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Sustainability of Forest Development in China from the Perspective of the Illegal Logging Trade

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Abstract: The illegal logging trade (ILT) is considered one of the major causes of global deforestation and ecological unsustainability. To prevent the price-suppressing damage caused by ILT to the local wood market and global ecological environment, the Chinese government and non-governmental organizations have taken many actions to deal with it. This study used wood trade data to analyze the current status of ILT in China, summarized the efforts and shortcomings of ILT response actions taken by China, and discussed the possible strategies and sustainable development prospects for combating ILT in China's future. After studying China's situation in the field of ILT and analyzing the advantages and disadvantages of China's measures to deal with ILT, this study found that the volume of ILT gradually increased in China from 2013 to 2020, which might also be one of the reasons for the slowdown in global ecological sustainability. The Chinese government and non-governmental organizations have taken many actions to deal with ILT through legislation, industry supervision, and international cooperation; to date, these response actions have achieved some positive results. Therefore, on this basis, this study proposed that China needs to further limit and manage ILT to achieve sustainable development of forest resources in the future. Strengthening the legislation, especially the restriction of ILT clauses, as a mandatory policy is the most important means to solve the ILT problem, which can provide the legal basis and a reference for other actions. Using economic means to encourage the import of legal wood is also a viable action to crowd out the trade of illegal wood. It is also necessary to promote an international certification system for wood and the standardization and systematization of logging is also a good way to mitigate ILT. Improving the management of wood being imported into China will fill a critical gap at the global scale in dealing with ILT and have positive impacts on combating global ILT.

Keywords: illegal logging trade; current status; response actions; sustainability expectation; China



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1. Introduction

Forests, the richest biological system on earth, account for about 90% of total terrestrial biodiversity [1]. Forests also contribute to sustainable development by preventing soil erosion and regulating the water supply in the world. In addition, forests play an important role in the carbon cycle and climate regulation by storing and releasing carbon dioxide [2]. The Kyoto Protocol, which was adopted in 1997 for the first time in an international agreement on climate change, clearly put forward forest carbon sinks as an important carbon pathway, recognized the contribution of forest carbon sinks to the mitigation of climate warming, and required the strengthening of sustainable forest management and vegetation restoration and protection [3]. Forest security has become a major issue related to the survival and development of human societies; thus, it has greatly concerned all countries in the world. Scholars from Germany, the United States, Brazil, and other countries have studied and researched the integrity and composition of forests from the perspective of healthy development [4–6].

However, deforestation is disrupting the global forest security and ecological balance. Deforestation is the second largest contributor to global anthropogenic greenhouse gas emissions [7], accounting for about 17% of total annual atmospheric carbon emissions [8]. Illegal logging has a direct negative impact on the amount of live wood carbon stored per unit area of forest and, in addition to this, logging activity itself generates more carbon emissions [9,10]. Unrestricted logging has led to the accumulation of wood and the global illegal logging trade (ILT) has been triggered by it. Driven by profits, ILT has intensified and is considered one of the major causes of global deforestation [11].

A direct effect of ILT is the incitement of more people to cut down forests, especially natural forests that have long been ecologically stable. Such rampant illegal logging will lead to the destruction of forest resources and their sustainable development [12]. This results in accelerated loss of virgin forests, degradation of habitats for the most endangered wildlife, loss of biodiversity, forest fires, soil erosion, and environmental problems, such as water pollution, flooding, and landslides [13]. Moreover, ILT also creates important social and economic problems. In countries where forest resources contribute significantly to economic development and social livelihoods, deforestation and forest degradation are the main limiting factors for living standards [14]. Forests have the function of providing essential productive materials and fuel for society, hence they are an important natural resource for sustainable development. Therefore, deforestation and degradation of forests due to ILT has a negative impact on the world's livelihoods. According to the estimates of the World Bank, the losses in the forest sector caused by deforestation and forest degradation has increased substantially from USD 42 billion to USD 88 billion annually [15]. In terms of social development, ILT is associated with (transnational) organized crime, which undermines the rule of law, weakens the binding force of law, breeds corruption and armed conflict in some countries, and ultimately violates human rights [16]. Furthermore, ILT has seriously distorted the legitimate competition in the international forest product trade market. Because most of the wood prices from illegal logging are lower than the legal prices, a large number of illegal wood and forest products have flooded into the international market, resulting in a decline in the world's wood prices.

In addition, considering the impact of foreign trade on a country's industry, ILT can also have a negative effect on the sustainability of China's forest development. As a major importer and consumer of the world's timber trade, if ILT is not restricted, a large number of illegal woods will flood into China's domestic wood market, which will inevitably affect its forest ecology. Firstly, it will affect the sustainability of forest development through market mechanisms. The entry of illegal woods will suppress the market price of forest products in China [17]. To maintain stability in pricing, the domestic forest market will choose more high-quality natural forests for exploitation, especially the destruction of woods with a long growth time, thus affecting the sustainability of forests [18]. Secondly, ILT will affect the sustainability of forest development through forest product enterprises. The influx of illegal wood will make China's domestic forest product enterprises lose their products and price advantages, the industrial chain will be impacted adversely, and part of the profits of forest product enterprises will be occupied by illegal trading enterprises [19]. Further, it will affect the operation and investment of forest product enterprises, making these enterprises gradually lose their funds and motivation to protect domestic forest ecology. Finally, ILT will affect the sustainability of forest development through domestic residents' consumption consciousness. The entry of illegal woods into the market will depress the market prices of domestic forest products in China and, with the consumption of illegal wood products, consumers will weaken their awareness of sustainable forest development [20].

ILT has raised public concern about the mismanagement and overexploitation of forests; more generally, it threatens the sustainability of forests and the natural environment. Since the 1990s, ILT has begun to receive widespread attention internationally and various countries want to effectively cope with it. As the world's major producer and consumer of forest products, China plays an extremely important role in the global forest product

market [21]. The trade of forest products in China is growing fast, with a large trade surplus, a large trade scale, and a high proportion of consumption in the world. China has become the world's largest country in forest product import [22]. The trade of forest products in China clearly shows the characteristics of raw materials being imported and manufactured products being exported; the import regions are mainly concentrated in Europe, North America, and other Asia-Pacific countries, while the export areas are mainly concentrated in Europe, East Asia, and North America [20]. Therefore, as an important player in the world's forestry trade, China's current situation and coping strategies for ILT will affect the sustainable development of the world's forestry. The National Forestry and Grassland Administration of China is actively exploring how to strengthen the legality management of forest product trade.

In light of this background, this study conducted the following analysis. Firstly, through an analysis of China's wood trade data, the trend and problems of ILT in China are presented. Secondly, this paper summarizes China's measures to deal with ILT from both governmental and non-governmental aspects and compares China with other countries. Finally, this paper looks into the prospect of China's response to ILT and, on the basis of the above analysis, proposes some useful recommendations for China to control ILT and achieve sustainable development. The originality of this study is that it took China as an example to summarize the ILA situation and its countermeasures and compared the gains and losses of this process. Then, this study looked into the next steps of China's response actions to the ILA situation, including what actions need to be continued and what actions need to be improved to promote the trade legitimacy and wood industry development in China and the ecological balance of the world.

2. Methodology

Considering the availability of data and relevant materials, this study used an exploratory case study approach to study the impact of ILT on the sustainability of forest development in China. The main purpose of this exploratory case study was to obtain a preliminary understanding of the phenomenon by examining the problems and trend of ILT in China, which can provide guidance and clues for deeper, more systematic, and thorough research. The immediate outcomes of an exploratory case study include the following: (1) developing an initial proposition or hypothesis about the phenomenon or problem under investigation; (2) developing and experimenting with methods that can be used for more in-depth research; (3) attempting to explore the possibility of conducting a more systematic and thorough study. It is in this sense that an exploratory case study often becomes a kind of leading research and the results of such study often open up new avenues, indicating the direction and path for subsequent research.

Firstly, this study analyzed trade data of forest products in China by using the import source analysis method to judge the impact of ILT on China. Secondly, through policy analysis, literature review, and interview research, this study summarized China's measures against ILT and compared them with those of other countries. Finally, based on the trade data and China forest resource data, the advantages and disadvantages of China's measures to deal with ILT were examined. The data involved in the study were all provided by official organizations, including the forest resource survey data of the Chinese government and the trade data of international organizations; therefore, the data used also had a certain degree of authority and credibility. In addition to the descriptive, classification, analysis, and synthesis methods used, this study conducted expert interviews and qualitative analysis of China's legislation and enforcement of ILT, as well as NGO certification and other aspects, which provided a more comprehensive and in-depth analysis of the ILT impact on the sustainability of forest development in China.

The use of an exploratory case study approach provided key insights that can inform the decision-making process for implementing China's response to ILT. However, it should be noted that the various conclusions and results obtained through an exploratory case study were only a "preliminary impression" of a certain phenomenon or problem; it is

difficult to use exploratory case studies to obtain systematic and definitive answers or to study the underlying influencing mechanism. In other words, the results of exploratory case studies are often only a background or starting point for more specialized research [23].

3. The Current Status of Illegal Logging Trade in China

3.1. Amount of Illegal Logging Trade in China

In recent years, with the rapid growth of domestic demand and the development of the wood processing industry, China has become one of the world's leading countries and the largest wood importer in forest product trade [24]. However, according to the official data released by the National Forestry and Grassland Administration of China in 2022, China's existing forest area is 231 million hectares; the forest coverage rate is 24.02% [25], which is far lower than the global average of 31% [26]; the per capita forest area is only one-fourth of the global per capita level. Imported wood is the main source of wood demand, especially after China completely stopped commercial logging of natural forests in 2017, thereby providing a huge growth space for imported wood [24]. As an indispensable material resource in the national economy, wood has risen to the status of national strategic materials; therefore, it is necessary to understand the amount of imported wood in China.

China is currently the world's largest importer and consumer of wood products and its external dependence on wood consumption is very high; 80% of China's tropical wood is imported from ten source countries, as well as from China's largest timber supplier, Russia, where serious illegal logging is widespread [27]. The methods usually used to estimate the scale of ILT include timber balance analysis [28], input–output analysis [29], analysis of the difference between legal and illegal wood products [30], import source analysis, and expert survey methods [28]. In order to obtain the “best guesses” so that people can understand the severity of ILT and take actions to limit it [31], this study used import source analysis to reflect the situation of ILT in China.

Import source analysis estimates ILT by multiplying the estimated rate of ILT in a source country by the volume of trade reported in official statistics [32]. The calculative process of import source analysis is calculating the number of roundwood equivalents and import values from official import data; these numbers are then multiplied by the estimated proportion of ILT-sourced wood to meet the needs of each consumer country. Import source analysis relies on the estimates of illegal logging rates in source countries (the classification of importing countries is shown in Table 1), which are often based on the existing literature, expert surveys, field surveys, and interviews with stakeholders [28]. This method indicates that if a country imports more from another country at a high risk of illegal logging, then the volume of illegally logged wood imported from that country will follow the same trend. Therefore, by knowing the volume of China's trade with different importing countries, it is possible to infer the trend of ILT in China.

Table 1. The classification of national risk levels.

Classification	High-Risk Countries	Low-Risk Countries	Other Countries
Countries	Cameroon, Equatorial Guinea, Gabon, Gambia, Ghana, Nigeria, Zambia, Brazil, Indonesia, Laos, Malaysia, Myanmar, Thailand, Vietnam, Papua New Guinea, Solomon Islands, Russia	Canada, USA, Chile, Uruguay, Japan, Korea, Australia, New Zealand, Austria, Belgium, Finland, France, Germany, Italy, Netherlands, Romania, Spain, Sweden, Switzerland, UK	Other countries in the world

Data sources: estimates of the global share of illegal logging from existing studies [28,33–37].

The total amount of wood imported by China shows a trend of year-on-year increase; the total amount of wood imported from countries with a high risk of ILT is also increasing yearly. As shown in Figure 1, the amount of wood imported by China from ILT high-risk countries in 2020 has increased five times compared with 2000. Therefore, it can be seen that the trend of ILT in China has gradually increased in recent years.

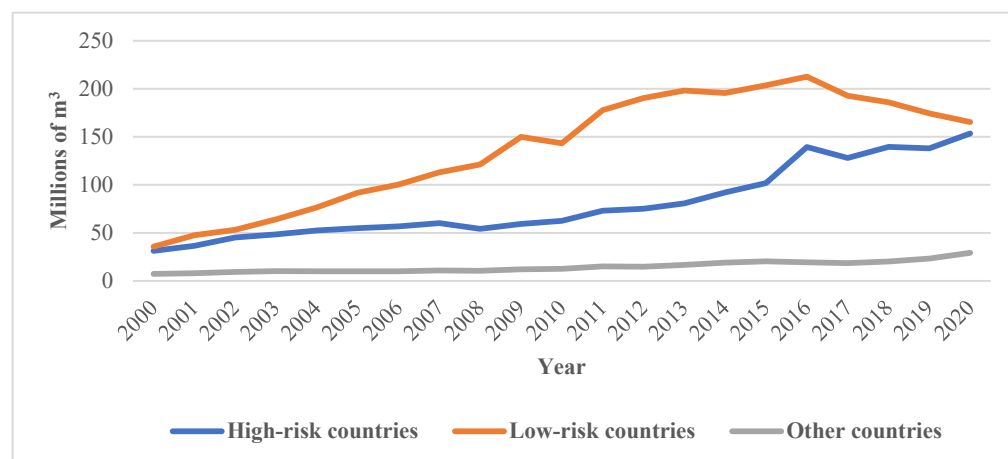


Figure 1. The amount of total imported wood in China from 2000 to 2020 (data source: the United Nations Comtrade [38]).

3.2. Proportion of Illegal Logging Trade in China

For study purposes, the wood trade structure is the proportion of high-risk countries, low-risk countries, and other countries with illegal logging that may affect China's ILT structure. On the one hand, a change in the proportion of wood imported from each source country reflects the characteristics of China's wood trade, that is, which countries China imports more wood from affects its ILT structure. Because of the large volume of wood trade in China, this will also affect the illegal logging situation in the world. On the other hand, the structure of wood imports also reflects the market characteristics of China's wood industry, that is, the source of raw materials and the possibility of using illegal wood for processing in China affect its wood industry. The source of raw materials for China's wood industry will ultimately have an impact on the market price of China's wood products and China's ecology.

According to the aforementioned division of countries with different risk levels, the calculation of the proportion of ILT in China is also displayed according to different countries. The proportion of wood imports from high-risk countries for ILT has changed over the past two decades in China.

The proportion of wood imports from high-risk countries for ILT has been decreasing since 2000, reached its lowest point in 2009, and has remained stable in subsequent years. However, starting in 2013, the proportion of wood imports from high-risk countries for ILT has shown a gradual increase; by 2020, this proportion had already reached the same level as it was in 2000 (Figure 2).

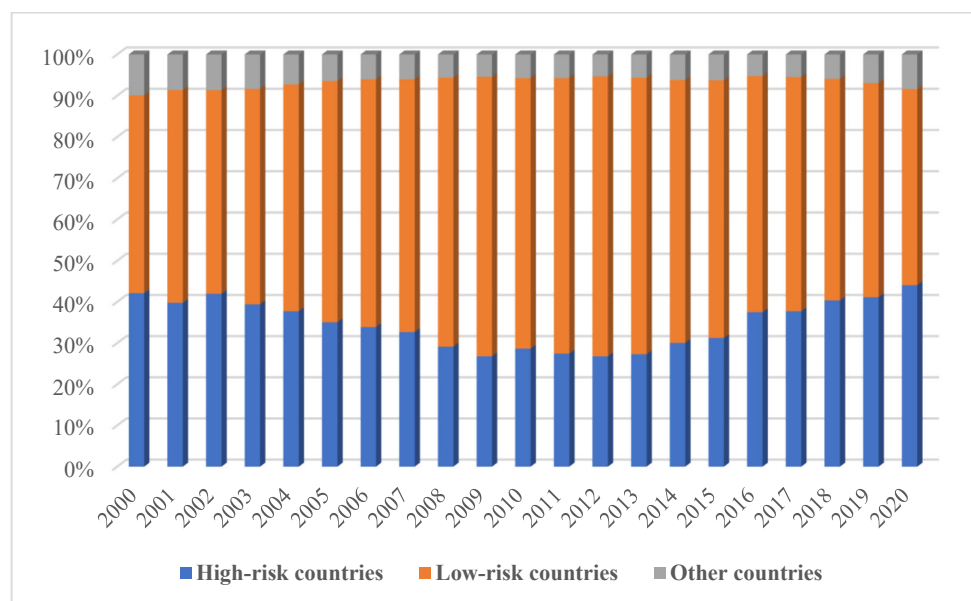


Figure 2. The proportion of imported wood in China from 2000 to 2020 (data source: the United Nations Comtrade [38]).

4. The Response Actions of China against Illegal Logging Trade

In order to solve the problem of ILT, the Chinese government and non-governmental organizations have taken a number of response actions and measures.

Domestically, the Chinese government has coped with ILT by implementing legislation, improving import regulations, establishing law enforcement agencies, and conducting special operations. Internationally, the Chinese government has further improved its wood import and export system, implemented green procurement policies, promoted forest certification, conducted wood legality verification, encouraged international cooperation, and conducted joint operations with international organizations to cope with ILT.

On the part of Chinese non-governmental organizations, enterprise associations have explored the construction of group standards for wood legality in China, conducted wood legality guidance, and actively trained their member enterprises. Chinese local wood enterprises have promoted a Certificate of Conformity (COC) system for international trade and have regulated their investments and operations under government guidance.

4.1. Government Actions

The Chinese government has always insisted on dealing with ILT by strengthening forest law enforcement and administration for all countries, protecting forest resources, and strictly controlling ILT [20,39]. The response actions taken by the Chinese government against ILT can be divided into two aspects: domestic and international.

4.1.1. Domestic Government Actions

- Legislation

In order to better cope with the ILT problem, the Chinese government has implemented legislation to strengthen forest resource management and wood product trade. The laws to cope with ILT in China mainly include the Forest Law, the Foreign Trade Law, the Customs Law, and the Regulations on the Origin of Import and Export Goods. The Forestry Law of the People's Republic of China is the most important law in China's legal system for dealing with wood trade. It clearly stipulates that permits approved by regulatory authorities must be obtained for wood trade; enterprises engaging in imported wood processing should establish records for raw materials and products; any enterprises and individuals are prohibited from engaging in illegal wood production, processing, and trade [40]. The

Implementation Regulations on the Forest Law, which are compatible with the Forest Law, also stipulate that “wood purchasing units and individuals shall not purchase wood without forest logging licenses or other legal certificates”, as well as establish and implement a forest resource management system to ensure the legality of wood trade [41]. In addition, based on the Forest Law, other laws, regulations, and institutions also provide detailed provisions on the restriction of illegal wood trade to support and supplement the Forest Law. These laws and regulations provide the legal basis for China to deal with ILT. The Foreign Trade Law, the Customs Law, and the Administration Regulations of the Import and Export of Prohibited or Restricted Wild Animals and Plants of the People’s Republic of China have made relevant provisions on the import or export of restricted goods, as well as the management of endangered wild animals and plants and their products.

- Law enforcement

In terms of the law enforcement process dealing with ILT, the Chinese government has set various types of law enforcement agencies to take measures to control the illegal wood industry chain. Firstly, at the import stage, the China Customs can carry out inspections on wood imports; only those with import licenses and complete customs declaration documents can enter China’s market. Secondly, in the transport and processing links, if there is an inflow of illegal woods, the Chinese forest police can enforce legal actions on the middlemen and industrial units. Finally, in the marketing link, the Chinese market supervision and administration department and the forest management department can further supervise. From import to availability on the market, the Chinese government has set up regulatory agencies to control every link. The Chinese government’s efforts in forest and deforestation legislation have achieved certain results and various types of illegal activities that damage forest resources have decreased year by year; especially, the number of ILT administrative cases has been at a low level in recent years (Figure 3).

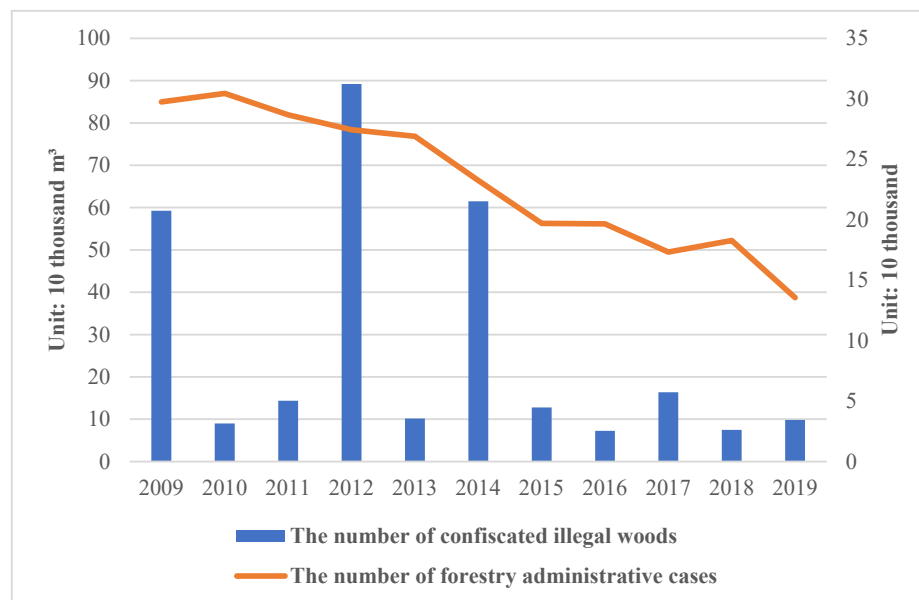


Figure 3. Number of forestry administrative cases and confiscated illegal woods in China from 2009 to 2019 (data sources: China Forestry and Grassland Development Report 2009–2019).

In general, the laws and regulations of China have established forest management systems and licensing systems. Together, these systems form an integrated regulatory architecture for forest source and wood trade management, which provides a good foundation for forest sustainable development in China.

- Green procurement policy

The amount of government wood procurement in China is huge; the implementation of a green procurement policy has a strong leverage role, which can promote the development of green industry and the formation of a green consumer market for wood. Green procurement is also a very effective way to establish a good image of the government, protect the ecological environment, and promote an environmentally friendly society. In 2002, the Chinese government formulated and announced the Government Procurement Law of the People's Republic of China, which covers procurement parties, procurement methods, procurement procedures, procurement contracts, supervision and inspection, and legal responsibilities. In November 2006 [42], the Chinese government announced a policy of public procurement of wood products. This policy applies to all levels of government; it is based on the China Environmental Label Certification Program that assesses and certifies the environmental impact of the production process of wood products [43]. Wood products within the scope of government procurement are generally finished products, such as office paper products, furniture, floors, and wooden doors; they also include semi-finished products used in engineering construction, such as sawn timber and wood-based panels.

The implementation of this policy has promoted the procurement of wood and forest products from legal sources by sellers, while also influencing and promoting legal logging among wood producers. At present, the National Forestry and Grassland Administration of China is actively promoting an expansion of the government's green procurement policy, which involves including certified forest products into government green procurement to control ILT and promote sustainable forest management [44]. However, the green procurement policy does not clearly stipulate whether purchased wood must come from sustainably managed forests or whether it must be legally logged. This is where the policy needs to improve further.

4.1.2. International Government Actions

- Forest certification

The Chinese government has made great efforts in forest certification and achieved notable results. The two international systems, Forest Stewardship Council (FSC) and Programme for the Endorsement of Forest Certification (PEFC), have set up offices in China to promote the development of their systems. As of July 2023, China has more than 1.50 million hm² of FSC-certified forests and over 19,000 COC-certified enterprises [45]. This will facilitate the use of indigenous wood in China and the standardized treatment of wood trade.

To establish a better international trade, the Chinese government specifically established the Forest Certification Department in the National Forestry and Grassland Administration and the Leading Group of China Forest Certification Work. The Chinese government announced the "China Forest Certification Implementation Rules" in 2009, marking it the first forest resource protection act of China as an international convention [46]. Since then, the Chinese government has announced a number of certification standards to help protect forest resources so as to better trade forest resources legally with other countries. The establishment of a forest certification system has gradually decreased the share of ILT in the market and forest resources have become better regulated. China's certification mark of forest products is different from the world's common certification marks (Figure 4), but they all play a role in conveying information to consumers and merchants; China's management of forest product certification is conducive to further the mutual recognition of products and to promote consensus in the trade process.

The Chinese forest certification system is also actively exploring mutual recognition with international forest certification systems. In May 2011, the China Forest Certification Council (CFCC) applied for PEFC membership. In July 2011, the CFCC officially became a member of PEFC, which is the world's largest forest certification system [47]. In 2012, the National Forestry and Grassland Administration of China also submitted formal mutual recognition materials to PEFC and it officially obtained the international mutual recognition of the PEFC system in early 2014 [48].



Figure 4. China’s forest certification mark (a) and common forest certification marks (b,c).

Forest certification is a useful way to improve forest management through market mechanism, that is, improving the forest management level by influencing forest product trade. In this way, forest management units sustainably manage and supervise wood trade, and production and processing enterprises purchase raw wood materials that have been certified, thus achieving a crowding-out effect on ILT woods. At the same time, sellers know which products have been certified and consumers purchase products with a forest certification mark. This has a countervailing effect on ILT, making consumers more inclined to buy wood products with certification.

- International Cooperation

Due to the complexity and extensiveness of the ILT problem, effective management of ILT requires mutual cooperation and joint actions via international cooperation. China has established bilateral talks with several countries to cope with ILT and it has actively participated in regional processes for forest law enforcement and administration in Asia, Europe, and North Asia [49]. The main countries and start times are shown in Table 2.

Table 2. International cooperation between China and other countries to deal with illegal logging trade.

Country	Start Time	Main Consensus
The United States	2008	The Memorandum of Understanding to combat ILT and the ILT problem is included in the U.S.–China Strategic Economic Dialogue.
European Union	2008	The establishment of China–EU bilateral coordination mechanism on forest law enforcement and administration.
The United Kingdom	2009	The project of “Research on the Legal Recognition System of Chinese Wood” start-up.
Australia	2009	The Memorandum of Understanding between China and Australia on combating ILT.
Japan	2010	The Memorandum of Cooperation between China and Japan on combating ILT.
Indonesia	2002	The Memorandum of Understanding between China and Indonesia on combating ILT.
Russia	2009	The pilot program of “A Guide on Sustainable Overseas Forest Management and Utilization by Chinese Enterprises”.

Data sources: Internet information.

The Chinese government has also been very concerned about forest resources in wood-producing countries and it has taken active measures to help wood-exporting countries protect and develop their forest resources rationally. In recent years, China has provided personnel training to some wood-producing countries affiliated with the Association of Southeast Asian Nations (ASEAN) and countries in Africa and Oceania to strengthen the management level of forest managers in these countries [50]. China has also helped some neighboring countries restore their forest resources and encouraged Chinese enterprises

to carry out afforestation and drug substitution planting in Myanmar, Laos, Cambodia, and other countries [51]. The main purpose of the Chinese government's international cooperation is to slow down or avoid the destruction of natural forests, cope with ILT at the source, and solve the livelihood problems of local residents. At the Fifth Ministerial Conference of the Forum on China–Africa Cooperation (FOCAC) held in July 2012, “Forest protection and management” was included as one of the key topics [52]. In this conference, forestry assistance to Gabon, Congo (Brazzaville), Cameroon, and Cambodia were included in the Chinese government's foreign aid program for the first time. The recipient countries were expected to receive Chinese machinery and equipment, technology, and management experience.

The Chinese government has attached great importance to regulating its overseas investment and the operation behavior of Chinese forestry enterprises. The National Forestry and Grassland Administration of China and the Ministry of Commerce jointly formulated and announced “A Guide on Sustainable Overseas Forest Management and Utilization by Chinese Enterprises” in 2009. In this handbook, Chinese forestry enterprises are required to strictly implement the laws and regulations of the host country when engaging in forest cultivation activities abroad, prohibit from engaging in ILT, protect forest land according to the law, and cultivate and utilize forests according to the concept of sustainable development [53]. Since the publication of this handbook, the Chinese government has conducted experimental projects on Chinese enterprises in Gabon, Guyana, the Russian Far East, and Mozambique, promoting the concept of sustainable development established for these enterprises [54].

The Chinese government has also actively participated in international conferences. China has successively joined the United Nations Convention to Combat Desertification (1994), the Convention on International Trade in Endangered Species of Wild Fauna and Flora (1980), the Convention on Wetlands (1992), the Convention on Biological Diversity (1992), and others [55]. China has implemented the International Tropical Wood Agreement (2006) and assisted wood-producing countries in controlling illegal logging [56]. China has also established cooperative relations with many countries and international organizations and has signed forestry cooperation agreements and intergovernmental agreements [57].

4.2. Non-Governmental Organization Actions

- Actions by enterprises

As the main market entities of the industrial chain, the actions taken by enterprises will affect the situation of ILT in China. According to the provisions of the Forest Law, wood enterprises are required to establish records for raw materials and products, which are designed to trace and avoid legal risks in the wood supply chain. When an enterprise needs to import wood, in addition to recording the scientific name, value, quantity, and the origin country's message of the imported wood, the enterprise should also record the measures it has taken to identify, prevent, and mitigate potential illegal risks in the wood supply chain. Thus, it is well documented that the enterprise has taken action to prevent ILT. The record system is the most effective way for Chinese enterprises to deal with ILT; a lot of practical experience has been accumulated in the practice process. Based on this system, enterprises can establish standardized systems and processes to ensure they are able to identify and manage risks in wood imports and avoid significant material and reputational damage as a result of these risks. As the demand for illegal timber decreases, ILT is also controlled.

Moreover, China is the world's leading processor and trader of forest products; the trading partners of China include many countries in the world. At the same time that Chinese enterprises have strengthened the legality of wood imports, Chinese wood export products have also improved their specifications, which together achieve the restriction of ILT. The demand for legal wood and its products in worldwide countries' markets is the stimulus for enhancing wood legality among Chinese enterprises. The international forest product trade market has been influenced by international laws and sustainable

trade policies and an increasing number of customers are making legality-related requests to Chinese wood enterprises, which will regulate the behaviors of Chinese enterprises; this trend will become more evident over time.

In response to the demand for wood legality in international markets, Chinese enterprises have taken a number of proactive actions. In addition to the record system for enterprises in the domestic scene, other actions include conducting third-party forest certification, developing green procurement policies for enterprises, establishing wood supply chain management systems, and participating in wood legality verification through NGO initiatives [54]. As of July 2023, more than 15,000 enterprises in China have obtained COC certification from the FSC (compared with less than 500 in 2006 [46]) and more than 360 enterprises have obtained COC certification from the CFCC [58].

- Actions by associations

The National Technical Committee 41 on Timber of Standardization Administrator of China (SAC/TC41), which was established in 1984 with the approval of the National Standardization Administration, entrusted the leadership of the National Forestry and Grassland Administration to engage in the technical work of national wood standardization and management of national wood standardization technology [59]. As of 2022, China has announced and implemented 140 national standards and 133 industry standards for wood, including 273 standards for wood foundation, logs and sawn timber, structural wood, etc. Compared with developed countries, the overall level of the standard system is basically the same as the international level. In China's wood national standards, there are 23 ISO international standards and foreign advanced standards. The wide application of standards, such as "Name of Chinese Main Woods" (GB/T 16734) and "Names of Main Woods Imported into China" (GB/T 18513), has effectively promoted the sustainable development of wood trade in China [60].

Although the Chinese government has not yet announced detailed standards regarding the legality of wood, Chinese forestry associations are actively working in this area. Their actions include encouragement and training for member enterprises and exploring industry standards for wood legality. The China National Products Industry Association (CNFPIA) was established in 1988 and currently has more than 3000 member enterprises [61]. In 2009, the CNFPIA created the "Wood legality verification in China" [62] and selected eight member enterprises to conduct experiments on wood legality certifications. On May 4, 2017, the association adopted the group standard "Wood legality verification in China" [63]. In addition, the CNFPIA provides guidance and assistance to its member enterprises regarding the legality of wood. However, the "Wood legality verification in China" does not fall under the category of mandatory standards and is only announced as a recommended group standard. This standard does not impose penalties on members who do not comply, nor does it have a means of monitoring or verifying its members' actions.

- Overseas Investment and Operation

Chinese forestry enterprises that engage in overseas investment strictly implement the laws and regulations of their host countries in accordance with "A Guide on Sustainable Overseas Silviculture by Chinese Enterprises" and "A Guide on Sustainable Overseas Forest Management and Utilization by Chinese Enterprises" [64]; protect forests in accordance with the host countries' law; cultivate and utilize forests with the concept of sustainable development; combat ILT with their own enterprise overseas actions. For example, a compliant Chinese forestry enterprise should first conduct a planning forest survey and a logging forest survey, whose aim is to assess the forest resource value of the land. To understand the distribution of forest land resources, a compliant Chinese forestry enterprise should determine the working blocks each year and build reasonable forest roads according to its forest survey report. After that, the enterprise could conduct logging, transport wood to its factory for primary processing, transport processed products to its port, and carry out the customs declaration and clearance procedures. The whole processes should strictly comply with international laws and regulations, perform responsible forest

management, introduce a product tracking system, prevent the risks of illegal logging and forest degradation, and protect the forest ecological environment in accordance with the requirements of the two guides.

The purpose of the two guides is to guide Chinese enterprises in rationally conducting overseas forest management, utilization, and protection on the basis of international conventions, such as the Convention on Biological Diversity and the Convention on Climate Change, so as to play a positive role in the sustainable development of global forest resources. They further regulate the behavior of Chinese enterprises engaged in forest resource management and wood processing and utilization overseas; improve industry self-discipline; promote the legal and sustainable management and use of global forest resources; strive to reduce ILT practices and their impact on the world environment.

5. The Sustainability Expectation of China Regarding the Illegal Logging Trade

5.1. *The Impact of the Illegal Logging Trade on China*

The restrictions on illegal wood import to China will have a positive impact on coping with ILT at the global level. Firstly, from the legal and policy perspective, as a major wood-processing country, China's strict laws and policies on wood import have reduced ILT between countries exporting raw wood materials and countries importing manufactured wood products, thereby partially reducing the possible impact of ILT. The legal actions of China against ILT will strengthen the middle link of industrial chain circulation in combatting ILT. Secondly, from the economic mechanism perspective, the persistence of ILT lowers wood prices and affects the production and trade of legal wood. As a major global producer and consumer of forest products, China's ban on ILT will boost the global legal wood market through price effects and will also greatly increase the incentive for wood-producing countries to build and implement national wood legality systems. Finally, from the legal forestry industry perspective, the supply gap created by the reduction in ILT will be replaced by Chinese domestic wood and legal wood from other countries, which will further promote global legal wood production and trade.

In 2023, China announced the National Reserve Forest Construction Plan (2018–2035), with the goal of building 20 million hectares of national reserve forest by 2035, which will generate a net increase of about 200 million m³ per year after completion (which will be equivalent to the total net imports of forest products converted into wood in China) and will achieve basic self-sufficiency in general timber [65]. This will also form the basis for China to abandon ILT.

Moreover, although the Chinese government has always maintained a “non-interference” attitude toward the affairs of other countries, in July 2021, the Ministry of Commerce and the Ministry of Ecological Environment of China jointly announced the “Guide on Green Development in Overseas Investment Cooperation”. The guide proposes that enterprises should “follow the international green rules”; when there are no relevant laws or regulations in certain wood-importing countries or when environmental standards are too low, enterprises are encouraged to adopt the standards that are generally accepted by international organizations and multilateral institutions or the Chinese standards to carry out overseas investment activities [66]. This goes beyond China's previous principle of requiring companies to comply with host country regulations and will have a positive impact on ILT. In addition, at the 15th meeting of the Conference of the Parties to the United Nations Convention on Biological Diversity (COP 15) in October 2021, the Chinese government announced the establishment of a host country fund of CNY 1.5 billion for biodiversity conservation in developing countries [67]. How it will be used for forest trade and sustainability development remains to be seen.

5.2. *The Impact on China's Wood Industry*

Restrictions on ILT will also promote the development of the wood industry in China. Firstly, a reduction in imports of illegally logged wood will be replaced by domestic legal wood production. Although China has implemented a total ban on logging in natural

forests since 2017 [19], the rapid development of tree plantation in China has largely achieved the replacement of natural forests. Table 3 shows the structures of commercial wood in China from 2015 to 2018. The amount of commercial wood from natural forests in 2015 was 5.2779 million m³, accounting for 7.31% of the total. By 2018, the amount of commercial wood from natural forests was 1.567 million m³, which was less than 2% of the total commodity wood production. Thus, there has been a clear decline in recent years in China.

Table 3. China's commodity wood structures, 2015–2018.

Year	Structure		Total
	Natural Forest	Plantation Forest	
2015	5,277,900 (7.31%)	66,904,200 (92.69%)	72,182,100
2016	1,707,100 (2.20%)	76,051,600 (97.80%)	77,758,700
2017	1,263,300 (1.50%)	82,718,400 (98.50%)	83,981,700
2018	1,567,000 (1.78%)	86,541,700 (98.22%)	88,108,700

The latest available official data were released in 2018 by the 9th National Forest Resources Inventory of China; newer survey data have not been released. The unit is m³.

According to the Ninth National Forest Resources Inventory of China, the existing plantation forests cover an area of 795.428 million ha., with an enormous storage volume of 3.387 billion m³ [68]. The inventory data show that plantation forests have great potential in China. In addition, plantation forests in China are dominated by medium-aged and young-aged wood forests [69], which indicates that China has the ability to compensate for the supply deficit caused by restricting illegally logged wood imports by increasing domestic wood production in the future. The price effect will also further stimulate the development of plantation forests.

Restricting ILT will also help improve the legitimacy of products manufactured by domestic wood-processing enterprises; the increased legitimacy level of wood products will promote Chinese wood-processing enterprises to further venture into the international market. China is the world's largest forest-product-processing country; its wood products are mainly exported to Japan, Korea, Vietnam, and America [21]. The introduction of the European Union Wood Regulation (EUTR) and the U.S. Lacey Act have put considerable pressure on Chinese wood-processing enterprises [70]. Therefore, China's initiative to improve the legality of forest products that it produces and to limit raw wood materials from ILT will help Chinese wood-processing enterprises to meet international standards and enter into the international market.

5.3. The International Experience for China

ILT threatens the sustainable development of forests and the natural environment in the future, which is not an issue that only China has attached great importance to but also arouses widespread concern around the world. Since the 1990s, countries around the world have shown a willingness to combat ILT and have taken a series of actions. These international experiences can be used as reference for China to limit ILT and further protect the sustainability of forest development.

Illegal logging was included in the 1998 Group of Eight (G8) Action Plan on Forests; over the next five years, the World Bank organized a series of regional conferences on Forest Law Enforcement and Governance (FLEG) to promote global consensus on combating ILT. This growing consensus led to the creation of the European Union Forest Law Enforcement, Governance and Trade (FLEGT) Action Plan. Since 2003, the FLEGT has served as a reference for European efforts to tackle ILT. Within this framework, the European Union adopted the European Union Timber Regulation (EUTR), which came into force in 2013, to prevent illegal forest products from entering the European market. The EU also has Voluntary Partnership Agreements (VPAs) with other wood-producing countries to limit ILT. In addition to the European Union, the United States has also banned through legisla-

tion the import of woods from ILT. In 2008, the United States revised the relevant contents related to restricting ILT through the Lacey Act. In order to deal with ILT and, thus, affect the domestic wood market and the sustainability of forest development, many developed countries have restricted ILT at the legislative level. For example, in 2012, Australia passed the Australia Illegal Logging Prohibition Act; in 2016, Japan passed the Clean Wood Act; in 2017, South Korea enacted the Amendments to the Enforcement Decree of the Act on the Sustainable Use of Timbers.

Green trade, which emphasizes the legality of wood, has become a new trend in world trade. Currently, the United States, the European Union, Australia, Japan, and South Korea lead the world in terms of legislation to tackle ILT. The goal of their legislations is to further compel wood producers, importers, processors, and consumers to perform due diligence obligations, combat ILT, and deny illegal wood access to the domestic market while protecting the development of the domestic wood industry and setting non-tariff barriers. The promulgation of these laws will have a significant impact on the world trade in forest products. In the short term, wood legality, as a non-tariff “green trade barrier”, will increase the costs for relevant enterprises in producing and processing countries. In the long term, the process of wood legality will promote a healthier trade in forest products.

The global response to ILT has been driven by trade regulations in individual countries that require importers to prove their wood is legal. Similarly, the major tropical wood-producing countries are making corresponding efforts to enhance compliance with legal regulations in consumer countries. For example, the world’s major wood producers have successively entered into VPA negotiations with the EU to ensure that wood exported to the EU meets the legal requirements. Figure 5 summarizes the progress of legislation and international cooperation in response to ILT in some countries. Because of the joint efforts of wood-producing and wood-consuming countries, the global fight against ILT has achieved certain results and the global production of illegal wood has dropped by nearly a quarter between 2002 and 2010 [34].

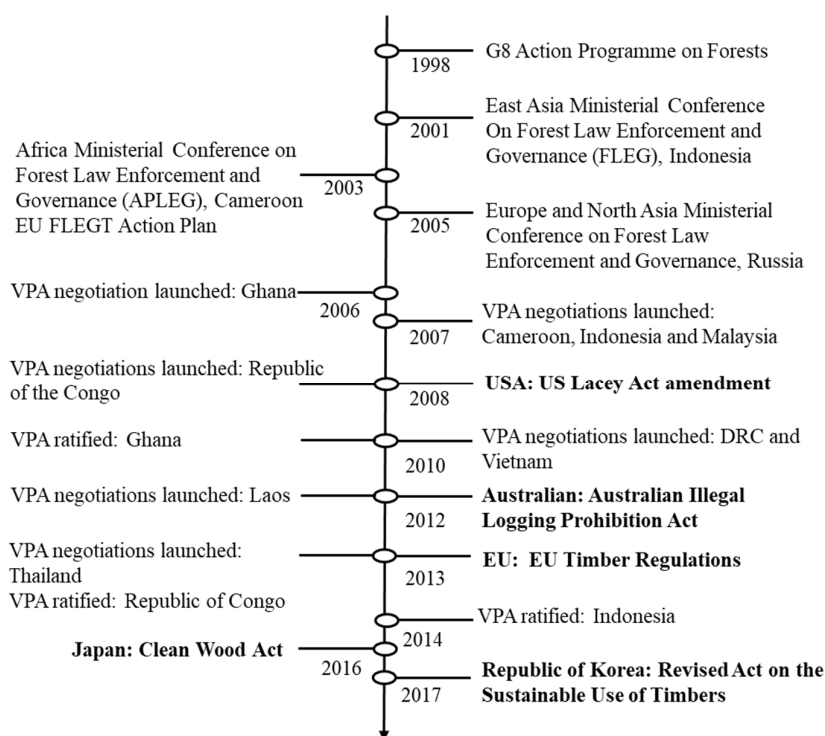


Figure 5. Timeline of the global response to illegal logging trade.

China can learn from the international experiences of other countries in coping with ILT. The first step is to further improve its legislation by making the legislation restricting ILT

more specific and operational and to strengthen the beneficial industry regulations into the form of law. The second step is enhancing domestic market management by strengthening the certification mechanism so that only with legal certification forest products can enter the market. Last but not least, it is necessary to keep up with the international community. Compared with developed countries' emphases on ILT, China has yet to cooperate and reach a partnership with them. Strengthening international cooperation is also an important means to limit ILT and maintain the sustainability of forest development.

6. Discussion

This study discussed the ILT impact on the sustainability of forest development in China and summarized the countermeasures to combat ILT (both government and non-government). In general, these measures have had a certain effect in different ways, helping China to better cope with ILT. As mentioned above, ILT is only one way to destroy the sustainability of forest development; there are many factors that can affect the sustainable development of China's forests. There are also different mechanisms underlying how ILT can affect the sustainability of forest development in China.

ILT affects the sustainability of China's forest development through the domestic market mechanism. On the one hand, the Chinese government promotes an international mutual recognition system between importing countries. Each batch of imported wood is accompanied by a legality certificate of the origin country through this measure and then the wood can be transported into China for domestic processing and be exported after being approved by the relevant authorities in China [49]. On the other hand, China subsidizes domestic forest products to help enterprises maintain a price advantage in the forest product market and encourages consumers to choose legitimate products for consumption under the condition of the same quality and price [17]. As a result, the ILT impact on China's forest product market will be reduced, the forest product market will become more regulated, and China's commercial forests will be merchantable, while natural forests will be protected.

ILT affects the sustainability of China's forest development through forest product enterprises. Since imported illegal timber mainly occupies the Chinese forest product market through price advantage [17], Chinese forest product enterprises and the government have chosen another way to deal with the situation, that is, by changing the low-level development mode of China's wood industry and realizing independent brand building by increasing the added value of forest products so that Chinese forest product enterprises can maintain their profits [71]; because of that, forest product enterprises are better able to invest in the legal exploitation of domestic forests in China [72]. Compared with the management of importing countries, it is easier for China to control its domestic forest product enterprises. As long as these domestic forest product enterprises can maintain profits and ensure legal logging, the sustainability of China's domestic forests can be protected in this respect.

ILT also affects the sustainability of China's forest development through consumers. The first step is to strengthen legislation and publicity to encourage Chinese consumers of forest products to choose legal forest products for consumption [73]. The second step is to increase the severity of punishment; forest police and market management departments will strictly regulate consumption of wood obtained through ILT. The final step is to encourage a green lifestyle. In addition to the consumption of legal forest products, the legitimate consumption of other resources is also advocated, so that consumers gradually establish an awareness of the concept of green consumption. In this way, consumers' consumption awareness of forest products will be changed so that products obtained through ILT will lose their market, while legal forest products within environmental tolerance will be favored by consumers and forest sustainability will be protected [74].

In addition to the abovementioned measures taken by China to cope with ILT, there is a need to explore their influence mechanisms and specific details on a deeper level, but, limited by the availability of data and policy texts, this paper does not discuss these

issues further. This also opens a starting point for our future research, which will include comparative research, quantitative analysis, case study, and other ways to explore the problems that this paper has not been able to study in depth.

7. Conclusions and Recommendations

7.1. Conclusions

This study systematically examined the current status, response actions, and sustainability expectation for China with regard to ILT. The following conclusions are drawn from the analysis:

(1) The analysis of trade data indicated that wood import problems of China are of concern. In recent years, the volume and proportion of wood imports from high-risk countries have shown an increasing trend in China, further increasing the risk of illegal wood imports. The perpetuation of this trend could damage the sustainable development of the world's forestry, reduce trades among countries, weaken the influence of wood trade regulations in trading countries, and reduce the incentive for main wood-producing countries to build and implement wood legality systems.

(2) The Chinese government and the private sectors have made significant efforts to cope with ILT, but there is still room for improvement. In the domestic scene, the Chinese government has enacted forest laws and improved import management regulations, established administrative agencies to strengthen enforcement, and launched special operations to cope with ILT. Internationally, the Chinese government has further improved its wood control system, implemented green procurement policies, promoted forest certification, conducted wood legality verification, conducted international cooperations, and conducted joint operations with international organizations to cope with ILT. For the private sectors, industry associations are actively exploring the construction of group standards for wood legality in China and conducting guidance and training for member enterprises, while domestic wood enterprises are actively pursuing COC certification and regulating their overseas investments and operations. Compared with other countries, the wood legitimacy check standards of China are still at the voluntary level and have not been estimated as national standards; their mandatory and influential scope still needs to be improved. China is still relatively weak in the management of imported wood legality; its legislation needs to be further strengthened.

(3) China's further strengthening of its imported wood legality management will have a positive effect at the global scale with regard to ILT; it will also benefit the development of domestic wood enterprises and foreign trades. The restriction of ILT in China will compensate for the middle link of the industrial chain to combat the global illegal wood trade. The price effect will also boost global legal wood production and trade and enhance the incentive for wood-producing countries to build and implement national wood legality systems. The supply gap created by a reduction in ILT will be replaced by Chinese domestic wood and legal wood from other countries. Moreover, China's plantation forests have great potential and ability to compensate for the supply shortfall from reduced imports by increasing domestic wood production in the future. The price effect will further stimulate the development of plantation forests. Restrictions on ILT will reduce the risk of illegal products for domestic wood enterprises and help enterprises venture into the international market.

7.2. Recommendations

Based on the above conclusions, this study proposed the following policy recommendations to help China deal with ILT.

(1) Improve wood legislation.

The Chinese forest legal systems in the management of wood trade still need to be improved. China needs to establish a stricter forest product trade management system and wood certificate system according to the law; the management of wood transportation also needs to be improved to cope with the ILT challenge. In accordance with the legislative

ideas of effectively protecting forest resources and fully guaranteeing legal forestry products and to meet the reform requirements of sustainable development, Chinese forest laws need to stipulate national trade standards and permits for forest resources, as well as establish a register system. It is also necessary to meet practical needs via legislation, improve the scope and conditions of forest import and export, standardize the management of forest product import and export, and strengthen the status of law in the development and trading of forest products. ILT can be effectively controlled only if the country imposes mandatory forest product management at the legal level.

(2) Control illegal logging and associated trade through economic means.

China needs to continue to improve the setting indicators and control of forest development, optimize the structure of wood trade, and implement more precise economic policies. Guided by actual demand and combining quantitative indicators, an effective economic evaluation system for forestry trade should be constructed. China also needs to establish an adjustment mechanism for wood products, take full account of local resource endowments and differences, coordinate forest trade management policies, and establish a differentiated forest protection system. Forest trade security policies, including management of forest trade process, differentiated forest trade development policies, and strict access and development supervision, are also needed. While realizing the supply of forestry products reasonably, China should balance regional differences in its forest protection system.

(3) Promote mutual recognition of quality certification.

China should learn from international standards and certification experiences, classify national forestry management certifications according to mutual recognition degree, and clarify the difference in key indicators for different certifications and at different levels. Firstly, it is important to learn from previously signed mutual recognition agreements and classify and sort out the similarity between China's certification standards and the world's standards. Secondly, in the framework of sustainable development, different countries are divided into different echelons. Combined with the trade conditions, the Chinese government needs to establish effective and targeted measures to facilitate trade and investment in forestry products, simplify mutual recognition procedures, and expand the scope of authorization through cooperation and communication. Thirdly, China needs to recommend its forestry product standards to countries that lack forestry certification standards, strengthen technical assistance and training for conformity assessment, accelerate the integration of standard certification, and pay attention to the differences in standardization in different regions; in this way, the development of forestry product standards can operate effectively in other countries, the global reputation of China's forestry standards can be enhanced, and an international certification brand can be built.

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