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Forest certification management experience in Asia Pacific and Europe: A case study of Malaysia and Sweden

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Abstract: The forest certification is a voluntary programme to ensure that the timber harvested from forests is processed in a sustainable manner by following specific standards. The Programme for the Endorsement of Forest Certification (PEFC) was introduced in 1999 using the bottom-up approach, and it gives flexibility for a country to set up their own PEFC standard based on current practices in sustainable forest management (SFM), regulation, and governance. This practice has led to the development of various PEFC standards for each country; thus, the impact of PEFC certification differs from country to country. In accordance with that, this study aimed to evaluate the PEFC standard application in developed and developing countries, namely in Sweden and Malaysia. The study also analysed the impact of forest certification on governance and economic aspects within Asia Pacific and Europe. The outcome of this study indicates that the PEFC standards developed by these countries showed similarities; for example, both countries are focusing on social and environmental requirements. Meanwhile, the differences were shown in the criteria, terms used, and the focus area. The impact analysis exhibited that countries are facing similar issues, especially market access and premium prices. This study revealed that each country develops different standards based on current practices, forest diversification, and regulations.

Keywords: economy; governance; Malaysian Timber Certification Scheme; Programme for the Endorsement of Forest Certification; sustainable forest management

Forests are an important component of ecosystems and natural landscapes. They provide crucial ecosystem services and valuable products to the nation and community. Forests have benefited humans by providing resources such as timber for housing and construction, fuel for heating, food, and medicine. At the same time, they also play important roles as carbon sinks, watersheds for clean water, soil protection, and function, as well as providing habitats for flora and fauna. Over the past

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few decades, the world's forests have experienced huge pressure from the demand for timber, rapid economic growth, and urbanisation processes, which have led to increasing deforestation.

Forest issues have continued to dominate and draw attention globally in numerous international policy and political agendas after the Earth Summit. The United Nations Commission on Sustainable Development (UNCSD) was established to track developments and pinpoint issues with the implementation of Agenda 21. It was recognised in the field of forestry that ongoing discussion and debate are necessary to strengthen the political commitment through an intergovernmental forum to handle new forest concerns.

The idea of forest sustainability is not new because it has long served as the foundation for forest planning and management in many nations. The idea has been applied for many years to ensure a consistent supply of goods and services. The production of timber equal to the annual growth of a forest was the foundation of early efforts to advance sustainability. Simply put, the annual increment determines the volume and amount of harvested timber. Since then, academia and international institutions have translated various interpretations of sustainable forest management (SFM). This sustainable forest also uses the three main pillars of sustainable development, which are economic, social, and environmental ones, as the core of forest management. These three pillars guide the development of sustainable forest management (SFM), which takes into account the products and services that forests produce. Therefore, SFM can be interpreted as 'the process of managing permanent forest land to achieve one or more management objectives related to the production of forest products and desired services without reducing the natural value that affects the social and physical environment' (ITTO 1992).

Many researchers and academics have viewed forest certification as a novel form of governance (Bartley 2003; Cashore et al. 2004; Gulbrandsen 2004; Pattberg 2005; Bernstein 2007; Dingwerth 2008). Forest certification was created as a market-driven, voluntary approach. As a new institution, Cashore et al. (2004) called for forest certification of 'Non-State Market-Driven' governance systems. This is because companies in the market supply chain, not the central government, decide if they will follow the rules and procedures of these private governance systems. This has drawn numerous academics and researchers who are interested in examining the theoretical underpinnings, as well as a wide range of causes and reasons. According to a number of scholars (Bass 1999; Elliott 2000; Vogt et al. 2000; Bass et al. 2001), certification may have positive effects on forest management, economics, social issues, and the environment. Benefits of forest management include better performance standards, improved resource control, and better forest management systems. Market access improvements, as well as improvements to company reputation and corporate ethics, are anticipated economic benefits. For example, balancing the goals of forest owners, reducing poverty, enhancing labour rights and living conditions, and encouraging community involvement are all examples of social benefits. Among other things, the environmental advantages include forest identification with high conservation value, biodiversity preservation and promotion, and environmental conservation.

An emphasis of the certification programme on monitoring, auditing, and improving forest practices, along with the stand-level economic, ecological, and social benefits, can make it a potent tool for bringing about a change in forest management practices. Many nations have taken the effort to create national forest certification programmes that are referenced and recognised by international programmes like the Forest Stewardship Council (FSC) or the Programme for the Endorsement of Forest Certification Schemes (PEFC). The FSC scheme, which focuses on environmental, social, and economic viability components, was established in 1993 by environmental and social non-governmental organisations like Greenpeace, Friends of the Earth (FOE), and the World-Wide Fund for Nature (WWF). The FSC promotes environmentally friendly production of wood and non-timber forest products while preserving the biodiversity, productivity, and ecological processes of the forest without compromising the respect for the rights of the workers and the communities that rely on the forests for their livelihoods. The FSC has created a set of principles and criteria that define responsible forest management at the international level and apply to all types of forests: temperate, tropical, and boreal, as well as natural forests and plantations. Meanwhile, the PEFC scheme (initially named the Pan-European Forest Certification

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Scheme) was established as a response to the implementation of the FSC, which did not address the needs of small private forest owners and was dominated by NGOs. PEFC was set up as an umbrella organisation; it was created to compare independent national standards for forestry management with internationally recognised standards. It also provided a way for regional or national certification schemes for sustainable forest management to be recognised by each other.

The worldwide demand for forest certification among landowners and the public has shown an increasing trend in recent years, and there is a concern that forest consumers might assume that all certification standards are equivalent. Rawson Clark and Kozar (2011) stated that there is a lack of mechanism to allow consumers to decide which certification programme label has relevance to the most sustainably managed forests. Due to that, academic institutions from Europe have an interest in comparing the strengths and weaknesses of certification programmes like Basso et al. (2018), focusing on the process of the FSC programme in North and South America. The study found out that the establishment of certification was not similar among the American countries. Laclau et al. (2019) studied the challenges in implementing national standards for sustainable forest management in Argentina, Uruguay, and Chile; meanwhile, Bhattarai et al. (2019) focused on the challenges faced by Nepal in FSC certification. A recent study by Gutierrez Garzon et al. (2020) concentrated on a comparative analysis of five certification programmes.

The findings of literature analysis show that most of the recent studies comparing the different forest certification programmes at the national and international levels are focusing on North America and southern European countries. Few studies have compared and analysed the application of certification standards between Southeast Asian and European countries. The acceptance level of certification was found to be varied, especially between developed and developing countries, as the requirements were based on the country's needs. Therefore, these differences have an implication that the acceptance of certification will be interrupted or will receive a good response from the timber industry. In connection with that, this study was conducted by comparing two countries that use their respective forest certification programmes. The main question of the study was to determine whether there is a difference in the application and level of acceptance of forest certification between developed and developing countries; hence, to provide an answer to this question, this study outlined two objectives. The first objective was to determine the difference in governance, focusing on the similarities and differences of principles and criteria of sustainable forest management used in Malaysia and Sweden. The second objective was to analyse the impacts of forest certification on economics and governance in Asia Pacific and Europe. The findings of the present study will help improve the governance of the certification programme, especially in Malaysia.

MATERIAL AND METHODS

To reach the first objective, document analysis was used to identify and describe the differences in the main features of forest certification programmes in Sweden and Malaysia, both of which adopted the PEFC standard. Principles under the Malaysian Timber Certification Scheme (MTCS) were used as a baseline to do a document analysis. From all nine principles under the MTCS standard, keywords were identified to find a similarity between both certification programmes. Mapping analysis was carried out after sorting the similarity by merging both principle linkages that will be presented in a table form. Meanwhile, for the second objective, to seek the impacts of forest certification, the analysis for the literature review was based on an extensive body of reports, books, and journal articles selected from diverse academic scholars and researchers around the globe. Many research studies have attempted to analyse the contribution of forest certification, reasons, and barriers for the adoption of forest certification and chain of custody, premium price and market access, cost of certification, consumer and industry perceptions of certified and non-certified wood products, forest owners' perceptions and motivation for certification on forest management, smallholder certified communities, and consumer willingness to pay for certified wood products. This literature review aimed to highlight the issues of forest certification, specifically the experience gained and the impacts of forest certification. The literature review report focused on two geographical regions, specifically Asia Pacific and Europe. The two selected thematic areas were economics and governance,

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as these themes provide information on the process and benefits of forest certification in the context of SFM.

Criteria, indicators, and certification standards. The main objective of the formulation of criteria and indicators for sustainable forest management was to measure progress and improve management practices in the field. Certification serves as a process to ascertain the level of achievement in accordance with established standards for sustainable forest management. The auditing process takes place within a given forest area, at the level of the Forest Management Unit, and within a given timeframe. Because of this, the criteria and indicators (C&I) for SFM and forest certification are unique. This is because C&I for SFM are usually developed at the national level and are mostly descriptive in nature. Policymakers and governments primarily use them for reporting and informational purposes. Meanwhile, forest certification focuses on the level of forest management units, sets prescriptive standards, and checks how far sustainable forest management has come (Rametsteiner, Simula 2003). In this regard, C&I for SFM are a reference basis for the development of forest certification standards.

The certification in Malaysia is under the purview of the Malaysian Timber Certification Council (MTCC), known as Malaysian Timber Certification Scheme (MTCS); they adopted the Malaysian Criteria and Indicators (MC&I) as the baseline for the certification programme. This programme consists of 9 principles, 49 criteria, 112 indicators and 460 verifiers under the Malaysian Criteria and Indicators (MC&I) for sustainable forest management (SFM), or, in short, MC&I SFM. Meanwhile, Sweden, as a member of PEFC, has adopted the Pan-European criteria and indicators as a basis for creating its forestry standard. This standard consists of 2 chapters, 25 objectives and 123 fundamental guidelines. Towards understanding the application of certification programmes for these two countries, the main document of each certification programme was reviewed. Mapping analysis was conducted to determine whether there is a similarity or difference in subjects by comparing other certification programme principles. Table 1 shows the structure of the forestry standard of certified programmes. For MTCS, the description of certification programmes is divided into principles, criteria, indicators, and verifiers (MTCC 2021). Meanwhile, for PEFC Sweden, the terms used in explaining the standards are chapter, objective, fundamental guidelines, and requirement (PEFC Sweden 2023). To address our main line of mapping analysis, we reviewed the main document of PEFC Sweden certification standard and the MTCS standard to determine whether the topics are related to each other. In this investigation, we only focused on the principles and criteria components for both certifications. We sought equivalence between MTCS and similar aspects that occurred in the PEFC Sweden standard. We analysed all 9 MTCS principles and examined whether they appeared in the PEFC Sweden standard. During this investigation, we found that a standard can refer to the entire set of principles, criteria and indicators. Therefore, for the analysis presented here, we employed standardised terms to avoid any confusion, as shown in Table 2, while Table 3 shows the list of principles for both certification programmes.

Table 1. Structure of forestry standards for Malaysia and Sweden

Certification programmes	Description	Endorsement	Scope	Enforcement
Malaysian Timber Certification Scheme	9 principles 49 criteria 112 indicators 460 verifiers	PEFC	national	voluntary
PEFC Sweden	2 chapters 25 objectives 123 fundamental guidelines	PEFC	national	voluntary

PEFC – Programme for the Endorsement of Forest Certification
Source: MTCC (2021); PEFC Sweden (2023)

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Table 2. The use of standardised terms

Malaysian Timber Certification Scheme	PEFC Sweden	Standard term
Principle	chapter	principle
Criteria	objectives	criteria
Indicator	fundamental guidelines	indicator

PEFC – Programme for the Endorsement of Forest Certification

Table 3. List of principles in both certification programmes

Malaysian Timber Certification Scheme	PEFC Sweden
1. Compliance with laws	1. Environment and production
2. Tenure and use rights and responsibilities	2. Social requirement
3. Indigenous people's rights	
4. Community relations and workers' rights	
5. Benefits of the forest	
6. Environmental impacts	
7. Management plan	
8. Monitoring and assessment	
9. Maintenance of high conservation value areas	

PEFC – Programme for the Endorsement of Forest Certification

RESULTS AND DISCUSSION

As a tropical country, Malaysia has a total area of 33 million ha, and it consists of three regions, namely Peninsular Malaysia, Sabah, and Sarawak. The total forested area in Malaysia is approximately 54% of its total land area, with Peninsular Malaysia around 5.73 million ha, Sabah 4.68 million ha, and Sarawak 7.72 million ha (MENR 2022). Forests in Malaysia are classified by their roles and functions, as defined by the Forestry Department of Peninsular Malaysia, the Sabah Forestry Department, and the Sarawak Forestry Department. The categorisation of forests primarily includes permanent reserves, protected forests, and productive forests. Forest management in Malaysia is divided into three regions: Peninsular Malaysia, Sabah, and Sarawak. Each of these regions in Malaysia has its own distinct administrative structure, regulations, and legislation for managing its own forest areas. Peninsular Malaysia is divided into two levels, namely the Federal and State levels. The Forest Department of Peninsular Malaysia (FDPM) and the State Forestry Department are responsible for managing the forests in Peninsular Malaysia. This is regulated by the National Forest Act 1984 (amended 1993) and the National Forestry Policy 1978 (revised 1992), and subsequently the Forestry Policy of Peninsular Malaysia (FPPM). The FDPM is entrusted with an essential role at the federal level in creating policies and procedures connected to regulations, as well as providing advice and technical services to the states. Meanwhile, forest management and administration at the state level are under the jurisdiction of the State Forests Enactment, State Forests Rules, Wood-Based Industrial Enactment, and Wood-Based Industrial Rules. For Sabah, forests are managed by the Sabah Forestry Department, and they are regulated under the Sabah Forest Enactment 1968, Forest Rules 1969, Forest (Timber) Enactment 2015, and Sabah Forest Policy. Whereas for Sarawak, forests are managed by the Forest Department Sarawak (FDS), implementing the Forest Ordinance 2015 (Cap. 71), Forest Regulations, and Sarawak Forest Policy (2019).

Sweden, a developed nation, focuses its economy on exports like iron ore, hydropower, and timber products. Coniferous forests cover an estimated two-thirds of Sweden's area of 40.7 million ha. Sweden's forests have a very homogeneous species composition, with Scots pine accounting for 37%, Norway spruce for 46%, and other deciduous species making up about 15%. Sweden's woods have undergone a regeneration process in the last century, following logging for cattle grazing, building, and shipping purposes. Forests are extensively cleared to provide charcoal and poles for mining operations. The twentieth century saw the initiation of forest restoration initiatives, which coincided with the implementation of the Forestry Act in 1903. The current yearly growth rate of forests is predicted to be 122 million m^3 (PEFC Sweden 2023). Approximately 28 million ha, which is equivalent to 70% of Sweden's total land area, is forested. Forest ownership in Sweden is composed of private persons, private enterprises, government entities, and other private owners. Private enterprises, including physical assets, farms, and single proprietorships, own approximately 48% of productive woods. A total of 300 000 individuals own around 220 000 management units, with wom-

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en accounting for 38% of the ownership. According to the Swedish EPA (2024), private firms own 24% of the forest area, state-owned enterprises own 12%, state forests account for 8%, forests owned by other private entities, such as churches and charities, account for 6%, and other public ownership accounts for 1% of productive forests. The Swedish Forest Agency is the regulatory body responsible for ensuring that individual or corporate forest owners adhere to the rules laid down in the Forestry Act. The Swedish Forestry Act was approved by legislators in 1993 (PEFC Sweden 2017), and subsequent modifications and amendments of this policy have consistently had majority approval from both the government and members of the Parliament. Two laws were introduced: the 'Forestry policy in line with the times' bill in 2008 and the newest bill in 2022, which focuses on strengthening property rights, implementing flexible protection measures, and enhancing incentives for nature conservation in forests (PEFC Sweden 2017).

The Forest Agency oversees the implementation of the Forestry Act and ensures adherence to environmental regulations. The objective is to guarantee progress toward sustainable development as outlined in Agenda 2030. The Swedish government has established 16 environmental quality objectives and a number of significant targets to ensure compliance with the environmental code (Swedish EPA 2024). The governing body charged with overseeing and evaluating these environmental goals is the Swedish Environmental Protection Agency, also known as the Swedish EPA. Sweden also employs other compliance acts and codes to ensure forest sustainability. One such example is The Land Code (1970:994), which is overseen by the Land Registration Division under the Ministry of Rural Affairs and Infrastructure, and The Reindeer Husbandry Act and The Heritage Conservation Act (Vogt et al. 2000). In the context of the certification programme under PEFC for both countries, the forestry standards they set are based on their forest structure, policy, and governance. Figure 1 below illustrates the consistency of both principles under the PEFC Sweden and MTCS forestry standards. Table 4 shows a breakdown of PEFC Sweden criteria for further understanding.

Figure 1 shows that the MTCS programme used the Malaysian Criteria and Indicators for sustainable forest management (MC&I) as a basis for the forestry certification standard. At the same time, PEFC Sweden used the criteria, indicators, and operational guidelines from the Lisbon resolution (1998) L1 and L2, Swedish forestry legisla-

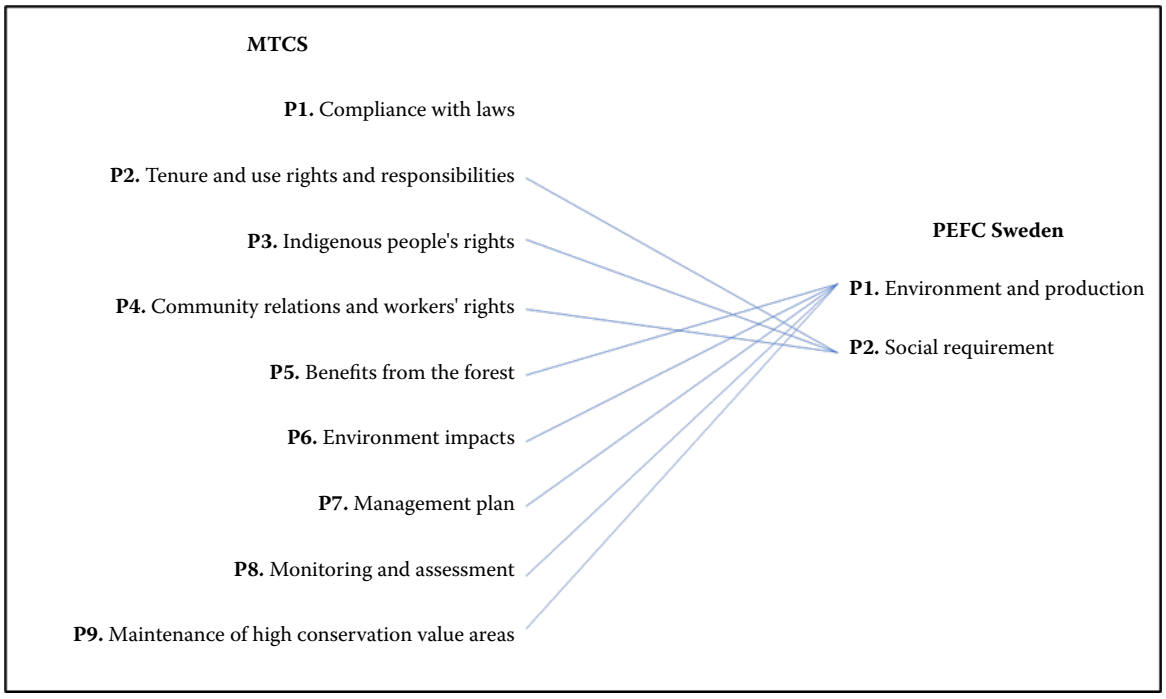

Figure 1. Consistency of MTCS and PEFC Sweden forestry standard

MTCS – Malaysian Timber Certification Scheme; PEFC – Programme for the Endorsement of Forest Certification

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Table 4. PEFC Sweden criteria

P1 (environment and production)	P2 (social requirement)
C1. Conversion of forest land	C1. Consideration for social values, recreation, and outdoor life
C2. Productive capacity of the forest land	C2. Rural development
C3. Forest management plan	C3. Forestry and reindeer husbandry
C4. Forest management	C4. Company responsibilities
C5. Game	C5. Employer responsibilities
C6. Forest fuel	C6. Insurances
C7. Set-asides for environmental purposes	C7. Work organisation
C8. Reindeer husbandry	C8. Work environment
C9. Landscape ecology	C9. Equal rights and opportunities
C10. Methods for soil and water protection	C10. Competence in forestry
C11. Edge and buffer zones	C11. Skill development
C12. Burning	C12. Family businesses
C13. Cultural environment	

PEFC – Programme for the Endorsement of Forest Certification
Source: PEFC Sweden (2023)

tion, and other relevant laws to build its standard. To further understand the consistency, Table 3 shows the criteria of the PEFC Sweden forestry standard. It is important to understand that the consistency of both forestry standards is not just at the principle level; it might also occur at the criterion level, depending on the style of documentation for both programmes. Of the nine principles under the MTCS programme, eight appeared in the PEFC Sweden forestry standard. P2, P3, and P4 under MTCS appeared in P2 for PEFC Sweden. Meanwhile, P5, P6, P7, P8, and P9 under MTCS appeared in P2 for PEFC Sweden. To elaborate on the consistency of each standard, the MTCS Malaysian Criteria and Indicators for sustainable forest management (MC&I) were used as a comparison with the PEFC Sweden forestry standard. Thus, the findings of the analysis for the nine principles are discussed accordingly as follows:

Principle 1: Compliance with laws. The forestry standard under the MTCS programme contains more indicators for regulatory compliance and is more detailed in the description. The verifier outlined the law, act, and regulation for each criterion. Meanwhile, for PEFC Sweden, the list of laws or regulations that are related to the standard is explained in simpler form, and information on current legislation can be obtained from the web-based services (PEFC Sweden 2023). Under the MTCS programme, the laws and regulations related to the forests are clearly listed in the standard, and it gives a deep insight into a better understanding of the regulatory framework. Since Malaysia is divided into three regions, namely Peninsular, Sabah, and Sarawak, it is crucial to elaborate on how the regulatory framework in each region is different because the regulation and governance in each region are different. In Sweden, centralised information is available, and web-based services provided by related forest agencies are convenient to access.

Principle 2: Tenure and use rights and responsibilities; Principle 3: Indigenous people's rights; Principle 4: Community relations and workers' rights. The MTCS programme elaborates the standard in three areas, P2, P3, and P4, which pertain to social aspects. P2 explains the criteria for long-term tenure and use rights to the land and forest resources. For P3, the focus is on the legal and customary rights of indigenous people. This principle acknowledges the indigenous people's right to own, use, and manage their land, territories, and resources. Meanwhile, P4 focuses on community and workers' rights, where the forest management operations must maintain and enhance the long-term social and economic well-being of local communities and forest workers. Under the PEFC Sweden forestry standard, the detailed explanation of the social aspect can be found in P2: Social requirements. This principle focuses on forest ownership, worker well-being, social and community economic enhancement, relationships among

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stakeholders, and the rights of public access to forests. In terms of community and worker aspects, MTCS and PEFC Sweden forestry standards show a similarity in terms of well-being and economics, and both standards also emphasise providing job opportunities, as well as a healthy working environment. Another aspect of social values involves public relationships. PEFC Sweden specifically highlights the role of forest owners in safeguarding public access rights for recreation and outdoor activities, while MTCS does not address this aspect. The forest governance in Sweden is different from Malaysia, where people have the right to access forests for recreational use and outdoor activities. Meanwhile, in Malaysia, there are rules and requirements that were set to limit the public from entering the forest, especially the Forest Management Unit (FMU) area. Table 5 shows the similarity aspects of the MTCS standard that appeared in the PEFC Sweden standard.

Principle 5: Benefits from forest; Principle 6: Environmental impacts; Principle 7: Management plan; Principle 8: Monitoring and assessment; Principle 9: Maintenance of high conservation value areas. The MTCS programme notes that the forestry planning should include environmental aspects. Under this programme, there are five principles that emphasise the importance of the environment, which are P5, P6, P7, and P8. The standard requires forest planning to ensure the sustainability of both natural forests and forest plantations. On top of that, forest owners were given a mandate to monitor and assess the forest within the FMU and the FMU itself in terms of forest products, chain of custody, management activities, and social and environmental impacts. Thus, it gives the forest manager a clear picture of what they should comply with under this standard. The structure of the five principles mentioned above shows a similarity with PEFC Sweden. Under PEFC Sweden, all five principles are combined into one, which is P2: Environment and production. The explanation of this principle is not as detailed as in the MTCS programme, but it is understandable for the first-time reader. Even though there are some similarities, both programmes have focus areas that are based on the country adaptation. For productive forests, PEFC Sweden clearly stated that all productive forest land that is larger than 20 acres (8 ha) must set aside at least 5% for environmental consideration under their forest management plan. For this set-aside, forest owners are in charge of making sure that habitats that need to be protected and areas that were given priority are in excellent shape. These areas should have high conservation values, be good for recreation and outdoor life, or have developable conservation values, other social values, or cultural heritage sites (PEFC Sweden 2023). Meanwhile, for MTCS, the forest management activities that are in high conservation value areas shall maintain or enhance the area. With relevant guidelines and consultation with relevant stakeholders and experts, the forest managers need to conduct an assessment to identify if the FMU area meets the criteria to be considered as having high conservation value. Table 6 shows the similarity aspects of the MTCS standard that appeared in the PEFC Sweden standard.

For the second objective, in order to look into the impact of forest certification for both regions,

Table 5. Content similarity of MTCS that appeared in PEFC Sweden standard

MTCS principles	PEFC Sweden criteria (P2. Social requirement)
P2. Tenure and use rights and responsibilities P3. Indigenous people's rights	C9. Equal rights and opportunities
P4. Community relations and workers' rights	C1. Insurances C2. Rural development C4. Company responsibilities C5. Employer responsibilities C7. Work organisation C8. Work environment C10. Competence in forestry C11. Skills development

MTCS – Malaysian Timber Certification Scheme; PEFC – Programme for the Endorsement of Forest Certification

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Table 6. Content similarity of MTCS that appeared in PEFC Sweden standard

MTCS principles	PEFC Sweden criteria (P1. Social requirements)
P5. Benefits of the forest	C2. Productive capacity of the forest land
	C13. Cultural environment
P6. Environmental impacts	C1. Conversion of forest land
	C5. Game
	C7. Set-asides for environmental purposes
	C10. Methods of soil and water protection
	C11. Edge and buffer zones
P7. Management plan	C3. Forest management plan
	C4. Forest management
	C9. Landscape ecology
P8. Monitoring and assessment	C3. Forest management plan
	C4. Forest management
P9. Maintenance of high conservation value areas	C7. Set-asides for environmental purposes

MTCS – Malaysian Timber Certification Scheme; PEFC – Programme for the Endorsement of Forest Certification

the document analysis from several studies was collected and compiled to get the full spectrum of forest certification.

Europe. FSC and PEFC are the most prevalent certification schemes in Europe. Many companies in Europe choose to be certified under both schemes because of their suitability and higher potential to trade certified timber products with reference to buyer demand and market trends. As of 2014, the total number of European countries that implemented forest certifications was 32 (Maesano et al. 2018). The application and achievement of forest certifications varied, with the lowest at 3.13% and the highest at 95.3%. There are countries that applied only one certification programme; however, most European countries applied both certification programmes. The total areas of forests in Europe certified based on programmes were 70 416 019 ha certified by FSC and 85 784 952 ha by PEFC (Maesano et al. 2018). The forest certification implementation process in Europe has significant implications for the industry, the country, local communities, and consumers.

Economics. Several scholars indicate that the chain of custody certification has resulted in positive changes for certified companies in terms of economic benefit. In Romania, the number of chain of custody (CoC) certified companies has rapidly increased, and the adoption of FSC CoC certification has an impact on obtaining new customers and improving the image and reputation of Romanian forestry companies (Halalisan et al. 2019). Similar benefits are received by the Croatian FSC holders, where FSC helps them to keep existing customers, obtain new customers, and facilitates increasing competitiveness, exports, and the company's image (Klarić et al. 2016). Meanwhile, in the Finnish wood product industry, through CoC certification, the industries received acceptance from environmentally sensitive consumers and were able to satisfy existing customers and, at the same time, create a favourable public reputation (Owari et al. 2006).

Galati et al. (2017) looked at how FSC certification has grown in the Italian forest-based industry, and they found that most companies are mainly driven to get certified for better recognition by customers. This is because the certification gives the company a positive corporate image by showing that it cares about protecting resources and using them responsibly. Furthermore, consumer demand and the aim to increase market competitiveness are also key reasons that guide companies to adopt FSC certification. A similar result was obtained by Klarić et al. (2016), where Croatian wood industry companies implemented FSC CoC certification due to demand by consumers and to stay competitive and survive in the market. Certification is also adopted in Europe because of pressure from the public and media (Michal et al. 2019), more sales and entering new markets (Paluš et al. 2017),

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as well as to keep market access and gain international recognition (Halalisan et al. 2019). In Finland, strong demand for certified products from the United Kingdom, Netherlands, and Germany has driven Finnish companies to adopt CoC certification, and the adoption of CoC certification is mainly limited to suppliers of primary wood products (Owari et al. 2006).

An assessment of CoC in the Czech Republic and in the Slovak Republic found that the key problems in the certified supply chain are that the certified companies do not have sufficient certified material inputs and pay too much for certified materials (Paluš et al. 2017). The overpriced certified materials are more problematic for companies that hold double certification schemes (PEFC and FSC) and for FSC-certified companies compared to PEFC-certified companies. This is due to the better availability of PEFC-certified raw material and the shortage of domestic FSC wood. A similar problem was also reported by Halalisan et al. (2013), where the companies that sell in foreign markets encountered a shortage of certified timber markets. Operational costs can also be found as barriers and a lack of interest for Czech business entities in the certification systems (Michal et al. 2019). For the paper industry and construction industry in the United Kingdom, the shortage of certified paper and certified hardwood supply creates external market barriers to the uptake of certified materials (Werndle et al. 2006).

In terms of the premium price, Paluš et al. (2017) pointed out that 51% of respondents do not pay more for certified products, and only 43% of respondents pay more in the range from 1% to 10% of the premium price, especially primary and secondary wood processing companies. This study revealed that 93% of respondents do not receive any green premium sales for their certified products. This is due to the value of the premium price that is not able to cover the costs of CoC certification, and therefore, it does not increase profitability and enhance business performance in the short term. Similar findings from Owari et al. (2006) also indicated that wood product companies in Finland expressed that it is impossible to charge a premium price for certified products and no longer expect to gain a premium price. Likewise, Romanian forestry companies do not consider the premium price as an important benefit (Halalisan et al. 2013, 2019).

A study on the willingness to pay of secondary wood manufacturers in Italy showed that the majority of the respondents are willing to pay a higher premium price for local wood materials compared to certified wood products (Paletto, Notaro 2018). This study demonstrated that 20.7% of respondents would be willing to pay a mean premium price of 4.13% for local wooden panels, and 23.1% of them would be willing to pay a mean premium price of 2.95% for local wooden planks. The main reasons for them to pay a premium price for local products are to promote the local wood market, to support the environmental protection of local forests, and the high quality of local wood materials. As for certified wood products, 19.0% of respondents are willing to pay a mean premium price of 2.68% for certified wooden panels, and 29.7% of them are willing to pay a mean premium price of 2.40% for certified wooden planks.

On the contrary, in terms of economic changes after FSC certification, Halalisan et al. (2018) found that the revenues did not increase after certification, and the sold certified wood did not have a higher price than the uncertified wood. It was also pointed out by Halalisan et al. (2018) that adopting FSC CoC certification did not have a big effect on profits because the revenues remained unchanged. This is because most companies in Romania adopted other types of certification, like ISO 9001 and ISO 140001, to maintain their export markets and meet customer needs. Furthermore, the costs of certification were frequently mentioned as a problem with certifications among Czech businesses that did not have the right series of the ISO management system or another system that would make the process of CoC certification easier (Michal et al. 2019).

Governance. A case study in Russia by Sundstrom and Henry (2017) uncovered the impact of FSC standards that influenced state policy, domestic forest governance, laws, and enforcement practices. The state forest regulators in Russia rejected the idea of a private certification, leading to a conflicted introduction of FSC. However, the need to meet FSC standards has led to greater changes in Russia. Sundstrom and Henry (2017) discovered that FSC indirectly influenced the Russian state forest governance, where new policies were revised, competitive domestic certification schemes were created, and new enforcement practices were implemented to accommodate certifica-

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tion. The impact of FSC in Russia was facilitated by a few conditions, including poor quality and decentralised governance, contradictions among overlapping standards, and foreign market demand.

It is hard to build institutions that can support forest certification in Russia, but it is an important part of the country's multi-level governance system. It shows that Russian foresters and other stakeholders want to play a bigger role in sustainable forest management (Ulybina, Fennell 2013). Clearly, forest certification has expanded the stakeholders' roles, particularly NGOs and local communities, in forest management. Furthermore, forest certification as a multi-level governance institution has created a new mechanism in Russia for linking and coordinating between local and global standards. The authors highlighted that the success or failure of forest certification as a way to govern at multiple levels depends a lot on people who work at the ground level, like logging operators in the forest, local bureaucrats, audit inspectors, and communities living near the forest. Nevertheless, the value and attitude of local stakeholders can also be the determining factors for the outcomes of certification efforts.

One can regard forest certification as a new governing mechanism, as it is voluntary. Hysing (2009) highlighted that forest certification can be governed through private governance without the intervention and authority of the government. Sweden's forest certification system can be thought of as a form of private governance in which non-governmental actors play a role. This type of governance is based on voluntary self-regulation rather than the government's sovereign authority. This situation created a high degree of discretion for the participating non-governmental actors to design and implement forest certification in Sweden. However, to some extent, forest certification has enabled the government to become indirectly involved in private governance by making it easier and more effective, by influencing public procurement policies, and by giving legitimacy to the private sector in private governance arrangements. With continuous interaction between governmental actors, forest certification schemes have reinforced the capability and effectiveness of public policy instruments and moulded their environments in line with government objectives.

Asia Pacific. The Forest Stewardship Council (FSC) and Programme for the Endorsement of Forest Certification (PEFC) schemes are increasingly used in the Asia Pacific countries. Many countries have also developed their own national forest certification schemes, such as Malaysia's Malaysian Timber Certification Council (MTCC), Indonesia's Indonesian Ecolabelling Institute and Indonesian Forestry Certification Cooperation (IFCC), China Forest Certification Council (CFCC) in China, and Japan's Sustainable Green Ecosystem Council (SGEC). The experiences and impacts of these certification schemes implemented by countries in the Asia Pacific were discussed within the context of the two main thematic areas.

Economics. Economically, the impact of forest certification can dramatically increase the competitiveness of certified forest companies as it aims at promoting financially viable forest management in certified enterprises. In Japan, Yusuhara Forest Owners' Cooperative (YFOC) began to seek FSC forest certification in late 1998, and the economic changes took place slowly (Ota 2006). With the continuous efforts of selling FSC-certified wood in the domestic housing construction market, YFOC has substantially increased their timber sales in recent years. The profitability of YFOC started to grow as they began to receive demand for certified sawn timber from builders who were building ecology-oriented houses. The builders perceived that FSC-certified timber was an environmentally friendly material. Indirectly, the FSC certification system acts as a tool that rejuvenates small-scale forestry in Japan and also creates many opportunities to develop businesses using certified timber with similar business models, like YFOC (Ota 2010).

Maraseni et al. (2017) highlighted that with the increasing demand for certified timber from the market, smallholder growers of acacia in Central Vietnam may not receive the same financial returns or total benefit compared to the sawmill company. Even though most of the certification costs of growers are covered by WWF and SNV (Netherlands Development Organisation), the difference in returns is higher for sawmills and still profitable even if the price of logs increases by 20% or the selling price of the product decreases by 10%. In China, Zhao et al. (2011) also found that the cost of certification was a major concern among landowners. The same study also mentioned that forest certification was not widely understood by the landowners in China, another major factor limiting participation.

However, Japanese forestry enterprises emphasised that FSC certification did not bring any eco-

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nomic benefits through the sale of certified wood as they had to bear the cost of certification (Sugiura et al. 2012). Similar studies by Sugiura and Oki (2018) found that forestry enterprises did not receive the expected profits from certification despite a heavy outlay of cost and effort for their certifications. Therefore, it proves that the market for certified wood products has proven difficult to build for many other reasons, ranging from poor public relations to weak relations between producers and regional wood dealers, as well as the scarcity of such dealers (Sugiura et al. 2012).

There is a premium market for certified wood products. A price comparison analysis by Kollert and Lagan (2007) highlighted that forest management certification can get certified logs at a higher price on the market. In particular, high-quality hardwood logs, especially Selangan Batu and Keruing ones destined for the export market, fetch a premium price of 27% to 56%. Even the lower-quality log examples, Kapur and Seraya, also fetch a premium price; however, the difference is less pronounced, 2% to 30%. The high market demand and favourable prices for certified timber help to pursue sustainable forest management standards, and they have been a key driver for improvements in forest management in some forests of the tropics. Nonetheless, certified forest products rarely resulted in a premium price in Japan, as the Japanese market has little influence on the trade in certified wood products (Owari, Sawanobori 2007). Moreover, premiums may not provide enough profit to cover the cost of certification. Iwanaga et al. (2019) elucidated factors and tendencies among certified stakeholders in expanding forest certification in Quang Tri Province, Vietnam. In the study, two certified companies obtained a higher selling price of timber after obtaining FSC certification. However, the selling price of logs for wood chips remains steady at USD 60 per tonne, as there is no wood chip company willing to buy for a premium price even with the FSC certification. Meanwhile, the income of the smallholders' group after certification increased due to the rise in timber prices on a long-term basis.

From the aspect of the chain of custody (CoC) certification, Ratnasingam et al. (2008), in a study of Malaysian wooden furniture manufacturers' readiness to embrace CoC certification, highlighted that the absence of premium price, limited market potential, and high cost were cited as the primary reasons deterring furniture manufacturers from adopting the chain of custody certification. Furthermore, the benefits derived from the adoption of chain of custody certification by furniture manufacturers in Malaysia are not apparent. On the other hand, the lack of demand for certified furniture products within the domestic and international markets of Southeast Asia is the primary factor for the reduced number of companies that are or consider being chain of custody (CoC) certified. Furthermore, Shukri (2008) highlighted that Malaysians do not place a high importance on the environmental or ecological attributes of a product when making their purchases. This is due to the lack of effort in promoting and developing ecologically conscious products towards Malaysian consumers. Regardless of the lack of purchases of certified timber products among Malaysians, manufacturers in Malaysia who are export-oriented companies, used certified wood materials to improve their image and reputation in the green wood products and also to meet customer demand, especially from the environmentally concerned consumers in the European market (Shukri, Ainul Mardhiah 2014).

The latest study on the export performance by Saadun et al. (2019) showed that there was significant positive growth of the export volume of certified timber products under the Malaysian Timber Certification Scheme (MTCS) between 2003 and 2015, with an estimated average rate of 22%. Several factors might contribute to the positive trends, including the increasing demand for certified timber from the industrialised countries and also the endorsement of MTCS by the PEFC scheme, which is exposed to new market access, especially in East Asia.

Governance. The governance of the certification process in the Asia Pacific countries is mostly established and governed by the government agencies that are responsible for forest management and the timber industry. As an example, the Malaysian Timber Certification Scheme (MTCS) was designed using PEFC guidelines and criteria. It was then moulded to meet the needs of local forest owners, managers, and the timber industry, as well as meeting the needs of global standards like PEFC and market standards. Malaysia's forests are generally regarded as well managed. As of 2022, 5.35 million ha of forests acquired MTCS Forest Management Certification (FMC), and 384 timber companies obtained MTCS CoC (Chain of Custody) certification (MTCC 2018). Almost all the state-owned forest management units in Peninsular Malaysia are

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Table 7. Key positive and negative impacts found by our analyses, based on the two themes

Theme	Positive impact	Negative impact
Economics	– Forest certification increases the competitiveness of certified forest companies. – With the certification, they can improve market shares, and they have the ability to obtain premium price for forest products, access to international markets, joint ventures with foreign companies, price security for forest products, the potential for increased profits, and an increased ability to invest in community development plans and programs. – There is significant positive growth of the export volume of certified timber products, for example, under the Malaysian Timber Certification Scheme (MTCS) between 2003 and 2015, with an estimated average rate of 22%. – The employment opportunity provided the villagers with higher wages in this area, which were even larger compared to those in non-certified forests by timber dealers. – With the CoC certification, the industries received acceptance from environmentally sensitive consumers and were able to satisfy existing customers, and, at the same time, improve forestry companies' image and reputation.	– The cost of certification was a major concern among timber concessionaires or landowners. – Lack of knowledge and understanding about forest certification by timber concessionaires or landowners, due to poor public relations, weak relations between producers and regional wood dealers, as well as the scarcity of such dealers. – Certified forest products scarcely resulted in a premium price, like in Japan, as the Japanese market has little influence on the trade in certified wood products. This is also true in Malaysia and in many European countries. – Chain of custody (CoC) certification is in low demand in Malaysia, where a lack of premium price, limited market potential and high cost were cited as the primary reasons deterring furniture manufacturers from adopting the chain of custody certification. – The key problem in the certified supply chain faced among certified companies is the sufficient quantity of certified material inputs and overpriced certified materials – Revenues did not increase after certification, and the sold certified wood did not have a higher price than the uncertified wood; thus, there was no significant impact on profits as the revenues remained unchanged.
Governance	– The structure of governance in many countries is based on the government of the country. For example, in Malaysia, Indonesia, and China, the establishment of certification agencies, certification legislation, criteria, mechanisms, and programs is designed by the government and governed by the Federal Government agencies. – There are also initiatives made by the timber concessionaires to implement certification using FSC or PEFC. – The impact of the FSC standard that has influenced the state policy, domestic forest governance, laws and enforcement practices. – Forest certification can be governed through private governance without the intervention and authority of the government. – Forest certification has enabled the government to indirectly enhance the involvement of the private governing arrangements through facilitation and support, shaping public procurement policies, and providing legitimacy. – Continuous interaction between governmental actors and forest certification schemes has reinforced the capability and effectiveness of public policy instruments and moulded its environment in line with government objectives. – The public procurement policies encouraged the procurement or purchasing of sustainable forest products, such as paper, furniture, and building supplies for offices.	– The good forest governance management requires a strong support from the local community and NGOs, especially in the process of implementation of the forest legislation system and forest management. – There is a need to focus on issues such as volume and types of species of timber harvest allowed to achieve sustainable harvesting and implement SFM. – The inefficiencies of the legal frameworks (management plans) in managing sustainable harvesting signalled that the government must improve the legal framework in harvesting, and uniform standards of FSC need to be used by all community-based forests. – The government must take proactive steps in managing SFM, as good SFM lies with government and public policies, as in the case in Tanzania. – The certified concessions are only able to resolve problems at the forest management unit level, due to the limited scale of the adoption of certification while the issue of deforestation occurred on a large scale (Savilaakso et al. 2017).

CoC – Chain of Custody; FSC – Forest Stewardship Council; MTCS – Malaysian Timber Certification Scheme; NGOs – non-governmental organisations; PEFC – Programme for the Endorsement of Forest Certification; SFM – sustainable forest management

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MTCC-certified, while the area of certified forests in Sabah and Sarawak is more limited.

Although top-down in nature, the practice illustrates that there are also bottom-up approaches to practice, with the participation of local communities and non-governmental organisations. Their participation comes from many aspects. For example, an initiative by the Bornion Timber Sdn. Bhd. in Sabah, Malaysia, established a rubber plantation that covers an area of 25 000 ha, which is located within their timber concession areas. This plantation helps the local community as an economic opportunity, where it created an economical timber crop for sustainable forest development while producing a secondary product, latex, which plays a major role in the local community's benefit. They recruit local community members as rubber tappers and provide training for them to become professional rubber tappers. They also provide facilities such as quarters with electricity and gravity water, all safety measures such as fire extinguishers based on forest certification requirements, and sports facilities. In addition, the company established a Bornion Rainforest Research Area for conservation purposes that covers an area of 688 ha. The management of this forest was established with support from the Sabah Wildlife Department, WWF, and other NGOs for training and joint operations of wildlife wardens, in which people from the local communities participated. The function of the community forest and the provision of the community livelihood must be preserved and maintained. The main activities in forest plantation, natural forest, and conservation can be utilised to empower the local community benefits. The forest certification process created an opportunity for the industry and local community in the governance process and system, as this ensures sustainability for the forest ecosystem and its provision potential for the timber industry in the future.

Key findings of the impacts of forest certification. Since the implementation of forest certification, the fundamental economic outcomes and benefits anticipated by forest managers, producers, timber traders and timber companies have mainly focused on enhancing and improving the market access for their timber products and, at the same time, receiving premium prices. Table 7 shows a brief explanation of the key findings from the document analysis based on the two themes, which are economics and governance.

CONCLUSION

Forest certification is currently an important policy instrument to ensure sustainable forest management implementation and to achieve its objectives and targets. It is a voluntary, market-based instrument, with non-state authorities emerging to govern the process. Furthermore, several authors have indicated that certification could bring a range of potential benefits in forest management, economics, and social and environmental impacts. However, despite many years of implementing forest certification, evaluating the potential impact of the implementation process has generated mixed results and will continue to remain a challenging task.

Results from this study showed that both Malaysia and Sweden have some similarities and differences in their forest management standards. Malaysia is considered a megadiverse country that has more complex flora and fauna species; thus, its timber species are also diverse. On top of that, Malaysia was divided into three regions: Peninsular Malaysia, Sabah, and Sarawak, which consist of different sets of governance and regulation. Hence, it led to challenges in setting up the standard for forest management. As a result, Malaysia developed a more complex and detailed certification standard, taking into account regional governances, rules, and regulations. Meanwhile, in Sweden, the standard for forest management is written down in a simpler form with sufficient information, yet it also provides additional information or links for users to understand more about forests and the regulation structure. The implication for the sustainable development that was found in this investigation showed that the MTCS demonstrated how the certification can address a complex, multi-jurisdictional governance, while PEFC Sweden highlighted the efficiency of centralised systems with high stakeholder trust. In terms of balancing conservation and production, both systems enforced conservation [e.g. high conservation value (HCV) areas in Malaysia, set-asides in Sweden], but Sweden's focus on landscape-scale ecology offered lessons for integrating biodiversity with industrial forestry. For stakeholder inclusivity, Malaysia could enhance smallholder participation by simplifying regional regulatory disparities, whereas Sweden showed how public access rights can coexist with private ownership.

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The current review on impact studies from two regions, specifically the Asia Pacific and Europe, found that forest certification has positive impacts on both the economy and the government. In terms of economic benefits, findings indicated that forest concessionaires, timber companies, and traders acknowledged that they were able to experience improved market access for their timber products. Consequently, it created better competitiveness and improved corporate image in the international timber markets. On the contrary, there were diverse results with respect to receiving premium prices for their timber products. Substantial changes in institutions have taken place to accommodate the requirements of forest certification. To improve the uptake of forest certification on a wider scale, it would be advisable that consumers in developed countries pay a premium price for certified timber as a motivation for more companies and concession holders to have their forests certified. It must be realised that sustainable forest management is a process and requires time to achieve the desired goals. It involves complex ecological, economic, social, and environmental factors that determine the success of SFM in the long run. Furthermore, sound policies, strong legislation, adequate manpower, and efficient organisations are prerequisites for the continuous improvement of sustainable forest management. Finally, strong and lasting political commitment, sufficient financial support, and investment in forest management are of utmost critical importance to ensure forest sustainability.

By having the PEFC certification, both countries showed commitment to developing their standards based on their country's needs and ultimately achieving sustainable production without damaging the environment. Even though there are differences in each approach, it suits the current situation. Political influences play major roles in ensuring the forest management in each country and following consumer awareness. Forest certification is not a one-size-fits-all solution. The MTCS and PEFC Sweden certification illustrated how SFM principles can be successfully adapted to tropical and boreal ecosystems, respectively. By learning from Malaysia's legal precision and Sweden's participatory governance, global frameworks can evolve to better protect forests – our most vital natural capital – while supporting equitable development. It is recommended that future research should explore the certification role in climate mitigation (e.g. REDD+) and the socio-economic impacts on forest-dependent communities, particularly in the Global South. More investigation is also needed to delve deeper into the links between national legislation and forest certification languages.

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