood.

11.1.2.3 *Pulpwood*

In keeping with the increase in demand for paper and paperboard, demand volume has continued in an upward trend, and it is anticipated to increase in line with future economic growth.

The supply volume of domestic timber (primarily broad-leaved trees) has been decreasing rapidly since 1985 due to the effects of the appreciation of the yen which has made imports so much cheaper. However, this is expected to revert to the same level in the future through the utilization of thinned timbers, etc.

Foreign timber will continue in an upward trend from now on, and it is anticipated that the significance of timber from plantations will increase due to environmental issues in the producing countries, etc.

Furthermore, while promoting effective utilization of timber resources, it is anticipated that the demand volume of timber residue from manufacturing plants, etc. will increase.

11.1.2.4 *Timber for other purposes*

The demand volume of bed-logs for *shiitake* mushroom culture is anticipated to increase in line with people's tendency towards more nature-oriented and genuine awareness, etc. in the future. It is also anticipated that the demand volume for charcoal will increase mainly for business use, outdoor recreation and soil improvement.

As mentioned above, in the future, the total demand volume for timber is expected to increase steadily in Japan.

Regarding supply volume of domestic timber used mainly for sawn timber will increase, while foreign timber will remain at the same level or move in an upward trend. In the meantime, exporting countries are expected to become more diversified and there will be an increase in the finished and semi-finished product importation ratio.

Table 8: Demand and Supply Projection for Forest Products - calculated on basis of potential evolution away from current tendencies (Unit: 1 million m³)

Classification		Average Actual results for 1992-1994	2005	2015	
Timber for sawn timber	Demand volume	51	50~52	50~54	
	Supply volume	Domestic supply volume	17	20~21	23~26
		Imported volume	34	30~31	27~28
Timber for wood panels	Demand volume	(1) 17	(1) 18~20	(1) 18~21	
	Supply volume	Domestic supply volume	1	2~3	3~4
		Imported volume	17	16~17	15~17
Timber for pulp	Demand volume	(6) 40	(7) 44	(8) 48	
	Supply volume	Domestic supply volume	8	8	8
		Imported volume	33	36	40
Timber for other purposes	Demand volume	2	3	3	
	Supply volume	Domestic supply volume	2	2	2
		Imported volume	1	1	1
Total	Demand volume	(7) 111	(8) 115~119	(8) 119~126	
	Supply volume	Domestic supply volume	27	32~34	36~40
		Imported volume	83	83~85	83~86

Notes:

1. Figures in parentheses are approximately demand volume for plant residue, etc. and exclusive.
2. Timber for other purposes means firewood, bed-log for *shiitake* mushroom culture, etc.
3. Since the figures are rounded off, the total average of actual results between 1992 and 1994 do not coincide.

Table 9: Projections of demand and supply - case of calculating on a basis of continued current tendencies (Unit: 1 million m³)

Classification		Average Actual results for 1992-1994	2005	2015	
Timber for sawn timber	Demand volume		51	48	45
	Supply volume	Domestic supply volume	17	15	13
		Imported volume	34	33	32
Timber for wood panels	Demand volume		(1) 17	(1) 18	(1) 18
	Supply volume	Domestic supply volume	1	0	0
		Imported volume	17	18	18
Timber for pulp	Demand volume		(6) 40	(6) 45	(6) 50
	Supply volume	Domestic supply volume	8	4	3
		Imported volume	33	41	47
Timber for other purposes	Demand volume		2	2	2
	Supply volume	Domestic supply volume	2	1	1
		Imported volume	1	1	1
Total	Demand volume		(7) 111	(7) 113	(7) 115
	Supply volume	Domestic supply volume	27	20	17
		Imported volume	83	93	98

Notes:

1. Based on recent demand and supply conditions, this estimation is demand and supply for forest products in a case where tendency continues.
2. Figures in parentheses are approximately demand volume for plant residue, etc. and exclusive.
3. Timber for other purposes means firewood, bed-log for shiitake mushroom culture, etc.
4. Since the figures are rounded off, the total average of actual results between 1992 and 1994 do not coincide.

11.2 Issues Concerning Demand and Supply of Forest Products in the Future

In order to achieve in reality the projections presented above, since “watersheds” are regarded as a basic unit, it is necessary to endeavour to revitalize the forestry and timber industries by incorporating interested parties such as forestry management bodies, forestry enterprises, timber processors, traders and timber distributors. However, the following are some especially important issues.

11.2.1 Measures for Securing Sustainability

From the viewpoint of promoting timber supply through sustainable forest management, it is necessary to promote diversification and extension of felling period in order to adjust the age class structure and thinning and to secure sound of forests while taking into consideration the promotion of non-clear cutting method, etc. in order to secure diversity of forest.

11.2.2 Intensification of Forest Management Foundation and Securing Stable Timber Supply System

In order to lead domestic forest resources anticipated to mature in the future to increase in an actual supply volume, it is necessary to strengthen the foundation for this by diversification of forest operations and management among the forestry management bodies. At the same time, it is necessary to improve the stability of the supply system of timber by encouraging cooperation among the interested parties in production and consumption, from the viewpoint of prices, quality, lots and sales channels, etc.

Furthermore, it is anticipated that international timber demand mainly in developing countries will increase in the future. In order to take advantage of utilizing domestic forest resources for the purpose of securing the sustainability of forests in the world, it is important to have a stable timber supply system.

11.2.3 Enhancement of Timber Utilization

In order to promote activation of the forestry and timber industry, it is important not only to secure timber demand for housing, etc. but also to create new demand. For achieving this, it is necessary to have conditions in which wood can compete with non-wood-based materials from the viewpoint of quality, price and workability. At the same time, it is necessary to deal with consumer's needs grasping it appropriately, through public awareness of the advantages of timber as a material from the environmental and health aspects.

11.2.4 Promotion of Effective Timber Utilization

In order to promote thinning which is important from the viewpoint of soundness of forests, it is necessary to take steps favouring utilization of thinned timber.

From the viewpoint of promoting the fixation of carbon for longer period and reduction of waste, it is also important to take measures to extend utilization period of timber through improving the durability of housing, and effective utilization of plant residue and wood-based waste.

Furthermore, it is possible for timber to become fuel after it is utilized in various forms. Therefore, it is important to ultimately utilize as much as possible used timber as fuel wood.

11.2.5 Measures for Appropriate Timber Trade

It seems that Japan cannot help relying on foreign timber as a major portion of timber supply for a while. Consequently, through dialogue with producing countries and exchanging of information, it is necessary to promote appropriate timber importation.

Accordingly, to realize rules rendering the coexistence of free trade and environmental conservation, discussions have been held at the International Tropical Timber Organization (ITTO), Organization for Economic Cooperation and Development (OECD) and World Trade Organization (WTO), etc. Since there is a possibility that their results will have effects on timber demand and supply in the future, it is necessary for Japan to participate in these discussions in a positive manner.

List of Working Papers already printed

APFSOS/WP/01	Regional Study - The South Pacific
APFSOS/WP/02	Pacific Rim Demand and Supply Situation, Trends and Prospects: Implications for Forest Products Trade in the Asia-Pacific Region
APFSOS/WP/03	The Implications of the GATT Uruguay Round and other Trade Arrangements for the Asia-Pacific Forest Products Trade
APFSOS/WP/04	Status, Trends and Future Scenarios for Forest Conservation including Protected Areas in the Asia-Pacific Region
APFSOS/WP/05	In-Depth Country Study New Zealand
APFSOS/WP/06	In-Depth Country Study Republic of Korea
APFSOS/WP/07	Country Report - Malaysia
APFSOS/WP/08	Country Report - Union of Myanmar
APFSOS/WP/09	Challenges and Opportunities: Policy options for the forestry sector in the Asia-Pacific Region
APFSOS/WP/10	Sources of Non-wood Fibre for Paper, Board and Panels Production: Status, Trends and Prospects for India
APFSOS/WP/11	Country Report - Pakistan
APFSOS/WP/12	Trends and Outlook for Forest Products Consumption, Production and Trade in the Asia-Pacific Region
APFSOS/WP/13	Country Report - Australia
APFSOS/WP/14	Country Report - China
APFSOS/WP/15	Japan - In-Depth Country Study