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52

TROPICAL TIMBER TRENDS

A review of tropical timber production, consumption and trade, 1990–2020

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ITTO is an intergovernmental organization promoting the conservation, restoration and sustainable management, use and trade of tropical forest resources. Its members represent 80% of the world's tropical forests and 90% of the global trade in tropical timber and timber products. ITTO develops internationally agreed policy documents and guidelines to promote sustainable forest management and forest-based enterprises and assists tropical member countries to adapt such policies and guidelines to local conditions and to implement them in the field through projects. In addition, ITTO collects, analyzes and disseminates data on the production and trade of tropical timber and is the foremost source of information, statistics and trends related to the global tropical timber economy. Since it became operational in 1987, ITTO has funded more than 1200 projects, pre-projects and activities valued at more than USD 430 million. All projects are funded by voluntary contributions, the major donors to date being the governments of Japan and the United States of America.

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Front-cover photo: Log transportation in West Kalimantan, Indonesia. *Photo: Herry Prayitno/APHI*
Back-cover photo: Sorting tropical sawnwood at a mill in Mato Grosso, Brazil. *Photo: A. Benevides*

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FOREWORD

Although the economic and political organization of the world has changed dramatically since the 1980s when ITTO was established, trade in tropical forest products has remained a strong contributor to economic and social development in most tropical countries. Nowadays, the consumption of tropical forest products is often associated in the public mind with deforestation, despite increasing recognition that using forests sustainably is the best way to keep their many benefits flowing. The implementation of sustainable forest management (SFM) can help countries to secure those benefits over the long term by ensuring forests are not overexploited and can regenerate following moderate and controlled economic activity.

ITTO has been at the forefront of promoting SFM in the tropics since its creation to allow the consumption and trade of forest products while conserving the forests themselves. The Organization has played a critical role in recognizing and realizing the economic benefits and environmental services that tropical forests generate for local communities and globally, including through their increasingly important role in climate-change mitigation. Nevertheless, efficient implementation of SFM remains a challenge in the tropics. A key requirement for realizing the potential contributions of tropical forests to local and global objectives is market transparency, which is why a core objective of ITTO and its governing International Tropical Timber Agreement has been to improve the availability and reliability of statistics on tropical timber production and trade.

This study, carried out by independent consultant Frances Maplesden on behalf of ITTO, summarizes the Organization's core statistical data over the past three decades, providing an essential overview of long-term developments in tropical timber markets. For example, the study highlights the significant achievements of some ITTO producer countries in timber processing. Most countries exported mainly low-value-added products such as industrial roundwood or sawnwood in the 1990s, but many have progressed to higher-value-added products such as furniture in the past two decades. While the implementation of log export bans to boost local industries has had mixed results, the emergence of some countries as major value-added players has been astonishing.

The study recognizes that improved forest product definitions have been essential to ITTO's efforts to monitor the production and trade of tropical forest products. ITTO and its partners (the Food and Agriculture Organization of the United Nations, the United Nations Economic Commission for Europe, EuroStat and others) have elaborated specific, internationally agreed definitions of forest products through the development of the Joint Forest Sector Questionnaire, which has enabled the timely publication of regular market news and reliable global forest product statistics. This study, which ITTO is extremely grateful to Ms Maplesden for preparing, is an excellent example of the fruits of our collaborative efforts.

Sheam Satkuru
Executive Director, ITTO
Yokohama, October 2024

ACKNOWLEDGEMENTS

The author thanks ITTO for its support and resources for the preparation of this report and acknowledges ITTO's ongoing work to enable the public availability of global statistics on production, consumption and trade in tropical wood products. ITTO continues to improve the quality of its Statistics Database, thus providing a valuable resource for understanding the dynamics of the global trade in tropical wood products.

The author extends a special thanks to Jean-Christophe Claudon for originating the project and for his valuable assistance in preparing the report. His work in developing the structure of the ITTO Statistics Database has significantly improved data quality and reliability. The author also thanks Steve Johnson for reviewing the report and Alastair Sarre for editing it; the inputs of both helped improve the document.

ABBREVIATIONS

ASEAN	Association of South East Asian Nations
CEMAC	Central African Economic Union
EU	European Union
EU-27 + UK	The 27 countries of the European Union, plus the United Kingdom of Great Britain and Northern Ireland
FDI	foreign direct investment
FLEGT	Forest Law Enforcement, Governance and Trade
GDP	gross domestic product
GEC	global financial and economic crisis (2008–2009)
HS	Harmonized Commodity Description and Coding System
ITTO	International Tropical Timber Organization
Lao PDR	Lao People's Democratic Republic
m	metre(s)
SFM	sustainable forest management
SMEs	small and medium-sized enterprises
SPWP	secondary processed wood product
United Kingdom	United Kingdom of Great Britain and Northern Ireland
USD	United States dollar(s)

EXECUTIVE SUMMARY

There have been significant changes in world production, consumption and trade in tropical wood products since 1990. The availability and quality of tropical roundwood supply from natural forests has become increasingly restricted and economic and demographic changes have shifted the location and growth of tropical wood product industries—and the geographic location of demand—from developed to developing countries, especially China.

Three major economic shocks—the Asian financial crisis (1997–1998), the global financial and economic crisis (GEC) (2008–2009), and the COVID-19 pandemic (2020–2022)—had major impacts on the supply of and demand for tropical wood products. The Asian financial crisis led to an expansion of plantations of profitable commodities such as palm oil and rubber in Southeast Asia and an increase in the loss of natural forests. The GEC had significant impacts on construction and consumer spending—and therefore demand for tropical wood products—in developed economies, particularly in North America and the European Union (EU). However, growth in consumption and imports of primary wood products in China and India cushioned the impacts of the crisis for tropical exporters. In contrast to the GEC, when demand factors had the most impact on wood products trade, the COVID-19 pandemic resulted in severe disruptions to production, transport and shipping and thus supply chains.

Tropical roundwood production is dominated by six countries—Indonesia (30% by volume in 2020), India (18%), Viet Nam (12%), Brazil (11%), Thailand (4%) and Malaysia (4%). Malaysia's production has declined significantly since 1990, mostly in response to reductions in logging quotas associated with its sustainable forest management (SFM) policies. In contrast, production has grown over the period in Indonesia and Viet Nam. A major trend has been growth in roundwood production from plantations in tropical producer countries and a decline in production from natural forests, which has been affected by historical overexploitation and initiatives to enhance SFM and reduce illegal logging and trade.

Tropical sawnwood production was relatively steady globally between 1990 to 2000, rose to a peak in 2007, at 72.7 million m^3, and to another in 2017, at 80.8 million m^3, before retreating to 71.4 million m^3 in 2021. There have been significant differences in trends between countries, however, the most significant of which is the emergence of China as a major producer since 2012, which has a tropical sawnwood industry based on imported tropical logs. Brazil's production declined sharply from 2012, and production fell steadily in Malaysia and Indonesia from about 1990. The tropical sawnwood industry has been dominated by small and medium-sized enterprises (SMEs), which were more vulnerable than larger enterprises to the economic shocks described above.

The tropical sawmilling sector in Africa is highly export-dependent, with production affected by demand in export markets. A trend in the region since 2010 has been the transfer of industry investment from predominantly European-owned firms to Asian-owned firms, reflecting an increase in Chinese demand for hardwood sawnwood from non-traditional sources; Asia's demand for a wider range of species than sought by European buyers; and the high costs associated with producing certified products required by European markets.

Tropical plywood production has undergone major changes in location, from Japan (which was the dominant plywood producer and importer of tropical logs until the early 1990s) and Indonesia to Malaysia (until the 2000s) and then to China, India and, to a lesser extent, Viet Nam. These changes reflect the relative competitiveness of plywood processing in the major producer countries and growth in domestic plywood demand in China and India. Other notable trends include the declining availability of large-diameter peeler-quality logs, significant changes in production technology, rising production costs, and the increased availability of panel substitute products.

China and Viet Nam have become the major tropical manufacturing hubs for secondary processed wood products (SPWPs). Malaysia, Indonesia and Thailand are also important tropical SPWP producers based on plantation timbers. Tropical producer countries, however, are generally characterized by low levels of investment in wood technology, manufacturing, marketing, and research and development. Moreover, the preponderance of SMEs has exposed tropical producers during global economic shocks because of limitations to their access to finance, negotiating power, and ability to respond quickly when markets recover.

World trade in tropical industrial roundwood has trended downwards since 1990, with notable declines in 1997, 2007 and 2020 in response to global economic shocks and with peaks in 1990, 2000 and 2014 when demand in import markets surged. Major changes in the directions of trade have also occurred. The bulk of import demand has shifted from Japan and, to a lesser extent, the Republic of Korea, Taiwan Province of China and EU countries (which together accounted for 78% of world imports in 1990 but for only 9% in 2021) to mainly China and India, which were responsible for 62% and 16%, respectively, of world imports in 2021, compared with 4% and 5% in 1990. Trends in global imports of tropical logs since 2010 have largely reflected demand in China's domestic market and its export markets for SPWPs. China has diversified its tropical log sources from predominantly Southeast Asia to the Pacific and Africa.

Major trends in tropical log exports include a progressive decline in exports from Malaysia with the shrinking availability of resources though SFM initiatives; and a decline in exports from the Mekong subregion in response to a general decline in the availability of industrial roundwood from natural forests due to historical overexploitation, various government measures to limit harvesting in natural forests, restrictions on exports of primary wood products, and national and international measures to control illegal logging and cross-border trade. Africa's export focus has changed from EU countries to China; Papua New Guinea and Solomon Islands are now the dominant exporters of tropical logs, which go overwhelmingly to China.

Tropical log exports have been affected by trade restrictions imposed by exporter countries, particularly quantitative restrictions on exports of unprocessed logs, quotas on exports of certain products and species, and log export taxes. Although restrictions on exports of unprocessed logs have increased wood-processing capacity (e.g. in Indonesia, Malaysia and the Philippines), this has often come at a high economic cost in the form of subsidization and inefficiencies—low log-conversion efficiencies are associated with industrial overcapacity and high rates of deforestation.

Major trends in the tropical sawnwood trade since 1990 have been the decline in importance of Europe (particularly Belgium, France, Germany, Italy, the Netherlands, Spain and the United Kingdom), which has traditionally been an important market for tropical sawnwood, particularly from Africa; and the significant growth of China's tropical sawnwood imports, which reflects China's domestic consumption and demand from the country's export-oriented wood manufacturing industries, particularly wooden furniture and flooring, as well as the relative competitiveness of tropical sawnwood manufactured from imported tropical logs.

Exports of tropical sawnwood have transitioned from products sourced predominantly from natural forests to those sourced from plantations. There have been significant declines in sawnwood exports from Brazil, Indonesia and Malaysia, but Thailand's exports of plantation-grown rubberwood have grown since 2009, almost all of which has gone to China's wooden furniture industry.

Plywood is the major tropical wood-based panel product, although its production and trade has declined since the 1990s, when tropical plywood dominated the trade in wood-based panels. A major change in tropical plywood imports has been the decline in Japan's imports as its demand shifted to domestic plywood in response to the declining availability and relatively high prices of South Sea plywood; the risk of exchange-rate fluctuations (which affect imported plywood but not Japanese plywood manufactured from domestic materials); government promotion aimed at expanding domestic wood use; and consumer concerns about the environmental consequences of using tropical hardwoods. Technology changes also enabled the industry to transition from the use of tropical hardwoods to softwoods.

United States tropical plywood imports are linked closely to housing and construction trends, with imports accelerating between 2017 to 2021 amid surging economic growth and housing starts, in addition to do-it-yourself home improvements and repairs during the COVID-19 pandemic. Antidumping investigations and the imposition of antidumping duties by the United States have affected the country's imports of tropical plywood from China, with importers diversifying their supply sources to other tropical plywood suppliers.

The tropical plywood export trade has been dominated by China, Indonesia, Malaysia and Viet Nam, with export trends reflecting the relative competitiveness of these countries, related mainly to supply-side issues, specifically access to supplies of peeler logs of an appropriate quality and international concerns about legal sourcing and governance. In 1996, the peak year, Indonesia supplied 52% of world exports and Malaysia supplied 29%, but exports by China and Viet Nam were small. China became a major exporter in the 2000s and Viet Nam has emerged more recently (since 2017).

There has been significant growth in the value of exports of SPWPs from tropical countries, up from USD 1.7 billion in 1990, to USD 14.7 billion in 2000, to USD 36.1 billion in 2022. There has also been rapid growth in wooden furniture exports from China and among tropical exporters, notably Viet Nam: the share of wooden furniture in total SPWP exports (by value) from tropical countries increased from 28% in 1990, to 57% in 2000, to 75% in 2022. The bulk of exports are from the Asia-Pacific region. Viet Nam and other tropical exporters have benefited from United States antidumping measures on imports from China.

The dominant markets for SPWP imports are countries with developed economies. Global demand for wooden furniture and joinery products follows trends in housing starts and consumer spending in the EU and the United States and in the competitiveness of imported compared with domestically produced products. Imports of wooden furniture have grown considerably worldwide since 1990, especially in Australia, EU countries, Japan, the Republic of Korea and the United States.

1 INTRODUCTION

The tropical wood products sector has seen considerable change since 1990. The availability and quality of tropical roundwood supply from natural forests has become more restricted, and economic and demographic changes have shifted the location and growth of tropical wood product industries—and the geographic location of demand—from developed to developing countries, particularly China. This report explores the following major trends in the production and trade of tropical primary wood products and secondary processed wood products (SPWPs) in the period 1990–2020: consumer market trends and drivers affecting tropical wood markets; changes in roundwood supply and tropical wood product production in producer countries; and developments in the trade of tropical wood products.

The report reviews quantitative time-series data from the ITTO Statistics Database, which has published data series on tropical timber production, consumption and trade since 1990. In recent years, these data have been derived from the Joint Forest Sector Questionnaire, an initiative of ITTO, the Food and Agriculture Organization of the United Nations, EUROSTAT and United Nations Economic Cooperation in Europe, as well as other sources. The analysis in this report also uses information from ITTO's *Biennial Review and Assessment of the World Timber Situation*,[1] the ITTO Market Information Service[2] and other relevant sources. Data in this study are for the most recent year reliably available, with readily available economic statistics and some other data reported up to 2023. ITTO's most recently published data for production and trade of tropical timber extends through 2022; however, data for 2022 (and for some countries, also 2021) are often based on estimates due to delays in the production of final statistics in many countries. This means that the primary time series for this long-term study is the period 1990–2020, while some charts/data series presented have differing end points based on data availability/reliability.

The scope of the study comprises products specified in the International Tropical Timber Agreement, 2006, in which the definition of tropical timber is "tropical wood for industrial uses, which grows or is produced in the countries situated between the Tropic of Cancer and the Tropic of Capricorn. The term covers logs, sawnwood, veneer sheets and plywood". This study investigates production and trade trends across value chains and therefore products derived from these primary wood products—furniture and parts, mouldings, windows, doors, decking products, and flooring. The study excludes woodfuel; pulpwood, pulp and paper products; and reconstituted boards such as particleboard and medium-density fibreboard.

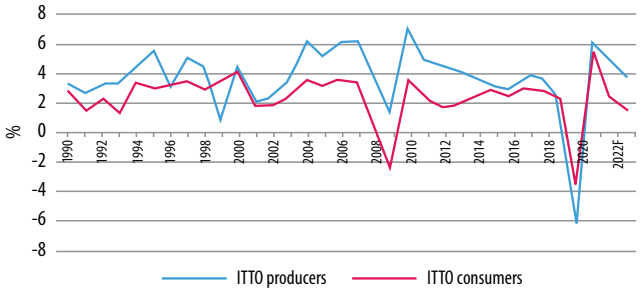
1 The reviews were annual until 2012. All reports are available at www.itto.int/biennal_review
2 Available at www.itto.int/market_information_service

2 CONSUMER MARKET TRENDS AND DRIVERS

Macroeconomic trends affecting tropical wood markets

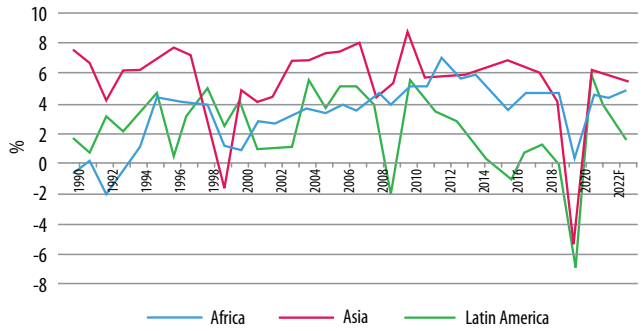
Global economic fluctuations have had significant impacts on tropical timber production and trade since 1990. Growth in gross domestic product (GDP) is an important indicator of demand for tropical wood products because of its impact on housing and construction activity and consumer wealth and spending, which have flow-on effects on demand for wood-based products. GDP growth in ITTO producer and consumer countries fluctuated significantly between 1990 and 2023 (Figure 1; Figure 2; Figure 3). It contracted sharply in response to three major economic shocks—the Asian financial crisis (1997–1998), which mostly affected the Asian region, and the global financial and economic crisis (GEC) (2008–2009) and COVID-19 pandemic (2020–2022), which were both of global magnitude. A recession in 2001 mainly affected developed economies, especially the United States of America and countries in the European Union (EU) (Figure 3).

Figure 1: Real gross domestic product growth, by ITTO producers and consumers, 1990–2023



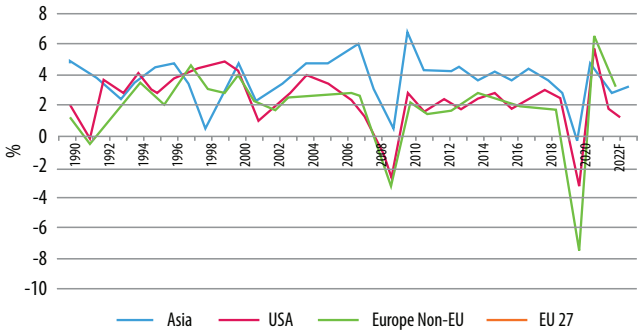
Note: F = forecast. Source: IMF (2023).

Figure 2: Real gross domestic product growth, by ITTO producer region, 1990–2023



Note: F = forecast. Source: IMF (2023).

Figure 3: Real gross domestic product growth, ITTO consumer region, 1990–2023



Note: F = forecast. Source: IMF (2023).

The Asian financial crisis in 1997–1998

The Asian financial crisis began in Thailand in 1997 following the collapse of the Thai baht and spread to other countries in East and Southeast Asia. Indonesia, the Republic of Korea and Thailand were most affected by the crisis. The impacts on the forest sectors in Asia included changes in the relative prices of some commodities during the crisis years, resulting in the expansion of cultivated areas of the more profitable ones (e.g. rubber and palm oil in Southeast Asia); the expansion of agriculture to increase government revenues and compensate for the loss of household incomes, resulting in deforestation; and declining timber demand, which led to a reduction in harvesting (although there is evidence that this outcome was counterbalanced by an intensification of illegal activities to generate income; Antonarakis et al. 2022). Although there were fears of global financial contagion, the economic recovery in 1998–1999 was rapid.

The global financial and economic crisis in 2008–2009

The GEC had its origins in mid-2007 in the United States and spread rapidly to other parts of the world. A subsequent global recession, which was at its most severe in 2009, resulted in declining economic growth in many tropical-timber-consuming countries, rising unemployment, and large declines in international trade and capital flows. The impacts on GDP growth were most severe in developed economies. The United States was most affected initially: the collapse of its subprime mortgage market (a major contributor to the crisis) had marked impacts on disposable incomes, consumer demand and housing starts. With interdependent globalized markets, the effects quickly spread to EU countries and to developing countries with strong trading links with the EU and the United States.

Asian producer and consumer economies outpaced other regions during the crisis and led the recovery, supported by strong export performance (despite slowing exports to the EU and the United States) and growing domestic demand, especially in China and India. Many Asian economies were cushioned from the full impacts of the economic shock because they had adopted stronger economic frameworks in the aftermath of the 1997 Asian financial crisis. African countries were less affected by the GEC, being relatively insulated from financial spillovers from the EU with increasing diversification of its exports to fast-growing emerging economies (particularly China) and high commodity prices, which benefited the region's commodity exporters. Important macroeconomic impacts of the GEC included the following (Maplesden et al. 2013):

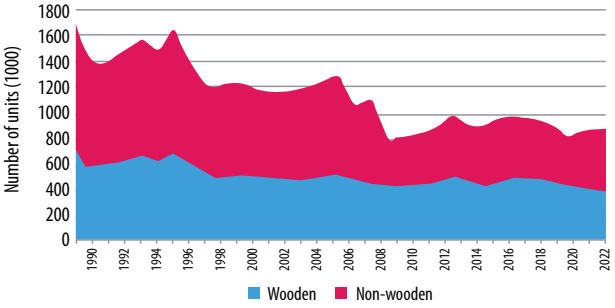
- China's post-crisis growth strategy, which focused on domestic sources of growth rather than exports;
- exchange-rate volatility;
- significant declines in consumer spending, housing starts and construction activity in the EU and the United States;
- high unemployment in developed economies, which acted to slow recovery in housing starts;
- substantial contractions in international investment, including foreign direct investment (FDI) inflows to producer countries;
- volatility in energy and transport costs;
- disruptions for many firms and countries involved in supply-chain networks;
- the most competitive ITTO producer countries (e.g., Brazil, Indonesia, Malaysia and Thailand) having a comparative advantage in responding quickly to market signals and sustaining growth; and
- the strengthening of regional cooperation in producer regions.

The global housing and construction market is a significant end-use sector for tropical wood products, and construction activity in Japan (Figure 4) and the United States (Figure 5) is indicative of global construction trends in tropical consumer markets. Depressed housing markets were a key aspect of the GEC: United States housing starts reached a record low in 2009 and, as of 2023, had not recovered to the peak of 2.3 million starts achieved in 2006. Japan's residential housing starts also plunged in 2009, although government promotion of wooden public buildings in public construction in 2010 led to an increase in wood consumption.

Major trends in tropical wood products trade resulting from the GEC included the following:

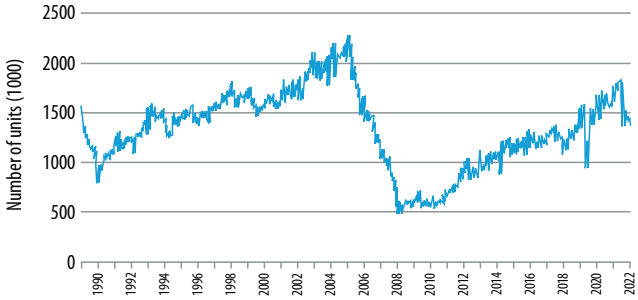
- The impacts on construction and consumer spending in developed economies had significant consequences for demand for tropical wood products in developed economies, particularly in North America and Europe (although the effects were uneven among European countries).

Figure 4: Japan housing starts, 1990–2022



Source: Government of Japan (undated).

Figure 5: United States housing starts, 1990–2022



Note: Annual rate of starts for new privately owned housing units, seasonally adjusted total units.

Source: United States Census Bureau (2023).

- Although demand waned in the EU and the United States, domestic demand expanded in producer countries and some parts of Asia. In the long term, the GEC reinforced existing trends in the tropical trade, with consumer demand for end-use tropical wood product exports shifting from the EU and the United States to Asia.
- Growth in the consumption and import of primary wood products in China and India cushioned the impact of the GEC on the exporters of tropical primary wood products. China's tropical log imports dropped in 2009 but recovered to pre-crisis levels in 2010.
- Many tropical producer countries diversified their trade patterns during the GEC to focus more on intraregional trade and other new and emerging markets.
- The substitution of tropical wood products by a range of alternative wood and non-wood products had been occurring well before the GEC but was reinforced by reduced price expectations during the crisis.
- The GEC accentuated the risks associated with a focus on exports. Several tropical producer countries continue today (late 2023) to export significant proportions of their

wood product production and thus remain exposed to external demand shocks. The vulnerability of exporters of tropical primary wood products during the GEC was not as severe as predicted initially, largely because of the rapid growth in exports of primary products to China and India, the domestic markets of which continued to grow.

- The predominance of small and medium-sized enterprises (SMEs) in tropical timber wood processing is a challenge for tropical supplying countries during downturns in global demand. In the aftermath of the GEC, the rationalization of SMEs and downsizing of the tropical wood-processing industries (with consolidation around the larger enterprises) has provided benefits, however.
- Tropical timber competitiveness became more important during the GEC, with factors such as price, product differentiation and supply-chain responsiveness (particularly just-in-time delivery) rising in importance.

The COVID-19 pandemic in 2020–2022

The COVID-19 pandemic triggered a severe global economic recession in the first half of 2020, with the spread of the virus leading to lockdowns, production stoppages, disruptions to global value chains, and a collapse in global trade volumes and values. International trade and commodity prices rebounded sharply in the second half of 2020, however, as strict lockdowns were lifted globally and demand firmed, especially in China. The impacts on production, consumption and trade were varied, depending on the severity of the pandemic in individual countries and the steps taken to control and mitigate the impacts of the virus. The global economy, weakened by the pandemic, was subject to several additional shocks in 2022, including higher-than-expected inflation worldwide, especially in the United States and major European economies, which led to tighter financial conditions and a reduction in the consumption of wood-based products; a worse-than-anticipated slowdown in China, the major tropical wood market, reflecting COVID-19 outbreaks and lockdowns and regulatory controls to limit property speculation; and negative spillovers from the war in Ukraine.

In the Asia-Pacific region, Viet Nam's economy was aided during the pandemic by the quick and sustained resumption of production and exports and by support from public investment stimulus and resilient foreign direct investment. Malaysia, the Philippines and Thailand were more severely affected by the crisis, and Myanmar's economy was hindered by continued political unrest. GDP growth in Latin America dropped sharply in 2020 but recovered strongly in 2021.

Demand in major tropical wood product markets was unpredictable during the height of the pandemic. In contrast to the GEC, which had significant impacts on the housing sector in the United States, housing starts continued to rise in that country at the start of the pandemic, slumped in April 2020 due to unseasonably cold weather, and then trended upwards again, reaching a peak in April 2022. The pandemic also led to significant spending on do-it-yourself home improvement and repairs, despite the slowdown in the broader United States economy. In the important China market, real-estate investment plunged in early 2020 but returned to growth later in the year in response to containment of the virus and considerable public investment. Economic growth resumed in China in 2021, supported by rising production, consumption and investment and with significant policy support and inflows of FDI from international firms. These measures led to a strong rebound in construction activity, but growth in wood product imports was dampened by a global shortage of shipping containers and escalating shipping costs.

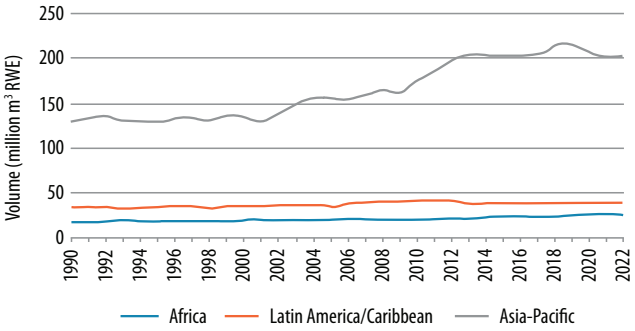
In contrast to the GEC, where demand factors had the most significant impact on the wood products trade, the pandemic resulted in severe disruptions to production, transport and shipping and thus supply chains.

3 TROPICAL TIMBER PRODUCTION TRENDS, 1990–2021

Tropical industrial roundwood production

Tropical hardwood roundwood production is dominated by the Asia-Pacific region (Figure 6). Production in the region was relatively stable in the decade 1990–2000 but trended upwards between 2001 and 2019, when production reached 215.6 million m^3, nearly double the volume in 2001. Production dipped in 2001, 2009 and 2020 in response to declining consumption levels in end-use markets, as reflected in GDP growth trends (Figure 2 and Figure 3), although roundwood production in the region showed impressive growth in the years following the economic shocks in 2001 and 2009. Production was relatively stable between 1990 and 2022 and reasonably unaffected by the global economic shocks—although there were differences between countries, with those countries dependent on exports experiencing greater impacts. The overall effect of the COVID-19 crisis on tropical roundwood production is yet to be fully quantified.

Figure 6: Industrial tropical roundwood production, by ITTO producer region, 1990–2022

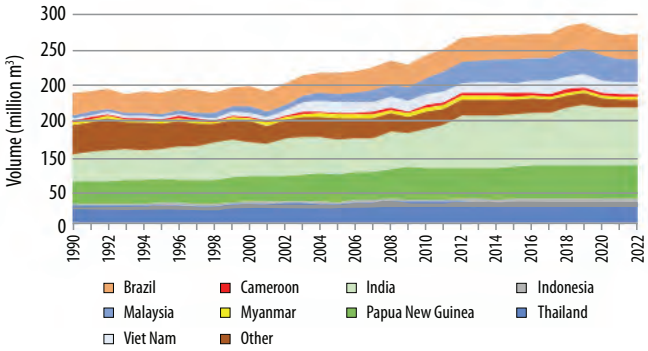


Note: Data are for non-coniferous tropical roundwood production in ITTO producer regions.

Source: ITTO Statistics Database.

Figure 7 shows trends in tropical roundwood production in major producer countries. The most recent available data (2021) indicates that production is dominated by six countries—Indonesia (30% by volume), India (18%), Viet Nam (12%), Brazil (11%), Thailand (4%) and Malaysia (4%). Malaysia is one of the few ITTO producer countries to provide regular production data to international agencies. Its production declined significantly between 1990 and 2022, from 41.0 million m^3 (22% of global production) to 11.2 million m^3. This contraction was mostly in response to reductions in logging quotas associated with the country's sustainable forest management (SFM) policies. In contrast, production grew in Indonesia and Viet Nam over the period

Figure 7: Tropical log production by major ITTO producer countries, 1990–2022



Source: ITTO Statistics Database.

due to the development of plantations. In many tropical producer countries, natural-forest production levels declined due to historical overexploitation, followed by initiatives to enhance SFM and clamp down on illegal logging and trade, which reduced the volume of wood in natural forests available for commercial harvest.

Tropical roundwood production from plantations

Only a limited amount of hard data is available from official sources to quantify trends in wood production from tropical plantations globally, although some estimates have been attempted using various assumptions. The most recent available estimate, by Held et al. (2021), indicates that while hardwood production in natural forests in tropical producer regions has been relatively stable since 1990 (at about 150–160 million m^3 per year), the share of total industrial roundwood production held by natural forests has declined from 58% in 1990 to 35% in 2021. Plantation production (including pulplogs) in tropical producer countries is estimated to have grown from about 120 million m^3 in 1990 to 317 million m^3 in 2021 (65% of industrial roundwood production), with most of this comprising pulplogs. There is considerable variation between regions and countries, however, with plantations providing the bulk of industrial roundwood production in Latin America and the Caribbean (81% in 2021) and Southeast Asia (66%) but less than one-third in Africa (30%).

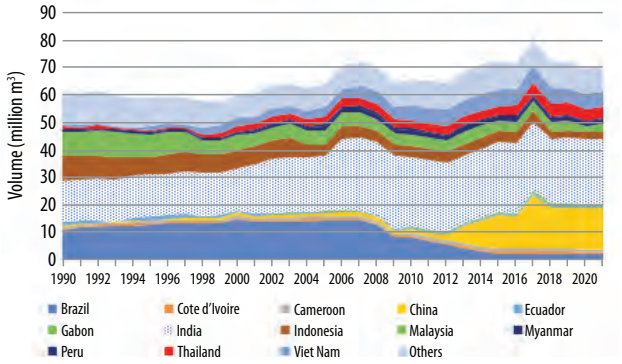
The regional differences in log production from plantations reflects differing levels of investment attractiveness, with plantation-sector investors especially active in Asia and Latin America, where there are significant markets and economic growth and forest companies are looking to obtain market share and secure access to resources as part of their global strategies. In Africa, investment inflows have been limited by the pre-

maturity of timber and forestry markets and difficult access to land: the green-field nature of most investment opportunities have tended to deter international investors (Held et al. 2021). Moreover, FDI inflows are known to be restricted in countries that lack macroeconomic stability and facilitative institutions: many African (and other ITTO) producer countries are at the low end of Transparency International's Corruption Perceptions Index (Transparency International 2022), which reduces the attractiveness of investment in plantation forestry.

Tropical sawnwood production

Globally, tropical sawnwood production was relatively stable between 1990 to 2000; it then rose to a peak of 72.7 million m^3 in 2007 and another peak (80.8 million m^3) in 2017, followed by a decline to 71.4 million m^3 in 2021, with major differences between countries (Figure 8). The most significant change has been the emergence of China as a major tropical sawnwood producer (based on imported tropical logs) after 2012. Viet Nam's production also rose over the three decades, from a relatively small base. Brazil's sawnwood production dropped significantly after about 2007, and Malaysia and Indonesia's production declined steadily between 1990 and 2021. Although many tropical producers have introduced log export restrictions to support the supply of logs to domestic processors, tropical wood processors are increasingly supply-constrained due to historical overexploitation of natural forests and, in some producer countries (e.g. Malaysia), SFM initiatives in response to this.

Figure 8: Tropical sawnwood production, by producer country, 1990–2021



Source: ITTO Statistics Database.

Tropical sawnwood production has been affected disproportionately by global economic crises because the tropical sawnwood industry is dominated by SMEs, which are more vulnerable than larger enterprises to economic shocks. During the GEC, for example, tropical wood-processing industries reported production curtailments and plant shutdowns because of limited access to finance, weak negotiating power, and limited ability to respond quickly when markets recovered (Maplesden et al. 2013). In Asia, export-dependent tropical sawnwood producers, such as Malaysia, were affected more than producers with large consumption bases (and therefore less vulnerability to reduced export demand), such as India, Indonesia and Thailand. Overcapacity in Asian sawmilling industries was a threat to the competitiveness of the sawmilling industry (as well as to SFM goals), well before the GEC. In lower-income countries such as Cambodia, Myanmar and the Lao People's Democratic Republic (Lao PDR), poor sawlog recoveries due to low levels of technology and training also threatened efforts to achieve SFM.

Sawnwood production and exports were affected in 2020–2021 during the COVID-19 pandemic by government measures to contain the virus, which led to labour shortages, surging production costs and severe supply-chain issues.

Tropical sawnwood production in Africa is dominated by Cameroon, the Congo, Côte d'Ivoire, Gabon, Ghana and Mozambique. The region's sawmilling industries are export-dependent, and production is subject to fluctuations in demand in export markets. A trend in the last decade or so in Africa has been the transfer of industry investment from predominantly European to Asian-owned firms, reflecting an increase in Chinese demand for hardwood sawnwood from non-traditional sources, Asia's demand for a wider range of species than sought by European buyers, and the high costs associated with producing certified products, as required by European markets.

During the GEC, many major tropical producers in Africa (especially Cameroon, the Congo and Gabon) relaxed their log export restrictions to help forest companies increase their profitability (many local sawmills having closed during the recession). A change in the species used domestically compared with those available for export also occurred, with higher-value species favoured to increase the export value of sawnwood (and other wood products). Another consequence of producers turning to higher-value species was a reported reduction in the use of lesser-used species, with implications for the marketing of these species and achievement of SFM goals. Many African countries reimposed log export restrictions in 2010 to assist the recovery of the sawmilling and other wood-processing industries, aided by increases in prices and demand in the EU and the growing markets for sawnwood in China and India.

Tropical plywood production

Tropical plywood production was relatively stable between 1990 and 2008, with the exception of 1998, when production contracted in the major producer countries—Indonesia, Japan and Malaysia—at the height of the Asian financial crisis. World tropical plywood production surged from 2008 to a peak in 2015, declined in 2016 and then trended upwards again, reaching 47.8 million m^3 in 2021 (Figure 9).

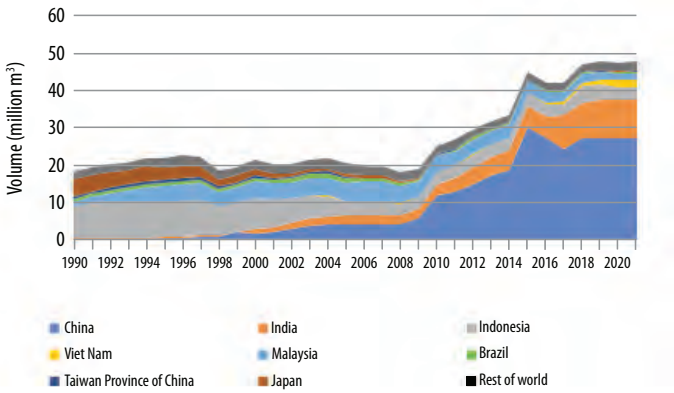
Tropical plywood production has undergone significant changes since 1990, such as:

- the major production bases shifting from Japan (which was the dominant plywood producer and importer of tropical logs until the early 1990s) and Indonesia to Malaysia (until the 2000s) and then to China, India and, to lesser extent, Viet Nam;
- the decreasing availability of large-diameter peeler-quality logs for plywood production;
- significant changes in production technology that enabled the use of lower-quality substrates to produce combi-plywood products;
- rising production costs—the cost of glue, peeler logs and labour (particularly in China in recent years) has increased considerably; and
- the increasing availability of panel substitute products such as softwood plywood, birch and poplar plywood, oriented strandboard, laminated veneer lumber, I-beams, wood plastic composites, and veneered medium-density fibreboard, which have reduced market share for tropical plywood and put downward pressure on prices and pressure on producers to cut costs.

Changes in production location mostly reflect changes in the relative competitiveness of plywood processing in the major producer countries and the significant growth of domestic plywood demand in China and India. Chinese production accounted for 0.5% of world tropical plywood production in 1990, but this increased dramatically to 8% in 2000 and 57% in 2021. The expansion was mainly in response to rapid growth in domestic plywood demand in China's downstream industries, such as building construction, wooden furniture manufacturing, automobile manufacturing and shipbuilding. Production growth stalled in 2008 when the value-added tax rebate for plywood was reduced, the Chinese currency appreciated relative to other major currencies (diminishing returns to the sector), and demand declined dramatically in the United States (China's major tropical plywood market). Although plant closures were reported in 2008 and 2009 in China's major producing provinces in response to rising raw-material and labour costs and a general weakening of export prices, production increased in 2009, assisted by a domestic housing boom in the latter half of the year and by an export rebound. The plywood industry also restructured in response to the global downturn in demand, with export production consolidating around the larger enterprises.

China's tropical plywood production was affected in 2018 by the introduction of strict environmental regulations, with many plants required to upgrade or replace technologies to reduce emissions and waste; the industry recovered as mills implemented the new rules. In 2020, production was disrupted

Figure 9: Tropical plywood production by major country, 1990–2021



Source: ITTO Statistics Database.

by COVID-19-related operating restrictions, supply-chain disruptions, and the cancellation of orders. The ongoing rationalization of the industry meant, however, that many of the larger and more-efficient enterprises were well-positioned to remain viable despite the negative effects of the pandemic. Production bounced back quickly, with a significant recovery in domestic demand compensating for the downturn in export demand, although the number of enterprises and the production capacity of China's total plywood industry declined slightly in 2022. China's plywood production has also been affected by the relocation of facilities to other producing countries—such as Viet Nam—to reduce production costs and avoid the prohibitive duties imposed by the United States on some Chinese plywood imports.

Tropical plywood is defined by the face veneer only. A major trend in the last three decades has been a change in the composition of tropical plywood from all-tropical veneers to the use of fast-growing plantation species such as poplar, eucalypts, acacias and radiata pine, in addition to lower-cost substrates such as palm and coconut.

Japan's tropical plywood production dropped significantly after the 1980s (when Japan was the major importer of Southeast Asian logs) as the availability of Southeast Asian logs became constrained and as plywood production capacity increased in Indonesia and Malaysia. Japan's production transitioned progressively from tropical hardwoods to predominantly softwoods—Russian larch and Japanese sugi and larch—as design improvements in rotary lathes for veneer manufacturing enabled veneer production of an acceptable quality from smaller-diameter logs. Japan's domestic production of tropical plywood based on imported logs ceased in 2021 (Sekiguchi and Ochi 2021). The transition from tropical hardwoods to softwoods in plywood manufacture shows the ability of technology to change the relative competitiveness of products.

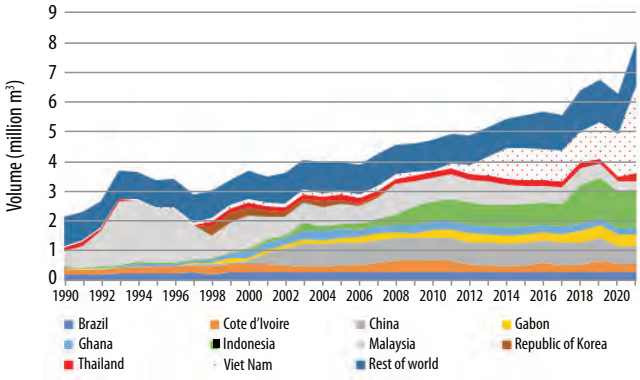
Indonesian and Malaysian plywood production is more heavily export-oriented than that of China and India and follows growth trends in export markets. Indonesia's plywood industry was assisted by log export restrictions and subsidies to the sector in the early 1990s, which resulted in significant plant overcapacity and contributed to deforestation and illegal harvesting (Fenton 1996). Production in both Indonesia and Malaysia was affected in 2008 by the contraction in export demand during the GEC. In 2020, production was curtailed by pandemic-related working restrictions, in addition to labour and log shortages and a lack of shipping containers. Malaysia's plywood mills have also been affected by a steady reduction in log supply due to policies aimed at implementing SFM and by rising input costs. India's production, in contrast, is based largely on imported tropical logs and domestic plantation species for core veneer. In response to log export restrictions in most traditional Southeast Asian supplying countries, Indian plywood manufacturers have increased log imports from other suppliers (particularly Papua New Guinea, Solomon Islands and African suppliers) and invested in veneer-manufacturing facilities in other tropical-plywood-producing countries.

Tropical veneer production

Global tropical veneer production has grown substantially, from about 2 million m^3 in 1990 to nearly 8 million m^3 in 2021. Figure 10 shows the dominance of Malaysian production in the 1990s, the emergence of China and Indonesia in the 2000s, and rapid growth in production in Viet Nam from 2011. Malaysia's share of world tropical veneer production plunged in the 1990s, from 57% in 1994 (the peak year) to 25% in 1998; the decline has continued, with Malaysia accounting for only 3% of world production in 2021. In contrast, Viet Nam's production amounted to only 3% of world production in 2011 but expanded rapidly to 36% (2.9 million m^3) in 2021. Tropical veneer production in Viet Nam is predominantly export-oriented; the substantial growth in the country's production reflects an expansion of its export markets.

Tropical veneer production in the most significant African veneer-producing countries—Côte d'Ivoire, Gabon and Ghana—has also focused on export markets, particularly the EU, where demand has been low since the GEC and dropped further in 2020 during the COVID-19 pandemic. A major development in Africa has been structural changes in foreign-invested veneer production facilities, with Asian producers (China, India and Malaysia) increasing investment in the region in response to the change in the location of demand from the EU to Asia and to reduce production costs and enable access to resources. EU veneer production companies operating in tropical Africa have been challenged by the declining availability of the timber species preferred by European markets, weakening consumption in the EU, and the low profitability of certified sustainable operations, which receive little or no market

Figure 10: Tropical veneer production, by country, 1990–2021



Source: ITTO Statistics Database.

premium but have higher operating costs. Asian investors are able to market a wider range of species and have less market imperative to supply legal and sustainable products.

Tropical secondary processed wood product production

Trend data on the volume of tropical SPWPs[3] are unavailable, but information on the value of exports, and anecdotal information at the country level,[4] suggest that China and Viet Nam have become the major tropical SPWP manufacturing hubs. Indonesia, Malaysia and Thailand are also important tropical SPWP producers, based on plantation timbers such as rubberwood (notably in Malaysia and Thailand), plantation teak (notably in Indonesia) and acacia (notably in Indonesia and Malaysia). EU wooden joinery and furniture manufacturers (particularly France and Italy) previously produced significant quantities of joinery and furniture products based on primary tropical wood product imports, but mounting competitive pressures from East European manufacturers, and lower-cost non-wood substitutes, have caused the downsizing and restructuring of the tropical SPWP industry in the EU.

There is evidence that tropical SPWP industries, both domestic and export-oriented, underwent significant restructuring as a result of the GEC. China is the world's largest producer of wooden furniture; it built a huge integrated wooden furniture industry, drawing on the rapid development of the domestic economy, high levels of foreign investment, a comparative advantage in skilled labour and raw-material costs compared with other manufacturing countries, and rapid growth in exports. Until the GEC, however, the industry was fragmented, with few large firms and numerous small manufacturers. It

3 SPWPs comprise wooden furniture and parts, builders' woodwork and joinery, wooden mouldings, and "other" SPWPs (which includes a wide variety of products such as picture frames, tableware, kitchenware and other small wooden items).
4 ITTO *Tropical Timber Market Report*, various issues.

experienced a significant decline in exports in 2009, and labour costs grew. In response, the industry began a process of restructuring, with major developments including:

- industry consolidation in favour of larger enterprises and the development of domestically oriented companies with their own brands and distribution channels;
- improvements in distribution channels, particularly domestically, which helped grow the domestic market and reduce distribution costs. The formation of industrial parks and centres consolidated the wood products industry throughout China;
- processing-cost reductions and productivity improvements, assisted by lower raw-material and energy costs. On the former, a trend towards substituting medium-density fibreboard and particleboard for plywood in furniture manufacture reduced production costs as the focus shifted to the domestic market, which was more price-sensitive. Domestically produced plywood also began substituting for imported plywood in high-end furniture manufacture;
- moving up the value chain, with emphasis on innovation and technological product improvements; and
- the establishment of furniture "clusters" that integrate production, sales, training, research and development and services.

The restructuring and upgrading of the industry gave Chinese manufacturers a competitive advantage over many other producer countries that were unable to provide significant targeted manufacturing and export assistance. The industry's competitiveness eroded over time due to rising labour and raw-material costs and increasing environmental requirements. Moreover, exports plunged in 2018 due to tariffs imposed on Chinese furniture imports by the United States, the major export market. These factors led some manufacturers—particularly foreign-owned enterprises operating in China—to relocate operations to Viet Nam. In 2020, the decline in China's wooden furniture exports was also associated with a rise in domestic consumption of furniture in response to an increase in real-estate development and household incomes. It is assumed, therefore, that production did not decline as steeply as exports (ITTO 2021).

Viet Nam is now the largest tropical-country exporter of SPWPs and one of the world's largest furniture exporters, with production based mainly on imported raw materials. The bulk (about 90%) of its production is exported, with production volumes following trends in export markets. About half of Viet Nam's production enterprises are foreign-owned (ITTO 2020a). Production stalled during the GEC but recovered in 2010 and grew rapidly, year-on-year. Production also picked up quickly after the height of the COVID-19 pandemic (2020), with exports responding to the surge in demand in the United States. The share of plantation material in wooden furniture has increased, with domestically grown acacia now estimated to provide about 14% of the wood used in furniture for export (Tran and Huynh 2020).

Other tropical-country SPWP producers have not matched the pace of growth in China and Viet Nam. Tropical producer countries are generally characterized by low levels of investment in wood technology, manufacturing, marketing and research and development. The preponderance of SMEs in tropical wood processing exposed tropical producers during global economic shocks in recent decades because of their general lack of access to finance, negotiating power and capacity to respond quickly as markets recovered. Ongoing rationalization and downsizing in the wood-processing sectors of many tropical producers has likely increased the competitiveness of the sector.

4 TROPICAL TIMBER TRADE TRENDS, 1990–2022

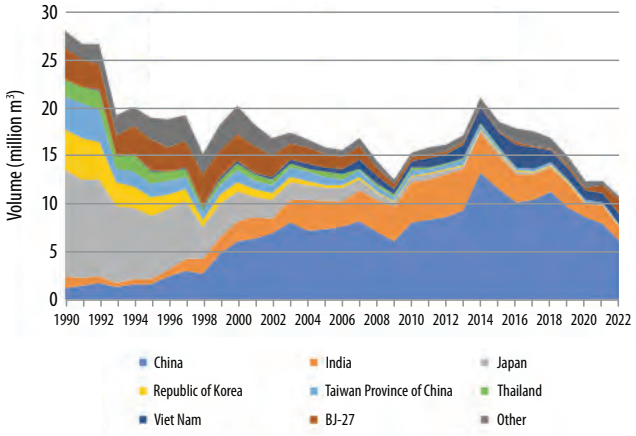
Tropical log imports

The tropical log trade has trended downwards since 1990, with notable declines in 1997, 2007 and 2020 in response to economic shocks and peaks in 1990, 2000 and 2014 during surges in demand in import markets (Figure 11). World imports of tropical logs totalled 28.2 million m^3 in 1990, 21.1 million m^3 in 2014, and 10.2 million m^3 in 2022.

Major changes in the tropical log trade include the following:

- **Direction of trade.** Many of the major supplying countries have restrictions on log exports, and the bulk of import demand has shifted from Japan and to a lesser extent the Republic of Korea, Taiwan Province of China and EU countries, which, combined, accounted for 78% of world imports in 1990 but for only 9% in 2021, to mainly China and India. Japan's demand for tropical logs, predominantly for the plywood industry, declined markedly in the 1990s as imports grew of competitively priced Indonesian plywood.
- **The dominance of China in the tropical log trade.** China and India have strengthened their positions as the dominant tropical log importers, accounting for 62% and 16%, respectively, of world imports in 2021, compared with 4% and 5%, respectively, in 1990 (when Japan dominated the trade). The trend in global tropical log imports since 2010 largely reflects demand in China's domestic market, as well as demand in export markets for China's SPWPs.
- **The impacts of the GEC.** The drop in construction and consumer spending in developed economies due to the GEC had significant effects on demand for tropical wood products in developed economies, especially in the EU and North America, although the effects were uneven in EU countries. As demand waned in the EU and the United States as a result of the crisis, it increased in producer countries and some parts of Asia. The GEC reinforced existing trends in the tropical trade as consumer demand for end-use products shifted from the EU and the United States to Asia. It has also been suggested that increasing demand in emerging markets and the emergence of more stringent measures to control illegal trade in developed economies encouraged the diversion of tropical timber trade from traditional importers in EU and North American markets to destinations with less-stringent regulatory frameworks (Masiero et al. 2015).
- **China's diversification of its tropical log sources from predominantly Southeast Asia to the Pacific and Africa.** A significant proportion of China's imports are from countries considered "high risk" in terms of legality documentation, particularly Papua New Guinea, Solomon Islands and African suppliers, posing challenges for China's export-oriented wood-processing industries, particularly wooden furniture.

Figure 11: Imports of tropical logs by importing country or region, 1990–2022



Source: ITTO Statistics Database.

- **The decline in importance of the tropical log trade.** The proportion of world tropical log imports to total log imports declined from 31% in 1990, to 17% in 2000, to 9% in 2022.

Developments in China's tropical log imports, 1990–2022

General trends in China's imports of tropical logs from 1990 to 2022 reflect trends in the availability of tropical wood supply and factors affecting demand in China's domestic and export markets.[5]

China's imports increased significantly from a low base in 1990, reaching a peak in 2007 before dropping in 2008 and 2009. Demand was depressed by a downturn in the construction industry, reduced demand for China's exports of SPWPs (mainly wooden furniture and plywood), a reduction in tax rebates for some export items (although these were partially reinstated in 2009), and a dramatic decline in imports from the Russian Federation— the major log supplier—following the Russian Federation's increase of its log export tax for softwood species and large-diameter birch logs from 20% of the customs-declared log value to 25%. A further planned increase to 80% of the log value was never implemented because of the negative impact of the global economic slowdown on the Russian wood industry, but the uncertainty provided urgency among Chinese importers to seek alternative log sources, in addition to increasing sawnwood imports. Although most of the shortfall was provided by other softwood-supplying countries (especially

5 Commentary in this section is based on text published in various editions of the *ITTO Biennial Review and Assessment of the World Timber Situation*, available at https://www.itto.int/annual_review.

Canada, New Zealand and the United States), some of the gap was supplied by tropical hardwood suppliers, notably Papua New Guinea and Solomon Islands.

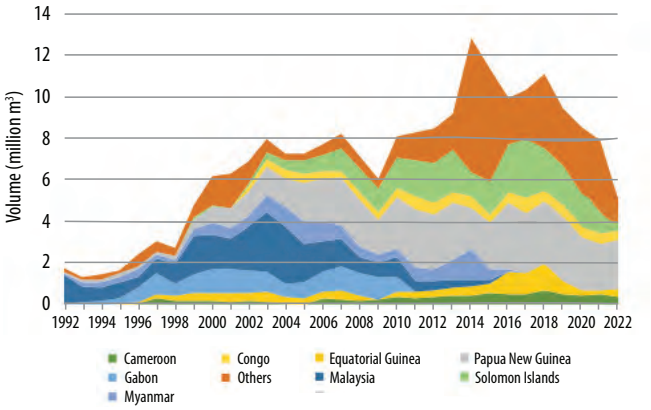
China's imports of tropical logs dropped by 26% between 2007 and 2009 but surged in 2010 to 8.1 million m^3, with all tropical supplying countries increasing their exports to China except Gabon, which put log export restrictions in place in May 2010. Log imports from all sources recovered in 2010 and 2011, surpassing pre-GEC levels, as domestic consumption responded to aggressive economic stimulus measures and export markets for China's finished wood products showed signs of recovery.

The peak year for China's tropical log imports was 2014, at 13.3 million m^3 (Figure 12). The surge in imports in that year was in response to government stimulus measures, which targeted the general economy and wood-based industries and contributed to a recovery in wood product exports and significant growth in the domestic market. Imports also increased significantly from Myanmar in anticipation of a log export ban in that country in 2014. China's tropical log imports dropped in 2015 (although they were still higher than in 2013), affected by measures to control an overheated property market, rising international freight costs, and a weakening of the currency, which pushed up the delivered cost of logs. Exports of SPWPs also plateaued in 2015, contributing to slower log demand. Imports picked up in 2016 and, although China's GDP growth slowed in 2017, government policies cushioned the impacts of a planned economic slowdown by targeting domestic consumption, pushing up domestic demand for wood-based products. Import demand was also accelerated by a total ban on commercial logging in China's national forests, which restricted the availability of domestic logs, particularly hardwoods, and caused prices to rise.

Tropical log imports continued to rise in 2018 despite a slowing economy in the second half of the year and the introduction of strict environmental regulations, which caused many small and medium-sized wood-processing enterprises to close or interrupt production to upgrade their emission- and waste-reduction technologies. Imports dropped in 2019, even before the COVID-19 pandemic, as the impact of the environmental regulations began to take full effect and in response to reduced consumer confidence and domestic consumption. Growing trade tensions with the United States accelerated the relocation of China's SPWP production facilities (particularly foreign-owned) to Viet Nam and other locations to avoid restrictive tariffs in United States markets.

China's tropical log imports contracted by 16% by volume in 2020 due to COVID-19-related response measures, which affected the availability of tropical logs, increased freight rates, reduced processing activities in the first quarter of 2020, and reduced demand for wood-based products in both domestic and export markets. The Chinese economy returned to growth later in the year as the virus was contained and in response to considerable public investment. The economic recovery was

Figure 12: China imports of tropical logs by major supplying country, 1992–2022



Source: ITTO Statistics Database.

uneven, however, with industrial production rebounding much more strongly than consumption and imports lagging behind a bounce in exports.

Economic growth picked up in 2021, supported by rising production, consumption and investment and with significant policy support and inflows of FDI from international firms. These measures led to a strong rebound in construction activity and a resumption in tropical log imports, although growth in wood product imports was dampened by a global shortage of shipping containers and by escalating shipping costs (the latter easing somewhat towards the end of 2021). In tropical Africa, shipments to China and other Asian destinations were affected by lower fleet deployment for African freight, with shipping companies focusing on more profitable routes such as those between the United States and Asia (Chambers 2021).

Tropical log imports increased in the first half of 2022, year-on-year, by 9% by volume and 7% by value, with imports from Papua New Guinea the main source of growth. Later in 2022, however, sporadic outbreaks of COVID-19 and subsequent lockdowns disrupted supply chains, affecting wood processing and consumer spending. Problems in China with timber procurement and delays in the delivery of raw materials were reported in December 2022 (Global Green Supply Chains Initiative 2022). In addition to a contraction in export market demand for China's processed wood products, a crisis in the country's real-estate sector constrained overall construction activity and reduced timber demand.

Domestic demand in China picked up in January 2023 in response to an earlier-than-anticipated relaxation of COVID-19 restrictions and the introduction of real-estate stimulus policies. Nevertheless, the recovery in economic growth was slower than expected, and tropical log imports declined by 14% in volume (to 1.54 million m^3) and by 32% in value (to USD 385 million) in the first quarter of 2023 (ITTO 2023a).

China has become less reliant on Southeast Asian log supplies in recent years as availability has declined. Instead, it has diversified its tropical supply sources to the Pacific and Africa, even though a number of exporters have full or partial logging or log export bans in place. China's tropical log imports from all major suppliers declined in 2022, except from Papua New Guinea, where import volumes rose by 8%, to 2.34 million m^3.

Tropical logs constituted only about 12% of China's total log imports in 2021; non-tropical log imports amounted to 55.7 million m^3, of which 5.87 million m^3 was temperate hardwoods.

Trade restrictions imposed by consumer countries

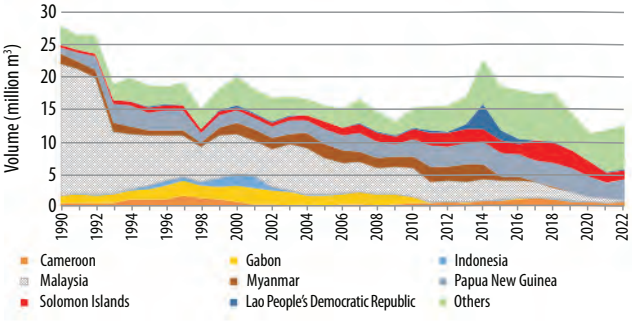
Trade sanctions on imports from certain tropical producer countries have had impacts on the tropical log trade. The United Nations Security Council, for example, imposed a ban on log imports from Liberia in mid-2003 with the intention of halting the use of wood-export revenues to fund illegal arms transactions. The embargo resulted in a sharp decline in log exports from Liberia (see Figure 14) and forced major importers such as China and France to seek alternative supplies. Initially imposed for ten months, the embargo was renewed for another year in 2004, despite pleas from the Liberian transitional government. The ban was lifted in 2006 after the Government of Liberia instituted a series of regulatory reforms.

Myanmar's tropical wood exports (teak logs, lumber and other finished products) were affected by economic sanctions imposed by the EU in 2008 in response to alleged human rights violations in the country, although the EU was not a major destination for Myanmar exports. The sanctions affected products imported both directly from Myanmar and indirectly from other countries (e.g. China). According to Woods and Canby (2011), the sanctions (which were lifted in 2012) stimulated illegal cross-border trade to importers such as China and India, with a high percentage of this wood re-exported to global markets. In 2021, the EU, the United Kingdom of Great Britain and Northern Ireland, the United States and other Western countries imposed sanctions against the Myanma Timber Enterprise, which has sole control of legal sales of timber in Myanmar, to prevent revenues from reaching the Myanmar military regime that took control of the country in February 2021.

Tropical log exports

The major suppliers of tropical logs in 2022 were Papua New Guinea and Solomon Islands in the Asia-Pacific region, Cameroon, the Congo, Equatorial Guinea and Mozambique in Africa, and Brazil (which has only emerged as a major log exporter since 2020) in Latin America and the Caribbean (Figure 13).

Figure 13: Tropical log exports by major country, 1990–2022



Source: ITTO Statistics Database.

There were significant differences in log export trends in the major tropical producer countries between 1990 and 2022, the most notable being the following:

- Malaysia's tropical log exports declined progressively, in light of a decline in the availability of wood resources due to the implementation of SFM policies; a ban on log exports from Sabah between 1993 and 1996 and reinstated in 2018; and quotas on log exports from Sarawak from 1992, which were reduced progressively over time. Malaysia's log exports declined from 20.4 million m^3 in 1990 (when Malaysia supplied 72% of world log exports by volume) to 6.2 million m^3 in 2000 (31% of world exports), to 0.3 million m^3 in 2022 (2% of world exports).
- Log exports from the Mekong subregion also declined progressively, with significant falls in recent years in response to a general decline in the availability of industrial roundwood from natural forests due to historical overexploitation, various government measures to limit harvesting levels in natural forests, restrictions on exports of primary wood products, and national and international measures to control illegal logging and cross-border trade. The log export trade in the subregion has historically been associated with a suspected high incidence of illegal cross-border trade with China and Viet Nam, the major importers; significant discrepancies in the trade in primary wood products have been reported among trading partners in the region.
- Myanmar's exports of tropical logs (primarily teak) peaked in 2013, at 2.7 million m^3 by volume and USD 1.45 billion by value, which was about 16% and 24%, respectively, of global tropical log exports in that year. Exports surged prior to an impending log export ban, announced in October 2012 and imposed in April 2014, which was designed to increase the access of domestic processors to raw materials. A ban was also imposed in 2013 on other timber exports except through Yangon to increase the efficiency of law enforcement by preventing cross-border trade. Import demand escalated in the ensuing period, with stockpiling

of Myanmar logs reported in India and Viet Nam (the major markets) before the ban was introduced. A one-year countrywide moratorium on logging (extended to ten years in the Bago Yoma Region) was declared in May 2016, and a ban on non-competitive sales of timber by the Myanma Timber Enterprise has been imposed since 2016, restricting the availability of roundwood for export (ITTO 2023b).

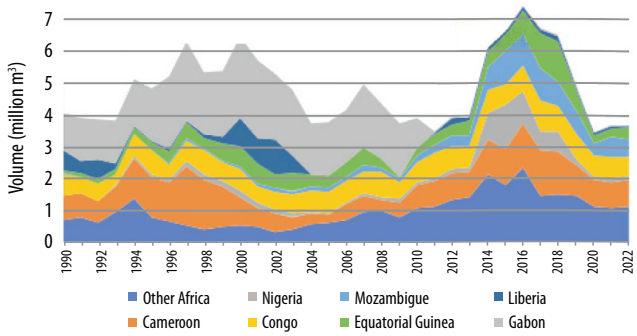
- Lao PDR's log exports followed a similar trend to Myanmar, peaking in 2014 in response to a surge in China's tropical log demand but declining thereafter to minimal levels in response to government interventions. The surge in exports between 2012 and 2014 was mainly in response to exponential growth in China's demand for rosewood species, particularly Siamese rosewood (*Dalbergia cochinchinensis*) and, to a lesser extent, Burma padauk (*Pterocarpus macrocarpus*).
- The primary driver of the plunge in log exports from Myanmar (as well as from Cambodia and Lao PDR) from 2015 has been the exploitation and depletion of the resource base, particularly of commercially valuable species such as rosewood and natural teak. Much of the commercially valuable natural-forest timber may have already been extracted.
- Over the period 1990–2022, tropical log exporters in Africa shifted their focus to markets outside the EU, particularly China and to a lesser extent India and Viet Nam. Gabon was the region's major exporter until 2011, when the government imposed a ban on log exports; nevertheless, African tropical log exports surged in 2013 and peaked in 2016, with significant increases in exports from Equatorial Guinea, Mozambique and Nigeria (Figure 14). The significant growth in exports from the region was driven by growth in consumer demand in China and by demand for African rosewood (*Pterocarpus erinaceus*) as a substitute for rosewood from Southeast Asia, even though many countries had log export restrictions in place (see Table 1).
- Although a number of tropical producer countries—particularly Cameroon, Côte d'Ivoire, the Democratic Republic of the Congo, Gabon, Malaysia, Papua New Guinea, Solomon Islands and Thailand—exported a significant proportion of their primary wood product production and were thus exposed to global demand shocks, world exports of tropical logs contracted only slightly during the GEC. China and India acted as buffers for tropical exporters when log demand contracted sharply in Western economies in response to steep contractions in construction activity and consumer spending. Many tropical exporters also diversified their trade to focus more on intraregional trade and other new emerging markets.
- The GEC had a significant effect on the direction and composition of trade from Africa. Gabon imposed log export quotas in 2008 but relaxed these during the GEC to maintain revenues and business in the poor trading conditions. Although the predominant species exported was okoumé, its share of the export volume declined from 52% in 2007 to 42% in 2009 (ATIBT 2010). This was because okoumé logs were targeted for use in domestic wood processing and exporters promoted higher-value species during the GEC. The number of species in the export mix was also reported to have declined during the GEC because less funding was available to promote lesser-known species.
- Africa's exports declined sharply from their peak in 2015, with exports in 2020 impeded by COVID-19 control measures and a lack of demand in major export markets. Exports increased by 8% in 2021, to 2.9 million m^3, but declined to 2.8 million m^3 in 2022 in after a slowdown in demand in China in the second half of that year. The major tropical log exporters in Africa in 2021 were Cameroon, the Congo, the Democratic Republic of the Congo, Ghana and Mozambique, and China, India and Viet Nam were the major export destinations. Imports by EU countries have diminished because African suppliers have found it difficult to meet the requirements of the EU Timber Regulation and its associated costs (ITTO 2023c).
- Papua New Guinea and Solomon Islands have become the dominant exporters of tropical logs. Their exports go overwhelmingly to China, and both countries are therefore dependent on market conditions in China. The growth in log exports by the two countries was in response to reduced supplies from other tropical exporters in Asia-Pacific and from the Russian Federation, which was the dominant log supplier to China before 2009 (when the Russian Federation implemented prohibitive log export taxes).
- The spread of COVID-19 and the institution of urban lockdowns had a significant impact on global timber supply chains between 2020 and 2022, with soaring freight rates and rising timber prices. Although freight rates have fallen since, wood supplies were also affected by transport disruptions in export ports and the difficulties faced by raw-material suppliers in securing shipping containers.

Tropical log export prices have been highly volatile, especially during economic crises, influenced by fluctuating supply-side and demand-side factors. Figure 15 and Figure 16 show trends in nominal unit values of tropical log exports by region and for major Asia-Pacific exporters, respectively.

Trade restrictions imposed by exporter countries

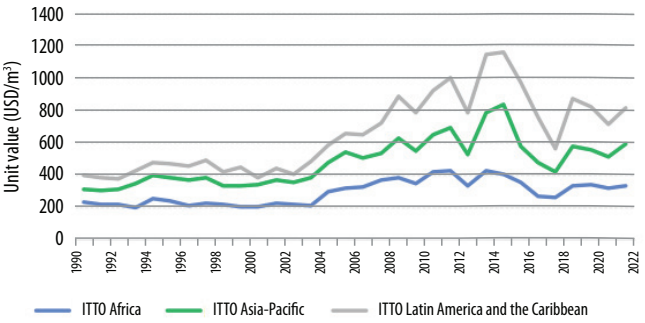
Exports of tropical logs have been affected by trade restrictions imposed by exporter countries, especially quantitative

Figure 14: Tropical log exports from Africa, by country, 1990–2022



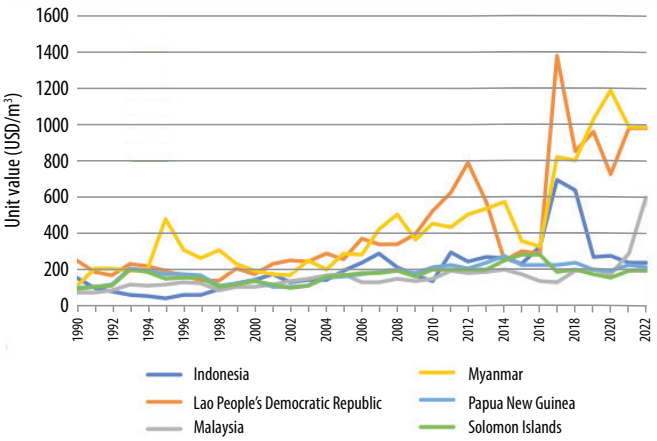
Note: Includes ITTO and non-ITTO countries.
Source: ITTO Statistics Database.

Figure 15: Unit values of tropical log exports by region, 1990–2022



Source: ITTO Statistics Database.

Figure 16: Unit values of tropical log exports by major Asia-Pacific exporters, 1990–2022



Source: ITTO Statistics Database.

restrictions on the export of unprocessed logs, quotas on the export of specified products and species, and log export taxes. The motivations vary from environmental (e.g. to curb overharvesting, deforestation and illegal logging) to social, political and economic (e.g. to encourage domestic wood processing and boost the development of local industries). Table 1 provides a summary of the export bans and restrictions imposed by a range of tropical wood producers.

Although most empirical studies have shown that the restriction of exports of unprocessed logs has increased wood-processing capacity (e.g. in Indonesia, Malaysia and the Philippines), there has been a high economic cost in the form of subsidization and inefficiencies, with poor log-conversion efficiencies associated with industrial overcapacity and high rates of deforestation (Fenton 1996; Resosudarmo and Yusuf 2006).

Log export bans have often been relaxed during economic crises to support domestic processing and boost local economies. In Indonesia, for example, the forest sector was severely affected by the Asian financial crisis, with the plywood industry's high debt levels impeding its ability to upgrade and to compete with the growing Chinese industry. Log export restrictions were relaxed and exports grew to China, with a high proportion reportedly of illegal origin. The government responded to high rates of deforestation by imposing a log export ban in October 2021.

Delays between the announcement and implementation of tropical log bans have often resulted in an increase in demand and a surge in exports before the ban comes into effect. In Gabon, for example, an announcement was made in November 2009 of the intention to prohibit the export of undressed roundwood. The ban was not implemented until May 2010, however, and the announcement triggered an upsurge in demand, especially from China and France (the major importers). In other major ITTO African supplying countries (Cameroon, the Congo and the Democratic Republic of the Congo), some log exports were diverted away from European destinations, where demand had dwindled, to the growing Chinese market. Cameroon also relaxed log export controls during the GEC as the wood-processing sector suffered setbacks in the depressed global market conditions. The country's log export quota on prime species was reimposed in 2011 but exports of lesser-known species were allowed to continue. As discussed previously, Myanmar's tropical log exports surged before an impending log export ban, which was announced in October 2012 but only imposed in April 2014.

Longer-term exports from African tropical countries will be affected by a planned ban on log exports by member countries of the Central African Economic Union (CEMAC), comprising Cameroon, the Central African Republic, Chad, the Congo, Equatorial Guinea and Gabon. The ban was initially scheduled to come into force on 1 January 2022 but was postponed to 1 January 2023 and then to a date to be determined (Kindzeka 2023). Despite the postponement, the Congo suspended log exports on 1 January 2023, and a total ban on log

Table 1: Primary-wood-product export bans and restrictions imposed by tropical producers

Region/country	Product and applicability
Asia-Pacific	
Cambodia	Ban on exports of logs and sawnwood and other specific species-based products (since 28/11/1996)
	Ban on exports of rare and endangered species (since 30/7/2022)
	Ban on exports of all timber to Viet Nam (January 2016)
India	Logging ban in natural forests
	Regional ban on exports of logs (since 2017) and sawnwood (since 2020)
Indonesia	V-Legal licensing requirement for voluntary-partnership-agreement-covered products exported to the European Union (15/11/2016)
	Reimplementation of ban on exports of logs and hoopwood (8/10/2001). Exports of plantation logs permitted (since 2017)
	Reimplementation of ban on exports of logs and hoopwood (8/10/2001). Exports of plantation logs permitted (since 2017)
	Reimplementation of ban on exports of logs and hoopwood (8/10/2001). Exports of plantation logs permitted (since 2017)
	Log export ban (1980–1992)
	Prohibitive tariff replaced log export ban (1992–1998)
Malaysia	Quota on the export of logs from Sarawak (1/1/1992), reduced progressively from 90% of the total volume of harvested logs permitted to be exported in 1992 to 20% from 2018
	Ban on export of logs from Sabah (1993–1996). Ban on export of logs from Sabah reimplemented (1/5/2018–3/1/2022)
	Ban on exports logs from Peninsular Malaysia (since 1985)
	Ban on exports of rubberwood (from 1/7/2017)
Myanmar	Ban on exports of logs (from 1/4/2014)
	Amendment to log export ban to permit exports from plantations (from 1/6/2019)
Papua New Guinea	Log export ban for certain species (1/1/1990)
	Quotas on logs allowed to be exported, now replaced by log export duties
	Ban on exports of all log concessions granted after 2010
Philippines	Ban on exports of lumber and semi-finished products from prohibited species (from 6/5/1989)
	Ban on exports of logs from natural forests, but the export of logs from plantation forests is permitted (from 6/5/1989)
	Ban on exports of raw logs (from 19/5/1975)
Viet Nam	Ban on the export of logs and sawnwood for wood harvested in natural forests (from 19/3/1992)
	Log export ban updated 18/5/2018
	Ban on exports of specific products derived from protected (Group IA & Group IIA) species (from 30/3/2006)
Africa	
Cameroon	Ban on exports of sawnwood greater than 15 cm in thickness (from 22/6/2000)
	Export quota on logs (20/1/1994–31/8/1999)
	Log export restrictions in the form of progressive increases in the share of annual cutting going to local processing (1999–2004). The export ban applied to selected hardwood species (e.g. bibolo, bubinga, iroko, moabi and wenge). Restrictions were extended to sawn boules and "clean sawn" logs in 2014
	Ban on exports of 31 species (since 2018), extended to 45 additional species in 2023, including moabi and okoumé
	Log export ban for Central African Economic Union countries originally scheduled for 1/1/2023, now delayed to a date to be confirmed
Congo	Ban on export of logs (from 1/1/2023)
	Ban on export of logs of most species; log export quota for certain high-quality species of 15% of each company's annual production volume (from 1/1/2000); this export quota was removed in the 2020 Forestry Code
Côte d'Ivoire	Ban on exports of unprocessed logs and sawn squares and flitches (from 6/9/1995)
	Ban on exports of *Pterocarpus* spp. and *Afrormosia elata* (from 25/7/2013)
Gabon	Ban on exports of logs, boules and throughcut logs (from 2011)
	Ban on exports of unprocessed and low-processed timber of three species: moabi, ozigo and kevazingo (intermittent from 30/6/2016, reinforced in April 2019)

Ghana	Ban on exports of logs from natural forests (from 1/1/1994)
	Levies on export of air-dried timber for nine important species
	Intermittent ban on harvesting and export of rosewood (*Pterocarpus erinaceus*), including a ban imposed on 15/7/2014
Liberia	Ban on logging and exports of logs under private-use permits (from 4/1/2013)
Nigeria	Ban on exports of logs and sawnwood (from 1/1/1976)
	Ban on exports of unfinished wood products, with species-based exceptions (from 1/1/1985)
Latin America and the Caribbean	
Brazil	Log export ban (since 1969)
	Exports of logs from forest plantations or sustainable management plans permitted (from 2005)
	Moratorium on bigleaf mahogany (*Swietenia macrophylla*) exports except from sustainable forest management plans (from 2001)
	Ban on exports of Brazil nut (*Bertholletia excelsa*) and rubberwood (*Hevea* spp.), except from sustainable forest management plans (from 30/11/2006)
	Ban on exports of endangered and vulnerable species, unless sourced from plantations or from sustainable forest management plans and categorized as vulnerable (from 23/9/2008)
Colombia	Regulations on log exports from natural forests (since 1968). Roundwood exports permitted from planted forests
Costa Rica	Log export ban. Export ban on roughly squared wood for certain species (from 1/1/1996)
Ecuador	Log export ban, except in limited quantities for scientific and experimental purposes (from 10/09/2004). Semi-finished forest products exports are allowed only when domestic needs and the minimum levels of industrialization have been met
	Export ban on mahogany and cedar logs
Guyana	Log exports permitted only for companies holding forest concessions. A log export ban applies to andiroba (*Carapa megistocarpa*) and jatoba (*Hymenaea courbaril*). Export taxes for logs and squares revised in 2013 for specific species and products
Nicaragua	Ban on timber exports of selected species—mahogany, royal cedar and pochote (from 1997). Mahogany exports are permitted for sawnwood, plywood and veneer. Sawnwood exports require a licence
Peru	Ban on the export of logs from natural forests (since 1/1/1972)
	Ban on the export of logs, hoopwood, cedar and mahogany sleepers, mahogany sawnwood thicker than 6 mm, and other articles of wood (from 1/1/1997)

Sources: Forest Trends (2023); various editions of ITTO's Tropical Timber Market Report.

exports was imposed in Gabon in 2010. A partial ban on log exports was implemented in Cameroon in 1999 in compliance with the provisions of the 1994 forestry law, with companies given five years to apply the ban. Logs continued to be exported from the country, however, via quota systems and exceptions for certain species built into the regulations. The Government of Cameroon has reportedly recently increased duties and export taxes on logs, prompting some operators to stop production in January 2023 (ITTO 2023d).

Tropical sawnwood trade

Figure 17 and Figure 18 shows imports and exports of tropical sawnwood from 1990 to 2022. World imports peaked in 2004 at 13.5 million m^3 before plunging to a record low in 2009, at 7.6 million m^3, mostly in response to a significant contraction in EU demand. World imports then trended upwards to a peak in 2017, at 12.7 million m^3, as China's import demand surged, before trending downwards to 11.0 million m^3 in 2021.

Tropical sawnwood import trends

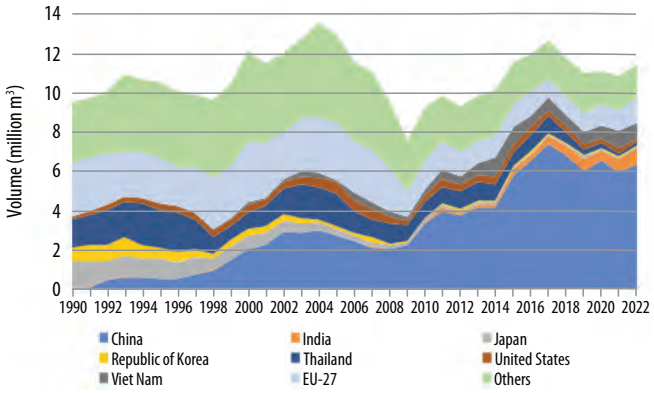
Major developments in the import trade over the period 1990–2022 include the following:

- **Significant growth in China's tropical sawnwood imports.** China's demand for tropical sawnwood imports reflects the country's domestic consumption as well as demand from the export-oriented wood manufacturing industries, particularly wooden furniture and flooring, and the relative competitiveness of tropical sawnwood manufactured from imported tropical logs. Imported tropical sawnwood is used mainly in furniture, interior decoration and home improvement and is more sensitive than softwood sawnwood to the export market environment (softwood sawnwood is used primarily in domestic construction). China's imports were negligible in 1990. Tropical sawnwood imports declined in volume in most Asian importing countries during the Asian financial crisis, but China's imports grew steadily, reaching a peak in 2004, as the country's wooden furniture production and exports grew. China's imports contracted slightly between 2004 and 2008 in response to restrictive trade measures imposed by the United States on some of China's wooden furniture exports, strong competition from

other low-cost suppliers and, in 2008, a sharp decline in demand for furniture in the United States, the major market, due to the impacts of the GEC. China's tropical sawnwood imports surged to a peak in 2017 of 7.4 million m^3, which was 58% of world imports, in response to the declining availability of tropical logs and growing demand for sawnwood in China's furniture and flooring industries. Imported tropical sawnwood also became more price-competitive than tropical sawnwood manufactured in China, where manufacturing costs had risen. China's tropical sawnwood imports declined year-on-year to a low of 6.1 million m^3 in 2019 and have fluctuated since, with impacts from disruptions in SPWP manufacturing resulting from COVID-19 lockdowns and, in 2022, from supply-chain disruptions triggered by the war in Ukraine and global shipping disruptions (ITTO 2023e).

- **Decline in importance of the EU market.** The EU (particularly Belgium, France, Germany, Italy, the Netherlands and the United Kingdom) was traditionally an important market for tropical sawnwood, particularly from Africa. Imports totalled 2.7 million m^3 in 1990, peaked in 2000 at 3.1 million m^3, and maintained a relatively high level until 2007. Imports started to contract before the GEC, with the tropical sawnwood market share declining in response to various factors, such as the diversion of global hardwood supply to competitive SPWP manufacturers in China and emerging markets; substitution by competitive European hardwood suppliers with better trading relationships than tropical supplying countries; changes in fashion trends favouring lighter-coloured temperate hardwoods; and a lack of availability of certified tropical sawnwood supplies. Tropical sawnwood imports plummeted in 2008 and 2009 as economic conditions deteriorated in most EU countries, reaching a record low of 1.3 million m^3 in 2009; the downward trend continued, with an import volume of 1.1 million m^3 in 2021.

Figure 17: Imports of tropical sawnwood, by major importing country or region, 1990–2022



Source: ITTO Statistics Database

- **Emergence of Viet Nam as a major importer.** Viet Nam has become a significant tropical sawnwood importer, with the growth in imports reflecting growth in the country's wooden furniture production and exports. The major suppliers have changed from predominantly Cambodia and Lao PDR to African countries. Although imports from the Mekong subregion fluctuated, they were relatively high until 2016, with large-scale smuggling of illegal timber from Cambodia into Viet Nam documented at the peak of the trade (Global Initiative Against Transnational Organized Crime 2021).
- **Thailand, historically a major importer, now an important exporter.** Thailand's imports from Malaysia mostly comprise structural materials consumed domestically, and import levels reflect growth in Thailand's construction industry. Imports from Lao PDR are reprocessed and exported as finished products and are therefore sensitive to demand trends in export markets. Thailand's sawnwood imports plunged in 1997–1998 during the Asian financial crisis but recovered to reach a peak in 2003. In 2010, unrelated to the GEC, political unrest in Thailand had a negative impact on the economy and the construction sector, leading to a reduction in tropical sawnwood imports.

Tropical sawnwood export trends

Major developments in the export trade of tropical sawnwood include the following:

- **Thailand now a major exporter of tropical sawnwood.** Thailand's exports have grown since 2009, and the country is now the dominant exporter globally of tropical sawnwood, most of which is of lower-cost plantation-grown rubberwood and almost all of which is exported to China as a raw material for that country's wooden furniture industry. Thailand's sawnwood exports have largely reflected market conditions in China, with volumes peaking in 2017 at 4.9 million m^3 and contracting in 2018 in response to the imposition of import tariffs by the United States on Chinese wooden furniture and the tightening of environmental controls on Chinese furniture manufacturers, which precipitated a decline in demand for rubberwood sawnwood used in furniture manufacture (Durst 2019). In the first half of 2020, at the start of the pandemic, Thailand's rubberwood sector was severely affected by declining demand in China and by logistical supply issues from China's imposed measures to control COVID-19. By May 2020, 60% of Thailand's sawmills had ceased production and 40% were working at minimum levels (ITTO 2020b).
- **Drops in sawnwood exports from Indonesia, Lao PDR and Malaysia.** Malaysia dominated world exports of tropical sawnwood between 1990 and the GEC (peaking in 1992, when exports totalled 5.4 million m^3, which was 54% of world exports), but the country's export volume fell thereafter,

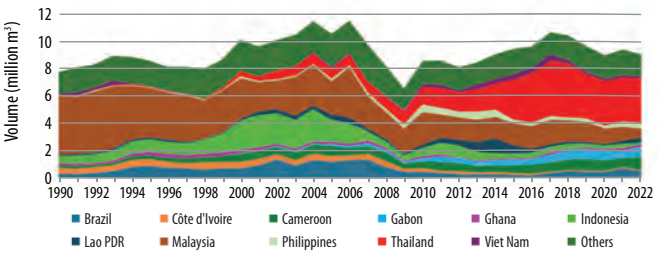
to 1.2 million m^3 in 2021 (10% of world exports). The availability of raw material declined in the country in response to the prioritization of domestic manufacturing and due to log-supply constraints caused by SFM policies. Although China was the major destination for Malaysia's tropical sawnwood exports in 2021 (13% of exports), there were diverse other export destinations, including Thailand (11%), the Philippines (10%), India (8%), Taiwan Province of China (6%) and the Netherlands (3%).

Indonesia was a significant tropical sawnwood exporter until the mid-2000s, shipping 2.9 million m^3 (20% of world exports) in 2004, the peak year. The country's exports declined dramatically in 2008, reflecting market conditions in China and the EU, the major markets. Exports remained relatively low thereafter; in 2021 they amounted to 0.4 million m^3, which was 3% of the world total. Although Indonesia's national timber legality assurance scheme, SVLK, became operational in 2014 and was expected to provide Indonesia's exporters with a competitive advantage in EU markets, SMEs have had difficulty in conforming to the requirements of the scheme, and expectations of significant growth in the EU market have not materialized.

Lao PDR's tropical sawnwood exports from natural forests have plunged in recent years. The volume reached nearly 1.3 million m^3 in 2014, at a value of USD 715 million, but had slumped to 210 000 m^3 by 2020. Sawnwood exports from natural forests were banned from 2016 but have continued, with Viet Nam now the major importer, followed by China and Thailand. Actual exports of sawnwood from Lao PDR during the GEC could have been higher than official records, with the suspected "creaming" of higher-value and large-diameter logs (Maplesden et al. 2013).

- **Gabon's tropical sawnwood exports up.** Gabon's tropical sawnwood production and exports increased after the imposition of a log export ban in 2011. Cameroon is Africa's major sawnwood exporter, with export trends following demand in EU markets, the major market destination, although exports have also grown to China and Viet Nam.

Figure 18: Tropical sawnwood exports by country, 1990–2022



Source: ITTO Statistics Database.

Tropical plywood trade

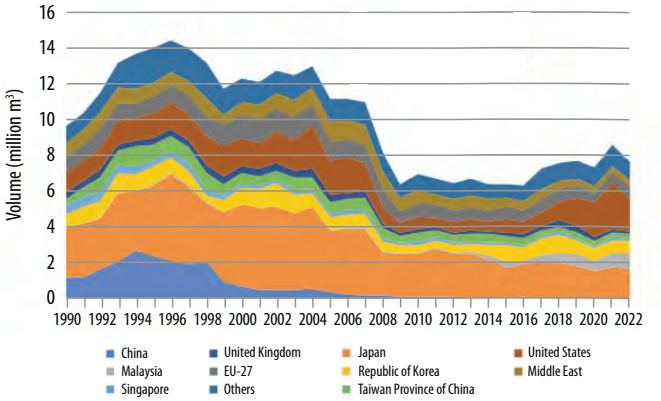
Plywood is the major tropical wood-based panel product, although its production and trade has declined since the 1990s, when tropical plywood dominated the trade in wood-based panels. World imports reached a peak of 14.5 million m^3 in 1996, before plunging to a low of 11.8 million m^3 in 1999, recovering to reach a high in 2004, and then plunging to a record low of 6.4 million m^3 in 2009. Global imports have remained relatively low since, although trending up slightly to 2021 (Figure 19).

Tropical plywood import trends

Developments in Japan's plywood imports. Japan was the dominant importer until 2020, but its imports of tropical plywood declined significantly, from a peak of 4.8 million m^3 in 1996 to 1.7 million m^3 in 2021. Imports benefited in the 1990s from an increase in the availability of Indonesian and Malaysian plywood, the declining competitiveness of the Japanese domestic tropical plywood industry, and, from 2010, the difficulties of the domestic plywood industry in procuring South Sea logs, which were increasingly diverted to other market destinations, especially China and India. Tropical plywood has been increasingly substituted by domestically produced softwood plywood and other panel products, particularly oriented strandboard in concrete formwork and medium-density fibreboard and particleboard in flooring applications. The market for tropical plywood in Japan has become more specialized and focused on a narrow range of niche markets.

Before the GEC, Japan's tropical plywood imports fluctuated in response to the availability of tropical logs for domestic plywood production and the prices of domestically produced tropical plywood relative to imported plywood from Malaysia and Indonesia. Imports fell by 25% in 2007 as a result of rising prices for Indonesian and Malaysian plywood and a dip in housing starts caused by poor implementation of the Building Standard Law, which was intended to crack down on the falsification of earthquake-resistance data for buildings. Imports stayed low in 2008 as global economic conditions deteriorated. Although Japan's total plywood imports fell by 18% in 2009 (to 2.9 million[3]) as a result of depressed housing starts, imports of tropical plywood increased slightly due to a decline in capacity of Japan's domestic tropical plywood mills, which curtailed production by 20–30% because of the depressed domestic market. Domestic mills also had difficulty in sourcing peeler logs from Malaysia as log demand in China and India escalated, reducing log availability. In late 2009, with Japan's plywood demand low and prices depressed, Malaysian suppliers began switching to other markets, leading to severely reduced inventories in Japan. Housing starts improved slightly in 2010, and domestic mills had difficulty sourcing tropical logs as demand escalated in China and India.

Figure 19: Global imports of tropical plywood, by major importing country or region, 1990–2022



Source: ITTO Statistics Database.

The earthquake and tsunami in March 2011 caused another demand shock to the Japanese economy that affected plywood demand. Japan's industrial output plunged immediately after the disaster and housing starts declined. Some domestic plywood capacity was affected, with around 25% of plywood capacity destroyed; supply disruptions and power shortages at viable plants further reduced production levels. By mid-2011, however, damaged plywood mills resumed production and mills that were not damaged increased production by almost 20% to meet demand for emergency housing in the affected areas. Many mills had been running well below capacity and were able to increase production substantially. Plywood imports surged immediately after the disaster, with aggressive purchasing, pushing up plywood prices. Most of the increase was from China and North America, with Indonesian producers unable to expand production because of a lack of log availability. Although plywood requirements for emergency repair work in the affected region were very high until mid-2011, demand in Japan's major plywood-consuming areas was slow and, by August 2011, demand for plywood for emergency housing had peaked and total plywood demand and imports began to drop.

In recent years, there has been a demand shift in Japan towards domestic plywood in response to the relatively high prices and reduced availability of South Sea plywood; the risk of exchange-rate fluctuations, which affect imported plywood but not Japanese plywood manufactured from domestic materials; government efforts to promote the expansion of domestic wood use; and consumer concerns about the environmental consequences of using tropical hardwoods. Exchange rates have had a major effect, with demand for imported tropical plywood influenced by the price differential between it and domestic softwood plywood.

Developments in United States imports of tropical plywood. The United States is a major importer of tropical plywood, although the value of its imports began dropping steeply in 2008 during the GEC. Hardwood plywood in the United States is used for cabinets, furniture, store fixtures, recreational vehicles and manufactured homes, as well as for residential house construction and remodelling. Plywood consumption is closely linked, therefore, to housing and construction trends.

Antidumping investigations and the imposition of antidumping duties by importing countries have affected trade in tropical wood products, including plywood. The price-competitiveness of tropical plywood from China became a major concern to United States hardwood plywood manufacturers before the GEC, when rising raw-material and labour costs put upward pressure on those manufacturers and lower input costs from imported plywood put downward pressure on finished-product prices. The United States International Trade Commission launched a formal investigation in March 2007 into the legality of wood product supplies from China and other countries that could be affecting the United States hardwood industry. In 2008, the Commission concluded that the increased market share of imported hardwood plywood was due to shifting United States consumer preferences; improved logistical capabilities in distribution and retailing, which improved the sourcing of imported products; and a trend for United States producers to broaden their product lines or supplement domestic production with imports of finished products (United States International Trade Commission 2008). In addition to reduced demand, the market for imported plywood during and after the GEC was affected by amendments to the Lacey Act, which meant that United States importers are required to ensure their imports of plant products, including tropical plywood, are from legal sources; the introduction of stringent controls on formaldehyde content in composite boards; and increased demand for green building products.

United States plywood imports began recovering in 2017. Although the United States administration had imposed antidumping and countervailing duties on certain hardwood plywood imports from China, effective from April 2017, imports from China declined only marginally. The ongoing United States–China trade dispute resulted in the imposition of additional 10% tariffs on wood-based products from China, including plywood, from September 2018, increasing to 25% in 2019. Some Chinese exporters relocated to other countries such as Indonesia and Thailand to avoid these prohibitive tariffs; the mislabelling of Harmonized Commodity Description and Coding System (HS) codes in import documentation was also alleged (Yap 2018). As of January 2024, China's tropical plywood exports are subject to antidumping duties in various countries, such as the EU-27, the Republic of Korea, Morocco, Türkiye and the United States.

Growth in United States imports of tropical plywood accelerated between 2017 and 2021, reaching 2.6 million m^3 in 2021, nearly three times the volume in 2017. The significant growth in imports over this period reflected growth in the housing and construction sector, including during the height of the COVID-19 pandemic, when demand increased for larger homes for home workers and for materials for do-it-yourself home improvement and repairs. Imports continued to rise in 2021 amid surging economic growth and housing starts, which reached the highest rate since 2006.

The relocation of some Chinese exporters to Viet Nam and other countries, and a subsequent surge in United States imports of tropical plywood from Viet Nam, led the United States Department of Commerce to initiate an inquiry into whether imports of hardwood plywood completed in Viet Nam using components from China were circumventing antidumping and countervailing duty orders on hardwood plywood from China (International Trade Administration 2020). A preliminary decision was announced in July 2022, which stated that, if plywood products imported from Viet Nam into the United States had cores using materials imported from China, they would be subject to the antidumping and antisubsidy duties applied to plywood from China. Plywood manufactured in Viet Nam with cores using materials manufactured in Viet Nam or in other countries would not be subject to the antidumping and antisubsidy duties, however.

Developments in China's imports of tropical plywood. China was a major tropical plywood importer in the 1990s, but its imports plunged from 1998 and are now low. The decline reflected significant growth in China's own plywood production capacity and in its softwood plywood production and imports. China's tropical plywood exports were subject to trade measures in its major markets of the EU, the Republic of Korea and the United States, with the EU imposing antidumping duties on Chinese okoumé-faced plywood in 2004, in addition to the United States trade measures discussed above. The export competitiveness of Chinese tropical plywood has also been affected by difficulties in supplying environmentally certified products due to complexities in supply chains, quality concerns and rising production costs. Although reliable data on China's tropical plywood production are unavailable, it can be assumed that tropical plywood has been used increasingly for domestic purposes, following incentives to increase domestic consumption.

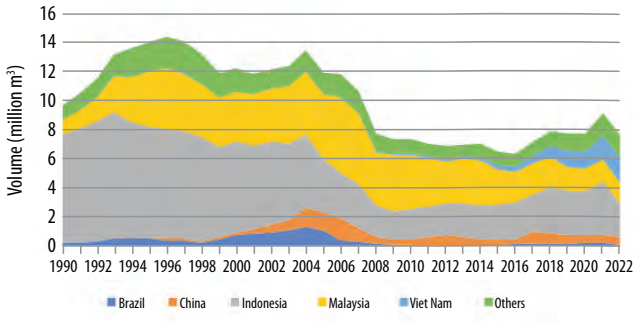
Tropical plywood export trends

The tropical plywood export trade has been dominated by China, Indonesia, Malaysia and Viet Nam (Figure 20), with export trends reflecting their relative competitiveness. These trends are driven mainly by access to supplies of peeler logs of appropriate quality and by international concerns about legal sourcing and governance. In 1996, the peak year for global tropical plywood exports, Indonesia supplied 52% of world exports and Malaysia supplied 29%, while exports by China were negligible. China emerged as a major exporter in the 2000s, and Viet Nam has emerged as a major player more recently (since about 2017).

Indonesia's tropical plywood exports peaked in 1993, at 8.6 million m^3, which was two-thirds of the world's total tropical plywood exports in that year and nearly half of all plywood exports (i.e. both tropical and non-tropical). The country's tropical plywood exports declined thereafter to 2009, to a record low of 1.9 million m^3, before trending upwards again, reaching 3.2 million m^3 in 2021. The significant decline in exports from the 1990s reflected the reduced availability of logs of peeler quality in Indonesia due to resource overexploitation, a sharp decline in legally sanctioned logging quotas, and improvements in forest law enforcement practices; lost sales because of concerns about the legality of Indonesian supply in major markets; and a decline in price-competitiveness in some markets compared with Malaysian plywood. Plywood production was also diverted to the domestic market, with the Indonesian furniture industry growing significantly. The recent growth in tropical plywood exports has been due to an increase in sales to the United States, the major market, with Indonesian (and other Asian) producers benefiting from a move among United States importers to diversify their sources of supply away from China to other Asian suppliers. China also shifted some of its production capacity to Indonesia (and Viet Nam) to avoid prohibitive tariffs on United States plywood imports from China. Indonesia started supplying Forest Law Enforcement, Governance and Trade (FLEGT)-licensed plywood to EU markets in 2016, although there is debate on whether this has provided it with a competitive advantage over other tropical plywood suppliers (Prasada et al. 2022).

The volume of Malaysia's tropical plywood exports was mostly steady (although comprising an increasing share of global tropical plywood exports) between 1993 and 2009 because of its more advanced certification programme, aggressive marketing, and the diversification of export markets. The country's plywood exports contracted from 2009, however, reaching 1.5 million m^3 in 2021, which was considerably less than the high of 5.2 million m^3 achieved in 2006. The decline in Malaysia's tropical plywood exports was due to chronic supply shortages of raw-material input (i.e. peeler logs) to plywood mills, rising production costs and export prices, and continued depressed demand in Japan, Malaysia's major market. Demand for Malaysian plywood logs increased in India after a log export ban in Myanmar from 2014 and again in 2017 before the introduction of a goods and services tax, which further decreased the supply of peeler logs for Malaysian plywood mills and pushed up domestic log prices. The competitiveness of Malaysian wood product exports has been challenged by the cost burden of certification, competition from lower-cost producers, and an escalation of shipping and freight charges. In contrast to Indonesia, which mainly supplies floor-base plywood to Japan, Malaysia's exports to Japan are used predominantly for concrete formwork, a commodity item with many distribution layers and relatively unsteady demand.

Figure 20: Tropical plywood exports, by country, 1990–2022



Source: ITTO Statistics Database.

Secondary processed wood product trade

SPWPs comprise wooden furniture and parts, builders' woodwork and joinery (which includes windows, doors, flooring and panelling), wooden mouldings, and "other" SPWPs (comprising a wide variety of products such as picture frames, tableware, kitchenware and other small wooden items). Monitoring the production and trade of tropical SPWP items is inherently difficult because few are classified by species in the HS and the data do not differentiate between tropical and non-tropical.[6] SPWP items may also be composite products composed of a combination of species and products such as veneer, medium-density fibreboard, plywood, sawnwood and non-wood products such as plastics and steel. It is assumed that many tropical producer countries produce and export significant quantities of wooden furniture and joinery manufactured from tropical primary wood products, along with China, which is a significant importer of tropical primary wood products. SPWP trade data are available only by value and it is therefore not possible to determine the volume of tropical SPWP trade; nevertheless, changes in trade values are likely indicative of changes in the volumes traded (taking into account changes in prices and exchange rates).

SPWP export trends

Important trends in the SPWP export trade between 1990 and 2022 include:

- significant growth in SPWP exports from tropical countries, with a value of USD 36.1 billion in 2022, up from USD 1.7 billion in 1990 and USD 14.7 billion in 2000 (Figure 21);
- rapid growth in wooden furniture exports from China and other tropical exporters, notably Viet Nam (Figure 22), with the share of wooden furniture in total SPWP export values from tropical countries increasing from 28% in 1990, to 57% in 2000, to 75% in 2022. The bulk of exports have been from the Asia-Pacific region; and
- Viet Nam and other tropical exporters benefiting from United States antidumping measures on imports from China.

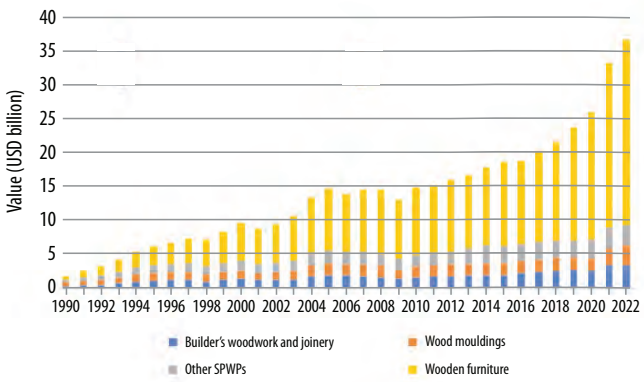
Rapid growth in China's wooden furniture exports. China dominates world exports of SPWPs: the value of its exports grew rapidly to USD 33.0 billion in 2014, declined to USD 30.3 billion in 2020, and jumped to USD 37.0 billion in 2022. Wooden furniture (particularly wooden bedroom furniture), which is China's largest wood-product export item, accounted for 69% of China's SPWP exports by value in 2022. China's tropical wooden furniture exports are strongly competitive in price-sensitive markets; nevertheless, the value of this trade has been growing at a faster rate than the quantity, indicating an expanding proportion of higher-value items in the product mix.

During the GEC, China's wooden-furniture-manufacturing industry benefited from rebates on value-added tax rebates for 117 wood-product export items, including bamboo products, wood-based panels, flooring products, and furniture products. The EU, Japan, the United Kingdom and the United States are the dominant markets for China's wooden furniture and parts. Exports to the United States (the biggest market) declined in 2008 and 2009 due to reduced consumer spending there and plummeting housing starts; nevertheless, the United States still accounted for more than one-third of China's total exports of furniture and parts in those years (the next-largest markets were the United Kingdom and Japan). Exports to the United States were also affected by antidumping duties imposed on wooden bedroom furniture from China in 2004. Successive reviews by the United States International Trade Commission determined that the duties should remain in place, assessing that United States furniture manufacturers would be disadvantaged if the duties were revoked. The duties resulted in the relocation of some manufacturers—particularly foreign-owned enterprises operating in China—to Viet Nam, and Chinese exports produced by foreign-invested multinationals fell steadily from their peak in 2005 (Maplesden et al. 2013). Some production was also diverted to items not subject to antidumping measures, such as seats with wooden frames. China's furniture industry was also challenged by environmental laws in the EU and the United States, which imposed restrictions on China's wooden furniture and parts. An important trend since the GEC has been the development of emerging markets as a source of external demand, particularly Association of South East Asian Nations (ASEAN) countries and the Middle East.

Chinese wooden furniture exports to the United States plunged from a peak of USD 10.1 billion in 2018 to USD 6.2 billion in 2020, with exports affected by retaliatory tariffs imposed by the United States on Chinese furniture imports (among other products), which accentuated the trend of relocation of furniture manufacturing to Viet Nam. In 2020, the drop in

6 Therefore, the data presented here are for tropical and non-tropical wood unless otherwise stated.

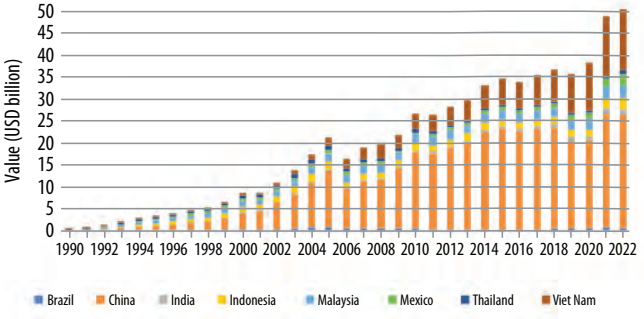
Figure 21: Exports of secondary processed wood products from tropical countries, 1990–2022



Note: Tropical countries include both ITTO and non-ITTO member countries in the tropics. China is not included in this classification.

Source: ITTO Statistics Database.

Figure 22: Exports of wooden furniture by major tropical exporters and China, 1990–2022



Source: ITTO Statistics Database.

China's wooden furniture exports was also associated with a rise in Chinese domestic consumption of furniture in response to an increase in real-estate development and household incomes (ITTO 2021). Exports to the United States picked up strongly in 2021 but fell again (by 14%) in 2022 due to COVID-19 restrictions and a slowdown in China's economy and real-estate sector, which affected Chinese production (and consumption) as well as global supply chains and trade. The United States accounted for 28% of Chinese wooden furniture exports (by value) in 2022, followed by Australia (6%), Japan (6%), the Republic of Korea (6%) and the United Kingdom (5%). The value of Chinese exports to ASEAN countries (assisted by the China–ASEAN Free Trade Agreement) and the Middle East (especially Saudi Arabia and the United Arab Emirates) have risen considerably in recent years as exporters have sought to diversify markets.

SPWP import trends

The dominant markets for SPWP imports are the EU countries and the United States (other significant importers are Australia, Canada, Japan and the Republic of Korea) (Figure 23). Global demand for wooden furniture and joinery products, therefore, follows trends in housing starts and consumer spending in the EU and the United States.

Developments in United States imports of wooden furniture. The United States is the biggest importer of wooden furniture and parts, accounting for more than one-third of world imports (by value) in 2022. The value of its SPWP imports has grown significantly since 1990, reaching USD 32.5 billion in 2022 (Figure 24). The value grew steeply between 1990 and the mid-2000s and then eased following the imposition of antidumping duties on wooden bedroom furniture from China (the major supplier). The value of wooden furniture imports then plummeted by 22% in 2009 during the GEC following the collapse of housing starts, as well as increased unemployment and reduced household income. Although China remained the dominant supplier to the United States, its shipments fell in 2009 while imports from Viet Nam increased, reflecting Viet Nam's comparative advantage in labour and overall production costs compared with China and a shift in China's focus towards other markets.

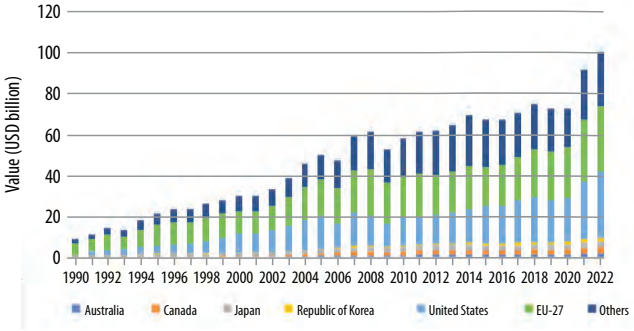
The value of United States wooden furniture imports rebounded by 20% in 2020, assisted by increased employment rates, low interest rates and stabilizing home prices, which led to increased consumer spending and demand for furniture.

As shown in Figure 24, wooden furniture imports by the United States grew considerably between 2011 and 2022 in value terms, driven by growth in housing starts, lower unemployment and growing consumer confidence. But rising furniture prices due to increased production costs in China and Viet Nam and the move of many Chinese producers up the value chain to produce higher-value products means that the volume of furniture demand might not have increased.

United States wooden furniture imports declined in 2019—before the COVID-19 pandemic—in response to persistent weakness in the housing market (although housing starts picked up strongly in the second half of 2019). Imports increased slightly in value in 2020: they slumped early in the year during the first wave of the pandemic but recovered strongly later in the year. Imports grew significantly in 2021, to USD 27.8 billion, up by 31% compared with 2020, amid surging economic growth, housing starts and consumer confidence.

Import value rose by another 17% in 2022, with the economy remaining strong despite the pandemic, supply-chain issues, the war in Ukraine (and its impacts on global energy markets), and high global inflation. In contrast to the EU, a significant proportion of United States imports of wooden furniture is from tropical countries (63% in 2022), mainly Brazil,

Figure 23: Imports of wooden furniture, by importing country and region, 1990–2022



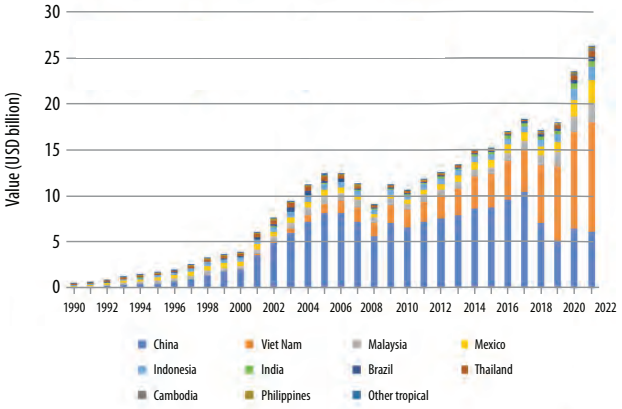
Source: ITTO Statistics Database.

Cambodia, India, Indonesia, Malaysia, Mexico, Thailand and Viet Nam. Tropical exporters plus China supplied 90% of US wooden furniture imports in 2021 and 84% in 2022. Imports from Viet Nam and China comprised 37 % and 22%, respectively, of United States imports of wooden furniture by value in 2022; imports from all major tropical suppliers rose significantly, including Viet Nam (where the value grew by 14%), but declined from China (by 13%).

Developments in EU-27 + UK imports of wooden furniture. Figure 25 shows wooden furniture imports by the EU-27 plus the United Kingdom (abbreviated here to EU-27 + UK, or simply "EU" for the period before the UK left the EU) from China and tropical suppliers between 1990 and 2022.

EU imports of SPWPs grew consistently in the decade to 2007 but slowed in 2008. Significant structural changes occurred in the furniture and joinery industries of many EU countries as imported products from Asia became more price-competitive in many market niches. EU wooden furniture imports from China and tropical countries plunged in 2009 and recovered slightly in 2010, although economic uncertainty in the euro zone dampened a sustained recovery in imports to GEC levels. Germany, France and the United Kingdom were the largest importers, followed by Italy, the Netherlands and Belgium, with most of these recording minor turnarounds in imports in 2010. Imports of wooden furniture from China and tropical countries fluctuated over the decade to 2020 (although the value in 2020 was similar to that in 2010) before surging by 41% in 2021, to USD 8.20 billion (and USD 8.18 billion in 2022) (Figure 25). Imports of wooden furniture from outside the EU-27 + UK represent only a small proportion of the region's furniture supply, with a large proportion of imports coming from intraregional suppliers; Eastern European suppliers (particularly Poland) are playing an increasing role in EU-27 + UK wooden furniture production and trade.

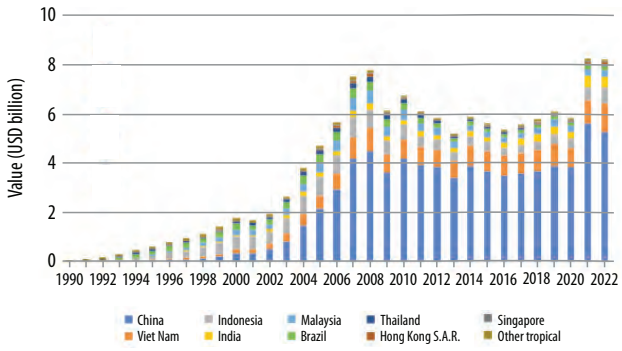
Figure 24: United States imports of wooden furniture from China and major tropical suppliers, 1991–2022



Source: United Nations (undated).

Imports from extraregional suppliers are mainly from China (the largest) and the tropical countries of Brazil, India, Indonesia, Malaysia and Viet Nam. EU-27 + UK imports from China surged in 2021, to USD 5.6 billion, as China diverted exports in response to retaliatory tariffs imposed by the United States and as EU-27 + UK demand surged for home furniture products and home-office furniture. Imports declined slightly in 2022, reflecting chronic supply problems caused by COVID-19 restrictions in China, supply-chain disruptions due to high energy prices, and a slowdown in China's economy and real-estate sector, which affected Chinese wooden-furniture production and global supply chains. Wooden furniture imports from China by the EU-27 + UK from China declined in 2022 but imports from Indonesia and Viet Nam—the largest tropical supplying countries—increased.

Figure 25: Imports of wooden furniture by the EU and EU-27 and United Kingdom from China and other major tropical suppliers, 1990–2022



Source: United Nations (undated).

Tropical suppliers to EU markets have faced several challenges in the last three decades. These have included fashion changes favouring temperate woods, the growing price-competitiveness of European producers, market prejudice against tropical woods, and substitution by other materials. Indonesia has been the only supplier of FLEGT-licensed furniture to EU-27 + UK markets; its exports to the region have increased, although a recent survey concluded that, since the beginning of the COVID-19 pandemic and the war in Ukraine and related trade sanctions, FLEGT licensing has played only a very minor role in timber purchasing decisions in the EU-27 + UK (ITTO/FLEGT IMM 2023). Other factors, such as the limitations of supply across all product ranges, trade restrictions, and high freight costs and product prices, were more important in purchasing decisions in 2020–2022.

5 FUTURE SUPPLY AND DEMAND FOR TROPICAL TIMBER

The tropical timber sector has been shaped since 1990 by complex interactions among a number of factors influencing production, consumption and trade. Global economic shocks associated with the Asian financial crisis, the GEC and the COVID-19 pandemic have had significant impacts on global timber consumption patterns, although production levels recovered within three to five years after the Asian financial crisis and the GEC. The GEC accelerated a shift in the consumption of tropical wood products from the EU and the United States to Asia (especially China and India). Production has declined in natural tropical forests and increased in plantations, with significant differences between countries based on the level of government and private-sector investment. Factors affecting the competitiveness of tropical exporters include exchange-rate volatility; rising production and transport costs (which have pushed up prices); product differentiation and supply-chain responsiveness; technological developments that have enabled substitution by other wood products and materials; requirements for certification in some consumer markets; and trade restrictions imposed on certain tropical timber exporters and products.

ITTO published projections of tropical timber supply and demand to 2050 (Held et al. 2021), drawing on the Global Forest Products Model, a dynamic model of worldwide forest-product production, consumption and trade. Key findings from the study are as follows:

- Global industrial roundwood production is projected to grow by 45% by 2050, to 2.8 billion m^3, but tropical production is projected to increase by only 24%, to 533 million m^3.
- All three tropical timber producer regions (i.e. sub-Saharan Africa, Latin America and Southeast Asia) will be net exporters of industrial roundwood by 2050, accounting for 19% of global production.
- Tropical industrial roundwood will increasingly be supplied by plantations, with natural forests projected to account for 27% of the volume in 2050, down from 35% in 2015.
- To maintain market share, timber production in tropical forests needs to become more competitive by expanding the range of commercial species and including revenue streams from carbon sequestration and other ecosystem services.
- Industrial concessions and communities will need to improve their silviculture and obtain third-party certification of legality and sustainability.
- With limited expansion possibilities for large-scale plantations, smallholders and agroforestry systems will become important producers. Both need to further increase productivity and timber quality.
- Private-equity capitalization and incentives for small-to-large plantation-based enterprises will be crucial for stimulating growth in the forest sector.
- Global production of primary wood products is projected to be 3.7 billion m^3 (roundwood equivalent) in 2050, an increase of 61% compared with 2015. Tropical production of primary wood products is projected to increase by only 36%, however, to 476 million m^3.
- Production increases in the tropical regions will be driven partly by exports: according to projections, net export volumes will contribute 23% to production growth to 2050 in Latin America and 30% in Southeast Asia.
- The domestic consumption of primary wood products will be relatively low in tropical producer regions in 2050, at 12% of global consumption, even though 38% of the world population will be living in those regions.
- Low domestic market demand in the tropical producer regions will constrain wood-industry development by deterring investments in modern, capital-intensive wood-processing industries.
- Forest industry employment in the tropical producer regions is projected to grow by 1.3 million jobs, to 7 million full-time equivalent employees in 2050.
- Future employment in the forest sector, especially in wood-processing industries, will require a well-trained workforce, which still needs to be developed.
- The forest industry in tropical producer regions will need to modernize in the lead-up to 2050 and invest more than USD 40 billion in the expansion of processing capacities.
- Transformative public and private investments will be required to overcome the tropical forest sector's challenges. Public investment would facilitate the raising of private investment at scale and is needed to stimulate sustainable growth.
- The tropical wood-processing sector will need to overcome structural barriers that hinder enterprise development.

ITTO will continue to monitor trends and developments in tropical timber production and trade, consistent with its objectives, to improve understanding of the structural conditions in timber markets, including long-term trends in consumption and production.

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There have been significant changes in the production, consumption and trade of tropical wood products globally since 1990. The availability and quality of tropical roundwood supply from natural forests has become increasingly restricted, and economic and demographic changes have shifted the location and growth of tropical wood product industries—and the geographic location of demand—from developed to developing countries, especially China. This study summarizes ITTO's core statistical data over the last three decades; it provides an essential overview of long-term developments in the tropical timber sector.

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