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臺灣與日本保安林制度比較研究：法律沿革與現行制度運作

The Comparative Study of Protection Forest System in Taiwan and Japan: Legal Evolution and Current Operation of the System

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本論文係 加藤葉月 (R11625047) 在國立臺灣大學 森林環境暨資源學系 完成之碩士學位論文，於民國 113 年 1 月 15 日承下列考試委員審查通過及口試及格，特此證明。

The undersigned, appointed by the School of Forestry and Resource Conservation on 15 January 2024, have examined a Master's Thesis entitled above presented by Hazuki KATO (R11625047) candidate and hereby certify that it is worthy of acceptance.

口試委員 Oral examination committee:

（指導教授 Advisor）　（指導教授 Advisor）

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中文摘要

保安林是政府指定用來提供特定公共功能的森林，例如水源保護或防止土壤侵蝕。保安林制度於 1897 年隨著日本《森林法》的頒布而建立，並於 1907 年引入台灣。兩國在戰前的保安林制度有許多相似之處，然而，這些制度產生了相當大的變化。而現在，在伐木和其他活動的監管細節上有許多不同之處。

本研究旨在識別影響兩國保安林制度從二戰後至今演變的因素，並檢視其當前運作的差異。因此，這項研究主要關注保安林制度政策的變化、國有林中的保安林面積變化及其與社會經濟狀況的因果關係。文獻回顧主要使用政府文件和統計數據。基於現況運作的差異，本研究僅限於國有林，以釐清其由林業管理機構的管理，並進行了與林業管理機構的訪談和文獻回顧。

研究發現，作為林業及林業政策的一部分，保安林制度受社會經濟狀況的影響，在規範和面積上發生了變化。造成兩國當前差異的因素可能包括森林所有權類型、與侵蝕防護工程的關係以及國際關係。

此外，關於當前保安林的管理，台灣對林業作業的規範更嚴格，而對保安林解除的規範則比日本寬鬆。然而，這一制度可能是為了在比日本更強的土地使用壓力下，確保當地居民與保安林之間的和諧運作。因此，定期進行保安林調查，並需要第三方委員會的決定來審查保安林的解除。

本研究能對於亞洲地區的保安林，保護公共利益功能制度的國際比較研究領域，提供有用的資訊。

關鍵詞：林業政策、國際比較、戰後、林地轉用、訪談調查

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Abstract

Protection forests are forests that are designated by a government to provide a specific public function, such as conservation of water sources or prevention of soil erosion. The protection forest system, which was established in 1897 with the enactment of the Forest Act in Japan, was introduced in Taiwan in 1907. There were many similarities among the pre-war protection forest systems of both countries. However, these systems have undergone considerable changes, and currently, have several differences in the regulatory details of logging and other activities.

This study aimed to identify factors that influenced the evolution of protection forest systems in both countries from the post-World War II period to the present, and to examine differences in their current operations. Accordingly, this study focused mainly on changes in the policies of the protection forest system and the protection forest area in national forests, and the causal relationship with social and economic conditions. A literature review was conducted primarily using government documents and statistical data. Regarding the current operational differences, the research was limited to the national forests to clarify their management by forestry administration agencies. Accordingly, interviews with the forestry administration agencies and literature reviews were conducted.

The study found that as part of forestry and forestry policies, protection forest systems have been influenced by socioeconomic conditions and have changed in regulation and area. Factors that may have caused the current differences between the two countries include the original forest ownership types, relationship with erosion control works, and international relations.

In addition, regarding the current management of protection forests, Taiwan has more stringent regulations on forestry operations and laxer regulations for revocation of protection forests than Japan. However, this system is possibly operated to ensure the harmony between the local people

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and the protection forest under stronger land use pressure than that in Japan. Accordingly, periodic surveys of protection forests are conducted and a decision by a third-party committee is required to review the revocation of protection forests.

This study will provide useful information in the field of international comparative research on systems for conservation of public interest functions of protection forests in the Asian region.

Keywords: Forestry policy, international comparison, post-war, conversion of forest, interview survey.

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Introduction

Section 1 Background and Research Question

In Taiwan and Japan, typhoons and earthquakes are common natural disasters. In particular, because of climate change weather disasters have become more devastating. It is important to manage forests that cover more than half of the land area in both countries to reduce damage and halt global warming.

Protection Forest System has long played a central role in the conservation and management of forests in both countries.

Protection forests are forests that are designated by governments to provide specific forest functions in the public interest, such as conservation of water resources and soil erosion. In Japan, the first Protection Forest System was established in 1897 with the enactment of the Forest Act. In Taiwan, the system was introduced by Japan in 1907 as the "Taiwan Protection Forest Rules" Despite some changes in both countries in the system from its introduction to the end of World War II, the content of the system and the ratio of protection forests to total forest area were almost similar, such as the fact that in principle, protection forest categories and clear cutting were prohibited, while only selection cutting for forest improvement was permitted.

However, currently, the cutting regulations in the Protection Forest System and the percentage of protection forests in the total forests between the two countries vastly differ. In this context, this study endeavors to answer the following questions:

What brought about the different changes in the Protection Forest System s in the two countries? How is the current management of Protection Forest Systems different in the two countries?

Section 2 Previous Research

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Previous research on the Protection Forest System and forest administration, mainly in Taiwan and Japan, was reviewed.

Regarding the evolution of Protection Forest Systems in Taiwan and Japan, studies on Taiwan's protection forests since the Japanese occupation and Japan's protection forests since 2000 are limited. In Taiwan, the "*Taiwan baoanlin yange yu guanli jianjie* (History and Management of Protection Forests in Taiwan)" (Zhang & Wu, 2006) was an overview of the Taiwan Protection Forest System from prewar to the present era published by the Forestry Bureau. In Japan, well-referenced and detailed "The Centennial History of the Protection Forest System," covers the pre-Forest Act period to 1995 and describes the social and economic situation.

International comparative studies on Protection Forest Systems, are scarce, owing to the difficulty of defining the term "protection forest" and the lack of a fixed translation.

However, in Japan, comparative studies between Japan and Europe can be found in the literature. Zorn(1999) compared the evolution of Protection Forest Systems in Germany, Austria, and Japan, and stated that "The necessity for conserving forests is common to most people on the earth. Protection became a common trend transferring from national states to the global arena, which also led to internationalization with a feedback on country comparison." He highlighted the international influence of forest protection policies and the difficulty of comparing and interpreting different countries' Protection Forest Systems, as each country has developed its own need-based system. Furthermore, he pointed out that the Protection Forest System, which, since the 1970s, included typical categories such as soil erosion, rockfall, and avalanche control, expanded to include other categories such as land use and environmental issues, and that protection forests can be used for economic reasons.

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International comparative studies on forestry policy are rare in the Asia. Regarding studies in Taiwan and Japan, Toshio Hagino's "*Cyosen・Mansyu・Taiwan ringyo hattatsushiron*" (1965) details Taiwan's forest policy and forest land development under Japanese colonial rule. Nakashima's "Development and Conservation of Forests in the Japanese Empire: a Case of Taiwan" describes the management of Taiwanese forests by Japan during the Imperial period. "An Investigation of the Transformed Forestry Sector in Japan and Taiwan" describes the evolution of forestry policy in Taiwan and Japan in the postwar period. The author mentions the similarity between Taiwan and Japan in that both countries shifted from timber production to a policy emphasizing forest conservation after economic growth.

However, few studies on the management and operation of Protection Forest Systems are available in both Taiwan and Japan.

In Taiwan, Hwang (2009) examined the management of coastal windbreak protection forests via a survey of protection forest management operations. Ke (2003) surveyed protection forests outside of national forests working circle and analyzed the degree of regulation violations in these forests. In addition, he analyzed the local residents' intentions using a questionnaire survey and concluded that while the public did not fully understand the effectiveness of protection forests, they had high expectations for protection forests to fulfill the function of land conservation.

In Japan, Kato & Tachibana (2022) and Fujikake & Ochi's studies (2022) found active logging in privately owned water source protection forests. In a study of national forests, Zhang (2009) conducted questionnaire surveys and interviews with forestry officials and entities who undertook logging and silviculture in national forests in the Nagano Prefecture. The study concluded that contracted projects for national headwater source conservation forests faced difficulties in performing appropriate operations and

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sustainable management amid personnel cutbacks, and emphasized the improvement of supervision systems and the development of contracting entities as issues that required redressal. In addition, studies on the concept and ideal form of protection forests have been published in Japan. Tsutsui (2008) opined that both the value of timber that cannot be calculated in the market because of logging restrictions in protection forests and the market value of timber obtained from logging should be taken into account. Furuido(2018) pointed out that compensation for loss in protection forests is limited only to the depreciation of standing timber and not to the opportunity loss owing to forest land conversion. The study indicated that the regulation of forest land conversion by protection forests can be considered as an intangible asset, as it compensates for the fact that regardless of ownership, the land is forest land.

In summary, studies on the recent changes of the Protection Forest System in both Taiwan and Japan are limited. However, in Taiwan, studies focusing on the operation of existing protection forests are the most common, whereas those on the criteria for designation and revocation of protection forests are particularly scarce. International comparative studies of Protection Forest Systems are few owing to the lack of definitions and terminology, and most such studies are within Europe or between Japan and Europe.

Section 3 Objectives, Methods, and Materials

The study diagram is outlined in Fig. 1. This study aims to identify factors that influenced the evolution of Protection Forest Systems in Taiwan and Japan and examine the differences in their current operation from the perspective of forest and forestry policy.

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The main focus was on the changes in laws and regulations related to protection forests and their relevance to socioeconomic conditions and natural disasters. The main research method was a literature review, which used legal and official documents published by governments and public agencies, and publicly available statistical data. Non-publicly available statistical data obtained via interviews were used as well.

The current status of protection forest operation in both countries was analyzed from the perspective of forest operations and forest land conversion regulations.

Interviews were primarily used with officials of the forestry management agencies.

Table 1. Interview schedule and interviewees

Interview Data	Interviees	Position	Place
2023/3/17	Shang-ming Wu	Protection Forest Operation	Forestry Bureau
2023/4/18	Shang-ming Wu	Protection Forest Operation	Forestry Bureau
2023/5/12	Qing-wang Ye, Yu-zhen Chen	Protection Forest Operation	Luodong Forest District Office
	Mei-jun You, Xin-zhao Huang	Protection Forest Revision Professionals	
2023/5/15	Kun-zhu Chen	Protection Forest Operation	Hsinchu Forest District Office
	Yun-qin Tian, Yu-qun Huang, Jun-de Li	Protection Forest Revision Professionals	
2023/6/2	Wu Shang-ming	Protection Forest Operation	Forestry Bureau
2023/6/27	Kun-zhu Chen	Protection Forest Operation	Hsinchu Forest District Office
	Yun-qin Tian, Yu-qun Huang, Jun-de Li	Protection Forest Revision Professionals	
2023/8/7	Tsai-Huei Chen	A member of Protection Forest Revoking Review Committee	Taiwan Forestry Research Intitute
2023/10/18	Tatsumi NAGAOKA Junichirou FUKUNAGA	Private Forest Department Conservation Division	Forestry Agency
	Tomonori MITANI	National Forest Department National Forest Planning Division	

Note: Surveys by the author

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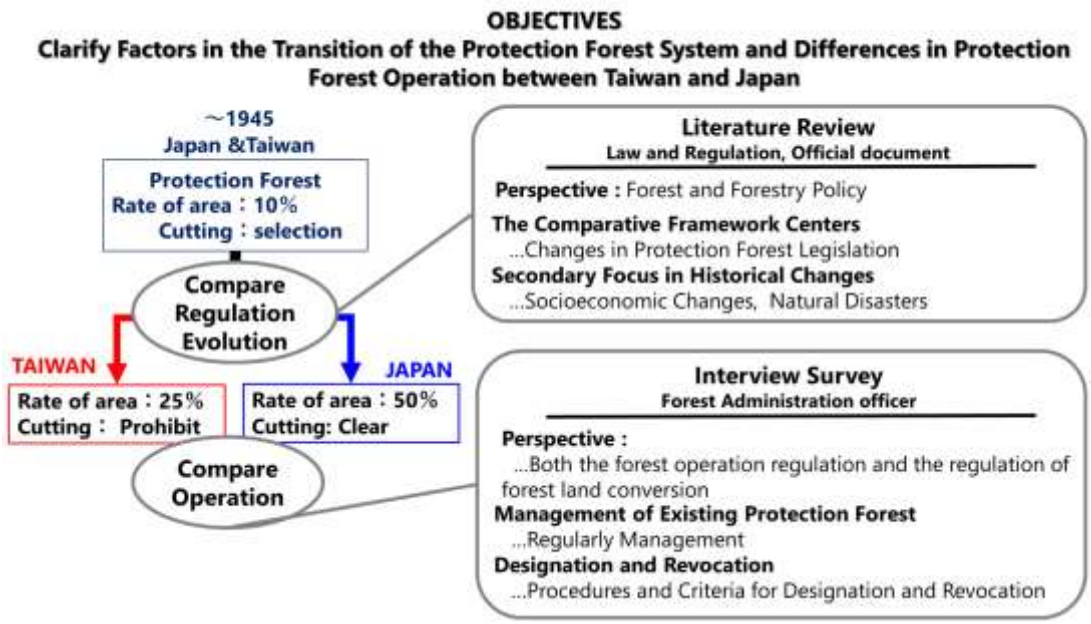

Figure 1. Study diagram(The author's works)

Section 4 Basic Information of Forest and Protection Forest in Taiwan and Japan

This section provides basic information on the land, population, forests, and protection forests in Taiwan and Japan and a summary of the Protection Forest Systems in both countries in the immediate post-World War II (WW2)period. Taiwan is approximately one-tenth the size of Japan and has twice the population density (Table 2). Taiwan and Japan have forests covering more than half of their land area. However, timber production rates are vastly different. In 2022, Taiwan's timber self-sufficiency rate was 1% (Taiwan Forestry Research Institute, 2023), while Japan's was approximately 40% (Forestry Agency, 2023).

Table 3 summarizes the area of forests and protection forests in both countries by ownership type. In Taiwan, 92.8% and 99.1% of all forests and all protection forests, respectively, are national forests. Conversely, in Japan, 69.4% of all forests are public and private forests. National forests and public and private forests account for 56.4% and 43.6% of protection forests, respectively. The pie charts illustrate the percentage of national forests and public and private forests in both countries that are protection

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forests. In Taiwan, the percentage of national forests is 25%, while that of public and private forests is 3% (Fig 2 and Fig 3). In contrast, currently, Japan has 90% of its national forests as protection forests (Fig 4). Public and private forests account for 31%, and public and private protection forests are few in number (Fig 5). Japan may have a larger percentage of both total forests and protection forests than Taiwan.

Next, the Protection Forest Systems of Taiwan and Japan as of 1945 were compared. Taiwan was under Japanese rule before the end of the war in 1945; therefore, the "*Taiwan Forest Rule*" was enforced, and after the war, the "*Forestry Act*" of the ROC was enforced in 1945 as well. At the end of the war, Japan's Protection Forest System was enforced under the "*Forestry Act*", which had been in effect since 1911. The requirements for protection forests were almost the same for all three; however, only the *Forestry Act* of the ROC includes "National defense" and "Prevention of Scenery."

All cutting regulations required a permit system, and in the ROC's Protection Forest System, the permission authority was held by the forest management organization, while in the other two systems, the authority was held by the local chief. In other words, all three did not prohibit cutting. In the ROC, the only requirement for the revocation of protection forests was "should the subsistence of a protection forest become unnecessary," which was unspecific. Under the *Taiwan Forest Rule*, the requirements for revocation of protection forest were "when the cause of designation as a protection forest ceases to exist" and "when a special reason arises in the public interest," which are similar to that in Japan's "*Forest Act*".

The authority for the revocation of protection forests lies with the central National Government Agency in charge of agriculture and forestry in both Japan and Taiwan.

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Table 2. Land Area, Population, and Population density in Taiwan and Japan

	Taiwan	Japan
Land Area	36,197 km^2	378,000 km^2
Population	23,260,000 ppl	124,090,000 ppl
Population density	640 ppl/km^2	340 ppl/km^2

Table 3. All Forests and Protection Forests Areas and Ratios by Ownership Type

		Taiwan		Japan	
	Ownership	Area(ha)	Ratio	Area(ha)	Ratio
All Forest	National	1,847,848	92.8%	7,657,000	30.6%
	Public & Private	143,296	7.2%	17,368,000	69.4%
	Total	1,991,144	100.0%	25,025,000	100.0%
Protection Forest	National	465,892	99.1%	6,917,119	56.4%
	Public & Private	4,024	0.9%	5,343, 671	43.6%
	Total	469,916	100.0%	12,260,790	100.0%

Ref. The Result of the Fourth National Forest Resources Survey (Chiu et. al, 2015) and Protection Forest Areas by ownership information based on the interview survey with the Forestry Bureau

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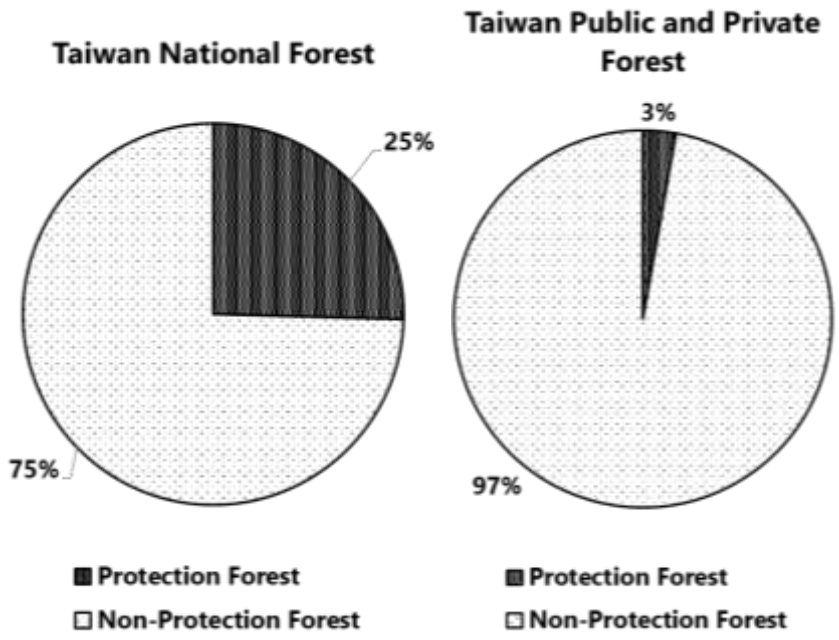

Figure. 2 Protection Forests - Proportion of National Forests in Taiwan

Figure. 3 Protection Forests - Proportion of Public and Private Forests in Taiwan

Ref. The Result of the Fourth National Forest Resources Survey (Forestry Bureau, 2015)

Protection Forest Areas by ownership information based on the interview survey with the Forestry Bureau

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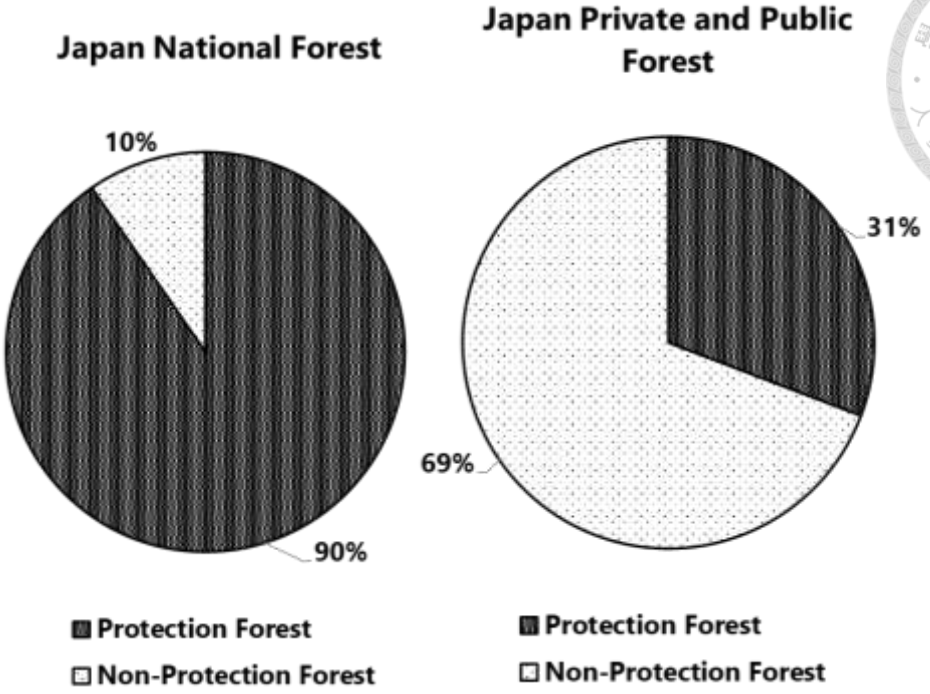

Figure 4. Protection Forest - Proportion of National Forests in Japan

Figure 5. Protection Forest - Proportion of Public and Private Forests in Japan

Ref. Outline of Forest and Forestry Statistics (Forestry Agency, 2023)

Table 4. Comparison of Protection Forest Regulations (as in 1945) between Taiwan and Japan

	Taiwan		Japan
	Taiwan Forest Rule(1919-1945)	Forestry Act(1945)	Forest Act(1911-1951)
Requirements for Protection Forest	1. Prevent damage from Soil erosion 2. Prevent damage from Blowing sand 3. Prevent damage from Floods, Wind, Tides 4. Prevent damage from Falling rock 5. Conservation of Water source 6. Fishing industry 7. Navigation 8. Public health 9. Prevention of Temple, Landmark, Historic relics	1. Prevent damage from Floods, Wind, Tides 2. Conservation of Water source 3. Prevent damage from Soil erosion, Blowing sand, Falling rock, Ice, Avalanches 4. National defense 5. Public health 6. Navigation 7. Fishing industry 8. Prevention of Landmark, Historic relics, Scenery	1. Prevent damage from Soil erosion 2. Prevent damage from Blowing sand 3. Prevent damage from Floods, Wind, Tides 4. Prevent damage from Avalanches, Falling rock 5. Conservation of Water resource 6. Fishing industry 7. Navigation 8. Public health 9. Prevention of Temple, Landmark, Historic relics
Cutting Regulations	Permission based	Permission based	Permission based
Authority to grand permission for cutting	The head of a local government	Forestry Management Organization	The head of a local government
Requirements for Revocation	When the cause of designation as a protection forest ceases to exist, or when a special reason arises in the public interest.	Should the subsistence of a protection forest become unnecessary	when there is no need for the protection forest to exist or when a special reason arises in the public interest.
Revocation Authority	Governor-General of Taiwan	Council of Agriculture	Cabinet Minister in charge

Note: Surveys by the author

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Chapter 1 Evolution of Protection Forest in Taiwan

Section 1 Overview of the History of Protection Forests

(1) Taiwan

This subsection provides a concise overview of the evolution of Taiwan's Protection Forest System. Following Japan's acquisition of Taiwan from the Qing in 1897, the "*Taiwan Protection Forest Rule*" were enacted in 1901. In 1906, a survey, for the designation of protection forests, was conducted, and in 1907, the forest in Kaoshing was designated as the first protection forest.

In 1919, the "*Taiwan Forest Rule*" was enacted, replacing the "*Taiwan Protection Forest Rule*." By the end of World War II, approximately 70% of Taiwan's current protection forest area had been designated as protection forests.

After World War II, Taiwan came under the governance of the Republic of China (ROC). The ROC's *Forestry Act*, which had similarities with the Japanese "*Taiwan Forest Rules*" in terms of operation regulations, albeit with some distinctions regarding the category of protection forests. To promote afforestation in the post-war period, the "*Taiwan Province Protection Forest Encouragement Act*" was promulgated in 1951.

In 1958, the "*Taiwan Forestry Policy and Management Guideline*" was promulgated; it stipulated the proper management of protection forest in section 1 of the Forestry Policy and the natural renewal or intensification of afforestation of protection forests in section 8 of the Forestry Management. In the same year, the "*Outline of Taiwan Forestry Reform Plan Implementation*" was promulgated, with section 4 stipulating the decision to resurvey and revoke protection forests, the establishment of management, and designation/revocation methods.

Consequently, the "Protection Forest Revision Survey" was conducted in 1964, which resulted in a reduction of >10,000 ha of protection forests. In addition, to promote the

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development of mineral resources, the provincial government's Ministry of Economic Affairs issued the "*Handling Procedures for Mining Cases within Protection Forest Land*" in 1966, which allowed industrial entities to be set up in protection forests.

In 1975, the "*Three Principles of Forestry Policy*", which significantly changed the direction of forestry policy, stated in Article 2 that the designation of protection forests should be expanded. Accordingly, the designation of protection forests was systematically and significantly expanded from 1977 to 1982, both in terms of forest categories and areas, in the 1976 "*Taiwan Forest Management Reform Plan*".

In 1989, the first comprehensive post-WW2 law on the management of the protection forests , the "*Regulations for Protection Forests Managements*," was promulgated, and in 1991, the "*Taiwan Province Protection Forests Practice*," , which outlined standard management practices for each protection forest category, was published.

In 1950, owing to the regulation of administrative zones and changes in the organization of forestry agencies, protection forests within and outside the National Forest Working Circle were under the administrative jurisdiction of the Forestry Bureau (F.B.), and local governments, respectively; however, in 2002, all protection forests within and outside the National Forest Working Circle were placed under the jurisdiction of the F. B.

From the late 1990s to the present, legislation on the revocation and development of protection forests was complied. Between 1996 and 2004, regulations on revocation of protection forest were repeatedly promulgated and amended, before the 2004 "*Revocation Standard for Protection Forest*"; in 2002, the "*Establishment and Review Guideline of the Taiwan Protection Forest Revocation Review Committee*," which sets out provisions for third-party consultation in the case of protection forest revocation, was promulgated.

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The 2001 "*Principle of Protection Forest Dotted Line Utilization*" stipulated that development could be carried out within a defined area (330 m^2) without revocation of the protection forest (changed to 660 m^2 in 2006). The 2010 "*Principle of Green Cover Compensation for the Use of Protection Forest in Development*" stipulates that forests should be created on alternative land when protection forests are developed on a large scale.

(2) **Period classification and reasons**

The following is a classification of previous studies that have covered the evolution of the Protection Forest System:

(1) Period of Japanese rule in Taiwan (1901–1945)

(2) Post-war Taiwan Provincial Government (1945–2003)

(protection forests in outside the National Forest Working Circle: Local government)

(3) Central government-administered management of all protection forests (2003–present)

The aforementioned classification is based on changes in the management authority of protection forests.

The following is the classification in "An Investigation of the Transformed Forestry Sector in Japan and Taiwan" (Weng et al, 2013)

(1) Forestry policy in the early years of Taiwan's Retrocession (1945–1958)

(2) Taiwan Forestry Policy and Management Guideline (1958–1975)

(3) Taiwan Forestry Management Reform Plan (1975–1991)

(4) Taiwan Forest Management Plan (1991–present)

The aforementioned classification was made according to major milestones in forestry policy.

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The present study considered the socioeconomic events that affected forest policy and protection forest policy based on the chronological classification of the previous studies for the following classification:

(1) Timber production period in post-war recovery and economic growth: 1945–1970

(2) Change in direction of Forestry policy 1 (emphasis on public benefit): 1971–1986

(3) Change in direction of Forestry policy 2 (forest conservation):1987–2022

The present study considered that the major changes in the direction of Taiwan's forestry policy occurred in 1975 and 1991, as described in previous studies (Weng et al, 2013).

Specifically, Taiwan's withdrawal from the UN (United Nations) in 1971 and the oil crisis of 1972 significantly impact on the change of direction in 1975, while the lifting of martial law in 1987 had a significant impact on the change of direction in 1991.

This chapter aims to identify changes in socioeconomic and political conditions and forestry policies internationally and in Taiwan, and the accompanying changes in laws and policies for protection forests. Accordingly, the following reasons were used to determine the time period classification:

(1) During the development and production period, timber production was promoted with assistance from the United States (US) for post-war reconstruction and the need for foreign currency. Protection forests were largely neglected, except in the early post-war period, and the area was reduced and industrial development was permitted within protection forests. Industrialization, consequent to economic growth and rising production costs, led to the transition to the "change in direction of Forestry policy 1" .

(2) The "change in direction of Forestry policy 1" was a period during which a government-led shift in emphasis, from timber production to the public interest, occurred amid the economic and international issues of the dollar crisis, the withdrawal

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from the UN, and the oil crisis, and the death of Chiang Kai-shek. During this period, the area of protection forests expanded greatly.

(3) During the period of "change in direction of Forestry policy 2" , the government and the public endeavored to shift the emphasis of forestry policy from public interest to forest conservation for the first time in the trend toward democratization, which began with the lifting of martial law in 1987.

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Table 5. Chronology of Protection Forest in Taiwan

Year	Law, Regulation
1901	"Taiwan Protection Forest Regulations"
1902	"Taiwan Protection Forest Regulations Enforcement Rules"
1905	"Taiwan Protection Forest Guideline"
1906	The survey for designation Protection Forest
1907	"Taiwan Protection Forest Regulations Enforcement Regulations"
1919	"Taiwan Forest Rule"
1929	"Taiwan Protection Forest Subsidy Regulations"
1932	"Forest Act"(ROC:Description of the Protection Forest is in Articles 9 to 10)
1937	Amendment to the Forest Act(ROC: "National Defence Protection Forest" added to Protection Forest)
1945	"Forest Act" by ROC
1950	Each county's forestry management office will be under the jurisdiction of Forest Bureau, but Outside working circle Protection Forest area and other 6 tasks will continue to be handled by the respective county and city government
1951	Taiwan Province Protection Forest Encouragement Act"
1958	"Taiwan Forestry Policy and Management Guideline" "Taiwan Forestry Reform Action Plan"
1964	"Four-year Expansio of Protection Forest Revision" "Protection Forest Revision Survey"
1966	"Handling Mining Cases within Protection Forest Areas Regulation"
1975	"The Three Principles"
1976	"Taiwan Forest Management Reform Pran"
1983	Protection Forests had incorporated into a unified numbering system.
1985	Amendment to the Forest Act
1989	"Regulation for Protection Forests Managements"
1991	Taiwan Province Protection Forests Practice
2001	"Criteria for Revoke Protection Forest Designation" "Protection Forest Point-Line Use Principle"
2002	"Establishment and Review Criteria of the Protection Forest declassifying Review Committee" "Meeting for Communication between the Forestry Bureau of the Council of Agriculture, Executive Yuan, and Directors of the Agriculture (Construction) Bureaus of Various County and City Governments."
2003	The acquisition of Outside working circle Protection Forest by Forestry Bureau, the Council of Agriculture, Exective Yuan
2004	"Revocation Standards for Protection Forest"
2005	Protection Forests Practice
2010	"Principles for Green Cover Compensation in the Use of Protection Forest Land for Development Activities"
2016	Development—Appropriate Under-forest Economy
2021	Endangered Species and Critical Habitat Ecosystem Services Payments Promotion Program

Note: Surveys by the author

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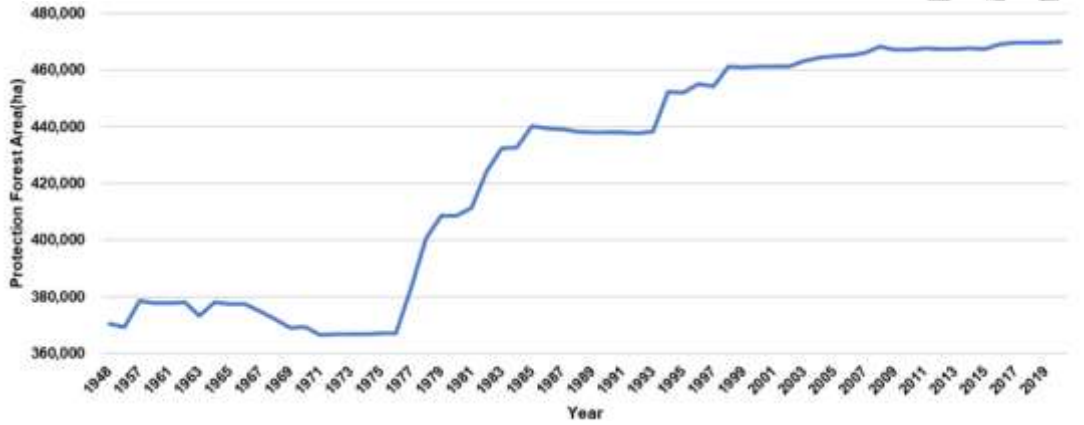

Figure 6. Change of Protection Forest Area (ha) in Taiwan (1923–2020)

Ref. "FORESTRY STATISTICS OF TAIWAN", Taiwan Forestry Bureau, each year.

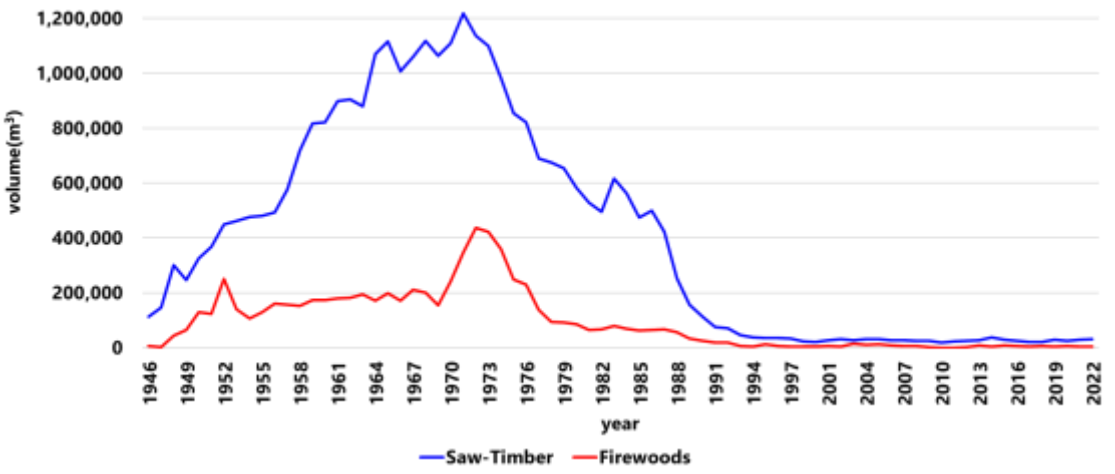

Figure 7 Change in Saw Timber and Firewood Production (m^3) in Taiwan

Ref. "FORESTRY STATISTICS OF TAIWAN", TAIWAN FORESTRY BUREAU, each year.

doi:10.6342/NTU202401356

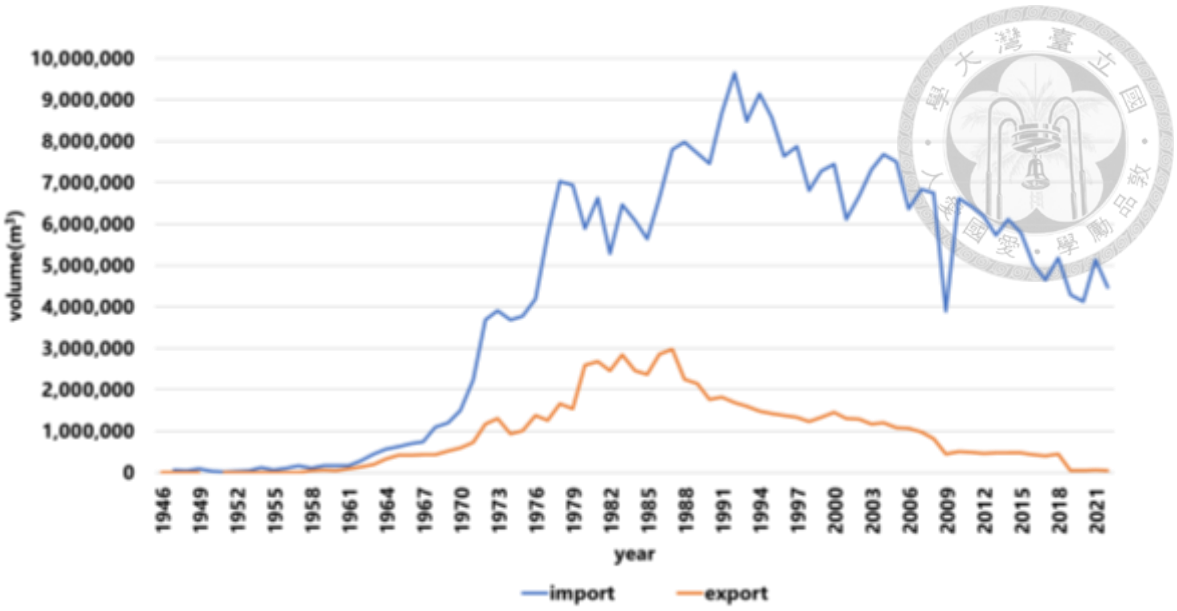

Figure. 8: Change in Import and Export of Wood products (m^3) in Taiwan (1946–2021)

Ref. Forestry and Nature Conservation Agency, Ministry of Agriculture, each year

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Section 2 (1) Timber Production Period in Post-war Recovery and Economic growth: 1945–1970

Table 6. Chronology of International and Taiwan Situation, Forestry Policy, and Protection Forests in Taiwan

	International	Taiwan	Forestry Policy	Protection Forest
1945	End of World War 2	Taiwan Retrocession	Amendment *"Forest Act"* (ROC)	Issued a Taiwan provincial circular: prohibiting the overcutting of Protection Forest
1946	the Indochina War	Issued Old Taiwan dollar	*"Taiwan Province Timber Harvesting Restrictions Regulation"*	Protection Forest Cuttting ban
1947		February 28 incident Taiwan Province Government "Agreement Concerning the United States Relief Assistance to the Chinese People"	the Forestry Bureau transformed into the Taiwan Forest Administration(TFA) Establish 'Committee for increased Timber Production'	
1948	Establish of IUCN	"Temporary Provisions Effective During the Period of National Mobilization for Suppression of the Communist Rebellion "		
1949		Promulgation of *"Martial Law"* The KMT retreat to Taiwan New Taiwan Dollar issued The *"37.5% Arable Rent Reduction Act"*		
1950	Korean War	Adjustment Administrative Divisions of Counties and Cites	the jurisdiction of the FDO was transferred to the county governments from TFA "Taiwan Provincial Forest Land Leasing and Afforestation Regulation"	the TFA was in charge of the management of Protection Forest within the National Forest Working Circle
1951		Sale of Public Farm Lands		"Taiwan Provincial Encouragement for Constructing Protection Forest Regulation"
1952	Treaty of Pearce between the Republic of China and Japan	Started "Four-Year Plan for Economic Development"	Establish Taiwan Provincial Camphor Refining Factory *"Wood Price Sales Assessment Regulation"*	
1954	Mutual Defense Treaty between the United States of America and the Republic of China The Geneva Conference	The *"Land-to-the-Tiller Act"*	Establish Timber Commodity Tax	
1956			The First Forest Resources Survey(1954-1956)	
1958	Great Leap Forward		*"Taiwan Forestry Policy and Management Guideline"* *"Taiwan Forestry Reform Action Plan"* the Taiwan Daxueshan Forestry Corporation was established	
1959		Tropical Depression 081		Allows establishment of mining rights in Protection Forest(Amended of *"Mining Act"*)
1960	the fifth WFC	Complete Central Cross-Island Highway	TFA trandformed into Forestry Bureau	
1961			Stopped Timber Commodity Tax	
1964	Declaration of suspension of U.S. aid to Taiwan		Start "Stand Conversion Project in Taiwan Forestry"(~1977)	
1965	North bombing by U.S. in the Vietnam War			*"Four-year Expansion of Protection Forest Revision"* *"Protection Forest Revision Survey"*
1966	the Cultural Revolution in The PRC(~1977)			
1967	Established ASEAN		End of camphor production in Taiwan. Decision restriction on Cypress Exports, and liberalization of Soft wood Timber importation	
1968			Regulations Governing Disposition of Forest Products of National Forests	
1969	the Sino-Soviet border conflict "Nixon Doctrine"	supplementary national election		
1970	Taiwan, completes repayment of debt to U.S.		the Taiwan Daxueshan Forestry Corporation was closed	

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(1) Postwar turmoil and high demand for timber (1945–1956)

- **International Situation**

Post-WW2, the US and the U.S.S.R. (Soviet Union) emerged as superpowers with equal power albeit different ideologies; hence, both sides were at odds ideologicall y, politically, and militarily, and other countries worldwide were entangled in the Cold War between both countries. The ROC, which acquired Taiwan post-WW 2, was no exception. In mainland China, the Chinese Civil War began again in 1945, and in October 1949, the Chinese Communist Party (CCP) declared the establishment of the People's Republic of China (PRC), and the ROC, led by the Kuomintang*(KMT), transferred to Taiwan.

In 1938, the US signed the "*Agreement Concerning the United States Relief Assistance to the Chinese People*" and the "*Economic Aid Agreement*" with the ROC and accordingly, provided large-scale aid. When the military situation in the Chinese Civil War was turning against the KMT, the US temporarily suspended its aid program to the ROC (Hayashi, 2023, pp.185-188). However, with the beginning of the Korean War in July 1950, aid was resumed (Tung, An-Chi, 1999). Initially, the US provided assistance for involvement, development, and economic self-sufficiency to prevent the spread of communism from mainland China to Taiwan. Subsequently, the policy shifted toward comprehensive support, including military assistance, and full-scale aid was resumed (Hayashi, 2023, p.191). Eventually, the conflict between the governments of the KMT and CCP was incorporated into the Cold War in the wake of the Korean War. The US sought to prevent both the unification of Taiwan by PRC and the recapture of the mainland by the ROC and maintain the status quo in the Taiwan Strait by signing the "*Mutual Defense Treaty between the United States of America and the Republic of*

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China" in 1954, which kept China divided (Maeda, 1995, pp.149-180; Matsumoto, 1998, pp.84-102; Romberg, 2016).

- **Taiwan Situation**

Post-WW2, Taiwan was seized by the KMT. Under the rule of the Kuomintang government, the Taiwanese people became increasingly anxious, and a riot, the "2.28 Incident," broke out, which was suppressed by the Kuomintang military. Furthermore, "*Martial law*," which came into effect in 1949 during the riots, controlled criticism of the KMT until 1987.

Under these circumstances, Taiwan's post-war period saw a focused investment in public enterprises (Ishida, 1997, p.367). From 1946–1952, Taiwan experienced inflationary conditions and prices rose sharply because of a decrease in production caused by the destruction of war, military demand, and import disconnection (Jen, 1983).

The issue of New Taiwan dollar in June 1949 fairly suppressed the inflation; however, from the second half of 1949 until 1952, prices of general goods, including timber, more than doubled (Chen, 2012). When the aid from the US resumed following the Korean War in 1950, the Taiwan Provincial Government launched a "*Four-Year Plan for Economic Development*" in 1952 under the policy of "Nurture industry through agriculture, Develop agriculture through industry" (Jen, 1983). The rehabilitation work was almost complete by 1952, and agriculture and industrial production had recovered to pre-war levels. In 1952, the government implemented the "*Wood Price Sales Assessment Regulation*," which stipulated that timber should be sold once every 10 days 15% lower than the average market price in each forestry area, in an attempt to control rising timber prices, albeit without a significant effect (Chen, 2012).

- **Forestry Policy**

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In the early years of the Taiwan restoration period, frequent changes in the organization of forestry authorities and the heads of directorates were common. Partly because of this, a unified direction for the forestry policy was noon-existent until 1958, when the "*Taiwan Forestry Policy and Management Guideline*" came into effect.

On October 25, 1945, the Taiwan provincial administrative executive office was established, and forest management and timber production was entrusted to the FB of the Agriculture Forestry Department, which was subordinated to the executive office. The entire province was divided into 10 forestry districts, and regional Forest District Offices (FDO) were set up to manage them. The university training forests were placed under the jurisdiction of the FB, and four model logging stations were set up. In 1947, with the establishment of the Taiwan Provincial Government, the FB was transformed into the Taiwan Forest Administration (TFA), which was separated into the TFA and the Forestry Department a year later, and soon reorganized into the TFA. From June 1949 to October 1950, the jurisdiction of the FDO was transferred to the county governments from the TFA. However, soon after, owing to the regulation of the administrative areas of Taiwan Province, the FDO was once again subordinated to the TFA (The Historical Research Commission of Taiwan Province, 1954).

Post-war forestry policy required focus on restoring rough post-war forest lands and meeting the high lumber demand. Therefore, afforestation and logging were parallelly implemented. As part of the afforestation policy, the "*Taiwan Provincial Forest Land Leasing and Afforestation Regulation*" was promulgated in 1950, granting the right to lease national forest lands. In 1953, the "*Taiwan Province Limitations on Cutting*" was promulgated, restricting cutting in some forests.

Concurrently, to maintain the management of forestry agencies and meet the high lumber demand, the production of forest products increased from the post-war period to

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1958. The forestry planning objectives of the agricultural sector in the "*Four-Year Plan for Economic Development*," which started in 1952, were to "Increase timber production, export high-grade timber, import ordinary timber, strive to obtain foreign currency, supply sufficient domestic timber demand and stabilize timber prices on the principle of not cutting timber indiscriminately" (Tsai, 1999).

The then-Director of the Economy Department advocated "(1) the promotion of public works by importing general construction timber through the use of U.S. aid and the consequent reduction of demand pressure for timber in the province, (2) the prevention of indiscriminate logging operations management, the increase of timber supply in the province and the acquisition of foreign currency through the export of high-grade timber" (Chen, 2012). Clearly, that the objectives of timber production were mainly to support economic construction and earn foreign currency, and simultaneously, produce and import softwood for timber supply for military and civilian use. Notably, according to the Taiwan Provincial Bureau of Finance, forestry income accounted for 30–40% of the total surplus of national utilities from 1952–1954 (Chen, 1999).

≪Protection Forest≫

Changes in forestry management agencies during the early years of the WW2 affected protection forests as well.

In 1946, the FDO placed under the jurisdiction of county governments were responsible for managing the National Forests Working Circle, including protection forests. When the FDO were subordinated to the F.B., protection forests were placed under the jurisdiction of the F.B. However, protection forests outside the National Forest Working Circle remained under the jurisdiction of the county and city governments (Zhang & Wu, 2016) until 2003.

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Protection forests were used as a means of forest conservation policy in the early years of Taiwan's restoration. The Director of the F.B. issued a circular in 1945 prohibiting the overcutting of protection forests (Yao, 2011), and in 1946, a circular demanded the conservation of protection forests on both sides of the railroad line and prohibited their cutting. In 1953, the "Taiwan Province Limitations on Cutting" clearly stated that protection forests were subject to cutting (abolished in 1958).

Conversely, the "Taiwan Provincial Encouragement for Constructing Protection Forest Regulation" that was promulgated in August 1963 recommended the planting of forests in security forests (abolished in 1963).

(2) Change in Economic Structure and Policy in Support of Wood Production (1956–1970)

- **International Situation**

In July 1953, the Korean War resulted in a ceasefire. In 1954, the Indochina War, which began in 1946 as Vietnam sought independence from France, resulted in a peace deal under the Geneva Conference. However, the US did not participate in this conference and instead began bombing North Vietnam and deploying ground troops from 1965, escalating the war into the Vietnam War. The Vietnam War was protracted and put pressure on US finances, leading to the Nixon Shock in 1971.

Concurrently, relations between the PRC and the U.S.S.R., which had supported North Vietnam, deteriorated after Soviet First Secretary Khrushchev's criticism of Stalin in 1956, leading to the Sino-Soviet border conflict in 1969. The US President Nixon, who took office in 1969, sought to both improve relations with China and withdraw from the Vietnam War, which led to China's UN membership in the 1970s and Nixon's visit to the PRC.

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➢ **Taiwan Situation**

Against the background of the worsening financial situation the US State Department declared the suspension of aid to Taiwan in 1964, and after the termination of new loans in 1968, aid from the US completely ended upon completion of repayment in 1970; however, Taiwan's economic development proceeded uninterruptedly.

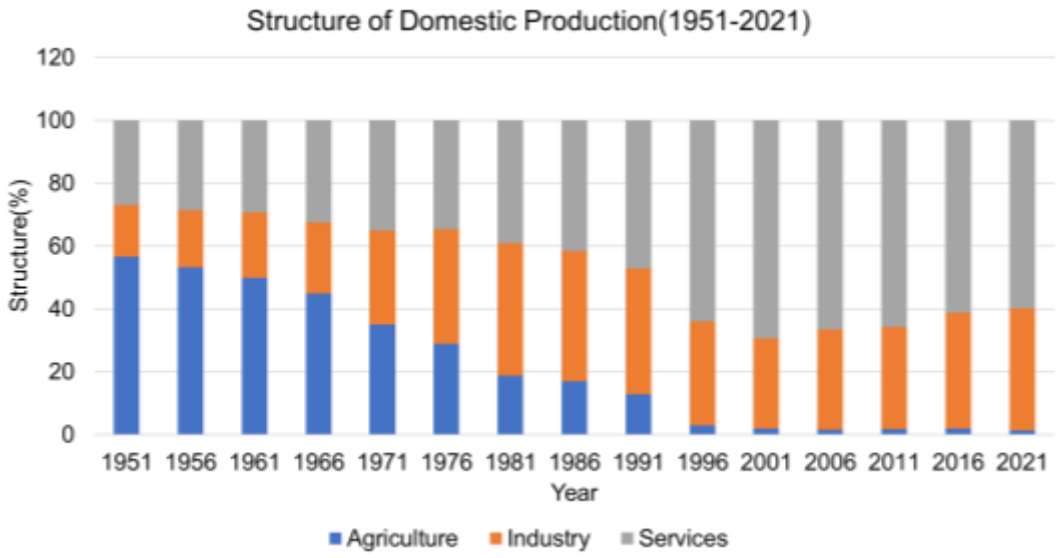

Figure 9: Structure of Domestic Production (1951–2021)

Ref.: "YEARBOOK OF ECONOMIC STATISTICS REPUBLIC OF CHINA" DEPARTMENT OF STATISTICS MINISTRY OF ECONOMIC AFFAIRS, each year

From 1957, Taiwan's economic structure began to rapidly change as it entered the second phase of the "*Four-Year Plan for Economic Development*." Between 1958 and 1963, manufacturing production in the gross domestic product rose from 16.77% to 21.98%, while private enterprises increased from 52.8% to 65.9%. In trade, exports increased significantly, and the ratio of export value to gross national product increased from 10.47% to 17.94%, moving Taiwan into an era of "Export-Oriented Industrialization" (Tung, 1999).

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In contrast, the agriculture, forestry and fisheries industries had been in decline since the 1960s. The share of agriculture in the industrial structure fell below 50% in the 1960s and was approximately 35% in 1971. In the early stages of Taiwan's post-war industrialization (1950s), the country lacked capital and technology and had few natural resources; hence, it had to rely on imports for essential goods, which inevitably made Taiwan an "Agricultural Product Exporting Country." In the 1960s, this structure underwent a major transformation and in the 1970s, Taiwan became an "Industrial Product Exporting Country" (Tung, 1999; Akaishi, 2019).

In Taiwan, the National Assembly and the Legislative Yuan were directly elected bodies that represented the "will of the people"; however, elections had not been held since 1948 because of the "*Temporary Provisions Effective During the Period of National Mobilization for Suppression of the Communist Rebellion*" (which granted the president the right to issue emergency orders) and the promulgation of martial law in 1949 (Tsuchiya, 2003). However, following the "*Nixon Doctrine*", Taiwan held a supplementary national election in 1969. This was the first-ever election held in Taiwan, with all elected representatives were from Taiwan (Tien & Shiau, 1992), and is often considered as beginning of Taiwan's democratization.

- **Forestry Policy**

To operate forestry agencies and meet the demand for timber, new forest resources had been needed since the post-war period, and in May 1953, the development of the Baxianshan Logging Station (L.S.) and Dasyueshan L.S. were planned. Subsequently, in 1958, the Taiwan Daxueshan Forestry Corporation was established. This was the only publicly owned and operated company in Taiwan's forestry history. Its capital was

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USD 160 million, of which USD 80 million was financed by loans from US (Chuang & Wu, 2004; Chen, 2001)

In 1956, at the end of the first phase of the "*Four-Year Plan for Economic Development*," President Chiang Kai-shek ordered the forestry industry to be reviewed in preparation for the planning of the second phase. In response, in August 1956, the provincial government formed the Sub-group for Forestry Proposal and prepared three proposals for the "*Taiwan Forestry Reform Proposal*," based on the results of the first survey of land use and forest resources in all provinces completed in 1956 (Chen, 2012). One among these, the "*Taiwan Forestry Policy and Management Guideline*," was promulgated in 1958 (Chiao, 1999). This comprised 15 and 23 articles, respectively. The F.B.'s chief secretary, Huang (1997) commented, "the Taiwan's forest policy in the 40's, which emphasises forestation and water and soil conservation on the one hand, and natural forest management on the other, is a typical multi-logging, multi-production and multi-foliation policy in the current socio-economic environment.' The Control Yuan period (19591964), when this policy was implemented, is regarded as the period of "emphasis on economic production."

The supply of provincial timber increased after 1958, while the provincial timber market was sluggish, leading to a supply-demand imbalance, lower timber prices, and an increase in timber stocks. Consequently, in 1961, the Ministry of Economic Affairs, the F.B., and other departments decided to increase timber exports and the "*Timber Commodity Tax*" was suspended (Jen, 1983). In addition, until 1968, high tariffs were applied to timber imports, and the domestic market was dominated by provincial timber, making the F.B., the main timber supplier in Taiwan at the time, the largest oligopoly(Zheng, 1999).

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With the volume of timber exports steadily increasing, the Taiwan Provincial Government organized the "Stand Conversion Project in Taiwan Forestry" in 1964 to demonstrate land productivity and requested material assistance from the UN World Food Program. The program was started in 1965 with UN assistance. It was originally planned for a 10-year period, from 1965 to 1974; however, the program was extended until 1977, as the ROC's withdrawal from the UN in 1971 made it impossible to receive assistance(Forestry and Nature Conservation Agency, Ministry of Agriculture, 2016).

Although changes were made to improve land productivity, the volume of imported timber gradually increased, and partly owing to the liberalization of some timber imports under a 1967 Executive Yuan agreement, by 1968 the volume of imported timber exceeded that of provincial timber(Jen, 1983). In addition, a team organized by the Provincial Department of Agriculture and Forestry at the request of the Provincial Government in 1965 pointed out that the Taiwan Provincial Public Enterprise "Taiwan Daxueshan Forestry Corporation" was running at a loss. Measures such as increasing the capacity of its sawmills were undertaken; however, the business situation did not improve, and the corporation ceased operations altogether in October 1970. Thereafter, the large machinery was purchased by South-East Asian countries (Chuang & Wu, 2004). In 1973, this corporation was merged into the F.B., and thereafter, the Taiwan Provincial Government did not continue active timber production and shifted its focus to the public interest.

≪Protection Forest≫

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In "*Taiwan Forestry Policy and Management Guideline*", the policy on protection forest is mentioned once each in the Forestry Policy and Management Policy as follows:

A. Taiwan's Forestry Policy…
   1. Forests that are designated as protection forest by the government for the purpose of national security, regardless of ownership, should be managed reasonably in the public interest to ensure that the forests will always be covered and, if necessary, may be acquired as state property.

B. Taiwan's Forestry Management…
   8. Protection forests and fine tree species shall be regenerated naturally as much as possible to accelerate afforestation.

In the same year, the *"Taiwan Forestry Reform Action Plan"* was also promulgated, specifying that protection forests should be reallocated.

4. Provincial Forest Management Plan outline
(2)Management plan for protection forest
a)Re-survey the condition of existing protection forests and determine whether they should be revoked or designated into other areas.
b)To establish various methods of protection forest management, operation, designation, revocation and logging.
c)In accordance multi with the principle of "multiple use of forests," all forests have the function of protecting water catchment areas. Therefore, appropriate measures should be taken on forest land other than protection forest to obtain to obtain the best protection for watersheds, and these measures should be included in the management plan of each property area.

6. Afforestation
(1)Preparation of long-term afforestation programs

In response to this plan, the "*Four-year Expansion of Protection Forest Revision*" and the "Protection Forest Revision Survey," were started in 1965. The planned period was from 1965 to 1974 (Table 7). The plan aimed to survey 115,000 ha from 1965 to 1967 and 20,000 ha from 1968 to 1974. Regarding the designation and revocation, the area

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revoked was generally expected to exceed the area designated throughout the 10-year period, with a total reduction of 1,100 ha. Although the year-wise final respective areas of designation and revocation were not known, the actual area of protection forests decreased by 10,617 ha over the decade. This was approximately 10 times the planned area, and in particular, in 1966, 1967, 1968, 1969, and 1971, a decrease of approximately 2,000 ha was observed compared with the previous years.

In summary, the function of protection forests for the purpose of fulfilling public utility functions was diminished during this period, as the timber production function was emphasized in forestry and forestry policy.

Table 7. Area of Planned and Actual of Protection Forest Revision Survey

	Area of Planed Protection Forest Survey(ha)				Area of Actual Protection Forest(ha)	
year	Survey	(A) Designation	(B) Revocation	(A)-(B)	Actual	Year-on-Year Change
1965	115,000	300	700	-400	377,466	
1966	115,000	300	400	-100	377,466	0
1967	115,000	300	400	-100	374,889	-2,576
1968	20,000	300	300	0	372,159	-2,730
1969	20,000	300	300	0	369,172	-2,987
1970	20,000	200	300	-100	369,471	299
1971	20,000	200	300	-100	366,618	-2,853
1972	20,000	200	300	-100	366,837	219
1973	20,000	200	300	-100	366,842	5
1974	20,000	200	300	-100	366,849	7
Total	485,000	2,500	3,600	-1,100	-	-10,617

Ref. Yu, S.H. (1983). Forest Resources Management

Section 3 (2) Change in Direction of Forestry Policy 1 (emphasis on public benefit):1971–1986

Table 8. Chronology of International and Taiwan Situation, Forestry Policy, and Protection Forest in Taiwan (1971–1986)

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	International	Taiwan	Forestry Policy	Protection Forest
1971	the United Nations General Assembly Resolution 2758 Nixon Shock	Leave the United Nation		
1972	United Nations Conference on the Human Environment Nixon goes to China	established National Health administration "National Park Law" The severing of diplomatic ties between Taiwan and Japan	Highest year of Domestic Timber Cutting The Second Forest Resources Survey(1972-1977)	
1973	the Yom Kippur War the First Oil Crisis	the Industrial Technology Research Institute(ITRI) was established	Ban on Log Export and Reduction in Cutting Volume The Forestry Bureau absorbed and merged the Taiwan Daxueshan Forestry Corporation	
1974		Start "Ten Major Construction Projects" Start supplementary election of the Legislative Yuan		
1975		Chiang Kai-shek passes away	*"Three principles of Forestry Policy"*	
1976			*"Taiwan Forest Management Reform Plan"* Stop the Sale of Public Farm Lands	
1977				Start *"Protection Forest Designation Expansion Plan"*
1978	the Iranian Revolution the Second Oil Crisis	Chiang Ching-kuo was elected president of the ROC		
1979	Iranian revolution the Second Oil Crisis	The severing of diplomatic ties between Taiwan and U.S.	Amendment "Taiwan Forest Management Reform Plan"	
1980	the Iran-Iraq War	Start "Twelve Point Construction"		
1981	Reagan became the President of the U.S.			
1983				Implementation of unified Protection Forest numbering
1984	10th G7 Summit			
1985	Plaza Accord			
1986	Chernobyl nuclear disaster	green oyster incident		

(1) "Ten Major Construction Projects" and "*Three Principles of Forestry Policy*" (1971–1975)

- **International Situation**

The 1970s was a time of major changes in international situations and power balance.

The stalemate in the Vietnam War, which is often referred to as a proxy war for the Cold War, and the economic downturn forced the US to change course both politically and economically. In 1971, the US President Nixon suspended the convertibility of US dollar bills to gold (the Nixon Shock), and the traditional currency system collapsed. In addition, on October 25, 1971, the UN General Assembly Resolution 2758 granted the PRC permanent membership of the UN Security Council.

The aforementioned closeness between the US and the PRC and the deteriorating relations between the PRC and the U.S.S.R lay behind this development.

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The Yom Kippur War in 1973 and the Iranian Revolution in 1978 triggered the first and second oil shocks, respectively, resulting in economic recession due to rising oil prices across the globe.

Simultaneously, the environmental movement became a new global trend from the 1970s, partly because of Rachel Carson's "*Silent Spring*," published in 1962. In June 1972, the UN Conference on the Human Environment, the world's first large-scale intergovernmental meeting on environmental issues, was held in Stockholm, and the "*Declaration of the United Nations Conference on the Human Environment*" was adopted.

- **Taiwan Situation**

The 1970s was a period of major political, diplomatic, and economic shocks in Taiwan's international relations.

The US President Nixon's visit to the PRC in 1971, the Nixon Shock, Taiwan's withdrawal from the UN following the UN General Assembly Resolution 2758, and the oil crisis of 1973, necessitated Taiwan's independence from the US in both the military and economic spheres(Igarashi, 2020).

During this period, Taiwan achieved steady economic growth, mainly in the export industries under the aegis of the economic development. However, Taiwan's diplomatic isolation and Chiang Kai-shek's death in 1975 put the legitimacy of the KMT, which was then a one-party dictatorship, at risk.

Chiang Ching-kuo, who became Premier of the ROC (President of the Executive Yuan) in 1972, sought legitimacy for the KMT's continuation in power, internally in Taiwan not externally, and promoted "Taiwanization." As part of this policy, the "Ten Major Construction Projects," a domestic infrastructure construction plan, was announced in 1973(Kannno, 2005). Wakabayashi(1999) described this national project

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as "proof of the KMT's quietly increasing inward-looking stance." Igarashi(2020, p.7) described the project as "an attempt at economic growth through infrastructure construction."

Ten Major Construction Projects

① Sun Ye-sen Freeway
② Chiang Kai-shek International Airport
③ Railway Electrification
④ North Link Line
⑤ Taichung Port
⑥ Su-ao Port
⑦ Large Shipyard (Kaoshiung Shipyard of CSBS)
⑧ Integrated steel mill (China Steel Corporation)
⑨ Oil refinery and industrial park
⑩ Nuclear Power Plant

Shortly thereafter, from 1980 to 1985, the Provincial Government launched the "*Twelve Construction Plan.*" Compared with the "*Ten Major Construction Projects*," which focused on heavy industry, this plan emphasized infrastructure, agriculture, culture, and regional development(Taiwan Railways Administration, 1980).

Twelve Construction Projects

(1) Completion of Taiwan's island-wide railroad network
(2) Constructing three new Cross-island highways
(3) Extend the freeway to the Pingtung.
(4) Expansion of the second phase of the China Steel Phase I project.
(5) Constructing the second and third nuclear power plants.
(6) Completion of Taichung Harbor Phase II and Phase III projects.
(7) Developing new towns and constructing more national residences
(8) Improvement of important farmland drainage system
(9) Construction of seawalls and riverbanks
(10) Construction of a four-lane highway between Pingtung and Galangepi
(11) Mechanization of agriculture
(12) Establishment of cultural centers

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Concurrently, the Industrial Technology Research Institute (ITRI), Taiwan's largest industrial technology research and development organization, was established in 1973 with the aim of making semiconductors a key industry.

In 1972, Chiang Ching-kuo who assumed the Premiership of the ROC, established a quota for Taiwan Province in the Legislative Yuan and arranged for a supplementary election every 3 years, which was held in the same year. Despite some obstacles, such as martial law, the indigenous legislators who were elected under this quota contributed to the enactment of environmental laws in the early years, by bringing to Congress citizens' dissatisfaction with the deterioration of their living environment because of environmental pollution(Hsiao, 1983).

The 1970s was a period of resource protectionism in Taiwan. In 1971, the National Health Administration of the Executive Yuan and its subordinate organization, the Environment Hygiene Administration, were established, with "Health" and "Pollution control" as its two main objectives. In 1945, the Hunting Law was promulgated, and hunting was completely banned in 1972. In addition, local governments began establishing their own forest reserves(Tseng, 1998).

- **Forestry Policy**

In the 1950s and 1960s, high tariffs were imposed on imported logs to protect the domestic forestry industry. However, in the 1970s, the development and utilization of forest resources in earlier years had resulted in a limited supply of domestic forest resources, and the plywood industry relied almost exclusively on imported lumber as raw materials. Liberalization of lumber imports, especially hardwood, was expanded in 1967, and import taxes were drastically lowered in 1973(Zheng, 1999).

Moreover, the Taiwan Daxueshan Forestry Corporation, a public enterprise operated by the Provincial Government, opened for business in 1956; however, in 1965, an

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investigation and review directed by the Taiwan Provincial Government concluded that it was unavoidably operating at a loss. It eventually ceased operations in 1971 and was merged into the F.B. in 1973. Various analyses conducted on the management difficulties of the Taiwan Daxueshan Forestry Corporation highlighted excessive logging and the high cost of log production(Zhuang & Wu, 2009).

Against this background, Chiang Ching-kuo appointed agricultural economist Lee Teng-hui and entrusted him with agro-forestry management reform. In early 1974, Lee Teng-hui held a meeting to discuss the then-state of Taiwan's forestry industry and the direction of reform. Subsequently, on June 19, 1974, Chiang Ching-kuo presented three principles for the management of Taiwan's forestry industry at a meeting of the Executive Yuan. In June 1975, they were officially announced as the "***Three Principles of Forestry Policy***," which signalled a shift in the direction of forestry policy from an emphasis on timber production to an emphasis on functions in the public interest. In 1976, the "***Taiwan Forest Management Reform Plan***" was promulgated(Chen, 2012).

≪Protection Forest≫

After the "*Protection Forest Revision Survey*," no significant policies were implemented in protection forests. However, Article 2 in the "*Three Principles of Forestry Policy*" of 1975, clearly stated that the area of protection forests should be expanded.

This suggested that the direction of forestry and forestry administration had changed from timber production to emphasis on public benefit.

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"*Three Principles of Forestry Policy*"

(1)The management and operation of the forest industry should be aimed at the long-term interests of national security, and it is not appropriate to exploit forests as a source of income.

(2) In order to enhance soil and water conservation, the area of Protection Forests should be expanded, and deforestation should be reduced.

(3)National Forest Land should be properly managed by the F.B.**, and the business of the existing timber merchants should be stopped and gradually reduced under the principle of protecting mountains and forests in order to maintain forest resources.**

(2)1976–1986

- **International Situation**

This period saw the rise of Islamist forces and the start of the Iranian Revolution (1979) and the Iran-Iraq War (1980).

Financially, it was a period of economic stagnation in the US. In an attempt to rebuild the US. economy after the stagnation of the 1970s, President Ronald Reagan, who took office in 1981, implemented spending cuts, tax cuts, deregulation, and other measures; however, these failed. Nevertheless, the US tax cuts and the strong dollar led to an increase in global imports of manufactured goods, which in turn expanded the Japanese and global economy. The strong dollar trend continued, and eventually, the Plaza Accord of 1985 between the US, Japan, Germany, the United Kingdom (UK), and France was signed to correct the dollar's appreciation.

- **Taiwan Situation**

The "*Ten Major Constructions Projects*" and "*Twelve-Point Constructions Projects*" of the 1970s promoted infrastructure constructions and fostered the heavy and chemical industries, and Taiwan continued to grow economically, while a second stage of import

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substitution occurred. Consequently, the light industry sector's share of Taiwan's total industrial output dropped from 60% in 1975 to 52.6% in 1985; however, Taiwan's economy continued to grow despite two external oil crises, with an average annual growth rate of 7.7% between 1974 and 1985(Huang, 1995).

Efforts to make semiconductors a key industry, which began in the 1970s, were successful, and the development of the electronics industry became widespread among small and medium-sized enterprises, leading to the concentration and development of consumer electronics and electronic component companies in the Taipei-Hsinchu area.

Concurrently, local communities in areas that had been affected by environmental pollution or where new development projects were planned began to engage in "self-help" movements (i.e., citizens who had been disadvantaged by pollution and other causes did not rely on the legal system for relief, and instead resorted private, forceful action), which spread throughout the country. The self-help environmental protection movement included group permissions, the acquisition of compensation, use of force to block pollution sources, and destruction of some facilities. Many scholars consider this period to be the dawn of the environmental movement, as large-scale lawsuits and protests against companies became increasingly active(Terao, 2015).

- **Forestry Policy**

Before the promulgation of the "*Three Principles of Forestry Policy*," the "*Taiwan Forestry Policy and Management Guideline*" (in effect since 1958) was revised in 1973, and a section on mountain control was added, although the policy of expanding artificial forestation through changing in forest composition remained unchanged. Following the announcement of the "*Three Principles of Forestry Policy*" in 1975, the "*Taiwan Forestry Policy and Management Guideline*" was revised, and "*Taiwan Forest Management Reform Measures*" were discussed; however, the "*Taiwan Forestry Policy*

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and Management Guideline" was finally abolished and the "*Taiwan Forest Management Reform Plan*" came into effect. Chen's (2012, pp.53-54) summary of this plan is as follows:

(1) Taiwan's forestry industry adopts the principle of conservation management, works for the welfare of the people, actively cultivates forest resources, emphasizes national land security, and cooperates with agricultural and industrial production for the purpose of enhancing the people's well-being.

(2) In accordance with the management plan of the national forest areas and the principle of afforestation by cutting, the standard annual afforestation area and the annual allowable logging volume are established as the basis for the annual afforestation and logging plans.

(3) From 1976 to 1980, the annual volume of logging and harvesting in the province shall be limited to 1,000,000 m^3 and an area of 12,000 ha, and the province's afforestation area shall be 30,000 ha.

(4) Cutting shall be limited to small-area or selective cutting operations, and cutting sites shall be reasonably allocated to each business area.

After the implementation of the "*Taiwan Forestry Policy and Management Guideline*," owing to the difficulty of managing the F.B. with the plan-specified cutting volume, its financial balance worsened. Therefore, the plan was revised in 1979, and the annual harvesting limit was raised from 1 million square meters to 1.5 million square meters. However, owing to the rising timber production costs and lower import tariffs, actual timber production was low (Hwang, 2005)

≪Protection Forest≫

Article of the "*Three Principles of Forestry Policy*"(1975) clearly states that the area of protection forest should be expanded. Of the 14 implementation plans for "*Taiwan*

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Forest Management Reform Plan," the "*Protection Forest Designation Expansion Plan*," which planned a large expansion in the area of protection forest from 1977 to 1982, was the first. The following is an excerpt from the plan:

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Protection Forest Designation Expansion Plan

- Construction Objectives

1・To fully develop the benefits of Protection Forest, to compound the current environmental needs of the society, to carefully consider the layout and area of existing Protection Forest, to expand the Protection Forest in important areas, and to compile the objectives and site conditions for designating various categories of Protection Forest. Principles for the selection of such areas are as follows:

1) Areas where the security function relies heavily on forests for the operation of major facilities and in line with regional development plans.
2) Areas in need of increased protection of railways, public roads, reservoir, power supply, etc., and management of their watersheds.
3) In coastal areas, areas where it is necessary to protect agricultural and industrial enterprises, people's life and property, tourism in developing areas, and other areas for national welfare, beautification of the environment, riverside and nature protection, and where it is necessary to expand Protection Forest areas.

2・The Protection Forest that have been thus designated shall be reviewed from time to time to determine the most effective management of the forests,

3・Forests designated as Protection Forest are to be re-organized to maintain a dense forest cover and are not to be cut down owing to lack of ownership or operational needs.

4・Survey the current state of the forests, investigate unmaintained and damaged forests, prioritize and incorporate them into annual plans, and complete reforestation by the deadline. Where forests are leased out for reforestation, the lessee must be encouraged to carry out reforestation by the deadline.

5. Depend on the purpose of the Protection Forest designation, the Protection Forest Practices Act, and the long-term care plan and actively and effectively manage the forests.

- Implementation Requirements

1・Expanded Designation Protection Forest

…An initial survey of 250,000 ha of important land areas in all provinces, including approximately 55,000 ha of Protection Forest to be designated as Protection Forests in the next 6 years. The following are the land areas and areas to be designated:

1) 20,000 ha of Landscape and Erosion Control Protection Forest on the both sides of the East-West Cross Island Highway, Southern Cross-Island Highway, the North and South Link Line, to be re-designated.

2) 27,000 ha of Headwater and Erosion Control Protection Forest in important watersheds areas such as Shimen, Mingde, Deji, Wushe, Zengwen, Wushantou,

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Agongdian, etc., are to be designated.
3)1,300 ha of Windbreak, Sand, and Tide Protection Forest for the protection of farmland communities and other national welfare.
4) A total of 6,700 ha will be added to other areas for water use, power supply, water supply, and protection belts on both sides of streams, nature reserves and areas required for academic research and sanitation.

As indicated in the plan, many of the areas slated for designation as protection forests were in the vicinity of public facilities. In conjunction with the expanded designation for protection forests, the F.B. was further instructed to conduct a comprehensive review of protection forests and develop a protection forest operation and long-term nursery plan. However, no major changes were made in regulations regarding the operation of protection forests.

In 1980, the "*Taiwan Forest Management Reform Plan Implementation Results Mid-term Report*" stated that of the total planned area of 55,000 ha to be designated as protection forests for the entire period (6 years), 45,854 ha had already been designated, indicating that the plan was being implemented at a faster pace than anticipated.

Section 4 (3) Change in Direction of Forestry Policy 2 (forest conservation): 1986–2022

Table 9. Chronology of International and Taiwan Situation, Forestry Policy, and Protection Forest in Taiwan (1987–2022)

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	International	Taiwan	Forestry Policy	Protection Forest
1987		Lifting of "*Martial Law*" Establish Environment Protection Administration Published an article, "Danda Forest District Cutting Site" in the magazine "Human"		
1988		Lee Teng-hui became President of Taiwan	Announced "The Forest Rescue Declaration of 1988"	
1989		Lunch the Privatization of state-owned enterprises(SOE's)	the Bureau's status was changed to a "civil service agency"	"*Regulations for Protection Forest Managements*"
1990	German reunification		Repeal of "*Taiwan Forest Management Reform Plan*", enactment of "*Taiwan Forest Management Plan*" The Third Forest Resource Survey(1990-1993)	
1991	the Gulf War The collapse of the Soviet Union		Decision to bancutting of natural forests, etc.	
1992	Announce "*Forest Principles*"	"*Public Nuisance Dispute Mediation Act*"		
1993	established the EU			
1994	UNFCCC entered in force	"*Environmental Impact Assessment Act*"	"*Soil and water Conservation Act*"	
1995			the Third National Forest Resource Survey(1989-1995)	
1996				"*Taiwan Province Revocation Criteria for Protection Forest*"
1997	COP3(Kyoto Protocol) Asian Finance Crisis			
1998		National Energy Conference		
1999		Downsize-Province 921 Earthquake		
2000		Amendment "*National Property Act*"		
2001	The Marrakesh Accords			"*Revocation Criteria for Protection Forest*" "*Principle of Protection Forest Dotted Line Utilization*"
2002		"*Basic Environment Act*"	Start Community Forestry Project	"*Establishment and Review Guideline of the Taiwan Protection Forest Revocation Review Committee*"
2003				Protection Forest Revision clarified in "*Regulation for Protection Forest Managements*"
2004			Amendment "*Forest Act*"	"Revocation Standard for Protection Forest"
2008			The Fourth Forest Resource Survey(2008-2014)	
2009	Great recession	Typhoon Morakot		
2010				"Principle of Green cover compensation for the use of Protection Forest in Development"
2011	Great East Japan Earthquake			
2015	The Paris Agreement on Climate change	"*Greenhouse Gas Reduction and Management Act*"		
2016			Started "Under Forest Economy" obtained FSC certification for national forest first time	
2017			Announced "First year of Domestic Timber" by Forestry Bureau	
2019			"*Key points of the review of the economic operation of the forest*"	

Note; Surveys by the author

- **International Situation**

The 1980s was a period of increasing influence in Asia, with the democratization of Korea and Taiwan and the economic growth of the ASEAN countries.

The Revolution of 1989 led to the fall of the Berlin Wall and the proclamation of the end of the Cold War. In 1993, the European Community changed its name to the European Union, unified its currency, and became with a competitor to the US.

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Meanwhile, in Asia, China signed an agreement with ASEAN with the intention of creating a large economic zone in Asia. Thenceforth, the world has continued to promote globalization including via the Trans-Pacific Partners Agreement (TPP).

In the 1970s, environmental awareness was gaining attention; however, as the currency and oil crises set off a global capitalist crisis, environmental policies receded worldwide. However, international discussions continued, and in 1980, the International Union for Conservation of Nature (IUCN) released the "*Would Conservation Strategy*," and the UN Conference on the Human Environment in 1972, the 10th G7 summit in 1984, and the Environment Minister's meeting at the OECD in 1985 recognized the need for developed countries to take action toward "Sustainable Development." The "*Statement of Forest Principles*" was issued at the 1992 Earth Summit. This was the first global agreement on forest issues. The Kyoto Protocol, which set legally binding numerical targets for developed countries to reduce emissions of greenhouse gases, was adopted at the 1997 Kyoto Conference on Climate Change (COP3).

- **Taiwan Situation**

Taiwan's economy continued to grow in the 1980s. The industrial structure was heavily dominated by the manufacturing sector until the early 1980s; however, this changed in the late 1980s when the service sector began to expand(Sato, 2001).

In 1986, the Democratic Progressive Party was formed, ending the KMT's one-party dictatorship. In 1987, "*Martial law*" was lifted, and Taiwan's democratization rapidly proceeded (Lee, 2014). In April 1991, the Constitution was amended to provide for regular elections to the Legislative Yuan, and in 1992, elections were held. Notably, >80% of the elected members were from Taiwan. In December 1998, the name Taiwan Province was effectively abolished, clearly indicating that Taiwan was no longer a province of mainland China.

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With the lifting of "*Martial law*," social protests became more prevalent. Although environmental protection received attention under the Provincial Government, Taiwan lagged behind other developed countries. This is because although international awareness of environmental protection had been growing since the 1970s, Taiwan had already withdrawn from the UN and consequently, pressure from the international community on environmental protection issues was weak, and the Provincial Government continued to prioritize economic development(Chen , 2012).

After the lifting of "*Martial law,"* the Environmental Protection Administration of the Executive Yuan was established in 1987, followed by the promulgation of the "*Public Nuisance Dispute Mediation Act*" in 1992, and the "*Environmental Impact Assessment Act*" in 1994. The political democratization process was linked to the environmental movement as well. In some areas, alliances were formed with the Democratic Progressive Party, which gained local power and prevented the expansion of industrial zones(Chiu, 2013).

- **Forestry Policy**

The F.B.'s business situation deteriorated as a result of logging restrictions in the "*Taiwan Forestry Management Reform Plan.*" Despite a revision of the plan in 1979, which raised the logging limit from 1,000,000 m^2 to 1,500,000 m^2, the rising cost of timber production and the reduction of timber import duties prevented logging from proceeding, worsening the F.B.'s business situation.

Environmental conservation movements began emerge openly in 1987 after "*Martial law*" was lifted. In the same year, conservationist Lai Qing-Biao published two articles in the magazine "*Human*," namely, "Protecting Taiwan's Most Backward and Primitive Forests" and "Danda Forest District Cutting Site" including photos of logging conducted by the F.B in the Danda Forest District. This led to the expansion of the forest

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protection movement by civil society, and on Arbor Day in March 1988, several hundred university professors signed the "The Forest Rescue Declaration of 1988," and a large protest movement was held to demand an end to the deforestation(Chen, 2012).

Subsequently, in 1990, the Council of Agriculture (COA) repealed the "*Taiwan Forest Management Reform Plan*" in 1990 and promulgated the "*Taiwan Forest Management Plan*," which included more stringent logging restrictions. However, the forest protection movement continued, and in August 1991, the COA of the Executive Yuan convened academics and conservation groups and held the "*National Forest Conference*" to discuss the future direction of the movement. Consequently, it was decided that logging would be banned in natural forests, and in November 1991, the "*Taiwan Forest Management Plan*" was revised and re-promulgated.

In 1989, the F.B.'s status was revised from an "enterprise organization" to a "civil service agency" with a civil service budget(FACA, 2023). The self-sufficiency rate for timber has continued to decline and is currently at <1%.

≪Protection Forest≫

Regarding forest conservation, the direction was toward stringent restrictions on overall forest operations, and the direction of expansion of protection forest, which were originally restricted areas for operations, was omitted. Although new regulations were established to prohibit logging in protection forests and required the government to bear the cost of planting private protection forests, the area of protection forests was not expanded. In 1989, the "*Regulation for Protection Forest Managements*," the first law on the comprehensive management of protection forests, was promulgated. Thenceforth, the development of laws and regulations concerning protection forests has progressed.

The "*Regulation for Protection Forest Managements*" has since been amended, namely in 1999, 2000, 2003, and 2012. The 1999 amendment changed the name of the

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management agency because of the non-existence of the Taiwan Provincial Government, and the 2000 amendment removed the municipal governments that had hitherto been the approval agency for the construction of roads in protection forests. In the 2003 amendment, salt protection forest was added to the category of protection forests, and more detailed conditions for the management of protection forests were stipulated. The 2012 amendment to Article 4 stipulated that the survey of all protection forest should be conducted once every 10 years and when a disaster occurs, even if it is not during the time of a protection forest designation revision.

A revised draft published in 2022, and the most significant change in the draft is the deletion of the section on clear-cutting, which currently, can be carried out if necessary for forest development. Although a decision is yet to be made, it is possible that Taiwan's protection forest will be completely cleared in the near future.

From the late 1990s to the early 2000s, the regulations regarding the revoking of protection forest designation were changed several times, with the 1966 "*Taiwan Province Revocation Criteria for Protection Forest*," the 2001 "*Revocation Criteria for Protection Forest*," and finally, the 2004 "*Revocation Standard for Protection Forest*," which has legal basis in the provisions of the *Forest Act*. The 1996 criteria clarified the types of protection forests that can be designated as such or the designation revoked:

1) Seaside areas and riversides that are impossible for forest use

2) Loss of the purpose of the designation as protection forest due to shoreline movement

3) Establishment of public facilities

4) Existence of alternative measures for protection forest

5) Establishment of paddy fields and other facilities within protection forest that do not impair its overall function

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6) Revision of protection forest boundaries

7) Loss of need for protection forests due to changes in forest and land conditions

The 2002 "*Establishment and Review Guideline of the Taiwan Protection Forest Revocation Review Committee*" clearly stipulates the procedures to be taken when revoking protection forests.

Furthermore, the time limit for the revocation of protection forests in non-forestry status was consistent with the regulations in the *National Property Act*. As of 1996, the revocation of protection forest in non-forestry status after May 27, 1967 was not permitted. However, in 2000, the *National Property Act* was amended to change the requirements for allowing the lending of non-public use national government-owned real estate . Until that time, the use of such real estate had to start before May 27, 1967; however, the data was changed to before July 21, 1993. Consequently, the criteria for "*Revocation Criteria for Protection Forest*," which came into effect in 2001, currently allows for the revocation of protection forests that were in non-forestry status before July 21, 1993.

This change provides a 20-year grace period, which is a possible relaxation of the time restrictions.

The 2002 "*Establishment and Review Guideline of the Taiwan Protection Forest Revocation Review Committee*" clearly stated that the committee had long been in place. In addition, at the 2002 "Cooperative Meeting between the F.B. of the COA and the Director Construction Bureau of each country and city government," discussions were held on the issue of outside working circle (O/W) protection forests that had been managed by local governments. Since all local governments did not want to manage the O/W protection forest in the future, the F.B. undertook their management in July 2003.

The F.B. has been endeavoring to obtain FSC certification for national forests, from

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2016 to the present(Japan Wood Products Export Association, 2017), and to revive domestic timber production, by launching the "First year of Domestic Timber" in 2017. In addition, since 2002, the F.B. has been involved in "Community Forestry," in which local communities patrol the forests and use them for educational purposes, and since 2016, it has been involved in the "Under Forest Economy," in which beekeeping and mushroom cultivation in the forests are used to earn profits. Both projects include the use of forests for protection forests. This is a direction to use forests for purposes other than timber production, and is currently under exploration.

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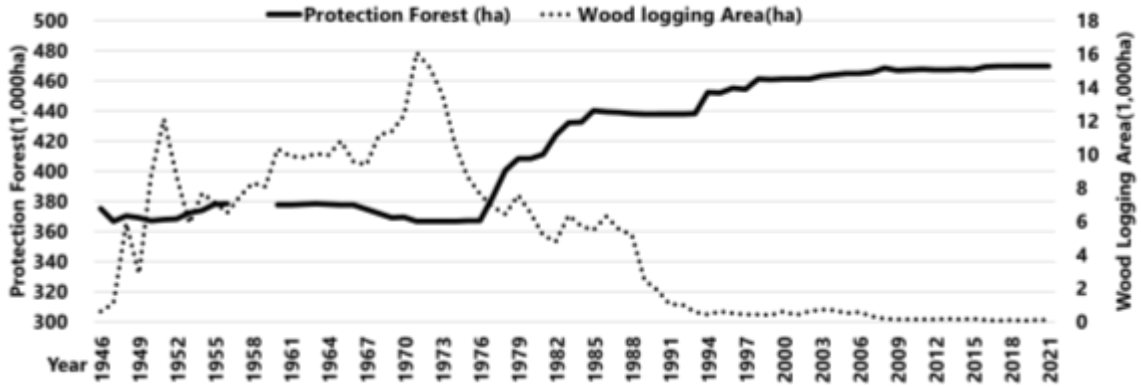
Chapter 2 Evolution of Protection Forests in Japan

…The period classification was based on that in the "The Centennial History of the Protection Forest System."(Editorial Committee of the Centennial History of the Protection Forest System, 1997).

Figure 10. Change of Protection Forest Area (ha) and Wood Logging Area (ha) in Japan (1946–2021)



Ref. Area of Protection Forest and Wood Logging in each year "The Outline of Forest and Forestry Statistics"

Table 10. Chronology of Social Situation, Forestry Policy, National Forest, and Protection Forest in Japan

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	Socioeconomic Situation	Forestry Policy	National Forest	Protection Forest	
1945	End of WW II				
1946	Matters Concerning Public Works				
1947		Unification national forest management	Independent Accounting System	Protection Forest Enhancement Projects(1947～1951)	
1948					
1950	Korean War(-1953)	Plan for the Increase in Wood Production Timber Production Increase Plan			
1951	Treaty of Peace with Japan	Amendment of the *Forest Act*		Establishment of a protection forest facility district system	
1954	Typhoon Marie The Geneva Conference			Enacted *Temporary Measures Act for Protection Forest Consolidation*	
1956	United Nations Accession the Jinmu boom				1st Protection Forest Consolidation Plan" Background: Frequent occurrence of natural disasters Focus: Headwater conservation forests
1957	Income Doubling Plan		Plan for the Improvement of Productivity in National Forest		
1959	Iwato Boom Typhoon Vera				
1961	"Income Doubling Plan"		Plan for the Increase in Wood Production		
1962		Amendment of the Forest Act			
1964	Tokyo Olimpic	Forestry Basic Act the full liberalization of the timber trade		Extension of *Temporary Measures Act for Protection Forest Consolidation*	
1967	Basic Law for Environmental Pollution Control				
1968	Air Pollution Control Law	Amendment of the Forest Act			
1969	New Comprehensive National Development Plan				2nd Protection Forest Consolidation Plan Background: Rapid increase in water demand due to rapid economic growth Focus: Headwater conservation forests
1970	Pollution Session of the Diet			Basic Survey on the Deployment of Public Health Forests	
1971	establishment of the Environment Agency				
1972	the Plan for Remodeling the Japanese Archipelago United Nations Conference on the Human Environment Natural Conservation Act				
1973	first oil crisis	new forest management	National forest management took financial measures		
1974		Amendment of the *Forest Act*		Extension of *Temporary Measures Act for Protection Forest Consolidation*	3rd Protection Forest Consolidation Plan Background: Deterioration of living environment due to urbanization, increased demand for forest recreation Focus: Public Health
			Enacted *National Forest Project Improvement Special Measures Act*		
1979	the Second Oil Crisis				
1983		Amendment of the *Forest Act*			
1984			Amendment of *National Forest Project Improvement Special Measures Act*	establishment of the "Specific Protection Forest System"	
1985	Plaza Accord				
1987	*Act on Development of Comprehensive Resort Areas*		Amendment of *National Forest Project Improvement Special Measures Act*		4th Protection Forest Consolidation Plan Background: Increase in abandoned protection forests due to the forestry recession Focus: Headwater conservation
1989		*Act on Special Measures concerning Improvement of Public Health Function of Forests*			
1990	Unification of East and West Germany				
1991	Dissolution of the Soviet Union	River Basin Management System	Amendment of *National Forest Project Improvement Special Measures Act*		
1992	The Earth Summit				
1994				Extension of *Temporary Measures Act for Protection Forest Consolidation*	5th Protection Forest Consolidation Plan Background: Many disasters caused by forest landslides Focus : Headwater conservation, Soil run-off prevention
1995	Great Hanshin-Awaji Earthquake				
1997	COP3 in Kyoto				
1998	*Act on Promotion of Global Warming Countermeasures*	Amendment of the *Forest Act*	Reform of National Forest Business. Managemen		
2001	COP7(Marrakech Accord)	Enactment of *Forest and Forestry Basic Act*			
2002	*Act on Special Districts for Structural Reform*				
2003	Ten-year Forest Sink Measures to Prevent Global Warming	Emergency Measures for the Development of a Reporting and Verification System for Forest Absorption			< Plan change in 2002 > Background: Forest and Forestry Basic Act
2004		Amendment of the *Forest Act*			
2005	Enforcement of the Kyoto Protocol				
2007	Amendment of *Building Standards Act*				
2009	Financial crisis	the Forest and Forestry Revitalization Plan			
2011	Great East Japan earthquake	Amendment of the *Forest Act*			
2012	Feed-in Tariff	Abolition of Special Account for National Forestry Projects			
2013		Change to public account for National Forestry Projects			
2016	Kumamoto earthquake	Clean Wood Act			
2019		The Forest Environmental Tax start	Tree-collecting rights system		
2020	Paris Agreement		Task Force on Renewable Energy Regulatory Comprehensive Review		
2021				Set up a website " Protection Forest Portal"	

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Note: Surveys by the author

Table 11. Protection Forest Consolidation Plan and Result

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Phase		1st	2st	3rd	4th	5th	
Year		1954-1963	1964-1973	1974-1983	1984-1993	1994-2002	1994-2003
General conditions		Frequent Natural Disasters	Rapid Increase in water demand due to rapid economic growth,etc.	Deterioration of living environment due to urbanization and increased demand for forest recreation	Increase in abandoned protection forests due to forestry recession	High incidence of forest land collapses Increased demand for quality water and greenery close by.	Adoption of the Kyoto Protocol Enacted the "Forest and Forestry Basic Act"
Priority designated protection forest		Headwater conservation		Headwater conservation Public health	Headwater conservation	Headwater conservation Soil run-off prevention Public Health	Headwater conservation Public Health Fish breeding
Target designated area(ha)	National	1,142,000	1,647,000	549,000		321,000	1,167,000
	Public & Private	2,616,000	1,242,000	828,000	470,000	538,000	667,000
	Total	4,058,000	2,889,000	1,377,000	643,000	858,000	1,834,000
Designation result		100%	105%	100%	100%	-	94%
Target purchase area(ha)		500,000	250,000	50,000	-	-	-
Result of purchase area(ha)		197226	57581	5205	547	-	-

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Ref. Editorial Committee of the Centennial History of the Protection Forest System, 1997, pp.145-254

Section 1 Post-WW2 Amendment of Forest Act: 1945–1962

- **Socioeconomic Situation**

In 1946, the Allied General Headquarters (GHQ) ordered the establishment of a new public works item in the general funto absorb the large number of unemployed people as a result of the collapse of the war economy.

In response, in July 1946, the Cabinet approved the "Matters Concerning Public Works," bringing erosion control, afforestation, and forest road projects under the purview of public works(Tsutsui, 1974).

- **Forestry Policy**

Tsutsui(1974) opined that postwar forestry policy began with conservation works such as mountain control projects.

The urgency and necessity for strengthening flood control and disaster prevention projects intensified consequent to wartime logging, forest land cultivation, and the extensive recurrent flood damage. From 1946 to 1947, a survey of disaster prevention measures resulted in the implementation of the "*Five-Year Plan for Erosion Control*" and the "*Protection Forest Enhancement Projects*." Simultaneously, in 1947, the Conservation Division in the Forestry Agency was established(Editorial Committee of the Centennial History of the Protection Forest System, p.124). Consequently, the Forestry Agency undertook erosion control works(Editorial Committee of the Centennial History of the Protection Forest System, 1997, p.126). In 1951, based on pre-war discussions and post-war recommendations from the GHQ, the "*Forest Act*" was revised to introduce the Forest Planning System.

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However, the number of degraded forest lands increased, and the degradation was particularly noticeable in private forest lands. Owing to the poor post-war financial situation, only one-third of the planned amount of restoration work was executed(Editorial Committee of the Centennial History of the Protection Forest System, 1997, p.146).

consequently, the "*Basic Outline for Erosion Control*" was formulated to establish and implement measures for erosion and flood control. In 1954, the "*Temporary Measures Act for Protection Forest Consolidation*," a 10-year time-limited law, was enacted as a concrete measure to expand and improve protection forests.

Furthermore, in response to the increasing timber demand, the Cutting Permission System was completely abolished in hardwood forests in 1957 and in all non-protection forests in 1962, with the aim of aggressively increasing forestry production.

- **National Forest Management**

In the post-war period, forestry policy was unified, and the national forest management adopted an independent accounting system in which labor costs and business expenses were paid for by a company's own income from forest products and other sources.

From the late 1950s onward, owing to the rapid increase in timber demand, the government formulated the "*Plan for the Improvement of Productivity in National Forest*," which was based on the concept of converting slow-growing natural forests to fast-growing planted forests. In 1950, the "*Plan for the Increase in Wood Production*" was formulated to increase logging based on the prospect of increased growth through the consolidation and improvement of silvicultural techniques. In the same year, the government formulated and promoted the "*Timber Production Increase Plan*," which aimed to increase the amount of timber harvested in national forests by twice or thrice the amount of growth.

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Until the 1960s, the national forestry business remained significantly profitable, partly because of high timber prices owing to a tight supply and demand. A portion of the profits was used to purchase private forest land for protection forests, and was transferred to the general funds as well.

- **Protection Forest**

● Change in the Protection Forest System

The present Protection Forest System was established by two post-war amendments to the *Forest Act.*

Moreover, the purpose and categories of protection forests were increased from 9 purposes and 12 categories to 11 purposes and 17 categories by the 1951 amendments. Four new categories of protection forests were added as follows: drought , snow-avalanche, fog-inflow prevention, and scenic site conservation forests. Conventional erosion control protection forest was divided into two categories, namely, soil run-off and landslide prevention forests. Conventional headwater protection forests were classified into two categories, namely, headwater conservation and drought prevention forests, because of the introduction of the concept of broadly protecting the entire river basin in protection forests and because the traditional localized water source recharge function was borne by drought-prevention forests(Editorial Committee of the Centennial History of the Protection Forest System, 1997, p.146).

Regarding logging regulations, selective cutting alone was the principle logging method in all categories of protection forests, from the pre-war period until the revision of the *Forest Act* in 1951.

The 1951 revision of the "*Forest Act*", brought logging and other protection forest operations under the newly created Forestry Plan System. In addition, as the number of protection forest categories increased, the method of logging protection forests was, in

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principle, established for several categories of protection forests. Under this law, clear-cutting is permitted in 13 categories of protection forests, including headwater conservation forests, for the purpose of forest improvement, although, in principle, selection cutting is permitted.

The 1962, revision of the *Forest Act* abolished the logging permission system for non-protection forests and replaced with a notification system. Therefore, the operation of protection forests hitherto performed by the Forestry Plan System, is performed by the "Requirement for Designation" for each protection forest. Furthermore, the principle of harvesting method was changed, and logging methods were defined for each category of protection forests. Four categories of protection forests, including headwater conservation forests, do not specify the species to be cut, i.e., clear-cutting is permitted. The purpose of logging is not limited to forest improvement, and post-logging artificial planting is permitted. This has made it possible to produce timber via clear-cutting in protection forests.

● **First Protection Forest Consolidation Plan**

The 1954 "*Temporary Measures Act for Protection Forest Consolidation* promoted the urgent and systematic deployment of protection forests in accordance with the "Protection Forest Consolidation Plan," which stipulated the planned areas and areas of forests to be designated and revoked as protection forests. Since the plan was based on the concept of river basin conservation, it was formulated on a basin basis rather than on a prefectural basis. This plan used a different perspective on forest management in protection forests, i.e., it was based on the principle of natural regeneration without consideration of use. The regulation stipulated that "the operation of protection forests should not be restricted more than necessary, as it depends on the expected function of the forest and the current condition of the forest" and that the operation restrictions

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should be determined by the designated purpose(Editorial Committee of the Centennial History of the Protection Forest System, 1997, p.157). In particular, 1962 revision of the *Forest Act* stated that since the purpose of protection forests for headwater conservation was to maintain the same level of forest cover throughout the catchment area, sufficient conservation benefits could be expected from good protection forests by having the forests cut down evenly in an annual cycle.

The protection forest consolidation plan that began in 1954 was aimed at enhancing the erosion and flood control functions of forests in response to the frequent natural disasters; therefore, the designation of headwater conservation forests were prioritized.

Section 2 Second to Fifth Protection Forest Consolidation Plan (1964-1993)

(1) Second Protection Forest Consolidation Plan (1964-1973)

- **Socioeconomic Situation**

The Jinmu boom of 1954–1957 and the Iwato boom of 1959–1961 ushered Japan into a period of high economic growth along with the commencement of the 1960 "Income Doubling Plan.". The plan aimed to concentrate industry in the Pacific Belt region, import labor from rural areas, use government funds to improve social capital, and double the national income and achieve full employment in 10 years (Arai, 2021, p.10). Furthermore, during this period, Japan shifted from a dependent economy to a self-sustaining economy, and from a recovery economy to an expansionary economy. In addition, the main sectors in the industrial structure changed from primary manufacturing and light manufacturing sectors to heavy chemical industry sectors.

Consequently, the development of large cities and the improvement of living standards that accompanied economic growth led to an increase in demand for urban and domestic water. Therefore, water issues were considered more important, and in 1960, a "*Special Committee on Water Resources*" was established within the Liberal

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Democratic Party (LDP) to study the use and development of water resources(Editorial Committee of the Centennial History of the Protection Forest System, 1997, p.182).

However, natural disasters, such as Typhoon Vera in 1961, were frequent, and the need for erosion and flood control remained high.

- **Forestry Policy・National Forest Management**

From the late 1950s, lumber demand for post-war reconstruction purposes surged, causing lumber prices to skyrocket.

In 1957, the "*Plan for the Improvement of Productivity in National Forest*" shifted the forests from natural to planted forests, and in 1961, the promulgation of the "*Plan for the Increase in Wood Production*" led to national forests being cut down twice or thrice more than the growth rate. In 1962, the *Forest Act* was amended to abolish the permit system for logging common forests, with the aim making lumber production more flexible to demand. In 1964, the "*Forestry Basic Act*" was enacted to promote forestry.

- **Protection Forest**

The Central Forestry Council's 1962 report on protection forests stated the need to secure water source recharge function, promote the systematic implementation of erosion control works, and promote the purchase of important protection forests.

Consequently, the "*Temporary Measures Act for Protection Forest Consolidation*" was extended once again.

When formulating the second phase of the "*Protection Forest Consolidation Plan*," the area required for headwater conservation forests was calculated based on the amount of water runoff from forested areas and the demand for various types of water in the 216 river basins throughout Japan, and the designation of protection forests was planned based on this calculation(Editorial Committee of the Centennial History of the Protection Forest System, 1997, p.190).

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Subsequently, the designation of headwater conservation forests to meet water demand, and soil run-off and landslide prevention forests to meet the need for erosion control and flood prevention, respectively, were planned.

(2) Third Protection Forest Consolidation Plan (1974-1983)

- **Socioeconomic Situation**

Since the 1960s, the living environment has rapidly deteriorated owing to the loss of natural resources, air pollution, noise, and destruction of scenic beauty caused by rapid economic growth; furthermore, health hazards caused by environmental pollution have occurred, especially in industrial areas.

Following the enactment of the "*Basic Law for Environmental Pollution Control*" in 1967, "*Air Pollution Control Law*" in 1968, "*Pollution Session of the Diet*" in 1970, and the "*Natural Conservation Act*" in 1972 and the establishment of the Environment Agency in 1971, public opinion and policy shifted toward improving and preserving the living and natural environments.

Concurrently, partly owing to the "Income Doubling Plan," young people from rural farming communities and mountainous villages began to migrate to the big cities, widening the regional disparity between overcrowded cities and depopulated countryside. The "New Comprehensive National Development Plan " was formulated in 1969 to promote high-speed transportation, such as bullet trains and highways, and development projects in rural areas. (Arai, 2021, p. 12).

- **Forestry Policy ・National Forest Management**

Between the policy promotion of foreign timber imports in 1961 and the full liberalization of the timber trade in 1964, timber prices stagnated. In addition, the income of national forest management decreased because of reductions in harvest volume in response to the demand for nature conservation.

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In 1969, consequent to the limitation of domestic timber supply and public opinion that prioritized the environment, the "*Utilization of National Forest Land Regulation*" was revised, and "*securing the public interest functions of forests*" was added to the management objectives of national forests.

In 1973, the government adopted a "*new forest management*" policy that emphasized the coordination of timber production with public interest functions such as land conservation and natural environment preservation , resulting in decreased clear-cutting areas. In 1974, the "*Forest Act"* was partially amended.

- **Protection Forest**

In 1970, a "*Basic Survey on the Deployment of Public Health Forests*" was conducted to study the ideal form of the Protection Forest System, and a survey on the designation of public health forests was conducted(Editorial Committee of the Centennial History of the Protection Forest System, 1997, p.198).

The "*Temporary Measures Act for Protection Forest Consolidation*" was re-examined and extended to coordinate with the "*Natural Conservation Act*" and the "*Forest Development Permission System*" and to expand the number of public health forests. In contrast to the first and second phases, the third phase of the Protection Forest Consolidation Plan designated a large scale of public health forests, and the area of these forests was considerably increased(Editorial Committee of the Centennial History of the Protection Forest System, 1997, p.209).

(3) Fourth Protection Forest Consolidation Plan (1984-1993)

- **Socioeconomic Situation**

In the 1980s, Japan's trade surplus surged, and the country entered a period of stable growth, becoming the world's largest trade surplus country.

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In 1972, the-then Japanese Prime Minister Kakuei Tanaka, , proposed the "*the Plan for Remodeling the Japanese Archipelago*," including the decentralization of industry and the development of a high-speed transportation network, which led to land purchases and development in areas across Japan that were considered candidate sites for large-scale projects, and land prices soared (Arai, 2022 Arai, 2022, p. 12). However, owing to factors such as the increasing service-oriented nature of the economy, population and industry density in Tokyo accelerated, and regional disparities remained unresolved. (Arai, 2022, p. 18).

Moreover, low growth affected the nation's declining purchasing power for housing in the 1980s, and housing prices fell. Timber prices fell into a long-term low-growth trend, and timber-related industries fell into a recession.

- **Forestry Policy ・National Forest Management**

In 1974, the "*Forest Act*" was amended to establish the "*Forest Development Permission Scheme*" to protect forests from destruction caused by overexploitation resulting from "*the Plan for Remodeling the Japanese Archipelago*." This stipulated that any development of ≥1 ha in non-protected forests would require review and permission (Fujiwara, 1991, p.7).

From the 1970s, the management of national forests began to rapidly deteriorate. In 1973, the national forest management took financial measures such as increasing the general fund's share of the cost of erosion control projects; however, from 1976, the management began to borrow money, and from 1977, the addition of interest on long-term debts made management even more difficult. Since 1978, a line of rationalization of national forest management, including rationalization of operations by promoting natural forestry operations and expanding the use of contracting out of operations, has been defined(Inoue, 1994).

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➢ **Protection Forest**

The recession in the forestry industry had weakened the motivation of forest owners to manage their forests, and the number of forests that had not been properly cleared, thinned, or otherwise managed increased. In particular, many protection forests were unprofitable, and with little incentive to restore them they fell into disrepair, resulting in an increased number of degraded and abandoned protection forests(Editorial Committee of the Centennial History of the Protection Forest System, 1997, p.215). In addition, landslides due to typhoons and earthquakes continued to occur after the 1980s, and the need for land conservation remained high(Ide, 2011, p.41).

Consequently, the "*Temporary Measures Act for Protection Forest Consolidation*" was extended for the third time. The fourth phase of the Protection Forest Consolidation Plan was characterized by the establishment of the "*Specific Protection Forest System*." It was a system to designate protection forests that require immediate implementation of forestry operations and was based on a Protection Forest Consolidation Plan by the Minister of Agriculture, Forestry, and Fisheries(Editorial Committee of the Centennial History of the Protection Forest System, 1997, p.219).

(4) The Fifth Protection Forest Consolidation Plan(1994-2003)

➢ **Socioeconomic Situation**

In 1985, the Plaza Accord was reached to correct the dollar's appreciation, which led to the appreciation of the yen. Subsequent monetary easing by the Bank of Japan and corporate efforts led to a boom; however, the economy peaked in 1991 and has been in recession to date.

Natural disasters continued to occur in Japan, and the number of houses in mountainous and foothill areas increased owing to the rapid development and urbanization, increasing the risk of mountain disasters.

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Moreover, the "*Act on Development of Comprehensive Resort Areas*" was promulgated in 1987 to promote the economy of depopulated areas. Under this act, national and local governments were granted preferential treatment, including deregulation of tourism development for resort development plans formulated by prefectures and approved by the national government. Large resort development plans such as ski resorts, golf courses, and theme parks were approved by the government in 42 regions throughout Japan. (Arai, 2022, p.18)

Simultaneously, the demand for safe water increased. The Central Environment Council's 1993 report addressed the issue of water quality, and in 1994, the "*Act on Advancement of Project for Quality Management of Raw Water*" was enacted.

Furthermore, the Prime Minister's Office conducted a "*Poll on Urban Greening*" in 1991, which revealed that people were dissatisfied with the "greenery" in their daily lives, and demands for the preservation of drinking water and greenery increased(Editorial Committee of the Centennial History of the Protection Forest System, 1997, p.231).

- **Forestry Policy ・National Forest Management**

In 1990, the "*Act on Special Measures concerning Improvement of Public Health Function of Forests*" was enacted. Under this law, the governor of a private forest owner could authorize the establishment of certain facilities if the plans conformed to facility standards and other requirements. With the governor's approval, a certain level of development was permitted without the Forest Act's permission for forest land development or the use of protection forests. In other words, development on a certain scale could be executed only under governor's authority, and the emphasis was placed on economic uses such as resort and golf course development, while the public interest functions of forests were neglected(Osawa & Koizumi, 2021, p.14).

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Based on the Forestry Policy Council's 1990 report, the Forest Act was partially amended in 1991 to introduce the "*River Basin Management System*." This policy aimed to divide the nation into 158 forest planning areas (river basins) and develop forests and conditions for timber production and other public interest functions of forests. Consequently, an integrated production system, from material production to distribution and processing, was established in the basins to promote efficient timber production, and in 1996, the outsourcing of forestry to the private sector was promoted.

- **Protection Forest**

In 1987, an administration inspection recommended the promotion of designation and proper management of protection forests for public interest, and in 1992, before the expiration of the "*Temporary Measures Act for Protection Forest Consolidation*," the Forestry Agency established the "*Preliminary Review Committee for the Temporary Measures Act for Protection Forest Consolidation*," which met thrice. Furthermore, in 1993, the Agency established the "*Review Committee on the Protection Forest System*" to analyze the current status and issues regarding the Protection Forest System overall. Thereafter, an amendment to the "*Temporary Measures Act for Protection Forest Consolidation*" was submitted to the Diet, and it was extended for the fourth time. The fifth phase of the Protection Forest Consolidation Plan was formulated.

The Fifth Phase of the Protection Forest Consolidation Plan focused on the following:

(1) Designation of soil run-off prevention forest in areas where the need for protection against mountain disasters was increasing due to development and urbanization

(2) Designation of headwater conservation and drought prevention forests to ensure a stable supply of high-quality water

(3) Designation of public health forests for the preservation of greenery around people

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In addition, the Specific Protection Forest System initiated in the fourth phase of the plan continued to be implemented.

Furthermore, following the "*Act on Development of Comprehensive Resort Areas*," a notice regarding coordination with areas designated as protection forests was issued, since many of the areas marked for development as comprehensive recreation areas included forests. The notice stipulated the following three conditions for allowing the release of protection forests: (1) no other suitable sites other than protection forests were available in terms of geographical conditions and use, (2) minimal risk of disaster or impact on the surrounding environment if development activities are carried out, and (3) consent from the interested municipality. This, together with the "*Act on Special Measures concerning Improvement of Public Health Function of Forests*," was feared to lead to overexploitation of forests and protection forests(Hareyama, 1993; Fujiwara, 1991; Goto, 1991).

Section 3. Revision of the Fifth Protection Forest Consolidation Plan-Current

(1) Before the Kyoto Protocol entered into force

- **Socioeconomic Situation**

International efforts to address global warming began with the adoption of the "*United Nations Framework Convention on Climate Change* (UNFCC)" at the 1992 Brazil Earth Summit. In 1997, the COP3 meeting was held, and the Kyoto Protocol was signed, setting legally binding numerical emission reduction targets for six greenhouse gases including carbon dioxide for developed countries for the period 2008–2012, and it entered into force in 2005.

The "*Law Concerning the Promotion of Measures to Cope with Global Warming*" was enacted in 1998 as a framework for Japan's global warming countermeasures. In

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2001, the rules for implementing the Kyoto Protocol were set forth in the Marrakesh Accord at COP7.

- **Forestry Policy**

The July 1997 "*Report of the Committee on Basic Policies for Forest, Forestry, and Wood Industry*" stated that public demands for the fulfillment of the public interest functions of forests, which are gaining relatively more attention than the needs for timber production, should be fully addressed.

In addition, the COP3 meeting recognized the function of forests in preventing global warming by absorbing carbon dioxide, thus giving forests a new role as "carbon sinks" (Izumi, 2003). In response to the aforementioned domestic and international situation, the "*Forestry Basic Act*" was revised in 2001, and the "*Forest and Forestry Basic Act*" was enacted with the main objectives of fulfilling the multifunctional role of forests and sustainable development of the forestry industry.

In the "*Outline of Global Warming Countermeasures*," 3.8% of the 6% greenhouse gas reduction target under the Kyoto Protocol was allocated for absorption by forests. The "*Ten-year Forest Sink Measures to Prevent Global Warming*" was formulated in 2003 to achieve this target. The measures emphasized the need to strengthen the reporting and verifying system of the amount of absorption. This was because, as of 2002, the statistical accuracy of forest resource data was remained unclear, and information on operations in planted and protection forests was insufficient, making it impossible to calculate and report absorption(Forestry and Forest Products Research Institute, 2003). The "*Emergency Measures for the Development of a Reporting and Verification System for Forest Absorption*" was implemented for a concrete implementation of these measures (Forestry Agency, Conservation Division, 2004).

- **National Forest Management**

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In 1998, a drastic reform of the national forest business management was implemented in response to its critical financial situation, with the accumulated debt reaching 3.8 trillion yen and to meet the growing expectations of the public for the fulfillment of the public interest function of forests. Specifically, the shift to management and management emphasizing functions for the public good, the outsourcing of forest operations to the private sector, and transfers from the general fund for rationalization of management were some of the reforms.

- **Protection Forest**

≪Revision of the Fifth Protection Forest Consolidation Plan≫

Following the 2001 "*Forest and Forestry Basic Act*," the Fifth Phase Protection Forest Consolidation Plan was revised in 2002. There were two main changes; one was related to the designation of protection forests, and the other was regarding operations within the protection forest areas.

●Revision of Plan about Designation of Protection Forest Plan

New criteria for designation of protection forests were added in the fifth phase of the plan. Based on the new criteria, additional protection forests were planned to be designated. Table 12 presents the initial and additional figures and details of the planned area of designation and the criteria for designation of protection forests.

Table 12. Revision of Designation Plan Area in Protection Forest Consolidation Plan

Cateegpry	Designation Plan Area(1,000ha)								
	Initial Plan			Additional Plan			Total Plan		
	National	Public & Private	Total	National	Public & Private	Total	National	Public & Private	Total
1 Headwater conservation	188	193	382	713	56	769	901	250	1,151
2 Soil run-off prevention	40	139	179	122	44	166	161	184	345
3 Landslide prevention	6	18	24	1	3	4	7	20	28
4 Drought prevention	24	91	115	5	1	6	29	92	121
5 Fish breeding	0	1	1	2	17	18	2	18	20
6 Public health	62	86	147	4	8	12	66	94	159
7 other	1	9	10	0	0	1	1	9	10
Total	321	538	858	847	129	976	1,167	667	1,834

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Ref. The outline of the fifth Protection Forest Consolidation Plan (Forestry Agency, 2002)

Table 13. Revision of Designation Criteria in Protection Forest Consolidation Plan

	Category	Criteria of Initial Plan	Criteria of Additional Plan
1	Headwater conservation	Ensure stable supply of high quality water (especially upstream of simple water supply systems)	Forests that are in danger of not functioning properly due to lack of appropriate forest management practices, and forests near mountain disaster risk areas.
2	Soil run-off prevention	Respond to frequent disasters	
3	Landslide prevention	—	
4	Drought prevention	(Same as Headwater conservation forest)	—
5	Fish breeding	—	Forests along river banks that are important for the protection of fishery resources, such as afforestation by fishery-related persons, etc.
6	Public health	Preservation and formation of natural environment, habitat and growth environment of wild animals, or living environment around urban areas, etc.	Forests that are expected to be a place for health, culture, and education, or where local efforts are being made.

Ref. The outline of the fifth Protection Forest Consolidation Plan (Forestry Agency, 2002)

Table 14. Revision of Designation Regulation of Cutting in Protection Forest Consolidation Plan

		Change Item(1,000ha)			
		Cutting Limits	Planting	Cutting Method	Total
Initial Plan	National	46	28	9	83
	Public & Private	44	42	12	98
	Total	90	70	20	180
Additional Plan	National	795	794	0	1,589
	Public & Private	430	468	2	900
	Total	1,225	1,262	2	2,490
Total Plan	National	841	822	9	1,672
	Public & Private	474	510	13	998
	Total	1,315	1,332	22	2,670

Ref. The outline of the fifth Protection Forest Consolidation Plan (Forestry Agency, 2002)

●Changes in Method of Operation in Requirements for Designation of Protection Forest

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In 2002, the "Order for Forest Act" was partially amended to revise the criteria for operation requirements for designation, relaxing the selection and thinning rates for protection forests. Based on this revision, a plan was added to the original plan to change the designated operation requirements for logging limits (thinning rate) and planting (species and number of trees) for protection forests that were scheduled for final logging or thinning during the 2002–2004 fiscal year. Details of the revisions to the criteria are as follows:

1. Revision of logging limits

① Increase in the maximum selection cutting rate, from a flat rate of 30% to a conditional rate 40%

Condition: Protection forests that are obligated to plant trees to ensure the smooth growth of understory trees planted after selection cutting, taking into consideration the implementation of uneven-aged forest operations.

② Increase in the maximum thinning rate, from 20% in principle to 35% with conditions

Condition: To ensure sufficient forest illumination and good growth of understory trees and to promote efficient thinning (reduce the number of thinning operations), with the upper limit of thinning set at 35% (previously, 20% in principle).

2. Review of planting obligations

To promote a diverse forest practice with a variety of tree species, the planting method was revised as follows:

① The minimum number of trees to be planted per hectare is to be set according to the site conditions for each tree species (previously, the uniform number was 3,000 trees).

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② The number of trees to be planted after tree selection is to be calculated by multiplying the selection rate (previously, no regulation).

③ In cases where naturally regenerating trees occupied a portion of a logging site, the number of trees planted is to be calculated based on the area of the logging site excluding that area (previously, no provision was made).

Table 12 presents the initial and additional plans. It can be observed that changes to the plans were made in over 1 million ha of protection forests in both national and private forests, and that logging restrictions and planting requirements were relaxed in over 1.3 million ha of protection forests. Conversely, changes in logging methods were few. Relaxation of the operation restrictions was considered to lead to more efficient forest maintenance.

≪After the abolishment of the "*Temporary Measures Act for Protection Forest Consolidation*"≫

The calculation of forest absorption is based on aerial photographs and drawings; however, the designation of protection forests is not based on drawings, rather on parcel numbers.

Therefore, as part of the "*Emergency Measures for the Development of a Reporting and Verification System for Forest Absorption*," information on the management of protection forests was compiled for the "*Urgent Development Project for Information on Management of Protection Forests as a Forest Sink*." This project intended to use statistical methods to evaluate the uncertainties in the data regarding the areas of protection forests.

The 2004 edition of the "*Outline of Protection Forest and Protection Facilities District System*" states that "In order for the entire area of a protection forest to be considered a

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forest sink, clear evidence is required to pass the review by the expert review team"; however, "being designated as a protection forest" alone was insufficient. Therefore, "it is necessary to prove that the protection forest is properly managed, i.e., that logging and development regulations are properly implemented in each individual protection forest."

In other words, the goal was to make the entire area of protection forests the target of forest sinks.

After this project, to ensure that protection forests would be recognized as a target for the calculation of absorption, data was developed for areas where errors related to information on the area of protection forests were expected to be particularly large ("*Measures to Strengthen Information Development on Protection Forests as Forest Sink*").

In 2008, when the first commitment period of the Kyoto Protocol began, the "*Emergency Maintenance Measures for Information on Natural Forest in Satoyama as a Forest Sink*" was implemented, which remained in force until 2012. This project promptly collected and maintained ownership information on natural regenerated forests in designated suitable areas to secure them as a forest sink measure. Finally, , protection forests were defined as forests for which "protection and conservation measures such as logging and conversion restrictions based on laws and regulations" are in place. The Kyoto Protocol had a large impact on protection forests.

(2) Ater the Kyoto Protocol entered into force

- **Socioeconomic**

Before the 1990s, following demands for urban expansion and resort development, administrative reforms were called for deregulations and shorter processing times for protection forests. Since the 1990s, the demand for renewable energy, and requests for

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the installation of such facilities, have increased. The "*Three-year Deregulation Program*"(1998) and the enactment of the "*Act on Special Districts for Structural Reform*"(2002) simplified documents, designated a period for the acceptance of applications, and implemented special exceptions for the revocation of protection forests in special districts for structural reform.

In 2012, the "*Feed-in Tariff (FIT) scheme for renewable energies*" began operations. This system requires electric utilities to purchase electricity generated from renewable energy sources at a fixed price to promote the spread of renewable energy, which has relatively high costs. This has led to an increased conversion of forests to renewable energy facilities. Forest land conversion for the installation of renewable energy facilities occurred in protection forests as well(Forestry Agency, 2021). This situation triggered mountain disasters and opposition movements by local residents, in some cases mainly associated with the installation of solar power generation facilities. Furthermore, following the operationalization of the Paris Agreement in 2020, Prime Minister Kan declared that "Japan aims to realize a carbon neutral, decarbonized society in 2050." The Cabinet Office established the "Task Force on Renewable Energy Regulatory Comprehensive Review" to realize a carbon neutral society by 2050. The purpose of the 17 meetings held between December 1, 2020 and December 13, 2021 was to reform the regulations that were barriers to the adoption of renewable energy as a main power source.

- **Forestry Policy and National Forest Management**

Following the 2011 Basic Plan for Forests and Forestry and the Forestry Policy Council's report, it was decided that national forestry projects would be managed by the general fund, while maintaining the framework of state management. Accordingly, the functional classification of national forests was reorganized, while the functional

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classification for the purpose of timber production was abolished, and the purpose of management and operation of national forests overall was set as the fulfillment of public interest functions(Forestry Agency, 2013).

- **Protection Forest**

Protection forests was the subject of the sixth meeting held on March 23, 2021, under the topic of "*Effective Use of Forests for the Expansion of Wind Power and Geothermal Power Generation*." The Japan Wind Power Association and the Japan Geothermal Association requested a shorter period for the revocation of protection forest and more flexibility in granting work permits. Consequently, the Forestry Agency set up the "Protection Forest Portal" to consolidate information on the revocation of protection forests, and prepared the wind power and geothermal sections of the "*Administrative Manual for Revocation of Protection Forests*." However, this manual did not go into the requirements for the revocation or restrictions on the use of protection forests.

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Chapter 3 Current State of Protection Forests in Taiwan

Section 1 Current state of ownership, category and distribution

(1) Current state of ownership, category, distribution of protection forest

Taiwan's forests are designated as management and ownership categories and are divided into national, public, and private forests (Article 3 of the "*Forestry Act*"). Furthermore, regardless of the type of ownership, forests are divided into areas inside and outside the National Forest Working Circle.

Since 2003, the forests inside National Forest Working Circle have been classified as National Protective Area, Natural Reserve Area, Forest Recreation Area, and Timber Management Area (Table 14). Forests in National Forest Working Circle are required to prepare a management plan, which is reviewed and implemented by the central government (Article 4 of the "*Forestry Act"*). The National Protective Area has similar management objectives as protection forests, and their management regulations include "*Regulation for Protection Forest Management*" and "*Protection Forest Practice*"; hence, a large overlap exists in the area with protection forests. However, protection forests exist in other areas as well, because this division, created in 2003, is not based on the layout of protection forests.

Protection forests are found scattered throughout the Taiwan forest ownership and management system. Protection forests of outside the National Forest Working Circle (O/W) was managed by local governments before 2003; thenceforth, they have been managed by the F.B. to date.

National forests account for >99% of all forests, with almost no public or private ownership. National forests account for > 99% of the total protection forests as well (Table 15). In addition, more protection forests are located O/W then inside of National Forest Working Circle (Table 16).

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According to the "*Regulation for Protection Forest Management*," there are 16 categories of protection forests in Taiwan; however, only 11 actually exist. Overall, most of the headwater and erosion control protection forests, and most of the protection forests are located in mountain areas (Fig 11). However, the distribution of protection forests on the coast is uneven because of the climatic differences between the eastern and western sides of the island. The eastern side of Taiwan faces the Pacific Ocean and is prone to tsunamis and high waves due to high wind speeds and wave highs. In addition, because the mountain range is parallel and close to the coastline, rivers are short, and the amount of drifting sand is low. Conversely, the western side faces the calm Taiwan Strait and has larger plains and longer rivers than the east side, resulting in a larger amount of drifting sand. Therefore, the eastern side has more windbreak and tidal protection forests, whereas the western side has more draft sand stabilization protection forests (Fig12).

Table 15. Division of National Forest Working Circle in Taiwan Region Forest Area

The Name of Division	Zoning Conditions
National Protective Area	1. Areas where Old Growth Forests are distributed 2. Nature Reserves designated by "*Cultural Heritage Preservation Act*" 3. Forest Reserves designated by "*Forest Act*" 4. Wildlife Refuge and Major Wildlife Habitats by "*Wildlife Conservation Act*" 5. Ecological Protected Areas, Landscape Protected Areas, and Heritage Areas designated by the "*National Park Act*"
Natural Reserve Area	1. Areas with an elevation of more than 2,500 m or a slope of more than 35 degrees. 2. Forest Land Classification as Class Ⅳ or Ⅴ areas. 3. Waterfront protection areas along rivers and their banks. 4. Protection Forest designated by the "*Forest Act*" 5. Limited Use Areas under the "*National Park Act*" 6. Designated Soil and Water Conservation Areas as defined by the "*Soil and Water Conservation Act*" and the Designated Soil and Water Conservation Areas demarcation and abolition criteria. 7. Water source quality protection area designated by "*Drinking Water Management Act*"
Forest Recreation Area	1. Forest Recreation Areas designated by "*Forest Act*" 2. Recreation Areas designated by "*National Park Act*" 3. Designated scenic areas designated by "*Act for the Development of Tourism*"
Timber Management Area	1. Areas with an elevation of less than 2,500 m and a slope of less than 35 degrees. 2. Areas with Forest Land Classification as Ⅰ, Ⅱ, or Ⅲ. 3. Areas of artificial forestation, flat terrain, and deep soil. 4. Areas adjacent to forest roads and areas for industrial and economic activities. 5. Part of the Limited Use Areas designated by the National Park Act, which meets the conditions of 1,2,3above.

Ref. Forestry Bureau, Sep. 2003(issue 135) Establishment of National Forest Division and Management Regulations

Table 16. Ownership of All Forests and Protection Forests

doi:10.6342/NTU202401356

	Ownership	Area(ha)	Ratio
All Forest	National Forest	1,847,848	92.8%
	Public &Private Forest	143,296	7.2%
	Total	1,991,144 -	
Protection Forest	National Forest	465,892	99.1%
	Public &Private Forest	4,024	0.9%
	Total	469,916 -	

Ref. All Forest: The Fifth Forest Resource Survey Report, by Forestry and Nature Conservation Agency, MOA(Ministry of Agriculture)

Protection Forest: The Information from Forestry and Nature Conservation Agency Officer

Table 17: Protection Forest Area by Ownership and Inside/Outside National Forest Working Circle (2022)

doi:10.6342/NTU202401356

Category	Working Circle	Total	National	Public	Private
Total		469,916	465,892	1,601	2,422
	In	409,267	409,223	13	31
	Out	60,648	56,669	1,588	2,391
Headwater	subtotal	300,442	299,498	590	354
	In	278,344	278,325	0	19
	Out	22,098	21,173	590	335
Erosion control	subtotal	141,489	139,139	670	1,679
	In	114,247	114,222	13	12
	Out	27,241	24,917	657	1,667
Draft sand stabilization	subtotal	5,146	4,878	198	70
	In				
	Out	5,146	4,878	198	70
Windbreak	subtotal	3,508	3,300	19	188
	In	1,437	1,437	0	0
	Out	2,072	1,864	19	188
Landscape	subtotal	13,406		57	119
	In	11,366	11,366	0	0
	Out	2,039	1,864	57	119
Flood control	subtotal	191	191		
	In				
	Out	191	191	0	0
Tide	subtotal	288	260	25	3
	In	7	7		
	Out	281	253	25	3
Rock falling	subtotal	25	25		
	In	21	21	0	0
	Out	4	4	0	0
Fishery	subtotal	5,005	4,958	42	
	In	3,820	3,820	0	0
	Out	1,185	1,138	42	4
Health	subtotal	311	307		4
	In				
	Out	311	307	0	4
Nature conservation	subtotal	105	105		
	In	25	25		
	Out	81	81	0	0

Ref.: The information from the Interview Survey with F.B. Officer

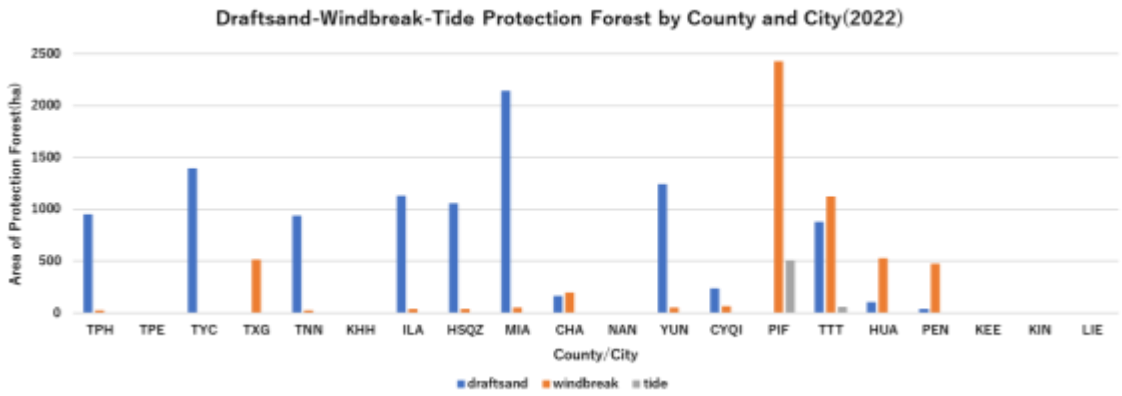
The following protection porest categories are not listed because they have not actually been designated: Salt protection forest, smoke protection forest, snow or avalanche prevention protection forest, national security protection forest, and navigation protection forest.

Ref.: The Information from Forestry and Nature Conservation Agency Officer

doi:10.6342/NTU202401356

Figure 11: Distribution of Protection Forests in Taiwan

Ref. Distribution of Protection Forest in Taiwan 1101_2, Geo Resource Cloud Library of Forestry and Nature Conservation Agency, MOA



doi:10.6342/NTU202401356

Figure 12: Draftsand – Windbreak Tide Protection Forest Area by County and City (2022)

Ref : FORESTRY STATISTICS(2022), Table 5 Protection Forest Area

(2) Management and Distribution of Protection Forest

≪Regulations on the use of Protection Forests≫

① Logging

Protection forests may not be logged unless they fall under any of the 6 clauses of Article 8 of the "*Regulations for Protection Forest Managements*" and permission has been obtained from the forestry administration.

≪Article 8 of the "*Regulations for Protection Forest Managements*"≫

1. Where cutting is necessary for regeneration and/or tending of the forest and the competent authority has approved such cutting

2. Where cutting is necessary for strengthening the functions of the protection forest and the competent authority has approved such cutting

3. Where salvage cutting is necessary to remove bamboos and/or trees that are stricken by diseases and pests or toppled down by wind, burned down in a forest fire, or suffering withering and/or other disasters and the competent authority has approved such withering

4. Where cutting is necessary for purposes of performing emergency rescue by the government and/or national security

5. Where cutting is necessary for purposes of conducting forestry experiments

6. Where cutting is necessary to remove obstructing bamboos and/or trees on the land used for public utilities, public facilities, public construction, and

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prospecting mineral deposits, mining or quarrying, and the competent authority has approved such cutting

When the above conditions are met, the logging method should be, in principle, selection cutting. Article 9 of the "*Regulations for Protection Forest Managements*" stipulates the following regarding logging area and timber volume for logging in the National Protection Forests:

"*Selection cutting of national protection forest shall be operated in accordance with the national forest management plan. The total area for selection cutting each year shall not exceed the quotient of the total operable standing timber area of the protection forest concerned divided by the applicable cutting cycle. The total selection cutting volume shall not exceed the product of the total volume of the that selection cutting area multiplied by the applicable selection cutting percent which shall not be larger than one third*."

Clear-cutting is prohibited in principle; however, it is allowed only when forest regeneration via selection cutting proves difficult. The method of clear-cutting and the area to be logged are stipulated in Article 10 of the "*Regulations for Protection Forest Managements*" as follows:

"Where it is difficult to regenerate the protection forest by selection cutting, horizontal cutting by strips or clear-cutting by strips or group-selection perpendicular to the monsoon may be performed instead. Where the total clear-cutting area for the year shall exceed three hectares, the clear-cutting shall be dispersed with the area of each cutting spot not exceeding three hectares.

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Where the total clear-cutting area of the protection forest provided in the preceding paragraph is less than three hectares in the year, partial clear-cutting may be performed instead at the interval of less than three years.

The dispersion of clear-cutting spots provided in the first paragraph shall apply mutatis mutandis to partial clear-cutting at an interval of less than three years."

② Planting

Regarding tree planting, conditions have been set forth for tree species and planting methods for some categories of protection forest in the "*Protection Forests Practices*" (Table 18).

Table 18: Planting Method by Protection Forest Categories

doi:10.6342/NTU202401356

Article 22, Forest Act	Article3, Regulations for Protection Forest Managements	Protection Forests Practice				
Purpose of Protection Forest	Categories of Protection Forest	Protected forest zone with a width of more than 50 m should be reserved.	Afforestation species	Planting	Other	For all
1. Essential for preventing damage from floods, wind, tides, salt, and smoke	1.Flood control		Multiple rooted, water resistant, wide spreading species.		About 1,500 plants/ha should be planted. Once the forest is closed, thinning should be conducted for the forest floor to be covered with an appropriate amount of undergrowth and groundcover.	
	2.Windbreak 3.Tide 4.Salt		Evergreen, wind-resistant, salt-resistant, cold-resistant, drought-resistant species	Triangular spacing	Prohibition of cutting down the windward side of the forest in the forest edge protection zone	
	5.Smoke		Evergreen tree with strong smoke resistance species			
2. Essential for the conservation of a water source or protection of a reservoir;	6.Headwater	Forests on both sides of the stream	Main species: Many roots, wide spreading, evergreen, densely branched, large crown trees are the main species Secondly species: Deciduous trees		About 1,500 plants/ha should be planted. Once the forest is closed, thinning should be conducted for the forest floor to be covered with an appropriate amount of undergrowth and groundcover.	1. Deep-rooted species should be selected. 2. The construction of multi-layer and mixed forests should be in accordance with the local ecosystem.
	7.Erosion control	Forests on both sides of streams and protected railroads and highways.	Strong germination species			
3. Essential for preventing damage from sand, soil erosion and blowing sand, falling rock, ice, or avalanches;	8.Draft sand stabilization		Evergreen, wind-resistant, salt-resistant, cold-resistant, drought-resistant species	Triangular spacing	Prohibition of cutting down the windward side of the forest in the forest edge protection zone	3.In order to improve the function of the protection forest, appropriate thinning should be carried out i a timely manner, but intense thinning should be avoided. In order to maintain the healthy state of the forest, the upper layer of the forest should be harvested according to the light level and the fertility of the lower layer of the forest.
	9.Rock falling prevention	Forests on both sides of streams and protected railroads and highways.	Strong germination species			
	10.Snow or avalanche prevention		Cold-resistant, snow-resistant, deep-rooted species.			
4. Essential to national defense	11.National security		Evergreen, wind-resistant, salt-resistant, cold-resistant, drought-resistant species	Triangular spacing	Prohibition of cutting down the windward side of the forest in the forest edge protection zone	
5. Essential to public health	12.Health		Native tree species.			
6. Essential for navigation	13.Navigation		Evergreen, wind-resistant, salt-resistant, cold-resistant, drought-resistant species	Triangular spacing	Prohibition of cutting down the windward side of the forest in the forest edge protection zone	
7. Essential for the fishing industry	14.Fishery					
8. Essential to the preservation of landmarks, historic relics, and scenery;	15.Landscape					
9. Essential to nature conservation.	16.Nature conservation	Forests on both sides of the stream	Native tree species.			

Note: Surveys by the author

③ Development

Logging, damaging wood or bamboo, developing livestock grazing sites, harvesting or excavating earth, rocks, grass cover, or tree roots cannot be done in protection forests without approval or consent from the government agency (Article. 30 of "*Forestry Act*").

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However, mineral-deposits prospecting, mining, or quarrying in protection forests may be conducted in accordance with Articles 13, 14, and 15 of "*Regulations for Protection Forest Managements*."

In addition, according to the "*Principle of Protection Forest Dotted Line Utilization*," point use of protection forests is allowed as long as national security and overall management of the protection forest remain unaffected. According to the F.B., >400 wind turbines have already been built in the protection forest because of this principle. However, the effect on the natural environment in the forest remains.

≪Protected and other restricted areas that overlap with protection forests≫

In Taiwan, forest land use is governed by various laws and regulations. This section describes the regulations regarding logging and development and the status of protection forests in this context.

In Taiwan, regardless of ownership, all forests are not allowed to be logged or freely developed. A permit must be obtained to log timber or collect forest products, and in some cases, Environmental Impact Assessments (EIA) must be conducted, reviewed, and approved before any forest land can be developed.

In addition to the basic forest land regulations, the 1991 "*Taiwan Forest Management Plan*" prohibits logging in Natural Forests, Protection Forests in Reservoir Watersheds, Ecological Protected Areas, Nature Reserves, National Parks, and areas where restoration via afforestation is impossible; furthermore, experimental or test forests are not permitted except for research purposes or for reasons of forest management. Additionally, land use regulations are in place for nature conservation purposes or in public interest. The areas in Taiwan where logging regulations set by law or regulation, the degree of cutting regulations, and its basis in law are presented in Table 18. In Table 19, the Restricted Areas are classified into two categories according to whether they are

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regulated by forest conditions or by legal designation. Those that are regulated by legal designation are further divided into two categories based on whether the purpose of the regulation is for nature conservation or for public good. Protection forests are classified as "public good" because they are intended to serve the public interests.

In terms of area, national scenic areas are the largest, followed by protection forests. Protection forests account for about 24% of the total area of the area regulated by law, indicating their major role in regulating land operations. Protection forests may overlap with other regulated areas; however, the law does not stipulate the superiority or inferiority of regulated areas. Therefore, when protection forests are surveyed, revoked, or designated, a consensus is reached directly with the management agency of the restricted area to determine its designation as a protection forest and its management (details in the next section).

Table 19. Type of District with Logging Restrictions imposed and the Laws and the Legal Basis for such Restrictions (Areas are for terrestrial areas only; overlapping areas are not subtracted)

Classification		Restricted District	Area(ha)*	Regulation of Logging	Legal basis
Forest Condition		Natural Forest	1,625,840	ban	*Taiwan Forest Management Plan*
		Impossible to re-forestation areas	(No Data)	ban	*Taiwan Forest Management Plan*
Legal Designation	For Nature Conservation	Nature Reserves	65,485	ban	*Cultural Heritage Preservation Act*
		Forest Reserves	20,789	ban	*Forest Act*
		National Park	310,156	ban	*National Park Law*
		National Natural Park	1,123	ban	*National Park Law*
		Wildlife Refuges	27,557	ban	*Wildlife Conservation Act*
		Major Wildlife Habitats	326,308	ban	*Wildlife Conservation Act*
	For Public Good	Forest Recreation Areas	35,461	in some occasions	*Forest Act*
		National Scenic Areas	532,012	Permission-based	*Act for the Development of Tourism*
		Protection Forest	530,531	ban(default)	*Forest Act*
		(Protection Forest in Reservoir Watershed)	(No Data)	ban	*Taiwan Forest Management Plan*
		Designated Soil and Water Conservation	(No Data)	in some occasions	*Soil and water Conservation Act*
		Water Quality and Quantity Protection Area	9,171	ban(default)	*Water Supply Act*
		Water Source Protection Zone	386,394	ban	*Drinking Water Management Act*
		Drinking Water intake Point	1,739	ban	*Drinking Water Management Act*
		Reservoir Watershed	2,151	Permission-based	*Slope land Conservation And Utilization Act*

doi:10.6342/NTU202401356

Ref. District for Nature Conservation…Forestry and Nature Conservation Agency. (2023). *自然保護區域總表* (Table of All Forest Nature Reserve Area). https://conservation.forest.gov.tw/total

Nature Forest: The Forth Forest Resource Survey Report, by Forestry and Nature Conservation Agency, MOA (Ministry of Agriculture)

Protection Forest: F.B., FORESTRY STATISTICS(2022), Table 5 Protection Forest Area

Water Quality and Quantity: Water Resource Agency, MOEA, (2023), https://welfare.wra.gov.tw/portal/Introduction.aspx

Water Source Protection Zone: Drinking Water intake Point…Drinking Water Management, Water Quality Protection, Ministry of Environment, (2023), 保護區查詢 (Reserve Enquiry), https://wsserver.epa.gov.tw/Protect_Area_Query.aspx

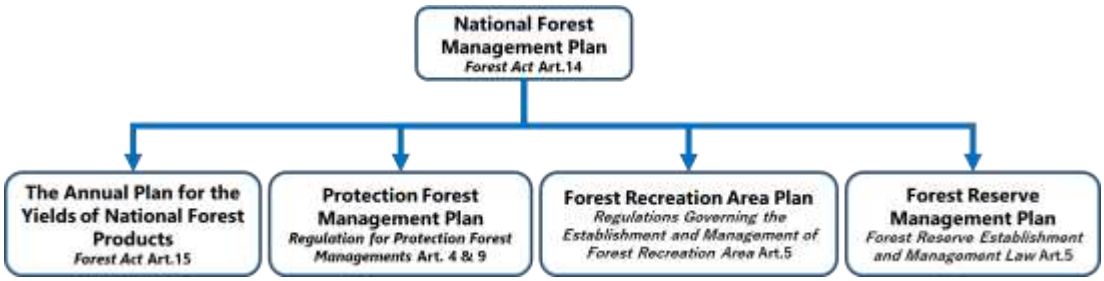

Figure 13 Protection Forest Management Plan and other Forest Management Plan

Ref. Yang Hong-Chi, 2019, Proposed Management Plan for State-Owned Forestry Districts, Taiwan Forestry 45(2)

The management of protection forest are divided into four main categories: short-term management, long-term management, designation, and revocation. Long-term management refers to the review of management methods, categories, and areas, which are determined for each protection forest categories over 10 years, whereas short-term

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management refers to the inspection of forest and land conditions and as-needed repair over <1 year.

Table 20. Types and Means of Management of Protection Forest

IN/OUT W.C / Type	Inside National W.C.	Outside National W.C.
Short-term(Daily)	Patrol by F.O.D*	Owner's responsibility
Long-term	Revision	Revision
Designation	Revision · Special	Revision · Special
Revocation	Revision · Special	Revision · Special

Note: Surveys by the author

＊F.O.D.＝Forest Office District

Measures that may be taken for the designation or revocation of a protection forest are "Protection Forest Revision" and "Special Procedure(專案)." These are described in the next section. The long-term management of protection forests is under the "*Protection Forest Review*." In principle, the FDO, F.B., and COA conduct the review once every 10 years.

Short-term management of protection forest is conducted by the FDO in the case of protection forests within National Forest Working Circle. In the case of protection forests O/W, the management is the owner's responsibility.

The forests in National Forest Working Circle are managed based on the "*National Forest Working Circle Management Plan*," which is prepared every 5 years by the FDO This plan is based on the "*Annual Plan for the Yields of National Forest Products*" (Fig13). System-wise, the "*Protection Forest Plan*" is under the "*National Forest Working Circle Management Plan*." However, according to a forestry district officer, the "*Protection Forest Plan*" does not reflect the content of the "*National Forest Working Circle Management Plan*." A "*Protection Forest Management Plan*" is

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prepared for each protection forest at the time of the "*Protection Forest Review*" and includes the management plan for protection forests O/W.

- Short-Term Management

Each FDO regularly patrols the forest lands in the National Forest Working Circle under its jurisdiction, regardless of whether the forest designated as a protection forest. Forest lands within the National Forest Working Circle are classified into three levels (A, B, and C) based on accessibility and the likelihood of disasters, and the patrol frequency varies from eight times a month for the A level, four times a month for the B level, to once a month for the C level. This is stipulated in the 2000 "*Work Guidelines for Forest Conservation by the Forestry Bureau, Council of Agriculture*."

In the absence of detailed criteria stipulated in this guideline, the FDO staff determine the classifications. In addition, although the forestry district officers are aware of a forest's status as a protection forest when conducting patrols, they do not make any special distinction between it and non-protection forests.

If any forest damage is found during the patrols, the situation is be treated accordingly. In case the forest is Protection Forest, it is managed in accordance with the "*Protection Forest Practice*," which defines the principles of management for each category of protection forest. However, according to the F.B. officer in charge of protection forests, most protection forests in the National Forest Working Circle in good condition and do not require any treatment.

Section 2 Protection Forest Revision

(1) Long-term management: "Protection Forest Revision"

—Protection Forest Revision Work Standard Guideline

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The main long-term management method for protection forests is the "Protection Forest Revision." This is a survey for all protection forests conducted by every FDO once every 10 years (the period may be extended to 15 years, if the forest conditions are in good). A similar survey has been conducted since the pre-war period; however, its existence was made clear after the 2003 amendment to the "*Regulation for Protection Forest Management*." In 2004, the F.B. prepared and distributed to each FDO's "*Protection Forest Revision Work Standard Guideline*."

Based on the guidelines, and the results of interviews with officers of F.B. and the Hsinchu FDO, it was found that the Protection Forest Revision is conducted with the involvement of the FDO, F.B., and the COA (Figure 14 and Table 21).

The initial investigation is conducted by the FDO First, the FDO prepares digitized forest maps and registers. During the pre-office work, software is used to map the forest and create orthophotos to confirm the status of leases and plan new designations or revocations.

Next, field inspections for boundary verification, measurements, forest condition, and timber accumulation inspection are conducted to determine the exact location of the forest to be designated or revoked as protection forests. The field inspection is usually conducted by four to five personnel who subsequently prepare documents to be submitted to the F.B., including the inspection results and future management plans for the protection forest. Next, discussions are held with the relevant agencies concerning the method of operation of the protection forests and their designation or revocation. The revision results are submitted to the F.B. after a consensus. The F.B. conducts another review based on the results of the FDO The results of the F.B.'s review may be divided into the following four categories.

(1) Neither Designation nor Revocation

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(2) Designation

(3) Revocation

(4) Revocation (requiring review by a third-party organization).

In the case of (1), the FDO has examined the Protection Forest and found the neither designation nor revocation is necessary. If the F.B. does not have any objections, the result is be finalized and announced without COA approval.

In case of (2), the results of the revision by the FDO to designate protection forests are submitted to the F.B., and if the F.B. approves, a public announcement is made that the forest is to be designated as a protection forest, and after the opinions of local residents are processed, the COA confirms the designation. In the case of (3), a forest that is proposed by the FDO for revocation of protection forest status when it meets none of the conditions specified in Article. 5-3 of the *"Revocation Standard for Protection Forest*"; the same procedures as in (2) are applied. In the case of (4), a forest that is proposed by the FDO for revocation of protection forest status when it meets one or more of the three clauses in Article 5 of the "*Revocation Standard for Protection Forest*." If the F.B. approves the revocation, it must establish a Protection Forest Revoking Review Committee, a third-party organization comprising academics and other experts, local residents, and the operating entity of the development that is the reason for the revocation. The committee members conduct a field inspection and discussion. Following the discussion, if the majority of the committee members approves the revocation, a public announcement is made, and the revocation is finally confirmed by the COA. Generally, the discussion in the Protection Forest Revoking Review Committee is not concluded at the first meeting; it is held several times albeit rarely. After the Protection Forest Revision, a "*Result Report of the Protection Forest Revision*" is prepared for each number.

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The designation and revocation processes and Protection Forest Revoking Review Committee are described in detail in the next section.

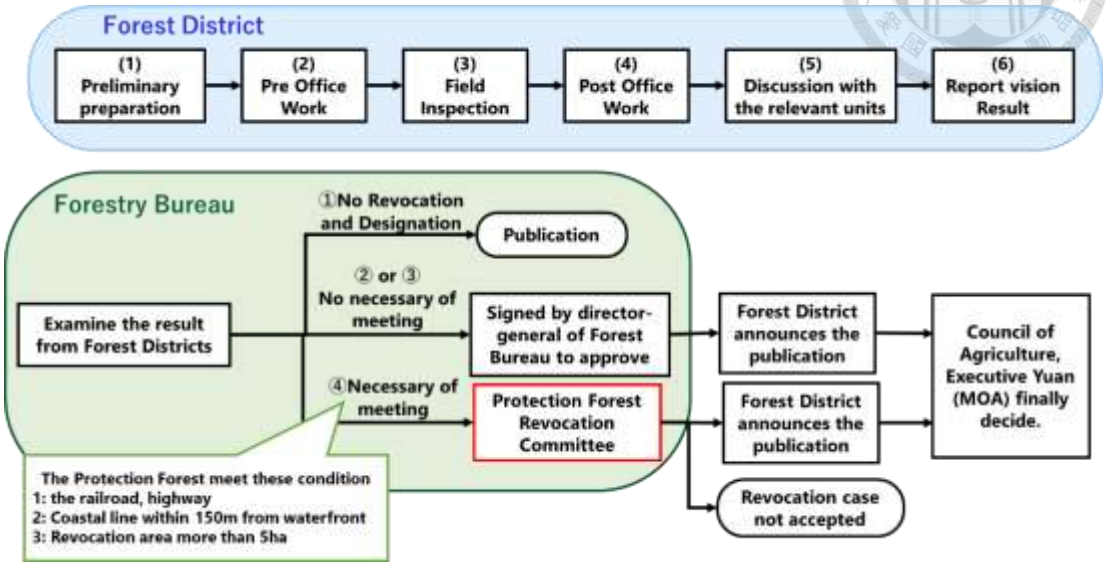

Figure 14: Flow of Protection Forest Revision

Ref.: Information from Interview Survey with the Officers of the F.B. and Hsinchu FDO

Table 21. Process of Protection Forest Revision in Forest District Office

Process in Brunch(FDO)	Contents
(1) Preliminary preparation	1. Cartographic information
	2. Register etc.
	3. Measuring instruments and materials
(2)Pre Office Work	1. Preparation of a basic sketch of the protection forest
	2. Satellite Control Points Selection and Replacement Control Points
	3. Map of carious types of leased land in the protection forests
	4. Protection Forest Stock Map
(3) Field Inspection	1. Protection Forest Field Surveys
	2. Satellite Control Points and Additional Control Points Survey
	3. Checking of known Satelite Control Point
	4. Additional Control Point
	5. Boundary Measurement
	6. Forest and Land condition survey
	7. Forest tree stock survey
(4) Post Office Work	1. Drawing: use AUTODESK MAP to create the drawings
	2. Computer file creation
	3. Filln in the form
	4. Production of Protection Forest Revision Report
(5) Discussion with the relevant units	Obtain agreement on the revision results from the management agencies of environmentally sensitive areas that overlap with the protection forest
(6)Report the revision results	Report the revision results to the Forestry Bureau. If there is any problem in the review by the Forestry Bureau, they will be consulted.

Ref.: Information from Interview Survey with the Officers of the F.B. and Hsinchu FDO

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≪Preparation of "*Result Report of the Protection Forest Revision*"≫

Table 22 presents the contents of the "*Result Report of the Protection Forest Revision*." Policies for the future management of the forest are set in "*The Protection Forest Management Plan*." The plan composition across result reports; however, most items are included as necessary. In principle, Taiwan's protection forest is closed to logging, and descriptions of logging methods or areas with logging limits are not well-defined.

Table 22. Table of Contents of "Result Report of the Protection Forest Revision"

doi:10.6342/NTU202401356

Name	Contents
1. Previous remarks	
(1)Purpose of the protection forest	Reason of designation and purpose of the protection forest
(2) Historical changes	Records of previous revision, designation and revocation
(3) Protection Forest Revision Scheduled in the year	Schedule of other protection forest revision for the year
(4) Related plan	Special procedure plan for the protection forest
2. Analysis of the current situation	
(1) Overview of the location and environment of the protection forest	Location of the protection forest(in relation to watershed, river, and road)
(2) Geographical overview	Topography and in relationship to the Disaster Sensitive Area
3. Operation of the revision	
(1) Revision schedule	Revision Date
(2) Inspectors	Number of people and names of those who have made revisions
(3) Preliminary preparation	Confimation of the protection forest maps, land registry, etc.
4. Field Inspection	
(1) Placement of Boundary posts	Explanation of boundary posts installation work
(2) Boundary Location	Details of boundary posts with photos
5. Result of revision	
(1) The result of revision	The revision results(designation, revocation)
(2) Land ownership	owners and management units of the proteciton forests
(3) Post-revision overview of the forest	Status of the protection forest compared to the previous revision
(4) Overview of non-forest use	Usage of non-forest use conditions area
(5) Description of the area to be designated	Description of the reason for the designation and the area to be designated
(6) Description of the area to be revoked	Description of the reason for the revocation and the area to be revoked
(7) Description of Protection Forest Boundary Adjustment	
(8) Important Events over the years	
(9) Summary of the revision results	Summary of the revision results
6. The Protection Forest Management Plan	
(1) Forest Management Plan(Cadaster Management)	Location, number of parcels, regisration progress, owner, use classiication, and land lease status of the relevant Protection Forest
(2) Law Enforcement	Treatment Method for Non-Forestry State
(3) Afforestation Plan	Plan for reforestation, etc. of Subject Protection Forest
(4) Estate Management Plan	The evaluation and the expected public benefit function of the Protection Forest, and Necessity of Maintaining the Protection Forest in the Future
(5) Resource Survey Management Plan	Evaluation of the Protection Forest as a designated categories and major future plannnin policies
(6) Monitoring Management Plan	Future Management Policy based on the results of this revision and the next scheduled year for the next Protection Forest Revision
(7) Non-Forestry State Management Plan(Forestry Management)	Owners and areas of non-managed forest areas, and treatment methods
(8) Forest Land Conservation	Future management regarding forest land protection(e.g., installation of boundary piles and improved monitoring)

Ref.: Information from Interview Survey with Officer of F.B. and Hsinchu FDO

(2) Actual cases of Protection Forest Revision

Practical Protection Forest Regular Inspection

●No. 1311 Drift-sand stabilization protection forest

- Comprising public forests and national forests

- National Forest area includes the area used by war veterans as residential land before 7/21/1993 and the area used as residential land thereafter (illegal).

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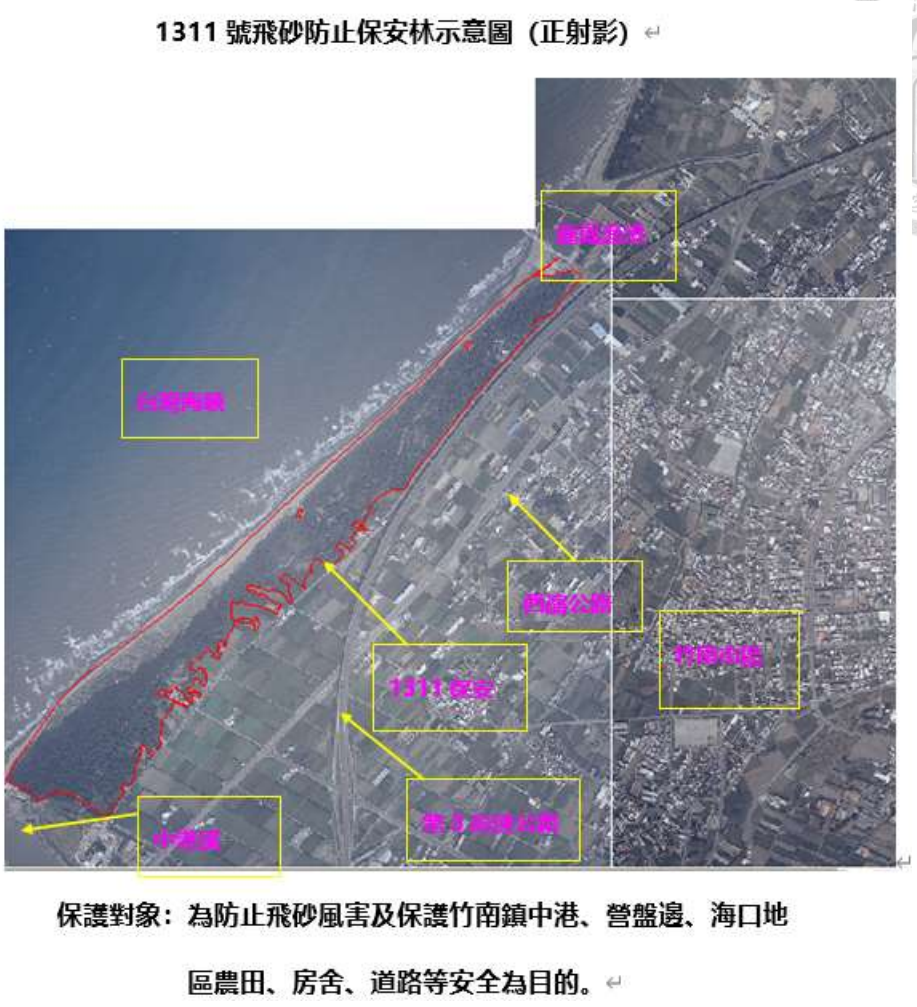

Figure 15. Photo of No. 1311 Protection Forest (inside red line)

Ref. Result Report of the No. 1311 Protection Forest Revision

≪History of previous designation and revocation ≫

Table 23. History of previous designation and revocation of Protection Forest 1311

Table of Content of "Result Report of the No. 1311 Protection Forest Revision"

doi:10.6342/NTU202401356

年度	項目	編入面積	解除面積	訂正面積	面積合計	面積增減	核訂公告文號
1908	編入	187.715 ha	0甲	0甲	141.426ha	0甲	民前3年1月19日告示第6號編入。
1966	檢訂(第一次)	0ha	0ha	0ha	141.426 ha	0ha	56年3月9日府農林字第14975號公告。
1983	檢訂(第二次)	18.214 ha	0 ha	0 ha	159.64 ha	+18.214ha	73年1月19日73府農林字第141410號公告。
1990	解除	0ha	3.742 ha	0 ha	155.898 ha	-3.742 ha	79年11月3日府農林字第110079號公告
1993	解除	0ha	0.109 ha	0ha	155.789 ha	-0.109 ha	82年1月20日府農林字第10446號公告
1994	檢訂(第三次)	0ha	41.562 ha	+0.900 ha	115.126ha	-40.666 ha	84年10月26日府農林字第103032號公告。
1997	解除	0ha	1.665 ha	0ha	113.461 ha	-1.665 ha	86年7月9日府農林字第053453號公告
1998	解除	0ha	3.138 ha	0ha	110.323 ha	-3.138 ha	87年7月20日府農林字第05524號公告
2002	解除	0 ha	2.440 ha	0 ha	107.884 ha	-2.440 ha	91年10月7日農授林務字第0911653887號公告。
2005	檢訂(第四次)	0ha	1.0569 ha	0 ha	106.827 ha	-1.057 ha	95年5月22日農授林務字第0951653815號公告。
2013	檢訂(第五次)	0ha	0ha	-0.0255 ha	106.801ha	-0.026 ha	102年8月15日農授林務字第1021722262號公告。

Ref. Result Report of the No. 1311 Protection Forest Revision

≪Work items≫

① Installation of protection forest boundary posts

The county government built the road in the protection forest area and set up boundary posts . Since the county government owned the protection forest and the road was public property, the Hsinchu FDO allowed the revocation of the protection forest.

② Check the forest condition in the protection forest

The survey was conducted by walking directly into the protection forest with a tablet displaying a map of the forest to confirm forest conditions and tree species by visual inspection. The map was marked with "查" at the checked spots. In cases it was difficult to go directly into the forest, a drone or other means was used for the survey.

③ Confirmation and survey of Protection Forest areas that are scheduled for revocation.

Currently, a veteran's residence is being constructed in the middle of the No. 1311

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drift-sand stability protection forest (in the national forest). The area for 5 houses constructed before 7/21/1993 is scheduled for revocation of protection forest in the future. At the time of the present study, the officer of the Hsinchu FDO was discussing whether to include the area behind the construction site (such as the backyard) in the revocation area for the 5 households. The other houses were built after 7/21/1993. A legal case is currently in court to decide whether or not the protection forest status should be revoked and if the houses should be removed from the site.

Section 3 Protection Forest Revocation procedures and their background

(1) Procedures for Protection Forest Revocation

- Legal requirement

The revocation of protection forest is regulated by Article 25-29 of the "*Forestry Act*" and the "*Revocation Standard for Protection Forest*."

The basic principle for revocation of protection forest is stipulated in Article 25, paragraph 1 of the "*Forestry Act*": "Should the subsistence of a conservation forest become unnecessary, subject to approval from the central government agency, it may be partially or wholly declassified." This is legal basis for the "*Revocation Standard for Protection Forest*.".

The process of revocation of protection forest can be roughly divided into two types. One is when the revocation is considered and approved by the Protection Forest Revision, the other is an application for revocation of a protection forest from a person concerned with the forest (called Special Procedure). Although the trigger for the revocation differs, the subsequent procedures and the examination criteria used for revocation are the same for both processes. Table 23 summarizes the investigations conducted at the time of revocation. This is based on the checklist used in the process of the Protection Forest Revision and the result of the study interviews.

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In terms of procedure, the checklist needs to be submitted for the Protection Forest Revision, and not for the Special Procedure. However, the criteria and perspectives for the review of the revocation are the same in both cases. The contents include the following: basic information about the relevant protection forest, including the area where the protection forest is to be revoked; whether or not there are any restricted areas around or overlapping with the relevant protection forest; the reasons for revocation; the reasonability for the revocation; and an evaluation of the natural and social environmental impacts of the revocation. According to the study interviews, these 20 items have no superiority or inferiority, and they are comprehensively evaluated.

Supplementary explanations for some of the items are described herein. If there is an overlap between an environmentally sensitive area (item 7) or a protected area (item 9) and the relevant protection forest, it is necessary to reach an agreement with the respective management agency regarding its revocation. As per Item 10, the forest condition of the protection forest to be revoked will make a difference in the probability of approval of the revocation. When the forest condition of the protection forest is determined to be sporadic, the vegetation is often dominated by pioneer plants, and in this case, the review process determines that the impact of the revocation on the surrounding area will be negligible. Conversely, when the forest is determined to be an intact forest, the vegetation is often at its climax, and in this case, the review process determines that the revocation of the protection forest would have a significant impact because it would be easier to log and develop the area. Therefore, when the forest condition of the protection forest is sporadic, revocation is more probable.

The existence of alternative land for the area to be revoked (item 18), whether the area to be revoked is the smallest (item 19), and the reason and proof must be provided by the FDO conducting inspection of the Protection Forest Revision, or by the applicant in

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the case of the Special Procedure. The criteria for this examination are (1) Reasonableness, (2) Necessity, and (3) Irreplaceability, depending on the reason and the proof.

The question of whether or not the revocation of protection forest will affect the surrounding environment (item 20) can be divided into two cases, depending on the reason for the protection forest revocation (detailed in the next section).

After the revocation of the protection forest is approved by the FDO, it submits the results of the inspection to the F.B. The F.B. reviews the survey results. Nevertheless, the F.B. rarely overturns the decision of the FDO because the F.B. recognizes that the FDO has the best understanding of the local situation. However, the F.B. may request the FDO to reduce the proposed revocation area.

After the review by the F.B., if the protection forest to be revoked meets any of the three items in Article 5 of "*Revocation Standard for Protection Forest*," i.e., if the forest is located the nearest ridgelines from railroads or important roads, if the forest is within 150 m from the waterfront in a coastal area, or if the revocation area is ≥5 ha or more, further survey and discussions are conducted by a third-party committee, the Protection Forest Revoking Committee. The rules of the committee are stipulated in Article 5 and 6 of the "*Revocation Standard for Protection Forest*" and in the "*Establishment and Review Guideline of the Taiwan Protection Forest Revocation Review Committee*." The number of members that make up the Protection Forest Revoking Committee at one time is 11, including 2 F.B. officials appointed by the Director of the F.B., 1 representative from the major organization that aims to revoke protection forests for development, 1 representative from the county government where the relevant protection forest is located, 3 representatives from among the local residents of the relevant protection forest, and academics and experts.

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The revocation of the protection forest is not approved unless two-thirds or more of the members present and three-fourths or more of the members present approve the revocation. Before the council meeting, all members of the committee conduct an on-site inspection. The subsequent process is as follows: (1) a member of the FDO explains about the forest, (2) local residents express their opinions about the revocation, (3) opinions expressed by the party applying for the revocation of the forest, (4) question and answer session, (5) discussion, and (6) vote.

Table 24. Key Points and Assessment Principles of Revocation Protection Forest Inspection

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Key Points and Assessment Principles of Revocation Protection Forest Inspection	Information obtained from interviews
1. The number of Protection Forest, category of Protection Forest	
2. The Revocation Protection Forest Area	
3. The current status of land, including tree species, Growth conditions, Canopy density(forest stand), Tree height, or Non-forestry condition	
4. Land ownership an operation and management authorities	
5. Description of the environment around the Protection Forest	
6. Are there any residential areas or places of frequent activities nearby?	
7. Is it located in the following environmentally sensitive area	
(1)The reservoir watershed	
(2)Above railroads and highways	
(3)Slope more than 55%	Consent to revoke if there are other administrators.
(4)Areas of severe erosion	
(5)Areas where soil and rocks are prone to collapse or potential landslides	
(6)Coastal areas within 150m of the waterfront	
8. Whether there is a particularly important conservation object	
9. Whether it is a legally designated conservation area:	
(1)Nature Reserve	
(2)Major Wildlife Habitat	
(3)National Forest Nature Reserve	
(4)Soil and Water Conservation Area	Consent to revoke if there are other administrators.
(5)Water Quality/Water Supply Protection Zones	
(6)Water Pollution Total Quantity Control Zone or Certain Distance of a Drinking Water Intake Area	
10. Is the Protection Forest area applied for revoke a scattered independent area or is it located within a intact forest zone?	•Independent area in the Sporadic distribution →Vegetation is mostly pioneer plants. ... it is easier to revoke Protection Forest than in the "Inside of a Complete Forest Band " •Intact Forest Zone →Vegetation is mostly in the climax zone. ... Because of large impact of revocation on the surrounding environment, revocation is more difficult than in "Independent area in the Sporadic Distribution"
11. Has the original purpose of designation disapeeared?	
12. The reason of Revocation	
13. Is there an alternative area?	
14. The width of the forest zone after revoke.	
15. Whether the revocation will result in discontinuous or fragmented forests	
16.Whether the revocation will affect the rights and interests if the interested parties.	
17. Whether this revocation case meets one of the circumstances listed in Article8. Paragraph 1 of the Forest Act.	
18. Is there no other site available for use other than the site of this application for revocation?	*18 and 19 ...the applicant for revocation must provide reasons and proof of these two items.
19. Is the area requested for release the minimum area necessary for the project?	
20. Is the overall Protection Forest of the land affected by the release.	1) Post-fact Compliance: No consideration of land protection efficacy 2) Pro-fact Compliance: Judging whether or not there is an impact after. There is no system to measure the impact after the revocation based on past literature. Criteria for judgment are ①Reasonableness ②Necessity ③Irreplaceability

Ref.: Information from Interview Survey with the Officers of the F.B. and Hsinchu FDO

(2) Reasons for Protection Forest Revocation; new development and Post-fact compliance

Logging or development of protection forest for any purpose cannot be done without permission, and penalties are stipulated in the "*Forestry Act*." However, the revocation of protection forests in Taiwan has a discrepancy with the legal provisions.

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The actual revocation of protection forest can be broadly classified into two types: pro-active compliance and post-fact compliance.

"Post-fact compliance" refers to cases in which development, such as the construction of a road or other structure in a protection forest can be done without obtaining permission for the revocation, and the protection forest status is revoked after this fact is discovered. The entity that conducts the development that causes the revocation may be a private individual, a corporation, or a public organization, and in some cases, the entity may or may not be aware of the existence of the forest. The two main reasons for this are the construction of public structures such as roads, parking lots, garbage dumps, culverts, etc., and the fact that the land is non-forested owing to use and development on the date specified by the law (July 21, 1993). Therefore, the three most frequently selected reasons for the revocation of protection forest among the seven items of Article 2 of the "*Revocation Standards for Protection Forest*" are as follows: item 1 (use for public interest), item 3 (reforestation is not possible), and item 7 (protection forest that was not used for forestry before July 21, 1993). Development and use of land often occur in coastal and urban areas where residents are active. Therefore, "post-fact compliance" often occurs in protection forests that in areas of high human activity, which are forest areas most often located O/W.

According to the "*Forestry Act*," it is illegal to develop protection forests before the revocation is authorized. However, according to the F.B. Officer, no penalty or punishment is imposed for those who actually develop protection forests before the revocation is authorized.

"Pro-active compliance" is a case in which a protection forest is revoked after approval for the revocation of the protection forest has been granted, and development commences. In this case, large-scale government-led developments, such as the

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construction of bridges or large factories, is often the reason for the revocation of protection forests. Therefore, in Article 2 of the "*Revocation Standard for Protection Forest*," item 1 (use for public interest) and item 2 (project for industry or public interest) are often selected as the reason for revocation. In addition, an environmental impact assessment is often required for the review of the revocation.

The difference between these two types of cases has a significant impact on the review process for the revocation of protection forests. Item 20 on the checklist used by the FDO when reviewing the revocation of protection forests pertains to whether or not the surrounding environment will be impacted after the protection forest status is revoked. In the case of post-fact compliance, land use does not change after the revocation because the forest has already been developed and is non-forested. Therefore, the impact on the surrounding environment is considered to be negligible. In the case of the proactive compliance, land use often changes from forested to non-forested status with the revocation. Therefore, the impact of the revocation on the surrounding environment is considered to be significant. Hence, the post-fact compliance type is more easily approved for the revocation than the proactive compliance type.

The area of revoked protection forests from 2012 to 2022 is listed by the reason for revocation (by item in Article 2 of the "*Revocation Standard for Protection Forest*") in Table 26. The top five items (1, 2, 3, 6, and 7) account for 98% of the total area. Item 1, which is likely to be selected for both post-fact compliance and pro-active compliance, can be omitted. Item 2, which is often selected in the case of pro-active compliance, is less than one-half the area of items 6 and 3 combined, which are often selected in the case of post-fact compliance. Since it was impossible to separate item 1 into the two cases, it cannot be determined definitively; however, when considered in conjunction with the interviewees' testimonies, it can be assumed that the area of revoked protection

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forest in the case of post-fact compliance is larger than that in the pro-active compliance.

Table 25. Two types of revocation of Protection Forest

Type	Case	Actor	Article 2 of Revocation Standard for Protection Forest
Proactive Compliance	New development	Company that received authorization from the government	1 Public Interest(From Article 1 Section 1 of Forest Act)
			2 Project for Industry or Public Good
Post-fact Compliance	Road, culvert, dumpsite	private citizen, company, local government	1 Public Interest(From Article 1 Section 1 of Forest Act)
			3 Reforestation is not possible
			7 Protection Forest that was not used for Forestry before July 21, 1993

Ref.: Information from Interview Survey with Officer of F.B. and Hsinchu FDO

Table 26. Area of revoked protection forests from 2012 to 2022 listed by the reason for revocation (Article 2 of the "*Revocation Standard for Protection Forest*")

Section	Contents	Revocation Area(ha)
1	Public Interest (Form Article1 Section1 of Forest Act)	207.9
2	Project for Industry or Public Good	61.8
3	Reforestation is not possible	87.8
4	Modify the Protection Forest Boundary	7.0
5	Original Functions of the Protection Forest have been replaced	4.0
6	The Original Beneficiaries no longer exists	96.4
7	Protection Forest that was not used for Forestry before July 21, 1993	77.6
	Total	542.5

Ref.: Information from Interview Survey with the Officers of the F.B. and Hsinchu FDO

(3) Background factors leading to Post-fact Compliance of Protection Forest Revocation

Why do cases of post-fact compliance, which is essentially a violation of the "*Forestry Act*," occur?

A member (Mr. Chen) of the Protection Forest Revoking Review Committee who was interviewed pointed out the following points as the background of this problem:

(1) Illegal construction is customary

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(2) Relaxation of laws and regulations

Regarding (1), according to Mr. Chen, Taiwan has a strong land use pressure and illegal construction is common.

According to statistics from the Construction and Planning Agency of Ministry of Interior, the number of illegal buildings across Taiwan is increasing. Agricultural land conversion has been active, with conversion to farm buildings and illegal farm building extensions, as reported by Takeyama et.al(2019). As for land use pressure, with the economic growth and population increase in the late 1980s, the demand for non-agricultural land in the county increased dramatically (Ministry of Agriculture, 2008), which is a major problems in Taiwan in the modern era.

In addition, according to Mr. Chen, even if the Forestry District Officer identifies the illegal development, it often does not result in penalties. This is because local Elected Representatives are able to mediate with the FDO and the F.B., taking into consideration the circumstances and sentiments of the local residents who have no other choice than to illegally use the land.

According to Mr. Chen, this situation arises from a Taiwanese concept of "Sentiment, Rationality, and Law." According to Huang (2022), "Sentiment, Rationality, and Law" means "(a) In the face of social disputes, it is advisable to give priority to seeking a solution through civil channel in accordance with the sentiments and rationality of the people, and to resort to the courts only as a last resort, and (b) Even when disputes are brought to the court, judges should not only look at the law when they adjudicate and make decisions, they should pay attention to the fact that 'the law is no more than a matter of human feelings', and take into account the requirements of emotion, reason, and law or even make the law give way to reason." In other words, sentiment and rationality carry more weightage than law judging.

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Local residents elect candidates who value residents' circumstances more than compliance with the law.

In addition, many cases of illegal construction and illegal land use have already been allowed to continue. Therefore, the F.B. is often forced to tolerate illegal activities. Notably, illegal use and occupation of O/W protection forests has become a problem, and in 2003, the Inspectorate submitted a corrective measures report, and in 2012, an investigation was conducted.

In 2003, the local government transferred jurisdiction over the management of the O/W protection forests to the F.B.

However, the cadastral map of the O/W protection forest was incomplete and unclear, and the number of local government officials in charge before 2003 was limited; hence, most did not know the geographical location and current status of the forest. Consequently, many O/W protection forests were illegally occupied and used when jurisdiction was transferred to the F.B.

As of 2003, the total area of illegal occupation and use of the O/W forests was 2,782.74 ha, which accounted for 5% of the total area of 56,506 ha of the O/W forests in 2003. Area-wise, illegal occupation accounted for 89% of the total area, and illegal land use accounted for 11%, indicating that illegal activities in the forests are mainly conducted by entities who were neither owners nor managers of the O/W protection forest. The average area per parcel was 0.31 ha for illegal occupation and 0.74 ha for illegal land use, indicating that illegal occupation was more than twice that of illegal land use. Illegal occupation is more prevalent on a smaller scale than illegal land use.

Regardless of illegal occupation or illegal land use, the most common use of land was as Illegal Cultivated Land in the three categories: Building Sites, Illegal Cultivated Land, and Fish farm and Other. In terms of the Illegal Cultivated Land area, illegal occupation

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is the most common use of farmland, while illegal land use is the most common for areca nut cultivation.

In illegal land use, tea plantation is approximately 1% of the total area; however, illegal occupation accounts for 19% of the total area. Since both areca nut and tea plantation tend to be distributed in hilly and mountainous areas, illegal land use is more common among forest owners in mountainous areas than illegal occupation.

Regarding relaxation of laws and regulations, the regulations for the revocation of protection forest have been relaxed/changed thrice: in 1996, in the "*Taiwan Province Revocation Criteria for Protection Forest*"; in 2001, in the "*Revocation Criteria for Protection Forest*"; and in 2004, in the "*Revocation Standard for Protection Forest*."

Table 28 compares the contents of the items in the regulations that allow for the revocation of protection forests. These items were divided into the following six categories: "Natural Environment," "Public Good,", "Alternative Protection Forest," "Boundary Change," "Non-Forest Period," "Absence of Beneficiaries or Protection Forest."

The three major changes are as follows:

1) Categories of public good that are eligible for revocation of protection forests have been expanded (expansion of the reasons for revocation)

2) Section that specifically targets coastal forests (windbreak and drift-sand stabilization protection forests) has been deleted

3) If the protection forest has been non-forested for a certain period of time, the protection forest status can be revoked. The start date of non-managed forest status has been changed from May 27, 1958, to July 21, 1982, and the

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period of non-managed forest condition for which revocation of protection forests is permitted has been shortened (relaxed time limit)

The conditions for revoking protection forest status can be viewed from two perspectives: expansion of the permissible range of post-revoke use and shortening the period of non-forest status.

In addition, in the "*Principle of Protection Forest Dotted Line Utilization*" regarding development within protection forests, the stipulated area allowed for public facilities without revocation of the protection forest status was 330 ha in 2001 when the law came into effect; however, this was changed to 660 ha in 2006. Thus, it is apparent that the restrictions on the development of protection forest on land use pressure are being relaxed as well.

Table 27. Statistical Tables on the Illegal Occupation and Land Use of O/W Protection Forest Area

	Total		Building Sites		Illegal Cultivated Land		Fishfarm and Other	
Unit	Number of Land Parcels	Area(ha)	Number of Land Parcels	Area(ha)	Number of Land Parcels	Area(ha)	Number of Land Parcels	Area(ha)
Illegal Occupation	7,990	2,474.68	2,772	133.16	3,501	1,901.27	1,717	440.25
Illegal Land Use	418	308.06	37	2.46	341	299.54	38	6.06
Total	8,408	2,782.74	2,809	135.62	3,842	2,200.81	1,755	446.31

Ref. No.101-0040 Corrected cases by the Control Yuan in 2012

Table 28. Categorized Area of Illegal Cultivated Land in O/W Protection Forest

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Unit	Total		Illegal Occupation		Illegal Land Use	
	Number of Land Parcels	Area(ha)	Number of Land Parcels	Area(ha)	Number of Land Parcels	Area(ha)
Farmland	1,709	660.38	1,499	583.59	210	76.79
Tea Plantation	53	70.16	47	14.57	6	55.59
Areca Nut	630	531.68	574	437.52	56	94.16
Orchard	748	630.73	717	570.37	31	60.36
Other	702	307.86	664	295.22	38	12.64
Total	3,842	2,200.81	3,501	1,901.27	341	299.54

Ref. No.101-0040 Corrected cases by the Control Yuan in 2012

Table 29. Changes in Criteria for Revocation Protection Forest

Type	*Taiwan Province Revocation Criteria for Protection Forest*(1996)	*Revocation Criteria for Protection Forest*(2001)	*Revocation Standard for Protection Forest*(2004)
Natural Environment	1. Formation of sea areas or riverbeds that it is impossible to restore the forests. 2. The original protection fores t is far away from the coast due to the shift of the coastline, and it is no longer exposed to strong monsoon winds, tidal erosion, and flying sand hazards, and the purpose of its designation has disappeared. 7.Changes in forest conditions, land conditions, or other environmental factors that make it unnecessary to continue to be a protection forest.	1. Formation of sea areas or riverbeds that it is impossible to restore the forests. 3.Because the coastline has shifted outward, the original protection forests have shifted inward and are no longer necessary, and an equal area of security forests has been incorporated into the new coastal area to continue the security functions of the original one, such as wind protection, tidal wave protection, and drifting sand protection.	3.Natural phenomena such as changes in geographic environment, which cause damage to the Protection Forest and make it impossible to reforest.
Public Good	3. Construction of seawalls, riverwalls, railroads, highways, national defense facilities, or other public facilities, public utilities, etc. that are not intended for forestry purposes.		(1) Necessary for the land use listed in Paragraph 1 of Article 8 of Forest Act*. (2) Project sites that have been examined and recognized as necessary for the promotion of industry or the public interest by the central government agency in charge of the purpose of the project, and have been approved by the Executive Yuan.
Alternative Protection Forest	4. Appropriate alternative measures are available to achieve the purposes of the existing protection forest.		5. The function and utility of the original protection forest shall be replaced by other protection forest.
Boundary Change	6. It is necessary to establish clear Protection Forest boundaries in accordance with cadastral voundaries, natural terrain, and forest class boundaries, etc., and the revision will not affect the overall function of the protection forest.	2. Without influencing the overall function of Protection Forest, it is necessary to amend the boundaries of protection forests to match the cadastral boundaries, natural terrain, and forest class boundaries.	4. Necessary for the amendment of the protection forest boundary to match the cadastral boundary, natural terrain, forest class boundary.
Non-Forest Period	5. Permanent construction sites, paddy fields, cultivated dry land, cemeteries, fishponds, ditches, salt fields, and other non-forestry land will not threaten the overall function of the protected forest. However, new illegal land cultivation and construction after May 27, 1958 shall not be lifted, and shall be strictly prohibited and prosecuted."		7. Before July 21, 1982, the protection forest land was not used for forestry and could not reforest.
Absence of Beneficiaries or Protection Targets		4. The original beneficiary no longer exists and there is no other new beneficiary.	4. The original beneficiary or object of protection no longer exists.

*Paragraph 1 of Article 8, *Forest Act*:
Should a national or public forest have any of the following, it may be leased, transferred or appropriated:
1. It is required for establishing a school, hospital, park or other public facilities;
2. It is required for national defense, transportation or water conservation
3. It is required for establishing public works;
4. It is required for establishing a duly approved national park, designated scenic area or forest recreation park.

Note: Surveys by the author

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Section 4 Protection Forest Designation

Procedure and Current Situation of Protection Forest Designation

The forests that could be designated as protection forests is stipulated in Articles 1 and 2 of the "*Forestry Act*" and Articles 20 and 21 of the "*Soil and water Conservation Act*."

The procedure for designation as protection forest is initiated at the time of Protection Forest Revision or Special Procedure by application. In the case of revocation of protection forests, a third-party committee, the Protection Forest Revoking Review Committee conducts a review when the relevant protection forest meets certain conditions. However, in the case of the designation of protection forest, no rules exist regarding review by a third-party committee.

According to the interviewed F.B. Officer, applications for the designation of protection forest as Special Procedure are few in number. In addition, currently, no plans are in place for the designation of new protection forests.

Therefore, most of the designation of protection forest is done at the time of the Protection Forest Revision. Since the Protection Forest Revision is for existing protection forests, few new forests are designated as protection forests. According to the interviewed F.B. Officials, all areas that should be designated as protection forests in Taiwan have already been designated as such. This was stated in the report at the end of the "Protection Forest Designation Expansion Plan," which was conducted during 1976–1982.

Most of the existing forest that are designated as protection forests are national forests. Even if there are forests adjacent to existing private protection forests, it is commonly understood, among officials involved in protection forest operations, that it is difficult to obtain the owner's approval for the expansion of protection forests; hence, from the beginning, private protection forests are not considered for expansion.

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Fig 16 and Table 29 present the designation area of protection forests from 2012 to 2021. Although the size of the area varies year-wise, >40 ha are constantly designated as protection forest every year. The only year in which >1,000 ha were designated as protection forest was in 2017, owing to the designation of a forest in Kaohsiung, which was severely damaged by the Typhoon Morakot in 2009, as an erosion control protection forest.

The reason for the 10-year gap between the occurrence of the typhoon and the designation as a protection forest is that the forest was originally a non-protection forest and could not be designated under the Protection Forest Revision; hence, the designation as a protection forest was delayed. Furthermore, work to control the erosion delayed the designation as well.

Partly because of this influence, erosion control protection forests had by far the largest area designated over the 10-year period in the category of protection forest. This is followed by the designation area of headwater protection forests.

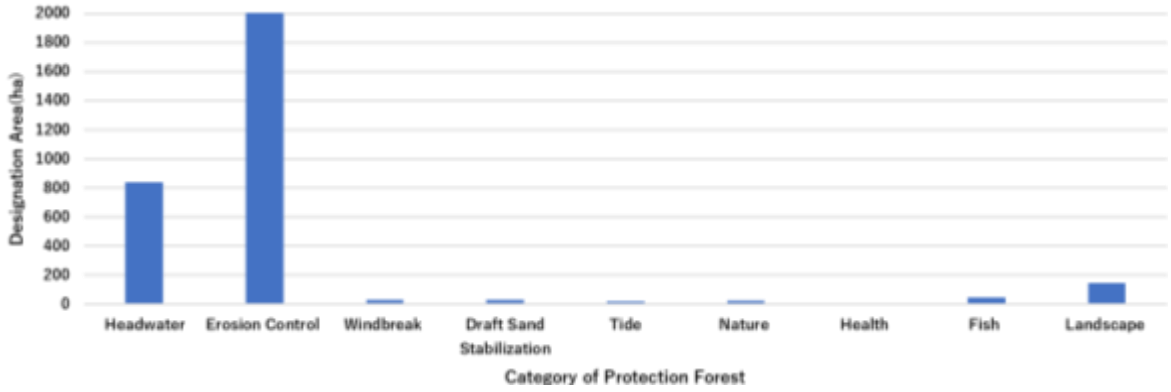

Figure 16: 2012–2021 Designation Protection Forest Area by Category of Protection Forest

Ref.: Information from Interview Survey with the Officer of the F.B.

Table 30. Designation Protection Forest Area by year (2012–2021)

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Year	Designation Area(ha)
2012	204.07
2013	350.95
2014	209.79
2015	51.04
2016	119.36
2017	1,798.31
2018	341.08
2019	43.20
2020	87.72
2021	204.05
Total	3,409.58

Ref.: Information from Interview Survey with the Officer of the F.B.

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Chapter 4 Operation of Protection Forest in Japan
Section 1 Current state of ownership and category

National forests account for 30% of Japan's forests and public and private forests account for 70%. Conversely, in terms of protection forests, national forests account for approximately 10% more than the public and private forests. This is because the protection forest rate for national forests is high at 90%, while that for public and private forests is only 30%.

In terms of overall protection forest categories, headwater conservation forests dominate, followed by soil run-off prevention and public health forests.
This is not a characteristic of the total alone, rather it is the same for both national and public and private forests.

Although the national forests accounted for a larger percentage of the total area of protection forests, the situation differs by category of protection forests (Table 31). Except for headwater conservation protection and public health forests, public and private forests account for a larger percentage than national forests. This is because many headwater conservation protection forests are located in the backcountry, where many national forests are located. Conversely, drift-sand, windbreak, tidal-wave, and salty-wind prevention forests, and fish breeding forests are more common among public and private forests because they are distributed mostly in privately owned coastal areas.

Table 31. Protection Forest Area by Category and Ownership

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	Category	National	Private and Public	Total
1	Headwater conservation forest	5,684,818	3,541,094	9,225,912
2	Soil run-off prevention forest	1,048,508	1,492,660	2,541,168
3	Landslide prevention forest	19,155	40,637	59,792
4	Shifting send prevention forest	3,608	12,434	16,042
5	Windbreak forest	22,276	33,370	55,646
6	Flood damage prevention forest	67	540	607
7	Tidal wave and salty wind prevention forest	4,933	7,321	12,254
8	Drought prevention forest	45,732	49,753	95,485
9	Snow drill prevention forest	0	31	31
10	Fog inflow prevention forest	8,738	52,145	60,883
11	Snow avalanche prevention forest	3,199	13,383	16,582
12	Rock fall prevention forest	395	2,095	2,490
13	Fire prevention forest	0	322	322
14	Fish breeding forest	5,095	27,303	32,398
15	Navigation landmark forest	44	275	319
16	Public health forest	62,888	59,954	122,842
17	Scenic site conservation forest	8,140	9,873	18,013
	Total	6,917,596	5,343,190	12,260,786

Ref. Protection Forest Area from "Outline of Forest and Forestry Statistics in 2022" (Forestry Agency, 2023)

Section 2 Management of Protection Forest

- **Protected and other restricted areas that overlap with Protection Forest**

Figure 17 exhibits the coordination between protection forests and other use-restricted areas, and Table 32 supplements the figure. The figure and table have been sourced from the "Land Use Coordination Guidance Principle in the Overlapping Areas of the Five Area Division" prepared by the Ministry of Land, Infrastructure, Transport, and Tourism.

Protection forests belong to forests in the five area divisions. In principle, protection forests are not allowed overlap with 'urbanization promotion areas and use districts,' 'area of agricultural land,' and 'Natural Wilderness Conservation Areas' (although not depicted in the chart, the "Coastal Conservation Area" defined by the Coastal Act cannot overlap with protection forests.). Furthermore, overlap between 'natural park

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areas' and 'nature conservation areas,' except for 'Natural Wilderness Conservation Areas,' and protection forest is possible, and the respective managing agencies coordinate with each other regarding use. As of 2001, approximately 54% of national park areas overlap with protection forests (Ministry of the Environment). In the case of other areas that overlap with protection forests, priority is accorded to the use of protection forests.

Protection forest regulations have an advantage over urban and agricultural lands regarding land use throughout the country, and are on equal standing with areas for nature conservation; however, these cannot be duplicated in areas where conservation is more necessary.

			Urban Areas			agricultural areas		forest areas		nature park areas		nature conservation areas		
Five Area Division	Sub Division	ha	urbanization promotion areas and use districts	urbanization control areas	Other	area of agricultural land	Other	Protection Forest	Other	Special Areas	Ordinary Areas	Natural Wilderness Conservation Areas	special zones	Ordinary Zones
Urban Areas	urbanization promotion areas and use districts	3,290,049												
	urbanization control areas	3,736,888	×											
	Other	3,042,110	×	×										
agricultural areas	area of agricultural land	4,190,000	×	–	–									
	Other	40,000	×	①	①	×								
forest areas	Protection Forest	12,260,790	×	–	–	×	–							
	Other	12,764,210	②	③	③	④	⑤	×						
nature park areas	Special Areas	3,658,961	×	–	–	–	–	○	○					
	Ordinary Areas	1,946,115	⑥	○	○	○	○	○	○	×				
nature conservation areas	Natural Wilderness Conservation Areas	5,631	×	×	×	×	×	×	–	×	×			
	special zones	42,758	×	–	–	–	–	○	○	×	×	×		
	Ordinary Zones	29,025	×	○	○	○	○	○	○	×	×	×	×	

Fig.17 Land Use Coordination Guidance Principle in the Overlapping Areas of the Five Area Division

Rif. "Land Use Coordination Guidance Principle in the Overlapping Areas of the Five Area Division" (Ministry of the Environment)

Table 32. Explanation of Signs in Figure 17

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Sign	Meaning
×	No overlap in institutional or actual conditions, with some exceptions.
←	In case of mutual overlap, priority is given to land use in the direction of the arrow.
○	In the case of mutual overlap, coordination shall be made so that the two areas are compatible.
①	Urban use is allowed while taking into consideration the current status of land use and coordinating it with agricultural use.
②	In principle, priority is given to urban use, but efforts are made to preserve forests as green areas.
③	Allow use as forests, while taking into consideration the current status of use as forests and controlling the use of the land as forests. Allow use as forests, while taking into consideration the current status of use as forests and controlling the use of the land as forests.
④	In principle, priority shall be given to agricultural use, but forest use shall be permitted in coordination with agricultural use.
⑤	Priority shall be given to forest use, but agricultural use shall be permitted in coordination with forest use.
⑥	Urban use shall be coordinated to maintain the function of the nature park as much as possible.

Rif. "Land Use Coordination Guidance Principle in the Overlapping Areas of the Five Area Division" from Ministry of Land, Infrastructure, Transport and Tourism.

- Protection Forest in National Forest

National forests are zoned into five types according to the "National Forest Management and Operation Regulations": "Ecosystem conservation type," "Disaster prevention type," "Leisure and culture type," "Residential circumstances type," and "Water resource type," and logging is conducted according to the management method of each type (Table 33).Therefore, operations are not classified by the presence or absence of protection forests. For forest lands designated as protection forests, the protection forests management regulations are applied in addition to the main management policies in the five forest types.

Management of national forests is based on a system of forest plans. A sole plan for national protection forests does not exist, rather they are integrated into the planning system. Figure 18 depicts the system of national forest management. Japan's Forest and Forestry Basic Plan was formulated in accordance with the "*Forest and Forestry Basic Act*," and revised approximately every 5 years in response to changes in forest and forestry conditions. The National Forestry Plan was formulated in line with the Forest and Forestry Basic Plan. This 15-year plan is revised every 5 years by the Minister of Agriculture, Forestry, and Fisheries in accordance with the "*Forest Act.*" It establishes

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targets for forest development and preservation, the planned volume of harvesting, and standards for forest management. This plan includes the country-wide planned area of protection forests. The planned area of these protection forests is based on the reports from the respective Regional Forest Offices.

The planned area for each forest is described in the "National Forest Practice Implementation Plan," which is formulated in accordance with the "*Utilization of National Forest Land Regulation*," and is implemented by the respective Regional Forest Offices.

Table 33. Five Types of National Forests

Type	Area(ha)	About cutting
Eco system conservation	1,708,205	Do not cut down trees except for those that are necessary according to the characteristics of the target to be protected.
Disaster prevention	1,471,451	Appropriate cutting shall be carried out when necessary to maintain the functions that should be demonstrated.
Leisure and culture	458,713	
Residential circumstances	2,265	
Water resources	3,934,907	Both main cutting and thinning shall be conducted. The area to be cut shall not exceed the maximum area specified for each operation group.

Ref. Table 1–3 Function Categories Area of Forest Species in National Forests, in "Statistics of Ntional Forest Operations"(Forestry Agency, 2023)

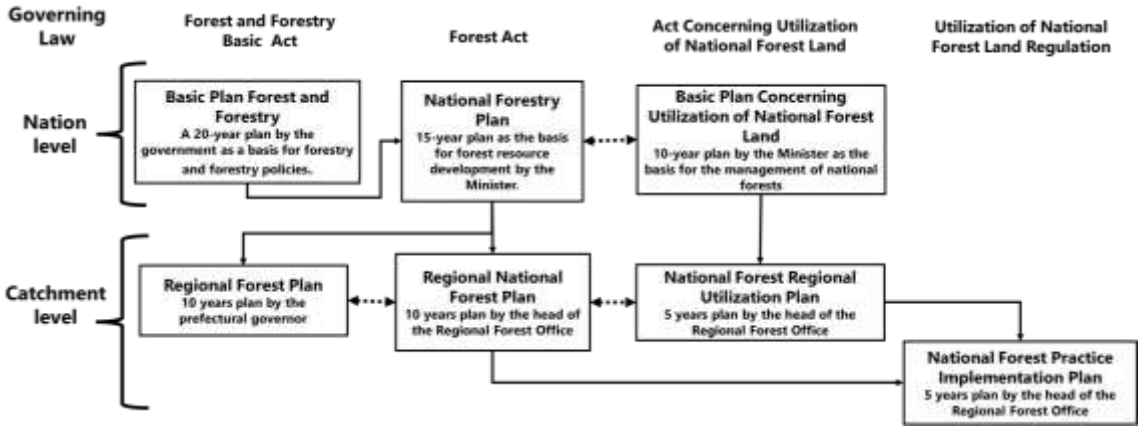

Figure 18: Structure of the Forest Planning System

Ref. "*Shinrin keikaku seido*"https://www.rinya.maff.go.jp/j/keikaku/sinrin_keikaku/ (Forestry Agency, Private Forest Department)

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- **Requirements for Designation of Protection Forests**

Currently, the management of protection forests in Japan is determined on a case-by-case basis according to the "*Requirements for Designation of Protection Forest*," regardless of the ownership type. These are the minimum requirements to achieve the purpose of designation of protection forests, and are defined in line with the designation, in accordance with the standards set forth in the "Order for Forest Act." There are three main requirements: (1) logging method, (2) logging limits, and (3) planting method. The "*Requirements for Designation of Protection Forest*" are determined separately for each protection forest; however, the principles for each category of protection forest are defined.

(1) Logging method

Currently, there are 17 types of protection forests in Japan. Four types (headwater conservation, windbreak, drought, and fog inflow prevention forests) are not designated for logging in principle; in other words, clear-cutting is permitted. Snow-avalanche, rockfall, and fire prevention forests are not permitted to be cut, while in the other categories only selection cutting is permitted in principle.

In principle, thinning is permitted, except in protection forest categories for which no thinning is allowed in the final cutting.

The purpose of logging is not limited to forest maintenance; hence, it is possible to produce timber for income purposes.

(2) Logging limits

The annual harvestable area is calculated by dividing the total area that can be clear-cut as the final cutting as per the standard age.

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In the case of clear-cutting in protection forests for the purpose of windbreak and fog inflow prevention, a band (at least 20 m wide) must be left in the area where the standard age or longer is maintained.

However, the area to be cut per site is limited to ≤20 ha for headwater conservation, windbreak, fog inflow prevention and fish breeding forests, and ≤10 ha for all other protection forests.

(3) Planting method

Table 34 summarizes the area of protection forests by final cutting method as specified in the actual requirements for designation of protection forests. The area of both national forests and public and private forests that can be clear-cut accounts for the majority of the total area of protection forests. This is probably because most of the headwater conservation forests, which account for the largest area of any protection forest category, can be clear-cut.

Table 34. Cutting Regulation of "*Requirements for Designation of Protection Forest*"

	Category	Final cutting method	Limited Area
1	Headwater conservation forest	Clear	Less than 20 ha
2	Soil run-off prevention forest	Selecting	Less than 10 ha
3	Landslide prevention forest		
4	Shifting send prevention forest		
5	Windbreak forest	Clear	Less than 20 ha
6	Flood damage prevention forest	Selecting	Less than 10 ha
7	Tidal wave and salty wind prevention forest		
8	Drought prevention forest	Clear	
9	Snow drill prevention forest	Selecting	
10	Fog inflow prevention forest	Clear	Less than 20 ha
11	Snow avalanche prevention forest	Ban	-
12	Rock fall prevention forest		-
13	Fire prevention forest		-
14	Fish breeding forest	Selecting	Less than 20 ha
15	Navigation landmark forest		Less than 10 ha
16	Public health forest		
17	Scenic site conservation forest		

Note: Surveys by the author

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Table 35. Area of Protection Forests by Final Cutting Method as Specified in the Actual Requirements for Designation

Categories of Protection Forest	Protection Forest Area Ratio(%) by the type								
	National Forest			Private and Public			Total		
	Ban	Selection	Clear	Ban	Selection	Clear	Ban	Selection	Clear
Total	4.4%	24.5%	71.1%	0.6%	11.5%	87.8%	2.8%	18.9%	78.4%
Headwater conservation forest	3.9%	19.2%	76.9%	0.1%	4.5%	95.4%	2.4%	13.6%	84.0%
Soil run-off prevention forest	6.3%	46.8%	47.0%	0.7%	20.3%	79.0%	3.0%	31.2%	65.8%
Landslide prevention forest	9.9%	89.7%	0.4%	1.8%	97.0%	1.2%	4.4%	94.7%	0.9%
Shifting send prevention forest	22.4%	63.6%	14.0%	2.9%	66.3%	30.8%	7.3%	65.7%	27.0%
Windbreak forest	4.6%	21.1%	74.3%	1.5%	23.5%	74.9%	2.8%	22.6%	74.7%
Flood damage prevention forest	0.0%	100.0%	0.0%	0.6%	98.7%	0.7%	0.5%	98.8%	0.7%
Tidal wave and salty wind prevention forest	5.9%	93.9%	0.2%	22.7%	77.2%	0.1%	16.0%	83.9%	0.1%
Drought prevention forest	3.0%	36.6%	60.4%	0.1%	19.7%	80.2%	1.5%	27.8%	70.7%
Snow drill prevention forest				0.0%	100.0%	0.0%	0.0%	100.0%	0.0%
Fog inflow prevention forest	0.0%	9.0%	91.0%	0.6%	6.4%	92.9%	0.5%	6.8%	92.6%
Snow avalanche prevention forest	49.8%	50.2%	0.0%	50.3%	49.6%	0.1%	50.2%	49.7%	0.1%
Rock fall prevention forest	53.2%	46.8%	0.0%	27.4%	72.2%	0.4%	31.5%	68.2%	0.4%
Fire prevention forest				92.9%	7.1%	0.0%	92.9%	7.1%	0.0%
Fish breeding forest	7.9%	91.8%	0.3%	3.0%	85.3%	11.6%	3.8%	86.4%	9.8%
Navigation landmark forest	2.3%	97.7%	0.0%	16.7%	83.3%	0.0%	14.7%	85.3%	0.0%
Public health forest	13.3%	84.4%	2.3%	9.8%	66.0%	24.2%	11.6%	75.4%	13.0%
Scenic site conservation forest	38.4%	61.6%	0.0%	7.7%	92.3%	0.0%	21.6%	78.4%	0.0%

Ref. Table of Area of Protection Forests by Final Cutting Method as Specified in the Actual Requirements for Designation in "Outline of Protection Forest and Protection Facilities District System" (Forestry Agency Conservation Division, 2023, p.45)

Section 3 Designation and Revocation of Protection Forest

While a planned area of designation for 15 years is listed in the National Forestry Plan a planned area for the revocation of protection forests is not listed, as this is done on a case-by-case basis upon application.

≪Requirements for Revocation of Protection Forests≫

In Japan, the requirements for revocation of protection forests are stringent, and basically impossible, regardless of ownership type. Revocation of a protection forest is possible only when it meets the conditions presented under " extinction of reasons for designation" or "public interest grounds."

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If the revocation of a protection forest involves forest land conversion , even more stringent requirements must be met (Table 35).

According to a Forestry Agency official, the most common reason for applications for revocation of protection forests is roadworks. Since most of these projects are, and were, public works and fulfill the requirements, the investigation process for revocation has been smooth. Conversely, applications for revocation of protection forests for renewable energy are few in number. Solar power generation is prohibited in protection forests, and applications for wind and geothermal power generation facilities are rare.

≪Procedure for Revocation of Protection Forests≫

The following figure illustrates the process of revocation of national protection forests with forest land conversion (Fig 19):

(1) Pre-filing Consultations with the Regional Forest Offices by the development company

(2) Applicant (company,.) submits documents to the head of the Regional Forest Office

(3) Head of the Regional Forest Office conducts prior consultation with the prefectural governor (or coastal administrator, if applicable).

(4) Application presented to the Minister of Agriculture, Forestry and Fisheries

(5) Acceptance of the application by the Minister, consultation with the Forestry Policy Council (voluntary), and consultation with the Minister of the Environment

(6) Prefectural governor receives notice of planned revocation from the Minister

(7) Prefectural governor issues public notice of planned revocation. If there are objections from directly interested parties, an open hearing is held to hear their opinions in the decision on the judgment on the appropriateness of the revocation.

(8) After 40 days have passed since the scheduled public notice without any objections or when the opinions have been dealt with, and it is deemed appropriate to revoke, the

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applicant (company) can work on the installation of alternative facilities after obtaining permission from the prefectural governor.

(9) Prefectural governor confirms the completion of the installation of alternative facilities, etc., and the Forestry Agency issues a final notice of the revocation and the revocation is finalized.

Unlike public and privately forests, the Minister of Agriculture, Forestry, and Fisheries has the authority to revoke all national protection forests. In addition, external companies cannot obtain the right to use national protection forests through loans or other means. Therefore, companies wishing to revoke a national protection forest must submit the necessary documents, similar to an application, to the head of the Regional Forest Office, who subsequently forwards the application to the Forestry Agency. Concurrently, , the applicant (company) must obtain other permits and approvals, such as those for the establishment of alternative facilities in the protection forest. Although the Minister of Agriculture, Forestry, and Fisheries can consult with the Forestry Policy Council to determine the appropriateness of the revocation of protection forests at the their discretion, this has rarely been done.

≪Designation of Protection Forests≫

There are two main reasons for designating national forests as protection forests: first, when erosion control works are undertaken following a disaster, and second, when the requirements for protection forests are met.

The process for designation as a protection forest is almost similar to that for revocation. However, in the case of emergency erosion control works, the designation of a protection forest can be made before 40 days have passed from the date of notification of the designation by the prefectural governor. The Minister of Agriculture, Forestry, and Fisheries can request the Forestry Policy Council to review the

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appropriateness of the designation of protection forests; however, as with the revocation of protection forests, this has rarely been done.

Table 36. Conditions for Revocation of Protection Forest for Conversion

Land Selection	1. Importance	It is impossible to have a protection forest that meets the following conditions 1)Erosion control work is implemented 2)the slope is more than 25 degrees 3)there is a high risk of collapse 4)it is close to houses and other facilities important to people's lives 5)it is close to the coast and the width of the belt is less than 150 m.
	2. Situation	The project for the reason of revocation must be for a public purpose. The difficulty of finding another suitable site.
	3. Area	The protection forest revocation area must be the minimum required.
Feasibility	4. Certainty	The following (a)-(d) have already been achieved or are certain to be achieved (a)The plan is specific and implemented as planned (b)Acquisition of rights to use land (c)Acquisition of necessary permits and approvals for land use or business, etc. (d)The company has sufficient credit, financial resources, and skills in the execution of the project.
	5. Consensus building	Consensus building among local residents in the areas around protection forests regarding the revokation of the conversion of protection forests
Replacement of functions	6. Alternative facilities	Ensure public functions that lose out as a result of the revocation of protection forests from conversion

Ref: Manual for the Protection Forests Revocation(Wind Power) p.26(Conservation Division Forestry Agency, 2023)

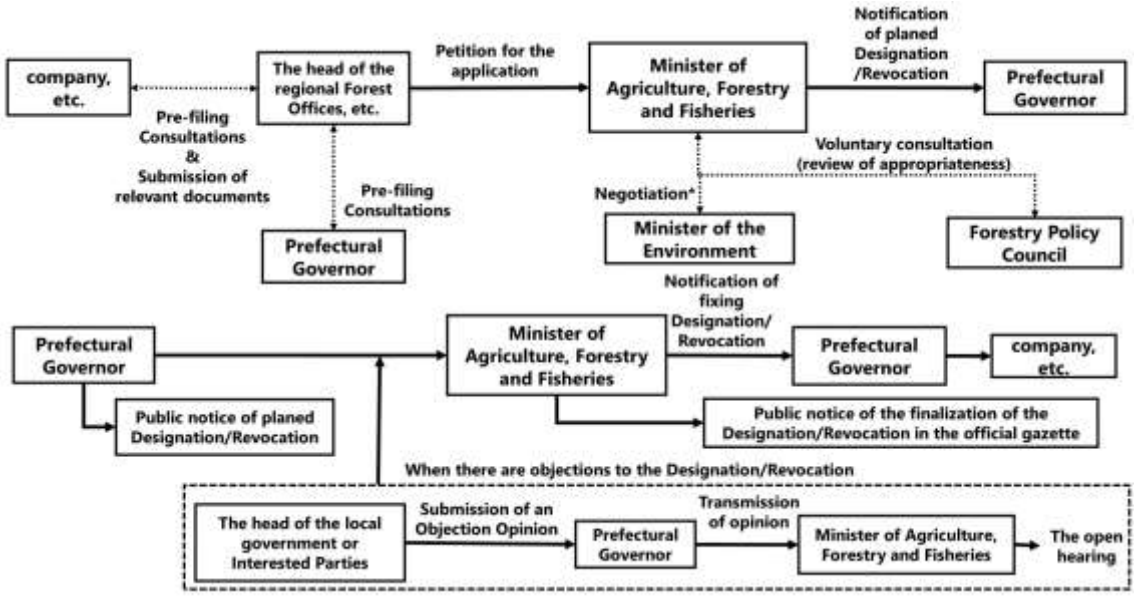

Figure 19 Procedure of Protection Forest Designation and Revocation

Note: Surveys by the author

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Chapter 5 Comparison of Protection Forests by Categories and Summary

Section 1 Comparison of Protection Forests by Categories

The major protection forests in Taiwan and Japan, which are used for headwater conservation and erosion control, are compared herein.

(1) Protection Forest Category in Taiwan and Japan

Owing to the climatic and topographical similarities and differences between Taiwan and Japan, not all protection forest categories are identical. The following table presents the correspondence between protection forest categories in Japan and Taiwan. In Japan, protection forests for the purpose of headwater resource conservation and erosion control were subdivided into two categories when the Forest Act was revised in 1951.

Table 37. Correspondence Table of Protection Forest Categories in Taiwan and Japan

Taiwan	Japan
Regulations for Conservation Forest Managements	Handling of Designation and Revocation of Protection Forest and Protection Facilities Area
1. Flood control protection forest;	6. Flood damage prevention forest
2. Windbreak protection forest;	5. Windbreak forest
3. Tide protection forest;	7. Tidal wave and salty wind prevention forest
4. Salt protection forest;	
5. Smoke protection forest;	
6. Headwater protection forest;	1. Headwater conservation forest 8. Drought prevention forest
7. Erosion control protection forest;	2. Soil run-off prevention forest 3. Landslide prevention forest
8. Draft sand stabilization protection forest;	4. Shifting send prevention forest
9. Rock falling prevention protection forest;	12. Rock fall prevention forest
10. Snow or avalanche prevention protection forest;	9. Snow drill prevention forest
11. National security protection forest;	
12. Health protection forest;	16. Public health forest
13. Navigation protection forest;	15. Navigation landmark forest
14. Fishery protection forest;	14. Fish breeding forest
15. Landscape protection forest; and	17. Scenic site conservation forest
16. Nature conservation protection forest.	
	10. Fog inflow prevention forest
	11. Snow avalanche prevention forest
	13. Fire prevention forest

Note: Surveys by the author

≪Protection Forest for Headwater Conservation≫

In Taiwan, Article 22, Paragraph 2 of the "*Forestry Act*," "Essential for the conservation of a water source or protection of a reservoir" is the basis for headwater

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protection forest stipulated in Article 3, Division 6 of the "*Regulations for Conservation Forest Managements*."

In Japan, Article 25, Paragraph 1 of the "*Forest Act*," "Conservation of the water resource" is the basis for headwater conservation forests, and Paragraph 5, "Protection against wind damage, flood damage, tidal damage, drought damage, snow damage, or fog damage" is the basis for drought prevention forests. The "*Forest Act*" was amended in 1951 to create headwater conservation forests for the purpose of wide-area river basin conservation, and the existing headwater conservation forests became drought prevention forests (Editorial Committee of the Centennial History of the Protection Forest System, 1997, p. 135).

≪Protection Forest for Erosion Control≫

In Taiwan, Article 22, Section 3 of the "*Forestry Act*," "Essential for preventing damage from sand, soil erosion and blowing sand, falling rock, ice, or avalanches" is the basis for "Erosion control protection forest."

In Japan, Article 25, Section 2 of the "*Forestry Act*," "prevention of soil runoff" is the basis for soil run-off prevention forests, and Section 3, "prevention of landslide prevention" is the basis for landslide prevention forests. Kawaguchi(1989) describes the difference between the two forests as follows:

Soil run-off prevention forests: "Forests necessary for preventing surface erosion of mountain areas and sediment run-off from upstream are designated as protection forests, which require a fairly large area and are most effective in preventing sediment run-off when located downstream near urban areas"(Kawaguchi, 1989, p.28).

Landslide prevention forests: "Landslide prevention forests are designated by the Forest Act to prevent the collapse of steep slopes with unstable ground when there is a

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risk of direct damage to houses, arable land, roads, etc. due to landslides"(Kawaguchi, 1989, pp.30-31).

(2) Area and Ownership

Overall, Taiwan has the largest proportion of national forests. However, the proportion of private forests for erosion control is only slightly larger than protection forests for headwater conservation.

In Japan, national forests account for a slightly larger proportion of the total and for headwater conservation protection forests, while private forests account for a larger proportion of the area of erosion control protection forests. In both countries, erosion control protection forests are more frequently located near urban areas than forests for water source recharge.

Table 38. Area and ratio of protection forests for all categories, headwater conservation, and erosion control

	Taiwan			Japan		
Category	Total	National	Public & Private	Total	National	Public & Private
Total	441,931ha	438,637ha (99.25%)	3,294ha (0.75%)	12,260.79ha	6,917,12ha (56.42%)	5,343,671ha (43.58%)
For Headwater Conservation	300,442ha	299,498ha (99.69%)	944ha (0.31%)	9,381,181ha	5,749,51ha (61.29%)	3,631,666ha (38.71%)
For Erosion control	141,489ha	139,139ha (98.34%)	2,349ha (1.66%)	2,675,043ha	1,098,58ha (41.07%)	1,576,461ha (58.93%)

Taiwan: "FORESTRY STATISTICS OF TAIWAN", Taiwan Forestry Bureau, each year.

Japan: Area of Protection Forest and Wood Logging in each year "The Outline of Forest and Forestry Statistics"

(3) Forest Area Change

Changes in the area and percentage of protected forests for headwater conservation and erosion control are presented by decade.

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The area of protection forests in Japan expanded significantly from 1950 to 1970, especially those for headwater conservation.

In Japan, the increase peaked thrice (1970, 1990, and 2010) and was the same for both protection forests for headwater conservation and erosion control, while in Taiwan it peaked twice, with different peaks for headwater conservation and erosion control.

Table 39. Area of Protection Forests and Rate of Change from 1950 to 2020

	Area(ha)				Rate of change from the previous year			
	Japan		Taiwan		Japan		Taiwan	
	Headwater	Soil erosion	Headwater	Soil erosion	Headwater	Soil erosion	Headwater	Soil erosion
1950	968,508	907,480	252,712	95,248				
1960	2,203,160	1,163,779	258,533	99,470	127.5%	28.2%	2.3%	4.4%
1970	5,151,406	1,491,116	255,001	100,350	133.8%	28.1%	-1.4%	0.9%
1980	5,451,617	1,696,621	274,090	112,871	5.8%	13.8%	7.5%	12.5%
1990	6,069,940	1,991,367	281,194	128,881	11.3%	17.4%	2.6%	14.2%
2000	6,460,390	2,153,997	298,317	134,747	6.4%	8.2%	6.1%	4.6%
2010	9,156,453	2,582,624	299,405	139,882	41.7%	19.9%	0.4%	3.8%
2020	9,361,358	2,666,184	300,432	141,485	2.2%	3.2%	0.3%	1.1%

Ref. Taiwan: "FORESTRY STATISTICS OF TAIWAN", Taiwan Forestry Bureau, each year.

Japan: Area of Protection Forest and Wood Logging in each year "The Outline of Forest and Forestry Statistics"

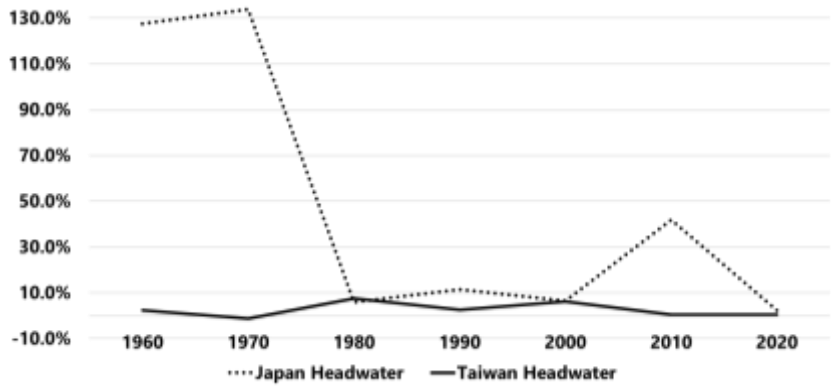

Figure 20. Rate of Change in Area of Protection Forest for Headwater Conservation

Ref. Taiwan: "FORESTRY STATISTICS OF TAIWAN", Taiwan Forestry Bureau,

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each year.

Japan: Area of Protection Forest and Wood Logging in each year "The Outline of Forest and Forestry Statistics"

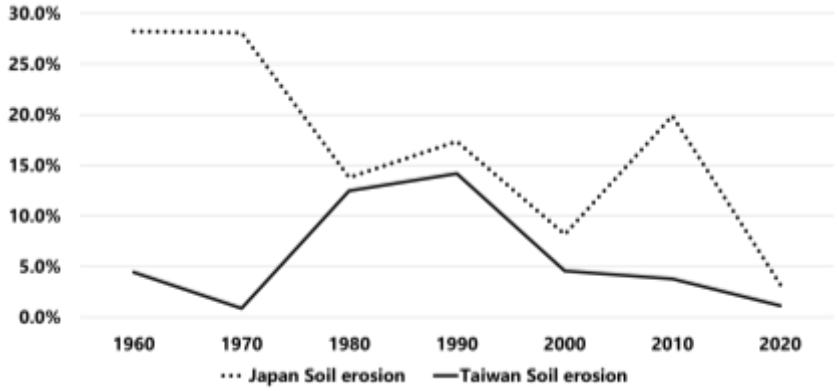

Figure 21. Rate of Change in Area of Protection Forest for Erosion Control

Taiwan: "FORESTRY STATISTICS OF TAIWAN", Taiwan Forestry Bureau, each year.

Japan: Area of Protection Forest and Wood Logging in each year "The Outline of Forest and Forestry Statistics"

(4) Forest Management Regulation

The principle of planting regulation by protection forest category exists in Taiwan, though not in Japan. Conversely, the principle of logging regulation exists in Japan, though not in Taiwan.

- Overall

In Taiwan, tree felling is prohibited except for forest maintenance, disasters, or when necessary for public works. In principle, all protection forests are subject to selection cutting; however, clear-cutting is possible when it is difficult to renew the forest by selection cutting. In addition, permission from the COA must be obtained before any logging is undertaken.

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In Japan, no restrictions are placed on cutting down forests in protection forests. Therefore, timber production for profit is possible as long as it is within regulations.

- Protection Forest for Headwater Conservation

In Taiwan, selection cutting is permitted in, and forest thinning is possible. Thinning after forest depression is recommended. However, forests on both sides of a mountain stream must be at least 50 m wide, and renewal is limited to selection cutting.

In Japan, regulations on clear-cutting of both headwater conservation forests and drought prevention forests are non-existent; hence, clear-cutting and thinning are possible. However, the logging limit for headwater conservation and drought prevention forests is 20 ha and 10 ha, respectively.

- Protection Forest for Erosion Control

In Taiwan, forests on both sides of streams, railroads, and highways are preserved as protection forests, with a width of ≥50 m, and selection cutting is used for renewal.

In Japan, the harvesting method for both soil run-off and landslide prevention forests is, in principle, selective logging.

Section 2 Results Summary

(1) The Evolution of Protection Forest in Taiwan and Japan

The main points concerning changes in Taiwan's Protection Forest System are as follows:

- Marginal change in regulations on logging in protection forests
- Protection forest area decreased in the 1960s and increased in the 1970s and 1980s
- In the 1980s, the regulations on forest management were clearly stipulated, and natural forest protection forests were added

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- In the 1990s and 2000s, the criteria for the revocation of protection forests and the development restrictions were eased

Taiwan's protection forest area has only changed twice: once during the 1954 survey on the relocation of protection forests, and once during the 1976 expansion plan for protection forests. From the post-war period to 1970, timber production was prioritized to meet the high demand for timber and the need for foreign currency, while the 1970s was a period when functions other than timber production were prioritized. The 1980s was a period in which environmental preservation began to be emphasized. After 1990, forest conservation movements became more extensive because of democratization, and in 1991, Taiwan's natural forests and other areas was prohibited from being logged, resulting in a decline in timber self-sufficiency. Concurrently, restrictions on the use of state-owned land were relaxed, and new land use demands arose, such as those for wind power generation. This trend may have led to the clarification of rules for protection forests and the addition of protection forest categories for the purpose of preserving the natural environment, while the criteria for revocation of protection forests and development restrictions, along with other laws and regulations, were relaxed.

The main points of change in Japan's Protection Forest System are as follows:

- In the early post-war period, the Protection Forest System became the governing law for erosion control works, and logging regulations were considerably eased
- During the land development boom in the late 1970s, regulations on development and revoke requirements for some protection forests were relaxed
- The 10-year time limit act was extended five times, and protection forest area was systematically expanded from 1954 to 2003

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- In 2002, the protection forest consolidation plan was revised midway, and 90% of national forests were designated as protection forests

Japan's Protection Forest System changed drastically in the early post-war period. Consequently, Japan's protection forests are currently used for erosion control works and timber production. Protection forest areas had expanded in the 50 years since the 1954 "*Temporary Measures Act for Protection Forest Consolidation*." However, different categories of protection forests were defined at different times to meet the evolving demands of the public interest functions. In particular, the adoption of the Kyoto Protocol in 1997 and the enactment of the "*Forest and Forestry Basic Act"* in 2001 led to a rapid increase in the area of national protection forests, which became the subject of studies on forest sinks as well.

(2) Operation of National Protection Forests in Taiwan and Japan

≪Management≫

In both countries, daily management follows the regulations of national forests. However, Taiwan has established the "Protection Forest Revision," which examines all protection forests once every 10 years to determine whether they continue to exist and their future management. In contrast, Japan lacks such a system.

≪Designation and Revocation≫

In Taiwan, new protection forests were rarely designated and were often added to existing protection forests. Conversely, in Japan, the Protection Forest Systemis the governing law for erosion control works; hence, areas where mountain disasters occur are newly designated as protection forests. Therefore, the ratio of the area designated as protection forests is larger in Japan than in Taiwan (Table 39).

The procedures for the revocation of protection forests are similar in both countries, albeit different in one respect: the presence or absence of a third-party committee. In

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Taiwan, a third-party committee comprising experts and others is required to review cases for the revocation of protection forests near the coastline and other highly important areas. In Japan, although third-party committees existed, holding these committee meetings was voluntary and rarely happened in practice. In addition, most of the reasons for the revocation of protection forests are common to both countries. However, in Taiwan it is possible to revoke protection forest status when the boundary of the forest changed or when it could be proved that the forest had not been in a forest state for a certain period of time.

Table 40. Designation and Revocation Area from 2018 to 2019

	Area(ha)				Ratio to the total Protection Forest area(%)			
	Designation		Revocation		Designation		Revocation	
Year	Taiwan	Japan	Taiwan	Japan	Taiwan	Japan	Taiwan	Japan
2018	341	26,828	11	282	0.073%	0.220%	0.002%	0.002%
2019	43	17,012	18	373	0.009%	0.139%	0.004%	0.003%
2020	88	14,681	10	229	0.019%	0.120%	0.002%	0.002%

Ref.

Taiwan: Information from Interview Survey with the Officers of the F.B.

Japan: Outline of Protection Forest and Protection Facilities District System"

(Forestry Agency Conservation Division, each year

Table 41. Revocation Procedure of Protection Forests in Taiwan and Japan

			Taiwan	Japan
way to revoke			Protection Forest Revision application	only application
The right to revocation			the central competent authority	Minister of Agriculture, Forestry and Fisheries
Third-party committee	Name		Protection Forest Revoking Review Committee	Forestry Policy Council
	Necessity		Required if conditions are met	Voluntary consultation
	Protection Forest subject to review	1	Forests from railroads and important highways to the nearest ridges.	All Protection Forest
		2	Forests in coastal areas within 150 m of the sea.	
		3	The revocation of forests larger than 5 ha in size.	

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Note: Surveys by the author

Table 42. Requirements for Revocation of Protection Forests in Taiwan and Japan

		Taiwan	Japan
Public Good		Projects for Public interest or industry	Projects for public by the government, etc.
Extinction of reasons for designation	**Natural Environment**	Reforestation is not possible by natural phenomena	
	Boundary Change	**Modify the Protection Forest Boundary**	—
	Alternative	Original functions replaced	Establish an alternative facility, etc.
	Absence of Beneficiaries or Protection Targets	The original beneficiary of protection no longer exists.	
	Non-Forestry prior to the specified date	**Protection Forest that was not used for forestry before July 21, 1993**	—

Note: Surveys by the author

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Conclusion and Discussion
Section 1 Discussion

(1) Evolution of Protection Forest

≪Difference in Cutting Regulation≫

The most important factor of difference between the two countries is forest ownership.

Unlike Taiwan, Japan's logging regulations changed drastically in the early postwar period, allowing clear-cutting and timber production in some categories of protection forests. This change was attributed to the "*Temporary Measures Act for Protection Forest Consolidation*" of 1954 and the "*Forest Act*" of 1962.

Japan originally had a high rate of private forests, and overcutting and degradation of private forests was a particular problem in Japan. Therefore, the expansion of protection forest designation to private forests was considered to require providing an incentive to private forest owners. Various studies have pointed out that the protection forest designation provided incentives for private forest owners, such as reduced inheritance taxes, in addition to the possibility of timber production, motivated them to designate their forests as protection forests(Mitsui, 1996; Kato, 1998).

As in Taiwan, the deterioration of forest lands was a problem in the early post-war period. However, since Taiwan has a fairly high ratio of national forests, provision of incentives to private forest owners was not required. In Taiwan, although there is a tax reduction for protection forests, the tax amount on forests is small(Wang & Yang, 1996); hence, the incentive for designation as protection forests may be weak.

≪Protection Forest Area≫

- **Erosion Control Works**

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The changes in protection forest area in both countries were caused by the different expansion plans implemented at different times under the different policies of each country. However, in Japan, protection forests continue to cover a certain area even after the expansion plan was completed. The relationship between erosion control works and the Protection Forest System is considered to be the reason for the differences between both countries.

In Japan, the law governing erosion control works is the Protection Forest System. Japan has a high risk of mountain disasters, and erosion control works for restoration and prevention are a constant necessity. Accordingly, protection forests are constantly being designated.

Taiwan, like Japan, has a high risk of mountain disasters; however, erosion control works are based on the "*Soil and Water Conservation Act*," which are undertaken by the Soil and Water Conservation Bureau. Consequently, there is little connection between the Protection Forest System and erosion control works, and mountain disasters are not often the reason for designation of protection forests.

This difference is considered to be directly related to the difference in protection forest area between the two countries.

- Kyoto Protocol

In Japan, the Fifth Phase of the Protection Forest Consolidation Plan (1994–2003) was revised in 2002, and the area of national forests designated as protection forests was considerably expanded, with 90% of national forests eventually becoming protection forests.

The reason for this revision is the 2001 Forest and Forestry Basic Act. Since 2003, there have been some investigations into whether designating protection forests would be sufficient and whether protection forests were ultimately used as "protection and

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conservation measures such as harvesting and conversion regulations based on laws and regulations"; therefore, the Protection Forest System was considered to be influenced by the Kyoto Protocol.

(2) Operation of Protection Forests

The operation of national protection forests in Taiwan and Japan is examined from the aspects of forest operation regulations and forest land conversion regulations (revocation of protection forests).

In terms of forest operation regulations, the two countries have different characteristics, with Taiwan being stringent while Japan being lenient. This difference may be attributed to differences in the ownership of forest lands, as discussed in the evolution of the Protection Forest System.

In terms of forest land conversion, an important assumption is that Taiwan's population density is nearly twice that of Japan, and land use pressure is high. The results reveal that Taiwan allows post-fact compliance for the revocation of protection forests and that the requirements for revocation tend to be lax. This could be regarded as a choice to ensure the coexistence of high land use pressure and the Protection Forest System. To prevent the diversion of highly important forest land, a third-party organization is established to deliberate on the issue, and a protection forest survey is conducted once every 10 years to prevent long-term abandonment of unauthorized development in protection forests.

In Japan, land use pressure is weaker than in Taiwan, and it is almost impossible to revoke protection forests, and illegal use and development of protection forests are rarely seen. Therefore, the need to establish a third-party committee or to conduct periodic surveys of protection forests is absent.

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Section 2 Conclusion & Contribution

➢ Conclusion

As part of forest and forestry policy, Protection Forest Systems have been affected by social and economic conditions and have changed in terms of regulation and area. Possible factors contributing to the current differences between Japan and Taiwan were the original forest ownership structure, relationship with erosion control works, and international relations.

In addition, although Taiwan has stringent regulations on forestry operations in protection forests, it has been concessive to local residents' pressure to use the forests when they are released from protection forests ("conversion of forest land"). In Japan, regulations on forestry operations in protection forests are less stringent, such as allowing timber production; however, regulations on the termination of forest protection forests ("conversion of forest land") are stringent both systematically and operationally.

In summary, Taiwan's Protection Forest System strongly preserves small important areas while co-existing with strong land use pressure, whereas Japan's Protection Forest System designates large areas and allows timber production under loose regulations, though it imposes strong restrictions on forest land conversion and development.

➢ Contribution

This study contributes to international body of knowledge of systems related to the public interest functions of forests.

In Japan, comparative studies on protection forests have long focused on the Protection Forest Systems in European countries such as Germany and France. However, comparisons from the perspective of land security, which is a role of the Protection Forest System, are challenging because of the differences in climatic zones, vegetation, and disaster risks, such as typhoons.

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Conversely, both Taiwan and Japan, the countries under focus in the present study, are located in East Asia and are subject to the similar disaster risks owing to the high frequency of typhoons, earthquakes, and other weather-related disasters. In addition, since the inception of the Protection Forest System is similar in both countries, a reasonable comparison of changes is quite possible.

Therefore, this study may provide useful insights into the systems related to the public interest functions of forests for future research on forest policy in Asia.

Section 3 Implication & Recommendation

- **Implication**

This study focused on the Protection Forest System from the post-war period to the present. However, the study results indicate the need to clarify the status of the prewar Protection Forest Systems in both countries.

In particular, the following three points merit attention:

1. Aboriginal peoples' use of forests in Taiwan and their relationship with the Protection Forest System
2. Relationship between erosion control works and the Protection Forest System in Japan and Taiwan
3. Relationship between the national forest overhaul and the Protection Forest System in Japan

- **Recommendation**

This study may serve as a case study in predicting the effect of changes in social and economic conditions and country-specific characteristics on the design of forestry systems in Asia.

In particular, this study suggests that the differences in forest ownership patterns and the influence of and constraints imposed by international conditions in Taiwan and

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Japan may have affected the Protection Forest System. This observation can be used in accordance with the country-specific policy objectives and directions and can have an impact on the design of forestry policies, especially the public interest functions of forests.

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