



## Background Analytical Study 4

# Sustainable consumption and production of forest products<sup>1</sup>

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<sup>1</sup> In response to paragraph 23 of resolution 12/1, the UN Forum on Forests Secretariat commissioned four background analytical studies on the contribution of forests to the achievement of the Sustainable Development Goals under review by the high level political forum on sustainable development in 2018, in consultation with the Bureau of the thirteenth session of the Forum. The studies include: (a) forest ecosystem services; (b) forests and water; (c) forests and energy; and (d) the sustainable consumption and production of forest products.

<sup>2</sup> The views and opinions expressed herein are those of the authors and do not necessarily reflect those of the United Nations Secretariat. The designations and terminology employed may not conform to United Nations practice and do not imply the expression of any opinion whatsoever on the part of the Organization

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## Executive summary

### Forest products: production, trade and consumption

About 60 per cent of the world's forests – approximately 2.4 billion hectares – are primarily or partially used for the production of wood and non-wood forest products. Wood fuel, including charcoal, accounts for about half of total global roundwood production, and industrial roundwood for the other half. Most wood fuel is used in its country of production, particularly in rural areas and in developing countries, for heating and cooking, usually on open fires or in simple cookstoves.

On a global scale, production of all other categories of wood products increased steadily from 2000 to 2006 but then fell sharply during the world financial crisis and the recession that followed. All product categories were affected, but those used in construction, especially sawnwood, fell particularly abruptly with the fall in activity in the housing sector; the impact was most evident in the US and its main foreign supplier, Canada. Global production of other categories, including pulp and paper, were less affected and is now significantly higher than in 2000.

International trade in wood products was similarly affected by the recession, falling by more than 20 per cent in 2008–09, after growing by over 60 per cent since 2000. Exports recovered quickly, but have remained roughly constant since 2011. In terms of volume, roughly half of trade is accounted for by the paper sector, and half by all other wood products. Trade in the latter, particularly in sawnwood, was most negatively affected by the recession, and has yet to substantially exceed pre-crisis levels. Trade in paper recovered quickly and has remained roughly stable since. In terms of value, trade in wooden furniture has seen the strongest growth both before and after the recession.

As with other natural resources, a significant proportion of the growth in trade has been caused by the expansion of demand in China, which has seen rapid and sustained growth in industries transforming raw material into finished and semi-finished wood products for export to Japan, the Middle East, the EU and the US, and also for growing domestic consumption. Between 2000 and 2015, China's estimated consumption by those industries increased nearly threefold, and since 2011 imports have exceeded production; the largest source is Russia, followed by Canada, New Zealand and the US. China is now by far the world's largest producer and consumer of wood-based panels and paper, the largest importer of industrial roundwood, sawnwood and pulp and recovered paper, and the largest exporter of wood-based panels and wooden furniture. The largest single global trade flow, however, remains the export of sawnwood from Canada to the US.

Many factors contribute to demand for wood products. These include population, not just its overall size but its rate of growth, levels of urbanisation, migration and changing age structures. The population density in any given country, particularly density per unit of forest, provides a good indication of the pressure on the country's forests. Increases in working age populations and in levels of urbanisation tend to increase the demand for housing and wood products used in construction and furnishing, though urbanisation can also reduce demand for wood fuel, as access to electricity and alternative forms of heating is generally easier in urban than in rural areas.

Demand for wood products is significantly affected by changes in income. All else being equal, increasing income tends to be associated with rising demand for wood products (apart from wood fuel), particularly those used in construction and housing. Paper consumption also tends to rise steeply with income, though in some high-income countries it is now falling, probably connected with the increasing use of IT and declining newspaper readership. High-income and more highly educated populations also tend to be more sensitive to the environmental and social impacts of consumption and more willing to demand recycled or certified sustainable products; this is also affected by business behaviour and public policy. Other public policies affecting demand include the incentives put in place in several countries, mainly in the EU, for renewable energy, leading to a rise in the consumption of wood fuel, chips and – especially – wood pellets. Future policy developments may include encouragement for the wider use of wood in construction, for climate objectives, and for the replacement of plastic by paper in packaging.

Technological change also affects demand; this includes developments in wood processing technology allowing improved rates of recovery and the use of small-dimension timber, and improvements in reuse and recycling. New uses for wood – for example, wood pellets for energy generation or cross-laminated timber for construction – may emerge, and entirely new technologies develop, such as biomaterials from biorefineries. Finally, a key determinant of demand is the availability on the market of alternatives to wood, such as concrete or brick for construction, or metals or plastics for other products. The extent to which alternatives are used varies not only with their price but with local culture and habits and public policy.

Non-wood forest products (NWFPs) include medicinal plants and raw materials for pharmaceutical products; other plant-based products, including foods, spices, herbs, fodder, fibres, fragrances, seeds, resins and oils; and animal-based products such as bushmeat, hides, honey, beeswax and edible insects. Data on production, consumption and trade is largely lacking, but their contribution to development and welfare is significant. In 2011 NWFPs generated an estimated US\$88 billion in income world-wide, though this probably an under-estimate. About 80 per cent of the population of the developing world uses NWFPs for health and nutritional needs and in 2011 forest products contributed to the provision of shelter for an estimated 1.3 billion people. NWFPs tend not to feature on the policy agenda, but some countries have adopted specific national strategies, promoting their sustainable use and fostering the development of small-scale non-wood forest enterprises.

### **Towards the sustainable supply of forest products: forests, deforestation and the SDGs**

As well as producing wood and non-wood products, forests provide solutions to challenges including poverty eradication, environmental sustainability, food security and agriculture, energy, clean water and watershed protection, biodiversity conservation, climate change, desertification and land degradation, and disaster risk reduction. More than 1.6 billion people world-wide – almost a quarter of the global population – depend on forests for food, medicines and fuel, as well as their jobs and livelihoods, and 200 million people, including many indigenous people, directly depend on forests for their survival. Forests have the potential to absorb and store about one tenth of the global anthropogenic carbon emissions projected for the first half of this century into their biomass, soils and products. Three-quarters of the world's freshwater is provided through forested catchments, and forests contain over 80 per cent of the world's terrestrial biodiversity.

The UN Sustainable Development Goals (SDGs) identify means of sustaining many of these functions. SDG 12, on sustainable consumption and production, is of particular relevance to the supply of forest products, though progress towards this goal has so far been very limited. SDG 15, on terrestrial ecosystems, sets goals for promoting sustainable forest management, halting deforestation by 2020, restoring degraded forests and increasing afforestation and reforestation. Progress here has been uneven. While the world's forest area has continued to shrink, the pace of forest loss has slowed; more forests are being protected, and areas under long-term management plans and voluntary certification have increased.

Overall, 30 per cent of the world's land area – about 4 billion hectares – is currently covered by forest, a reduction from 4.13 billion hectares in 1990, under the pressure of population increases and demand for land for crops and grazing, and of unsustainable levels of exploitation of forest resources. While the rate of net forest loss has slowed in the last two and a half decades, it remains unsustainably high. The bulk of the world's forests – 3.7 billion hectares (93 per cent) in 2015 – is natural forest, and this fell by a net 6.5 million hectares per year from 2010 to 2015. The remaining 291 million hectares is planted forest, which has increased by over 105 million hectares since 1990.

The most sustained programme of reforestation and afforestation has been in China, which for many years accounted for more afforestation than the rest of the world combined; it is now home to about 79 million hectares of planted forest. If not properly managed, however, afforestation and reforestation efforts risk the production of monocultures that diminish local biodiversity, introduce non-native and potentially invasive species, reduce stream flow and lose revenue from agriculture. The relatively new approach of forest landscape restoration makes use of collaborative approaches to harmonise the land-use decisions of stakeholders, with the aims of restoring ecological integrity and enhancing the development of local communities.

### **Policies to support sustainable production, trade and consumption of forest products**

The concept of sustainable forest management – sustainably managing forest resources and forest lands to meet the social, economic, ecological, cultural and spiritual needs of present and future generations – has become widely accepted, elaborated in considerable detail through regional processes, and incorporated widely in national legislation, development programmes, business strategies, NGO campaigns and forest certification schemes. Although it may be appealed to more frequently than it is implemented in reality, it has had a major impact on policy-making and practice.

National governments possess a huge range of policies and legislation designed to protect forests, encourage reforestation and afforestation, promote SFM and develop markets for sustainably produced forest products. Although on a global scale these are clearly still inadequate to prevent forest loss, many countries have seen encouraging developments in recent years. Some policies and legislation, however, have the opposite effect, promoting the unsustainable consumption of forest products and encouraging deforestation. The key underlying problem is that market prices for timber products, including paper, and the products derived from converted forest land, do not incorporate the value of the lost economic, social and environmental functions the forests would have provided; agriculture, for example (the main global cause of forest loss) is generally more profitable.

In recent years many governments have taken action to reduce the extent of illegal logging. This includes both improvements in forest governance and law enforcement in producer countries, the bilateral Voluntary Partnership Agreements between the EU and a number of developing countries, broader legislation aimed at excluding illegal products from consumer markets, and public and private procurement policies requiring legal (and sometimes sustainable) products. While the extent of illegal logging for timber appears to have fallen in the last ten years or so, the illegal clearance of forests for agriculture is now a major problem.

Many private-sector companies have taken action to exclude illegal and unsustainable wood products from their supply chains, and an increasing number have adopted targets for achieving zero deforestation or zero net deforestation in their supply chains, usually by 2020. Many companies have adopted purchasing policies aimed at sourcing sustainably produced timber and wood products and, increasingly, agricultural commodities associated with deforestation, such as palm oil or cocoa.

Many of these public policies and company approaches rely on forest certification schemes to discriminate between legal and sustainable and illegal and unsustainable products. The proportion of global forest area certified under either or both of the Forest Stewardship Council (FSC) or the Programme for the Endorsement of Forest Certification (PEFC) schemes reached almost 11 per cent in 2017, mostly in North America and Europe, and in 2016 an estimated 29 per cent of global industrial roundwood was certified.

‘Reducing emissions from deforestation and forest degradation, plus conservation’ – REDD+ – is a simple concept which is proving difficult in practice to implement. Donor countries have to date pledged more than US\$10 billion, most of which has been devoted to ‘readiness’ activities. In a few countries, REDD+ activities are now moving into the investment phase, scaling up policies and measures designed to address the drivers of deforestation and degradation. The third and final phase, however – performance-based payments for verified reductions in emissions – is in place in very few countries, largely due to major methodological, practical and political challenges, including problems of leakage and permanence, and weaknesses in governance and law enforcement. At least 90 per cent of REDD+ financing to date has derived from public sources, and the emergence of a global forest carbon market still seems to be many years off.

While no legally binding multilateral agreement on forests or the global timber trade exists, the activities of several international institutions are relevant to the implementation of sustainable forest management. These include the UN Forum on Forests (which hosted the negotiations leading to the UN Forest Instrument and the UN Strategic Plan for Forests 2017–2030), the Food and Agriculture Organisation, the International Tropical Timber Organisation, the UN Convention on Biological Diversity, the Convention on International Trade in Endangered Species of Wild Fauna and Flora and, with relevance to wildlife crime, the World Customs Organisation and Interpol, among others.

## **Conclusions**

Key policies and measures to promote the sustainable production and consumption of forest products include improvements in the utilisation of wood products, including the adoption and implementation of the ‘cascading principle’; support for technological developments aimed at underpinning this approach;

the introduction of policies to support legally and sustainably produced wood products in consumer markets; support for private-sector initiatives to source legal and sustainable products (both wood products and agricultural commodities); and encouragement for national policies designed to support the sustainable production and consumption of non-wood forest products.

Key policies and measures to promote sustainable forest management include: the reform of forest and land-use legislation, including the clarification of land tenure and access rights; improvements in levels of transparency and participation; support for improvements in forest governance and law enforcement; support for community forest management; greater protection of critical areas of forest such as those of high conservation value and high carbon stock; the implementation of systems of payments for ecosystem services, including climate mitigation (through REDD+ initiatives), watershed management, biodiversity protection, etc.; and elimination of perverse incentives, e.g. for unsustainable deforestation caused by agricultural expansion or for the unsustainable use of bioenergy; and support for natural forest landscape restoration.

All these measures require resources and capacity-building assistance to be made available to developing countries, through donor agencies and governments, including the REDD+ institutions.

# 1 Forest products: production, trade and consumption

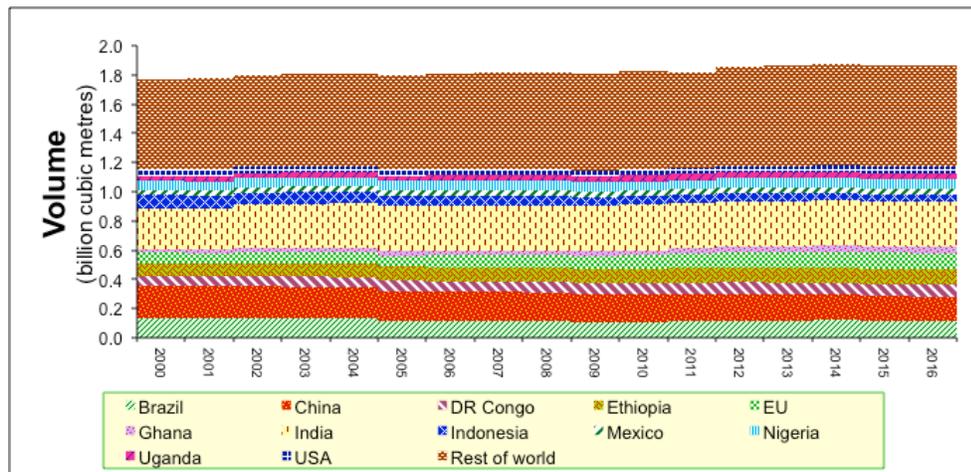
About 60 per cent of the world's forests – approximately 2.4 billion hectares – are primarily or partially used for the production of wood and non-wood forest products.<sup>3</sup> This chapter examines production, trade and consumption since 2000, including wood products (Sections 1.1 and 1.2) and non-wood forest products (Section 1.3). Annexes 1 and 2 provide more data on production and trade: Annex 1 for the different categories of wood products and Annex 2 for the major producing and trading countries (they also include sources for all the figures included in this chapter, except where otherwise noted). Annex 3 includes definitions of the various types of forest products.

## 1.1 Wood products: production, consumption and trade

Over 60 per cent of the world's roundwood production originates from just eight sources: Brazil, Canada, China, the EU, India, Indonesia, Russia and the US. About half of this is accounted for by wood fuel and half by industrial roundwood.<sup>4</sup>

Most wood fuel is used in rural areas and in developing countries, for heating and cooking, usually on open fires or in simple cookstoves. Although data for wood fuel is less reliable than for other categories of roundwood, estimates suggest that in 2016 Asia (39 per cent) and Africa (36 per cent) accounted for the bulk of global production. Volumes have been on a slight upward trend, growing by about 5 per cent (about 0.3 per cent per year) over the period 2000–16 (see Figure 1.1). Most wood fuel is consumed in its country of production; very little is traded internationally.

Figure 1.1 Global production of wood fuel, 2000–16



In recent years the use of wood in power stations and modern biomass burners has increased under the incentives adopted in some countries (particularly EU member states) for renewable energy. A large part

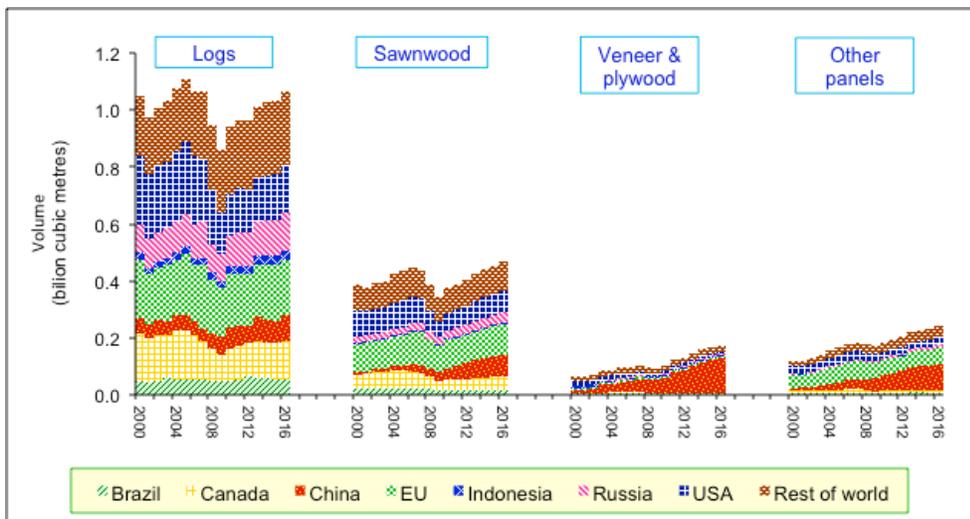
<sup>3</sup> *Global Forest Resources Assessment 2015* (FAO, 2<sup>nd</sup> edition, 2016), p. 3.

<sup>4</sup> FAOSTAT data at <http://www.fao.org/faostat/en/#data/FO>. Figures for 2016 are Brazil 6.9%, Canada 4.4%, China 8.9%, EU 12.3%, India 9.5%, Indonesia 3.2%, Russia 5.7%, US 10.8%; total 61.7%.

of the feedstock for biomass energy is wood residues and wastes and black liquor, however, which are not categorised as wood fuel.

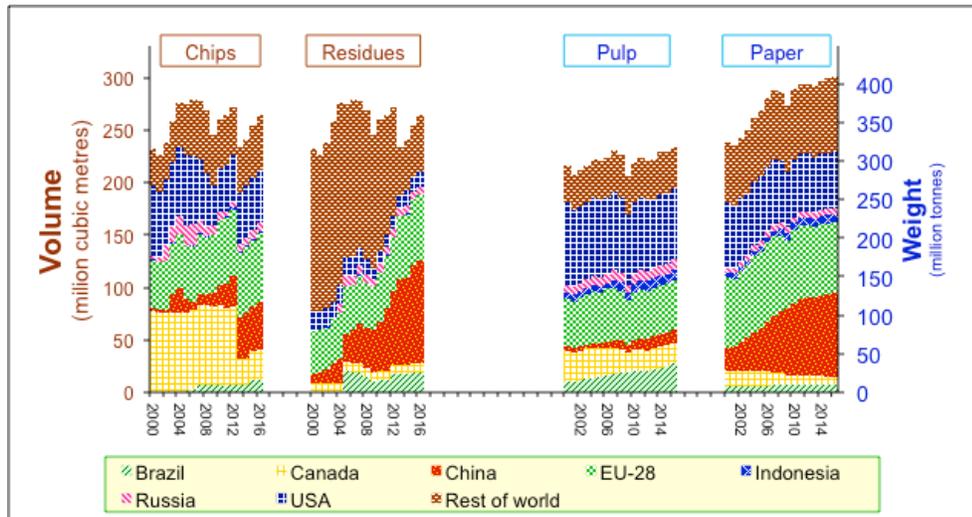
The eight sources listed above – Brazil, Canada, China, EU, India, Indonesia, Russia, US – account for about 80 per cent of global production of industrial roundwood.<sup>5</sup> On a global scale, production of roundwood and products such as sawnwood and plywood increased steadily from 2000 to 2006 but then fell sharply during the world financial crisis and the recession that followed (see Figures 1.2 and 1.3). All product categories were affected, but those used in construction, especially sawnwood, fell particularly abruptly. The housing sector tends to be especially vulnerable to recession; in the US, for example, housing starts fell from 2.27 million a year in January 2006 to 0.47 million in February 2009, and have yet to recover to much more than half the pre-crisis level.<sup>6</sup>

Figure 1.2 Global production of wood products (excluding paper and paper raw materials), 2000–16



<sup>5</sup> FAOSTAT data at <http://www.fao.org/faostat/en/#data/FO>. Figures for 2016 are Brazil 7.7%, Canada 8.4%, China 8.8%, EU 18.9%, India 2.6%, Indonesia 4.0%, Russia 10.6%, US 19.0%; total 80.1%.

<sup>6</sup> US Housing Starts, at <https://www.investing.com/economic-calendar/housing-starts-151>.

Figure 1.3 Global production of paper and paper raw materials, 2000–16<sup>7</sup>

The impact of the recession on timber markets was not evenly distributed; it was felt most strongly in the US and in its main foreign supplier, Canada (see Figures A1.7 – A1.9 in Annex 1). At the global level, sawnwood production recovered by about 2015. Production of other categories, including pulp and paper, were less affected and is now significantly higher than in 2000.

Timber and wood products, including paper, form an important component of international trade, reaching, according to Food and Agriculture Organisation (FAO) figures, a value of US\$227 billion in 2016, about 1.5 per cent of the value of total world merchandise exports<sup>8</sup> (though this is an under-estimate, as it does not include wooden furniture and some other product categories; about 1.8 per cent is a better estimate) (see Table 1.4 for production and exports).

<sup>7</sup> Wood chips and residues are included with the paper charts, as a raw material for pulp and paper production; both are also used, however, for making panels and as feedstock for power and heat generation.

<sup>8</sup> *World Trade Statistical Review 2017* (WTO, 2017), p. 19.

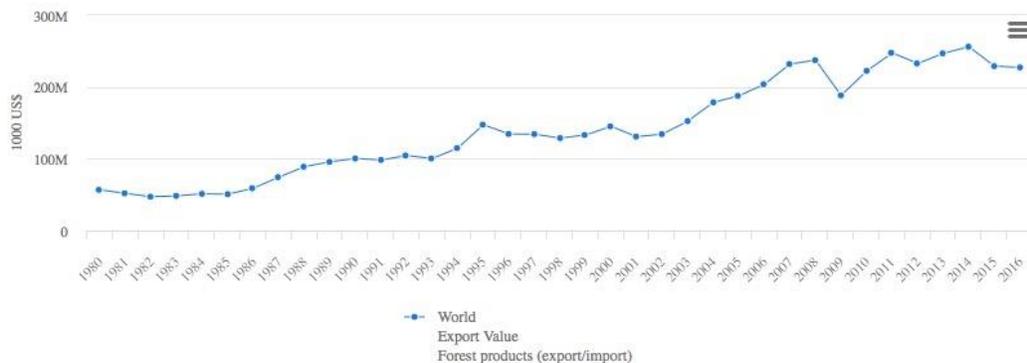
Table 1.4 Global production and exports of forest products in 2016

Product	Unit	Production			Exports				
		Change (%) compared to:			Change (%) compared to:				
		2016	2015	2000	1980	2016	2015	2000	1980
<b>Roundwood</b>	million m <sup>3</sup>	3 737	1%	8%	19%	132	2%	11%	40%
Wood fuel	million m <sup>3</sup>	1 863	0%	5%	11%	9	-4%	153%	
Industrial roundwood	million m <sup>3</sup>	1 874	3%	11%	30%	122	3%	7%	31%
<b>Wood pellets</b>	million tonnes	29	6%			17	8%		
<b>Sawnwood</b>	million m <sup>3</sup>	468	3%	21%	11%	147	7%	28%	109%
<b>Wood-based panels</b>	million m <sup>3</sup>	416	4%	123%	310%	91	7%	60%	457%
Veneer and plywood	million m <sup>3</sup>	174	3%	161%	296%	34	5%	56%	326%
Particleboard, OSB and fibreboard	million m <sup>3</sup>	242	5%	102%	321%	57	8%	62%	585%
<b>Wood pulp</b>	million tonnes	180	2%	5%	43%	64	6%	66%	201%
<b>Other fibre pulp</b>	million tonnes	12	-7%	-19%	70%	0.4	-7%	20%	88%
<b>Recovered paper</b>	million tonnes	230	1%	60%	354%	58	2%	135%	953%
<b>Paper and paperboard</b>	million tonnes	409	0%	26%	142%	111	0%	13%	218%
<b>Forest products value</b>	US\$ billion					227	-1%	57%	301%

Source: FAO, Forest Products Statistics

In value terms, the global timber trade grew by over 60 per cent between 2000 and 2008, and then fell sharply, by more than 20 per cent in a single year, during the recession following the world financial crisis (see Figure 1.5).

Figure 1.5 Value of global forest products exports, 1980–2016



Source: FAOSTAT data at <http://www.fao.org/faostat/en/#data/FO>

As with production, all product categories were affected, but trade in those used in construction fell particularly sharply. Exports recovered strongly thereafter, however, surpassing the 2008 peak by 2011, but remained roughly constant thereafter until a fall in 2015 and a smaller fall in 2016, accompanying a general slump in world trade.

In terms of volume,<sup>9</sup> roughly half of trade is accounted for by the paper sector, and half by all other wood products: each reached approximately 500 million cubic metres in 2016. Trade in timber products was far more badly affected by the global recession than trade in paper and its wood-based raw materials, and has yet to substantially exceed the quantity traded immediately prior to the crisis. While trade in pulp was hardly affected, and has continued to grow since the recession, trade in paper itself recovered quickly but has remained roughly stable since. (See Figures 1.6 and 1.7 for trade in timber products by volume and value, and Figures 1.8 and 1.9 for trade in paper and raw materials by value. Note the much higher value per cubic metre of furniture and paper compared to the other product categories.) (Note: all trade figures below exclude intra-EU trade.)

Figure 1.6 Trade in timber products (excluding paper and paper raw materials) by volume, 2000–16

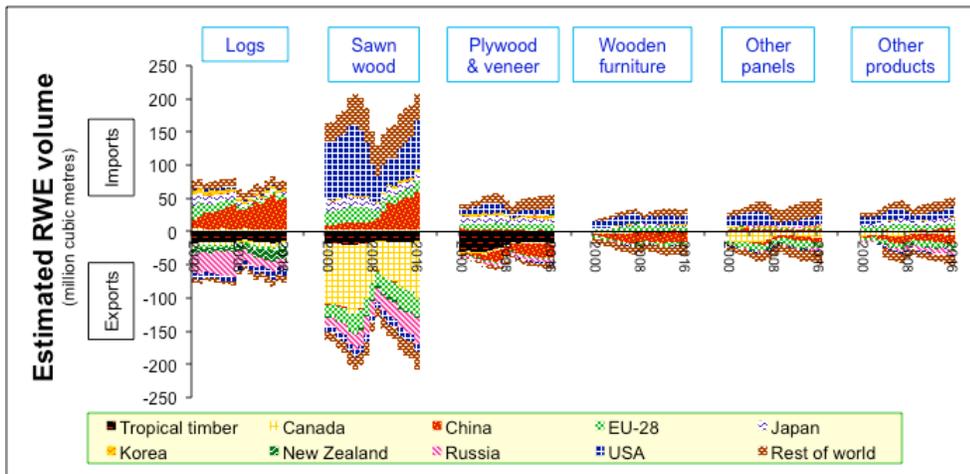
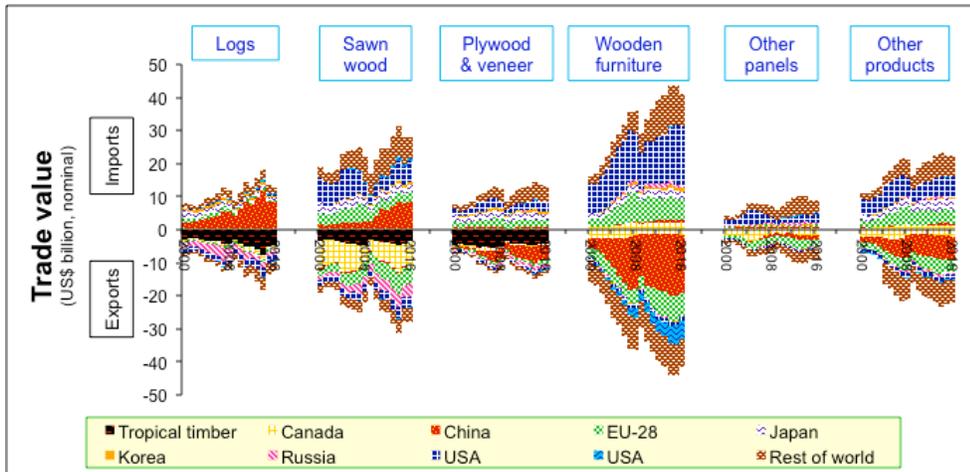


Figure 1.7 Trade in timber products (excluding paper and paper raw materials) by value, 2000–16



<sup>9</sup> Estimated roundwood equivalent volume (RWE).

Figure 1.8 Trade in paper and raw materials by volume, 2000–16

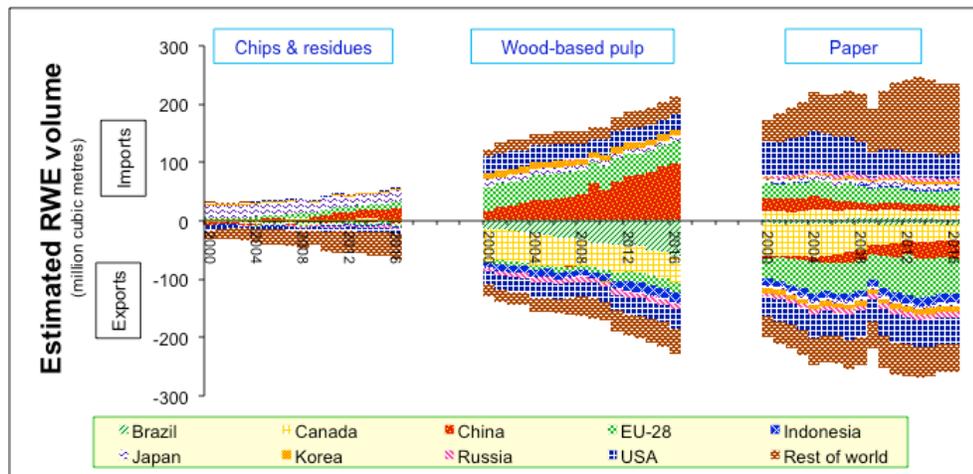
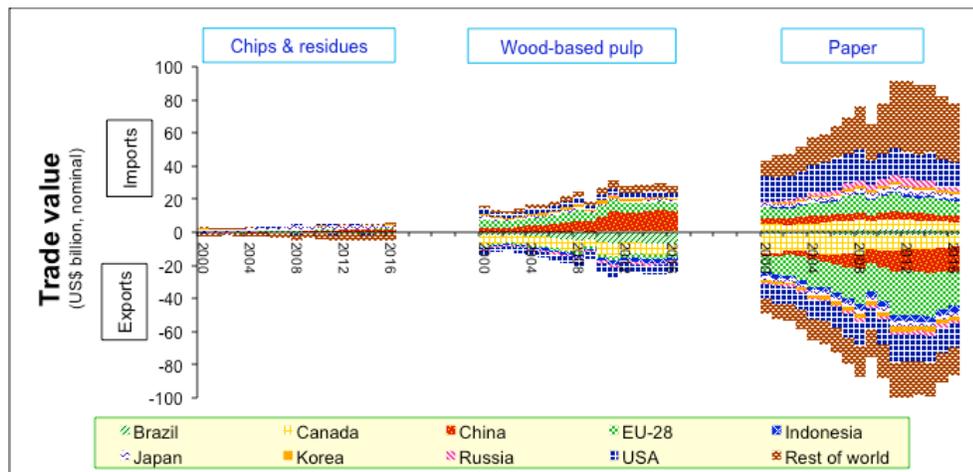


Figure 1.9 Trade in paper and raw materials by value, 2000–16



As with other natural resources, a significant proportion of the growth in world trade has been caused by the expansion of demand in China, which has seen rapid and sustained growth in industries transforming raw material into finished and semi-finished wood products for export to Japan, the Middle East, the EU and the US, and also for growing domestic consumption. Between 2000 and 2015, China's estimated consumption by those industries increased nearly threefold.

Chinese domestic production has also grown, but at a slower rate than consumption, so since 2011 imports have exceeded production, and in 2015 accounted for an estimated 55 per cent of total consumption by those industries.<sup>10</sup> In terms of volume, the largest source of imports has been Russia, followed by Canada, New Zealand and the US. Tropical countries accounted for nine of the top twenty sources of Chinese imports; over the five years 2011–15 Thailand was the largest (though in fact

<sup>10</sup> Sepul Kanti Barua, Juho Penttilä and Miika Malmström, *China as a Timber Consumer and Processing Country: An Analysis of China's Import and Export Statistics with in-depth Focus on Trade with the EU* (Indufor Oy, for WWF-UK, December 2016); *Global Forest Products Facts and Figures 2016* (FAO, 2017). This study defines consumption as production plus imports of logs and sawnwood minus exports of logs and sawnwood, rather than as end use.

Thailand’s wood exports were almost entirely of rubberwood sawnwood, which should not be classified as ‘tropical timber’). China is now by far the world’s largest producer and consumer of wood-based panels and paper, the largest importer of industrial roundwood, sawnwood and pulp and recovered paper, and the largest exporter of wood-based panels and wooden furniture.

The growth in China’s trade, in both imports and exports, can be seen, among other developments, in Figures 1.10 and 1.11, which compare global trade flows in timber sector products in 2000 and 2016, and Figures 1.12 and 1.13, which do the same for paper sector products. The largest single trade flow, however, is the export of sawnwood from Canada to the US.

Figure 1.10 Trade flows in timber sector products, 2000

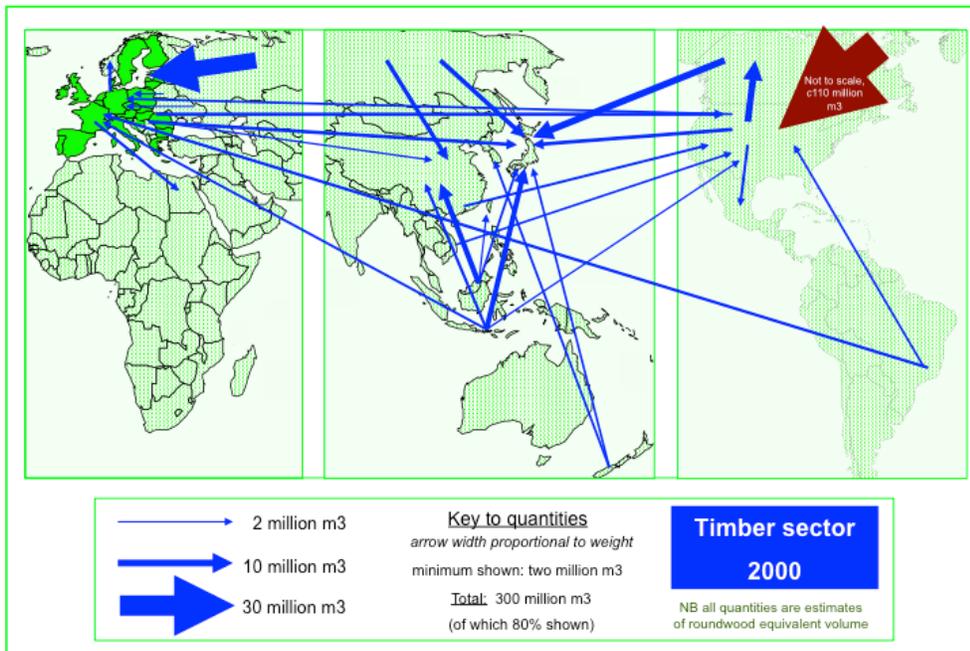


Figure 1.11 Trade flows in timber sector products, 2016

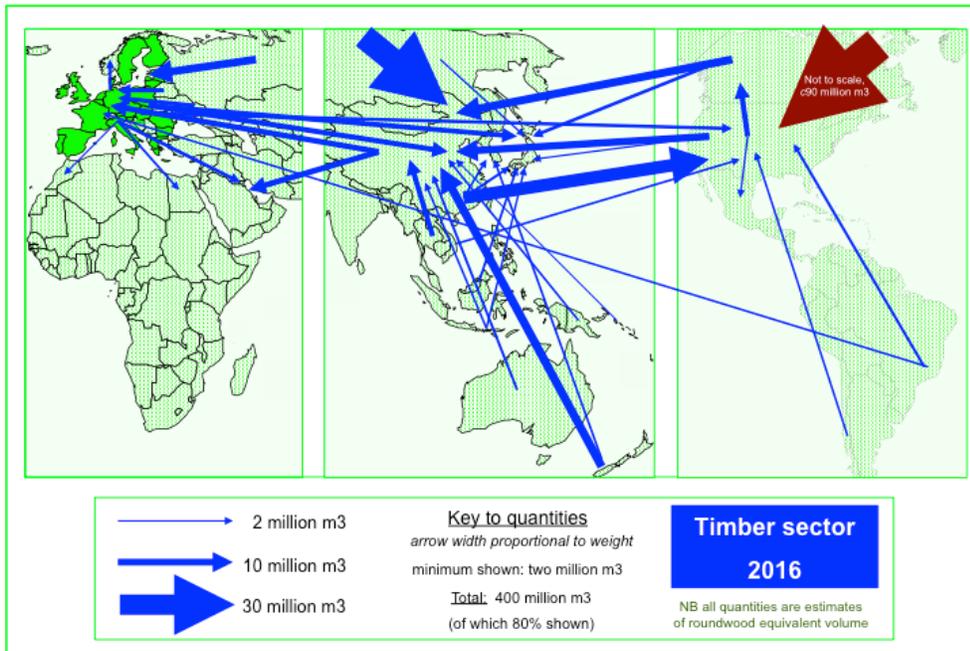
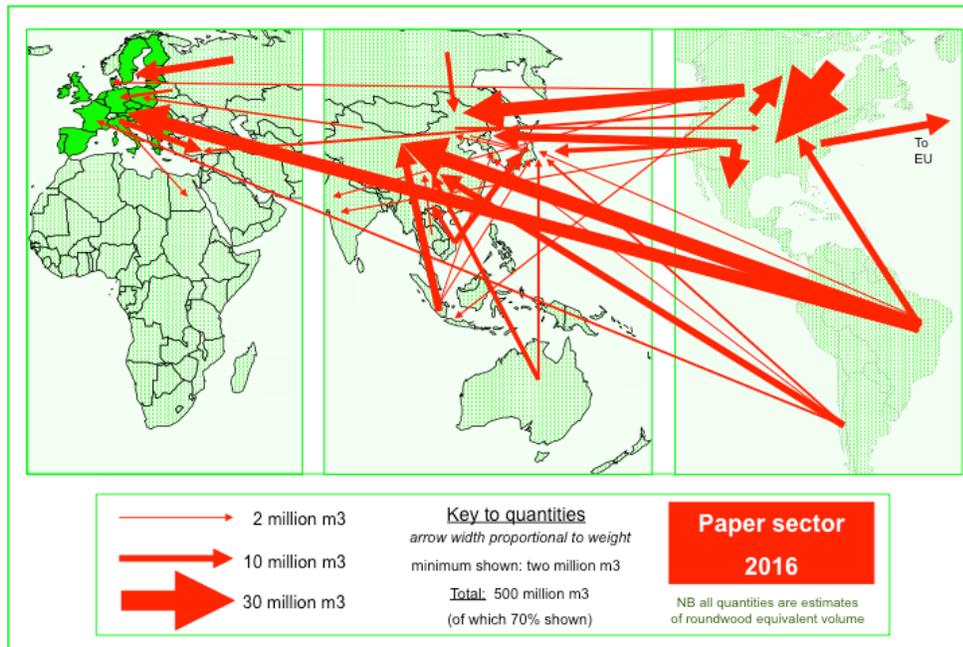


Figure 1.12 Trade flows in paper sector products, 2000



Figure 1.13 Trade flows in paper sector products, 2016



Looking at global trade in more detail, logs and sawnwood between them account for about two-thirds of the volume of trade in timber sector products (not including paper and its raw materials), though much less by value. Imports of both logs and sawnwood by China have increased strongly since 2000, offsetting falling imports in most other markets, particularly since the global recession of 2007–09. The main exporter of logs, Russia, has seen a dramatic fall in exports since the imposition of a softwood log export tax in 2008, and the country is now much more dependent on China as a destination for log exports than it was before the tax change.

In contrast, Russia's exports of sawnwood have rapidly increased, again predominantly to China, which accounted for more than 50 per cent of Russian exports in 2016. The largest global importer of sawnwood by some way, however, is the US, which imports it almost entirely from Canada, the world's largest exporter – mainly to the US, though Japan and China are also important export destinations. The US is also the world's largest producer, though growth in China has been rapid and in 2016 it produced only slightly less (77 million m<sup>3</sup>) than the US (78 million m<sup>3</sup>). China and the US are also the world's largest consumers of sawnwood.

The category of wood-based panels, which includes veneer, plywood, particleboard, oriented strand board (OSB) and fibreboard, has seen the strongest increase in production in recent years, mainly due to growth in the Asia-Pacific region, particularly China. International trade has also expanded, mostly in plywood, where Brazil, China, Indonesia, Malaysia and Russia (as suppliers) and the EU, Japan, Korea, the Middle East and the US (as destinations) dominate. The volume of plywood exports is increasing, except from Malaysia (particularly from Sarawak, in part due to concerns about illegality and unsustainability).

Most of the raw material for particleboard / OSB derives from mill by-products or plantations. The US is by far the largest importer, almost entirely from Canada, whose exports now account for about half the

global trade. China and the EU are the main exporters of fibreboard (which in trade data often includes laminate flooring).

The highest value category of timber products in trade is wooden furniture, where China dominates exports; its products are mainly assembled from composite components. For the period 2000–16 as a whole, the EU has been the second largest exporter, but it has now been overtaken, at least in terms of weight of exports, by Vietnam, which is attempting to emulate the Chinese model of importing raw material for furniture manufacture and export. The largest importers are the US, followed by the EU.

Wood pellets have only been identified separately in trade data since 2012, as a consequence of the very rapid recent growth in production, consumption and trade. The EU is the largest producer, manufacturing about half the world total. Total EU consumption is higher, however, thanks to the subsidies provided for biomass energy in many EU member states, so the EU is also a net importer, mainly from the US, with smaller volumes coming from Canada and Russia. In 2016 a single power station in the UK (Drax) by itself accounted for about two-thirds of the total of EU imports of wood pellets, which equates to almost a quarter of world trade. Korea is the only other significant importer of pellets, mainly from Vietnam. While the raw material for pellet production is mostly mill and forest residues, there is growing evidence suggesting sourcing also from the harvesting of whole trees, particularly in the US south-east (the main source of pellet production and exports).

If wood chips and residues are of sufficient quality they are likely to be used for pulp and paper production, but they can also be used for panel production or for energy. Although most chips and residues are consumed domestically, trade is significant. Japan has been much the largest importer for many years, but China's imports have climbed very rapidly and may soon overtake those of Japan; EU imports are also significant. The main suppliers are Australia, Chile, Russia, the US and Vietnam. The leading destinations tend to be China (whose imports have increased strongly) and Japan, except for supplies from Russia and the US for which the leading importers are the EU and Canada respectively.<sup>11</sup>

About a quarter of global pulp production is exported, mostly for paper mills in China, the EU and the US. Imports by China have increased rapidly while those by the EU and US have gradually fallen. The EU and US are also significant exporters, along with Chile, Indonesia and Russia, but the largest exporters by some way are Brazil (where exports have grown rapidly since 2000) and Canada.

Consistently with these trade developments, growth in the production of paper and paperboard since the recession has taken place almost entirely in the Asia-Pacific region, particularly in China (India's production is growing faster but from a much lower base), while production in the EU and US has fallen. About a quarter of total production is exported, mainly from China, the EU and the US.

Data for the consumption of forest products is not reliable on a global scale. Table 1.14 lists the major consumer countries for various categories of wood products (not including wood fuel), together with estimates for the percentage of global consumption they accounted for in 2016.

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<sup>11</sup> The sudden drop in Canada's production of chips in 2013 evident in Figure A1.21 is a result of FAO's statistical service changing its source of data from in-house estimates to data supplied by Canada, rather than any real fall in supply.

Table 1.14 Major consumers of forest products, 2016 (% of global consumption)

Country	Industrial roundwood	Wood pellets	Sawnwood	Panels	Pulp for paper	Recovered paper	Paper & paperboard
Belgium		4					
Brazil	8		3		3		
Canada	8		4		4		
China	11		24	49	19	36	27
Denmark		7					
Finland	3				4		
France		4					
Germany	3	7	4	3	3	7	5
India	3				4	3	4
Indonesia	4					3	
Italy		7					3
Japan			3		5	8	6
Korea		6				4	
Russia	9			3	3		
Sweden	4	6			5		
UK		26					
US	18	7	22	11	26	13	17
Others	29	26	40	34	24	26	38

'Others' includes countries listed in table but without figures in relevant column.

Source: FAO, Forest Products Statistics

## 1.2 Key drivers of demand for wood products

In most countries wood products are a ubiquitous part of modern life, being used in the construction of domestic, commercial and public buildings, in furniture and cabinetry, for the manufacture of printing and writing paper, newsprint, tissues and packaging and many other products; in many countries wood is also used for heating and cooking and in some for electricity generation. It is not surprising, then, that one of the main drivers of demand for wood products is population (currently growing, at a global level, at 1.1 per cent a year) – not just its overall size but also its rate of growth, levels of urbanisation, migration and changing age structures.<sup>12</sup> As well as the size of the population, its density in any given country, particularly in terms of density per unit of forest, provides a good indication of the pressure on forests in that country.

Changes in population age structures indirectly affect demand for wood products. Increases in working age populations – currently being experienced in many developing countries – are often associated with a high demand for housing, and therefore for wood products used in construction and furnishing. This

<sup>12</sup> UN DESA, World Population Prospects 2017, at <https://esa.un.org/unpd/wpp/>.

may be offset by contractions in demand in countries with ageing populations, though this also depends on cultural factors, such as family structure and degree of fragmentation. The competitiveness of economies in labour-intensive sectors may decline in the context of ageing populations, and also as wages and working practices improve, encouraging the relocation of labour-intensive industries (such as furniture manufacturing) to countries with more abundant labour.

The rate and extent of urbanisation also affects demand for wood products, most obviously through demand for timber for housing, including wood used in construction, such as plywood for forms and scaffolding, as well as wood incorporated in the building, window and door frames, doors and furniture. As discussed in Section 1.1, the global financial crisis and recession of 2008–09 had a major impact on housing starts, particularly in the US, with an immediate effect on demand for sawnwood, plywood and other products. Urbanisation can also, however, reduce demand for wood fuel, as access to electricity and alternative forms of heating is generally easier in urban than in rural areas.

Demand for wood products is significantly affected by changes in income, in complex and interconnected ways. All else being equal, increasing income – often characterised as the ‘growth of the global middle class’ – tends to be associated with rising demand for wood products (apart from wood fuel, where generally demand falls), particularly those used in construction and housing. The highest rate of growth as income rises is generally seen in the consumption of paper and paper products, including packaging. Consumption of paper products now appears to be falling in the US, however, and is growing only very slowly in Europe, suggesting that peak consumption may have been reached, probably connected with the increasing use of IT and social media and declining newspaper readership.

High-income and more highly educated populations also tend to be more sensitive to the environmental and social impacts of consumption and more willing to pay for ecosystem services (if given the opportunity and the information); this may feed through to a greater propensity to demand recycled or certified sustainable wood products, for example, with an accompanying impact on markets. Further changes in patterns of demand can be expected in the future, including, for example, a move away from plastics, particularly products such as single-use plastic bags; this may have the effect of increasing demand for paper packaging.

Developments such as these are significantly affected by business behaviour and public policy, which themselves relate to each other; this is discussed further in Chapter 3, which also considers efforts in producer countries to exclude illegal timber from supply chains, which can also affect the demand for wood products. One important set of policies affecting demand is the incentives put in place in several countries, mainly (though not only) in the EU, for renewable electricity, heat and transport. This has led to a rise in the consumption of wood fuel, chips and – especially – wood pellets in many EU member states, and growth in the exports of pellets from North America and Russia (mainly for the European market) and Vietnam (for Korea and Japan).

Developments in technology also affect the demand for wood products. These include, for example, developments in wood processing technology allowing improved rates of recovery and the use of small-dimension timber, largely through improvements in sawmilling technologies and the production of sliced veneer and reconstituted boards and panels. It also includes improvements in reuse and recycling, for example through the wider use of recovered paper or reconstituted wood products. This may be further encouraged by the adoption of circular-economy models focusing attention on the efficiency of resource

use, including the 'cascading' use of wood, using it in the following order of priority: manufacture of wood-based products, extending the products' service life, reuse, recycling, use as bio-energy and finally disposal.

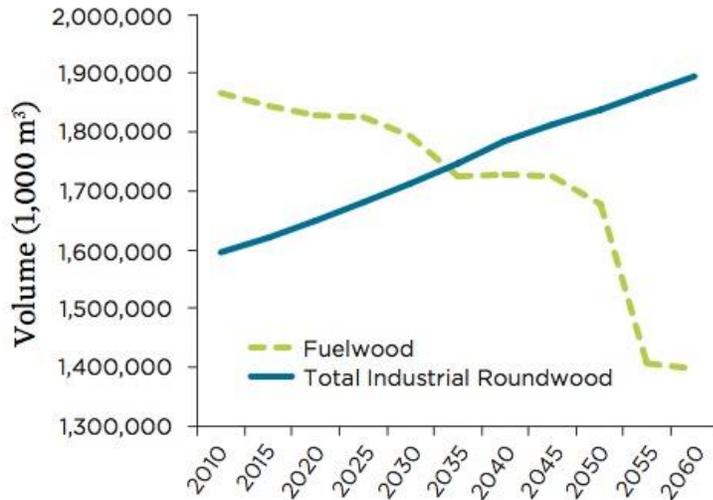
New technology also includes the emergence of new uses for wood, for example of wood pellets for energy generation or of cross-laminated timber for construction, now used for buildings up to 14 storeys (55 metres) tall (with higher ones planned). It also includes entirely new technologies, such as the production of biomaterials from biorefineries and the use of nanotechnology, for example in intelligent wood-based and paper-based products incorporating nano-sensors to measure forces, loads, moisture levels, temperature, pressure, chemical emissions or attack by wood-decaying fungi. One general impact of these and similar technological developments is a tendency to move away from the use of tropical timber, products of coniferous species being used instead.

Finally, a key determinant of demand is of course the availability on the market of alternatives to wood, such as concrete or brick for construction, or metals or plastics for other products. The extent to which alternatives are used varies not only with their price but with local culture and habits and public policy. For example, the use of wood or its alternatives in construction may be affected by government building regulations, and also by the habits of architects and building firms and their familiarity with the products in question. This may inhibit the spread of new techniques such as the use of cross-laminated timber for buildings, for example, though the adoption of ambitious climate policies may lead to a greater use of timber. The recent growth in concern over the impacts on plastics on ecosystems and human health may encourage the greater use of paper for packaging.

Many projections have been made of the future demand for wood products; they tend to vary mainly with the assumptions built in to the models. Figures 1.14 and 1.15 display two recent projections based on FAO data, for future consumption of wood fuel and industrial roundwood, and for woodpulp-based products, up to 2060. The model predicts that paper consumption will grow the fastest. Consumption of all paper categories is projected to increase by more than 100 per cent between 2010 and 2060, with recycled paper consumption increasing by 192 per cent, printing and writing paper by 180 per cent, and paperboard by 125 per cent. Consumption of solid wood products is expected also to grow, but at lower rates: sawnwood by 28 per cent, wood-based panels by 64 per cent, and veneer and plywood by 61 per cent. Wood fuel consumption is projected to fall by 23 per cent as traditional uses of wood for cooking and heating are abandoned as developing country populations grow in income and move from rural to urban areas.

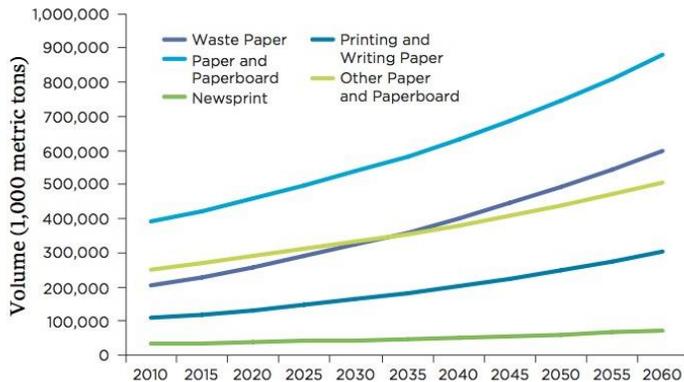
Whether these projections are realised in practice depends on a huge range of factors, including the demand for forest land for other products, and the kind of public policy changes discussed above and below in Chapters 2 and 3.

Figure 1.16 Projected global consumption of wood, 2010–2060



Source: Pipa Elias and Doug Boucher, *Planting for the Future: How Demand for Wood Products Could Be Friendly to Tropical Forests* (Union of Concern Scientists, 2014).

Figure 1.17 Projected global consumption of woodpulp-based products, 2010–2060



Source: as Figure 1.16.

### 1.3 Non-wood forest products

Non-wood forest products (NWFPs) fall into three main categories:<sup>13</sup>

- Medicinal plants and raw materials for pharmaceutical products.
- Other plant-based products, including foods (nuts, fruits, mushrooms, gums, syrups), food additives (spices, herbs, flavourings, sweeteners), fodder, fibres (such as bamboo or rattan), bark (including cork), fragrances for perfumes, ornamental pods and seeds, resins and oils.

<sup>13</sup> The term non-timber forest products (NTFPs) is often also used, but this generally includes wood fuel and small woods, whereas non-wood forest products (NWFPs) excludes all woody material.

- Animal-based products such as bushmeat or game, hides, skins and trophies, wild honey and beeswax, and edible insects.

Data on production, consumption and trade in these products is largely lacking. Their use is often confined to the informal sector, and data is thus difficult to capture through formal statistical collection; the number and types of products and species that could potentially fall into the category is vast; and agreement on a universal definition of NWFPs has not yet been reached. Where data is collected, it may be categorised under different headings, such as agriculture, though usually without any distinction between wild and farmed products. FAO is currently undertaking an attempt to improve the availability of statistics, but this seems likely to be a long process.<sup>14</sup>

The contribution of NWFPs to development and welfare, however, is significant. FAO has estimated that in 2011 the income generated from the cultivation and collection of NWFPs amounted to US\$88 billion world-wide (see Table 1.15).<sup>15</sup>

*Table 1.15 Estimated income from the informal production of NWFPs in 2011*

Region	Income (in million US\$ at 2011 prices)			
	Medicinal plants	Animal-based NWFPs	Plant-based NWFPs	Total
Africa	52	3 165	2 082	5 299
Asia and Oceania	171	3 549	63 688	67 408
Europe	446	2 130	5 450	8 026
North America	0	1 016	2 627	3 643
Latin America and Caribbean	29	646	2 963	3 638
World	697	10 506	76 810	88 013

Source: State of the World's Forests 2014 (FAO, 2015)

Although these figures were based on the gross production value, which is an overestimate of income, it was thought likely that the total income generated from the production of NWFPs was higher, possibly much higher. In particular, data was not available for the volume and value of bushmeat or game production for many countries where it was known to be important, and data for some important plant products (e.g. natural gums) was not available anywhere. In addition, the figure for medicinal plants included only income generated from the collection of raw materials for the production of medicine and not income generated further along the value chain.

Most of the total income was generated in Asia and Oceania, followed by Europe and Africa. Compared to other activities in the forest sector, income from NWFPs made the greatest additional contribution to GDP in Asia / Oceania and in Africa, where it accounted for 0.4 per cent and 0.3 per cent of GDP respectively. Women from poor households were generally those who relied most on NWFPs for household use and income. NWFPs can also provide raw materials for large-scale industrial processing,

<sup>14</sup> Simone Sorrenti, *Non-wood forest products in international statistical systems* (Non-wood Forest Products Series no. 22, FAO, 2017).

<sup>15</sup> The estimate was based on FAOSTAT agriculture statistics and data on medicinal plants from FAO's *Global Forest Resources Assessment 2010*, itself collected in 2005 and updated to 2011 prices.

and at least 150 NWFPs are significant in terms of international trade, including honey, gum arabic, rattan, bamboo, cork, nuts, mushrooms, resins, essential oils, and plant and animal parts for pharmaceutical products.<sup>16</sup>

Apart from formal measurements of income, it is estimated that some 80 per cent of the population of the developing world use NWFPs for health and nutritional needs. In 2011, an estimated 76 million tonnes of food from forests was consumed, and forest products contributed to the provision of shelter for about 1.3 billion people.<sup>17</sup> In 2001 the World Health Organisation estimated that around 2.8 billion people in China, India and Africa used traditional medicines, many of which originated in forests.<sup>18</sup>

Given this general lack of data and the informal nature of much of the production of NWFPs, it is not surprising that the products frequently do not feature on the policy agenda, either in terms of encouragement for their production, or policies for the protection of these natural resources on which many communities depend. A few countries, however, including Benin and Burkina Faso, have adopted specific national strategies for NWFPs, promoting their sustainable use and fostering the development of small-scale non-wood forest enterprises and markets.<sup>19</sup>

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<sup>16</sup> FAO, 'About non-wood forest products', <http://www.fao.org/forestry/nwfp/6388/en/>.

<sup>17</sup> *State of the World's Forests 2014* (FAO, 2015).

<sup>18</sup> *Traditional Medicine Strategy 2002–2005* (World Health Organisation, 2002).

<sup>19</sup> *State of the World's Forests 2014* (FAO, 2015).

## 2 Towards the sustainable supply of forest products: forests, deforestation and the SDGs

Having discussed the production, consumption and trade in forest products in Chapter 1, this chapter looks at broader issues around forests and begins to discuss approaches which can contribute to ensuring a sustainable supply of forest products in the future. Section 2.1 discusses the functions of forests and their contribution to sustainable development and Section 2.2 explores how forests and forest products are treated in the UN Sustainable Development Goals. Section 3 reviews recent developments in global rates of deforestation, reforestation and afforestation.

### 2.1 Forests and sustainable development

Forests fulfil far more functions than simply the production of wood and non-wood products. Indeed, they are vital to achieving global sustainable development.<sup>20</sup> They provide solutions to challenges including poverty eradication, environmental sustainability, food security and agriculture, energy, clean water and watershed protection, biodiversity conservation, mitigation of and adaptation to climate change, the combating of desertification and land degradation, and disaster risk reduction. Forests are vital for creating green economies, including green industries. More than 1.6 billion people world-wide – almost a quarter of the global population – depend on forests for food, medicines and fuel, as well as their jobs and livelihoods, and 200 million people, including many indigenous people, directly depend on forests for their survival. Forests contain over 80 per cent of the world's terrestrial biodiversity.

As vital sources of energy, water, livelihoods and biodiversity, forests play a crucial role in supplying the ecosystem services that society depends upon. Three-quarters of the world's freshwater, which is crucial for food production and human survival, among other things, is provided through forested catchments. Forests can help slow down or halt soil erosion and lock in soil moisture, helping to combat desertification and provide protection against flooding.

Healthy and resilient forests play a critical role in climate change mitigation and adaptation. As the largest storehouse of carbon after the oceans, forests have the potential to absorb and store about one tenth of the global anthropogenic carbon emissions projected for the first half of this century into their biomass, soils and products – though at present about 10 per cent of global greenhouse gas emissions are estimated to derive from deforestation.

Forests make direct and tangible contributions to food security, and indirect yet reliable resources to sustain rural livelihoods, particularly for vulnerable categories of people such as indigenous communities and women. As noted in Section 1.3, an estimated 80 per cent of the population of developing countries rely on medicines derived from forests as their primary form of health care.

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<sup>20</sup> Sources for this section include *Global Forest Resources Assessment 2015*, *State of the World's Forests 2016* and *TST Issues Brief: Forests* (UN Open Working Group Technical Support Team), [http://sustainabledevelopment.un.org/content/documents/2291Forest%20Issues%20Brief\\_FINAL.pdf](http://sustainabledevelopment.un.org/content/documents/2291Forest%20Issues%20Brief_FINAL.pdf).

The income generated from all types of forests, and trees outside forests, for people, countries and global trade is significant. In 2009, the formal forest sector's contribution to global income (from roundwood production, wood processing and pulp and paper) was estimated to be nearly US\$468 billion, accounting for nearly 1 per cent of global GDP. Over 10 million people are employed in the formal forest sector, and forests also provide employment to many seasonal workers in informal sectors around the world. In addition to monetary benefits, the value of the non-monetary benefits from forests – including environmental and social services to rural economies and households through the provision of energy, shelter and medicine – is estimated by some researchers to be equivalent to two to three times the estimated contribution to GDP.

## 2.2 Forests and the Sustainable Development Goals

The Sustainable Development Goals (SDGs) were agreed by the UN General Assembly in 2015 as the core of the 2030 Development Agenda, *Transforming our World: the 2030 Agenda for Sustainable Development*.<sup>21</sup> Between them, the SDGs attempt to identify means of sustaining many of the functions of forests described in the previous section.

SDG 12, on sustainable consumption and production, is of particular relevance to the sustainable supply of forest products (see box).

**Sustainable Development Goal 12. Ensure sustainable consumption and production patterns<sup>22</sup>**

12.1 Implement the 10 Year Framework of Programmes on Sustainable Consumption and Production Patterns, all countries taking action, with developed countries taking the lead, taking into account the development and capabilities of developing countries.

12.2 By 2030, achieve the sustainable management and efficient use of natural resources.

...

12.6 Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle.

12.7 Promote public procurement practices that are sustainable, in accordance with national policies and priorities.

12.8 By 2030, ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature.

...

The most recent report on the implementation of the SDGs, published in 2017, suggested that only limited progress had been made towards fulfilling SDG 12.<sup>23</sup> The global material footprint – the amount of raw material extracted to meet consumption demand – had increased over the first decade of the century, as had the amount of material used in production processes. Domestic material consumption per unit of GDP had fallen in most regions, though this was mainly due to the migration of manufacturing

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<sup>21</sup> United Nations, *Transforming Our World: The 2030 Agenda for Sustainable Development* (A/RES/70/1, 2015).

<sup>22</sup> Ibid.

<sup>23</sup> United Nations, *The Sustainable Development Goals Report 2017*, p. 43.

to Eastern and South-Eastern Asia and the rapid industrialisation that followed. Domestic material consumption per unit of GDP had risen in this region and, as a result, in the world as a whole. Total domestic material consumption had increased from 49 billion tonnes in 2000 to 71 billion tonnes in 2010; Eastern and South-Eastern Asia accounted for 42 per cent of this total.

Chapter 3 reviews some of the policies adopted at national and international levels to promote markets for sustainably produced forest products.

SDG 15, on ecosystems, deals with forest ecosystems as a whole, and sets goals for promoting sustainable forest management, halting deforestation by 2020, restoring degraded forests and increasing afforestation and reforestation (see box).

**Sustainable Development Goal 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss<sup>24</sup>**

15.1 By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements.

15.2 By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally.

...

15.5 Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species.

15.6 Promote fair and equitable sharing of the benefits arising from the utilization of genetic resources and promote appropriate access to such resources, as internationally agreed.

15.7 Take urgent action to end poaching and trafficking of protected species of flora and fauna and address both demand and supply of illegal wildlife products.

...

15.9 By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts

15.a Mobilize and significantly increase financial resources from all sources to conserve and sustainably use biodiversity and ecosystems.

15.b Mobilize significant resources from all sources and at all levels to finance sustainable forest management and provide adequate incentives to developing countries to advance such management, including for conservation and reforestation

15.c Enhance global support for efforts to combat poaching and trafficking of protected species, including by increasing the capacity of local communities to pursue sustainable livelihood opportunities.

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<sup>24</sup> United Nations, *Transforming Our World: The 2030 Agenda for Sustainable Development*.

The 2017 report found progress against this goal uneven. While the world's forest area had continued to shrink, the pace of forest loss had slowed. More forests were being protected, and areas under long-term management plans and voluntary certification had increased.<sup>25</sup> It seems highly unlikely, however, that the goal of halting deforestation by 2020 can be achieved. The same can probably be said of the UN Strategic Plan for Forests goal of increasing forest area by 3 per cent worldwide by 2030 (see further in Section 3.7), unless policies change significantly over the next few years.

The extent and rate of deforestation, reforestation and afforestation are examined in more detail in the next section, and Chapter 3 reviews some of the policies adopted at national and international levels to protect forests and encourage forest growth.

### 2.3 Deforestation, reforestation and afforestation

Overall, 30 per cent of the world's land area – about 4 billion hectares – is currently covered by forest, a reduction from 4.13 billion hectares in 1990, under the pressure of population increases and demand for land for crops and grazing, and of unsustainable levels of exploitation of forest resources.<sup>26</sup> According to the *Global Forest Resources Assessment 2015*, the global forest area fell by a net 129 million hectares between 1990 and 2015 (a 3.1 per cent net loss), while almost double this amount – 239 million hectares of forest – was cleared world-wide between 1990 and 2008 (gross loss). While the rate of gross deforestation has fallen in recent years – from 16 million hectares per year in the 1990s to 13 million hectares per year in the 2000s to 7.6 million hectares per year in the five years from 2010 to 2015 – it is still unsustainably high.

Overall, the bulk of the world's forests – 3.7 billion hectares, or 93 per cent, in 2015 – is natural forest, and this fell by a net 6.5 million hectares per year from 2010 to 2015 (a reduction from 10.6 million hectares per year in 1990–2000). The remaining 7 per cent (291 million hectares) is planted forest, or plantations, which has increased by over 105 million hectares since 1990. The average annual rate of increase in plantation area between 1990 and 2000 was 3.6 million hectares; the rate peaked at 5.9 million hectares per year for the period 2000–05 and slowed to 3.3 million hectares per year between 2010 and 2015, as planting rates fell in many regions.

The extent of forest loss has been geographically unevenly distributed. In temperate and boreal regions the process of deforestation slowed and reversed in the late nineteenth and early twentieth centuries, but it accelerated in the tropics, where it is still proceeding, though at a slightly slower rate in recent years.

At a regional level, South America suffered the largest net loss of forests in the decade to 2010 – about 4 million hectares (equivalent to 0.46 per cent of total forest cover) per year – followed by Africa, which lost about 3.4 million hectares (0.50 per cent) per year. Extensive forest fires and drought in Australia were largely responsible for a net loss of about 0.7 million hectares (0.36 per cent) per year in Oceania. Northern and Central American forest areas remained more or less stable, while European forests

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<sup>25</sup> United Nations, *The Sustainable Development Goals Report 2017*, p. 49.

<sup>26</sup> Sources for this section unless otherwise noted: *Global Forest Resources Assessment 2015* (FAO, 2016); *Global Forest Resources Assessment 2010* (FAO, 2011).

expanded, though at a slower rate than before (0.7 million hectares per year (+0.07 per cent) compared with 0.9 million hectares per year in the previous decade). The most dramatic change was in Asia, which, overall, reversed a net forest loss of about 0.6 million hectares per year in 1990–2000 to see a net gain of more than 2.2 million hectares per year (+0.37 per cent) in the following decade. This was mainly due to large-scale afforestation in China, and many other Asian countries continued to experience high net rates of forest loss; the Greater Mekong region, for example, lost about 8 million hectares in total from 1990 to 2010.

The rate of deforestation slowed further in the five years from 2010 to 2015. South America lost about 2.0 million hectares of forest, net, per year, though the loss of natural forests has been somewhat higher at 2.2 million hectares. Africa lost about 2.8 million hectares per year (with an annual loss of natural forest of 3.1 million hectares). Asia saw forest area expand by a net 0.8 million hectares per year, but lost about 1.0 million hectares annually of natural forest. Europe gained about 0.4 million hectares of forest per year, while North and Central America saw forests expand by 0.1 million hectares, though the natural forest area declined by 0.4 million hectares per year. Oceania gained about 0.3 million hectares per year.

The anticipated growth of demand for wood products discussed in Section 1.2 clearly risks increasing pressures on the remaining forest area. This joins other drivers of deforestation such as clearance for agriculture (confirmed by several recent studies as the main global driver), for both domestic consumption and export markets, mining, infrastructure development and urban expansion, and forest fires – an increasingly serious problem thanks in part to the impacts of climate change, as well as to the growth of plantations, which tend to be more vulnerable to fire than natural forest.<sup>27</sup>

Accordingly, increasing attention has been paid in many countries to strategies for reforestation (defined by FAO as the re-establishment of forest through planting and/or deliberate seeding on land classified as forest) and afforestation (the same activities, taking place on land that, until then, was not classified as forest), alongside measures to protect remaining forests and slow down or halt the rate of deforestation. Approaches such as these will be important in achieving the UN Strategic Plan for Forests goal of increasing forest area by 3 per cent worldwide by 2030.

Many such initiatives have been attempted over the last few decades. Notable examples include the Green Belt Movement, founded by Nobel laureate Wangari Maathai in 1977, which saw 51 million trees planted in Kenya. In Korea, a massive tree-planting programme by national and local governments added 11 billion trees between 1961 and 2008; the country has also assisted its northern neighbour, the Democratic People’s Republic of Korea, in its own efforts at reforestation. In Tanzania, the Kwimba Reforestation Project in the 1990s resulted in 6.4 billion trees planted to replace tree cover lost due to local use for firewood.

The Great Green Wall for the Sahara and Sahel Initiative, proposed by the African Union in 2007, aimed to plant a 15 km-wide 7,700 km-long barrier of trees across the continent to halt the advance of the Sahara and to reverse the spread of desertification through the Sahel region. So far it is claimed that 15

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<sup>27</sup> Kissinger, G., Herold, M. and de Sy, V., *Drivers of Deforestation and Degradation: A Synthesis Report for REDD+ Policy-Makers* (Lexeme Consulting, 2012); Hosonuma N., Herold M., de Sy V., De Fries R.S., Brockhaus M., Verchot L., Angelsen A., Romijn E., ‘An assessment of deforestation and forest degradation drivers in developing countries’, *Environmental Research Letters*, 7(4), 044009, 2012; European Commission, *The Impact of EU Consumption on Deforestation: Comprehensive analysis of the impact of EU consumption on deforestation* (European Commission, 2013).

per cent of the trees have been planted, largely in Senegal, with 4 million hectares of land restored. On a global scale, the Bonn Challenge of the International Union for the Conservation of Nature (IUCN) aims to bring 150 million hectares of degraded and deforested land into restoration by 2020, and 350 million hectares by 2030, generating an estimated US\$84 billion per year in net benefits, including through trade in forest products, as well as providing watershed protection, improved crop yields and climate mitigation.

China has seen the largest and most sustained programme of reforestation and afforestation, after the devastating Yangtze River floods in 1998 highlighted the dangers of deforestation. The country gradually introduced strict bans on logging in primary forests, a massive programme of expansion of forest reserves, and large-scale afforestation initiatives. For many years China has accounted for more afforestation than the rest of the world combined; on average 5 million hectares has been planted each year, resulting in an increase in forest cover of 9 per cent over the past 30 years. China is home to about 79 million hectares of planted forest, more than a quarter of the world's total. For the period 2016–20 the government aims to increase forest cover further, from 21.7 per cent of land area to 23 per cent.

Some of China's experiences, however, highlight the challenges of afforestation programmes. The Three Norths Shelterbelt Development Programme begun in 1978 – commonly called the 'Great Green Wall' – was designed to plant nearly 35 million hectares of new forest in a band stretching 4,500 km across northern China, with the aim of reversing centuries of desertification. By 2011, however, surveys suggested that 85 per cent of the new plantings had failed, because the non-native species used could not tolerate local conditions. Even though they had been selected to thrive in arid regions, in practice they depleted soil moisture and died, along with native vegetation which they deprived of water. Smaller-scale programmes using native species (and sometimes grasses rather than trees) proved more successful.

In general, if not properly managed, afforestation and reforestation efforts risk the production of monocultures that not only lack plant diversity but also reduce the number of available habitat types for animal species and diminish local biodiversity; they can also result in the introduction of non-native and potentially invasive species, reduced stream flow, and lost revenue from agriculture. The overall figures for the expansion of plantations quoted above may in fact be misleading, as studies have shown that planted forest is often far less dense than natural forest. As one study of the Chinese afforestation programme concluded:

China's forest cover gains are highly definition-dependent. If the definition of 'forest' follows FAO criteria (including immature and temporarily unstocked areas), China has gained 434,000 km<sup>2</sup> between 2000 and 2010. However, remotely detectable gains of vegetation that non-specialists would view as forest (tree cover higher than 5 m and minimum 50 per cent crown cover) are an order of magnitude less (33,000 km<sup>2</sup>).<sup>28</sup>

The concept of forest landscape restoration has recently emerged as a new approach to managing the dynamic and often complex interactions between the people, natural resources and land uses that comprise a landscape. It makes use of collaborative approaches to harmonise the many land-use decisions of stakeholders, with the aims of restoring ecological integrity and enhancing the development

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<sup>28</sup> Ahrends A, Hollingsworth PM, Beckschafer P, Chen H, Zomer RJ, Zhang L, Wang M, Xu J., 'China's fight to halt tree cover loss'. *Proc. R. Soc. B* 284: 20162559. 2017

of local communities as they attempt to increase and sustain the benefits they derive from the management of their land.<sup>29</sup> This approach is embedded in the IUCN's Bonn Challenge (see above). Something like it is also, in effect, gradually being implemented through the Great Green Wall for the Sahara and Sahel Initiative, where the initial emphasis on tree planting is giving way to an array of land use practices, including using simple water harvesting techniques, and protecting trees that emerge naturally on farms rather than clearing them to make room for crops.<sup>30</sup>

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<sup>29</sup> FAO, 'Forest Restoration and Rehabilitation', at <http://www.fao.org/sustainable-forest-management/toolbox/modules/forest-restoration-and-rehabilitation/basic-knowledge/en/>

<sup>30</sup> Jim Morrison, 'The "Great Green Wall" Didn't Stop Desertification, but it Evolved Into Something That Might', *Smithsonian Magazine* 23 August 2016; <https://www.smithsonianmag.com/science-nature/great-green-wall-stop-desertification-not-so-much-180960171/#AgmZGcsGhGif2kRo.99>

## 3 Policies to support sustainable production, trade and consumption of forest products

Having identified the demand for forest products in Chapter 1, and reviewed the pressures on forests in Chapter 2, along with the overall aims of the SDGs, this chapter provides a brief overview of the various international approaches to sustainable forest management and the main policies and measures taken at national, regional and international levels to protect forests and attempt to secure a sustainable supply of forest products in the future.

### 3.1 Sustainable forest management

The idea of sustainable forest management (SFM), an attempt to reflect the environmental and social as well as economic benefits provided by forests, became widely accepted after the UN Conference on Environment and Development in 1992 (the 'Earth Summit' in Rio de Janeiro), which first saw international commitment to the concept of sustainable development more broadly. As the Forest Principles, agreed at Rio, state: 'Forest resources and forest lands should be sustainably managed to meet the social, economic, ecological, cultural and spiritual needs of present and future generations'.<sup>31</sup> A similar but more elaborate definition was developed by the Ministerial Conference on the Protection of Forests in Europe (now known as Forest Europe), and has since been adopted by the FAO. It defines sustainable forest management as:

The stewardship and use of forests and forest lands in a way, and at a rate, that maintains their biodiversity, productivity, regeneration capacity, vitality and their potential to fulfil, now and in the future, relevant ecological, economic and social functions, at local, national, and global levels, and that does not cause damage to other ecosystems.<sup>32</sup>

A series of UN agreements have tried to set out principles for the management, conservation and development of forests, culminating in the UN Forest Instrument (formerly known as the Non-Legally Binding Instrument on All Types of Forests), agreed under the auspices of the UN Forum on Forests (UNFF) in 2007. The Instrument articulates a series of agreed policies and measures at the international and national levels to strengthen forest governance, technical and institutional capacity, policy and legal frameworks, forest sector investment and stakeholder participation.

Clearly, SFM covers a very broad range of issues. The UN Forest Instrument identifies seven key thematic elements: extent of forest resources, biological diversity, forest health and vitality, productive functions of forest resources, protective functions of forest resources, socio-economic functions, and the legal, policy and institutional framework.<sup>33</sup> More precise definitions of SFM inevitably vary from region to

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<sup>31</sup> Non-legally Binding Authoritative Statement of Principles for a Global Consensus on the Management, Conservation and Sustainable Development of all Types of Forests (the 'Forest Principles', 1992), para. 2(b); available at <http://www.un.org/documents/ga/conf151/aconf15126-3annex3.htm>.

<sup>32</sup> 'General Guidelines for the Sustainable Management of Forests in Europe' (Resolution H1 of the Second Ministerial Conference on the Protection of Forests in Europe, 16–17 June 1993, Helsinki), para D; available at [http://www.mcpfe.org/files/u1/helsinki\\_resolution\\_h1.pdf](http://www.mcpfe.org/files/u1/helsinki_resolution_h1.pdf)

<sup>33</sup> Food & Agriculture Organisation, *State of the World's Forests 2007* (FAO, 2007), p. 3.

region, since the types of forests, the needs of the populations who live in and around them, and the social, economic, environmental and political contexts in which their protection and management are set also vary regionally. This has led to a series of processes to define principles, criteria and indicators for SFM for particular regions. An FAO working paper in 2001 listed nine major intergovernmental processes involving some 150 countries.<sup>34</sup> The four most significant are those of the African Timber Organisation, the International Tropical Timber Organisation (ITTO), the Montreal Process on Criteria and Indicators for the Conservation and Sustainable Management of Temperate and Boreal Forests, and the Pan-European Forest Process on Criteria and Indicators for Sustainable Forest Management (the Helsinki Process of Forest Europe).<sup>35</sup>

Beyond these overarching global and regional agreements and documents, the concept of SFM has been incorporated very widely in national legislation, action plans and procurement policies, development assistance programmes and projects, business strategies, NGO campaigns and forest certification schemes, with detailed definitions often being drawn from these international processes. Although it is undoubtedly true that the concept of SFM may be appealed to more frequently than it is implemented in reality, it has had a major impact on policy-making and practices relevant to the world's forests.

### **3.2 National policies**

National governments possess a huge range of policies and legislation designed to protect forests, encourage their expansion, promote SFM and develop markets for sustainably produced forest products. Although on a global scale these are clearly still inadequate to prevent forest loss, many countries have seen encouraging developments in recent years.

A full discussion of these measures lies beyond the scope of this paper, and in any case full information is not available on all countries' policies. Policies aiming at protecting forests will clearly have a long-term impact on the extent of forest cover, but may also affect the supply of forest products, depending on the level of protection afforded to the forest and to what extent and under what conditions timber extraction is permitted. Clearly, legislation ensuring SFM – present in many countries – is the ideal outcome, but defining SFM at a national level is not always easy, and in countries with poor standards of governance and law enforcement, implementing it may be difficult or impossible (see further in Section 3.3). One of the most effective steps that can be taken in countries such as these is to clarify and enforce rights of land tenure and access; studies suggest that forests owned and managed by local communities tend to be better protected than those that are not, and also better able to deliver benefits such as support for rural livelihoods.

Policies aimed at limiting exports, for example through log export bans, quotas or export duties differentiated by product category, can have major effects on domestic markets; as can be seen, for example, in the impacts of the Russian log export duty on exports from Russia to China (see Section 1.1.).

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<sup>34</sup> Froylán Castañeda, Christel Palmberg-Lerche and Petteri Vuorinen, *Criteria and Indicators for Sustainable Forest Management: A Compendium* (FAO, 2001); available at <http://www.fao.org/docrep/004/ac135e/ac135e00.htm>

<sup>35</sup> The other five are the Regional Initiative for the Development and Implementation of National Level Criteria and Indicators for the Sustainable Management of Dry Forests in Asia; the Dry-Zone Africa Process on Criteria and Indicators for Sustainable Forest Management; the Lepaterique Process of Central America on Criteria and Indicators for Sustainable Forest Management; the Tarapoto Proposal of Criteria and Indicators for Sustainability of the Amazon Forest; and the Near East Process.

Generally put in place to encourage the growth of domestic wood processing industries and capture more of the value-added from the timber supply chain for local enterprises, such policies can have an effect if suitable infrastructure and appropriate support is in place to develop these industries. They can also, however, increase the incentives for illegal export in an attempt to evade the ban, quota or tax.

Policies aimed at supporting afforestation and reforestation will clearly affect the long-term supply of timber, though as discussed in Section 2.3, this can vary depending on whether the new woodland is regenerated natural forest or plantation. In many countries taxation, subsidies and land use regulations have been used to encourage tree planting; requirements can be put in place to ensure that trees are replanted after harvesting, and to prevent the cultivation of agricultural crops on particular types of land. Attempts have sometimes been made to establish systems of payments for the ecosystem services that forests provide, with the aim of increasing the value of standing forests, but this has often proved difficult, partly because of the wide range of services provided in practice by forests (see Section 2.1) and partly because of the difficulty in establishing secure property rights. So far this approach has been attempted most extensively through the REDD+ programmes discussed below in Section 3.6.

Government policy can support markets for sustainably harvested forest products, identified as such by, for example, forest certification schemes. One of the main mechanisms is the use of public procurement policy to require timber products purchased by government buyers to be legal and sustainable. In most countries governments tend to be large purchasers of products such as timber for construction and maintenance (e.g. for public buildings, harbour and sea defences or social housing), office and outdoor furniture and paper and packaging. Over 30 countries, including most EU member states, now possess such policies, though they vary substantially in their coverage in terms of products and levels of government, and whether they are voluntary or mandatory.<sup>36</sup>

Building regulations can also be used to encourage the use of timber in general, and certified sustainable timber in particular. So far this approach does not appear to be widespread despite the importance of construction in the demand for wood products. Regulations can also be put in place to promote the efficient production and processing of forest products, reducing waste and enhancing recycling; this type of approach seems likely to become more common as countries increasingly adopt policies designed to promote greater resource efficiency and circular-economy models.

It is not difficult, unfortunately, to identify policies and legislation that have the opposite effect, promoting the unsustainable consumption of forest products and encouraging deforestation. The main challenges to the supply of forest products, and to SFM and to forests in general, tend to originate from other economic sectors – mainly, world-wide, from agriculture. The key underlying problem is that market prices for timber products, including paper, and the products derived from converted forest land, do not incorporate the value of the lost economic, social and environmental functions the forests would have provided, including timber rentals, the production of non-wood forest products, the access to forests of forest communities, watershed and landscape protection, climate mitigation, and the provision of habitats for biodiversity. On top of this, the direct costs of harvesting and converting forests, at least in many tropical areas, are often subsidised or distorted in other ways, thus encouraging overuse.

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<sup>36</sup> Duncan Brack, *Promoting Legal and Sustainable Timber: Using Public Procurement Policy* (Chatham House, 2014).

Examples of such incentives for deforestation include favourable tax treatment or subsidies for forest conversion to agriculture, or for forest harvesting and wood production, including support for wood processing, land grants to farmers and settlers, subsidies for food production and food exports (for example through investing in port and other transport infrastructure), and for resource extraction such as mining. One relatively recent development is government support for renewable energy, including transport biofuels and sold biomass for power and heat. Support for biofuels in particular has encouraged the production and export of oilseed crops such as soy and oil palm, with accompanying impacts, direct and indirect, on forests. The biofuel sustainability criteria applied in the EU do not permit support for feedstock originating from the direct conversion of forests to agriculture, but indirect land use change – such as the conversion of food-crop land to oilseeds, and then of forests to food-crop land – is a genuine problem.

### 3.3 Forest law enforcement and governance

Concern over the extent of illegalities in the timber industry on a global scale first emerged in the 1990s, not just because of its impact on forests but also because of the scale of the losses in tax revenue to poor countries that it represented (about US\$5 billion a year, according to one estimate, at least triple the level of overseas development assistance for forests) and, in some countries, its links with armed conflict, such as the Khmer Rouge insurgency in Cambodia. Donor development assistance for forests, then mainly focused on promoting SFM, was not proving particularly effective, not least because it was dwarfed in scale by the value of timber products in international trade. Consumer countries also had no mechanisms in place to distinguish between legally and illegally logged products placed on their markets.

In 1998 the topic was included in the G8 Action Programme on Forests, and in 2001 the first ministerial conference on forest law enforcement and governance (FLEG) was held in Indonesia, where illegal logging was increasingly being experienced and recognised. The conference brought together governments, industry and NGOs from countries inside and outside the region, in an attempt to establish frameworks through which producer-country governments could work with one another and with governments of consumer countries to tackle illegal activities. It marked the first international recognition that consumer-country action to close consumer markets to illegal products was a necessary accompaniment to producer-country action to prevent illegal activities at source.

Although the East Asia conference and the following FLEG ministerials (in Africa in 2003 and Europe and North Asia in 2005) led to relatively few concrete actions in themselves, they did help to raise the profile of the issue and to trigger, in the EU, discussions that led to the Forest Law Enforcement, Governance and Trade (FLEGT) action plan. Agreed in 2003, the FLEGT action plan is still the most ambitious set of measures aimed at illegal logging and forest governance adopted by any consumer country or bloc to date.<sup>37</sup> It includes:

- The negotiation of FLEGT voluntary partnership agreements (VPAs) with timber-producing countries. These include a licensing system designed to identify legally produced products and license them for import to the EU (unlicensed products are denied entry), combined with

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<sup>37</sup> European Commission, *Communication from the Commission to the Council and the European Parliament: Forest Law Enforcement, Governance And Trade (FLEGT) – Proposal for an EU Action Plan* (May 2003).

capacity-building assistance to partner countries to set up the licensing scheme, improve enforcement and, where necessary, reform their laws.

- Consideration of additional legislative options to prohibit the import of illegal timber to the EU more broadly, particularly products originating from countries not participating in VPAs and therefore not covered by the licensing scheme.
- Encouragement for voluntary industry initiatives, and government procurement policy, to limit purchases to legal sources.
- Encouragement for financial institutions to scrutinise flows of finance to the forestry industry.

The bilateral VPAs with timber-producing countries lie at the heart of the FLEGT approach. By March 2018, VPAs had been concluded with six countries: Cameroon, the Central African Republic, Ghana, Indonesia, Liberia and the Republic of Congo. VPA negotiations were under way in a further nine countries: Côte d'Ivoire, Democratic Republic of the Congo (DRC), Gabon, Guyana, Honduras, Laos, Malaysia, Thailand and Vietnam. Several other countries have expressed an interest in entering negotiations.

The licensing system established under the terms of the VPA prevents the export from the partner country to the EU of any timber products that have not been licensed as legally produced (in fact all VPA countries so far are intending to license all their exports regardless of destination). In most cases the VPA negotiations have seen the adoption of multi-stakeholder processes to agree operational definitions of 'legally produced', and all the agreements contain commitments to reforms of forest laws and regulations to make them clearer and more comprehensive. They also contain provision for independent auditors to check the integrity of the legality assurance and licensing systems; in some cases civil society independent monitors also operate to scrutinise the forest sector and illegal activities more broadly. In November 2016 Indonesia started to issue FLEGT licenses to accompany its timber exports, its timber legality assurance system having been judged adequate by both parties to the VPA. To date it is the only VPA country to implement a licensing system; legality assurance systems have proved to be more complex and difficult to establish than originally anticipated.

In the US, the President's Initiative Against Illegal Logging was established in 2003, and in 2008 Congress voted to amend the 100-year-old Lacey Act, extending its prohibition on the import of wildlife illegally produced outside the US to cover timber and wood products as well. In turn this stimulated the EU to begin work on the component of the FLEGT action plan to consider whether additional legislation would be needed to deal with imports of illegal timber from non-VPA countries. This led eventually to the EU Timber Regulation (EUTR) agreed in 2010 and applying in full from March 2013.<sup>38</sup> This prohibits the placing of illegally harvested timber and timber products on the EU market, whether sourced from domestic production or from imports. Products accompanied by a FLEGT licence or a permit issued by the Convention on International Trade in Endangered Species (CITES) are considered to have been legally harvested for the purposes of the regulation.

The EUTR also places an obligation on companies to put in place systems of 'due diligence' to minimise the risk of their handling illegal timber. This includes means of ensuring access to information on the

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<sup>38</sup> Regulation (EU) No 995/2010 of the European Parliament and of the Council of 20 October 2010, laying down the obligations of operators who place timber and timber products on the market.

source of the products and a process of analysing and mitigating against the risk of placing illegal products on the market. Since it applies to any company which first places timber products on the market, it has very wide application and may prove to be the element of the EUTR with the widest and longest lasting impact. Although in the US the Lacey Act does not contain any requirements for industry to set up a similar system, the requirements placed by the courts on a number of companies subject to enforcement action have in effect created a similar 'due care' obligation on US importers of timber.

Other consumer countries have been influenced by these developments in the EU and US; legislation similar to the EUTR and US Lacey Act now exists in Australia and, in an essentially voluntary form, in Japan; legislation is in the process of development in Korea. As well as these legislative reforms, many countries – mostly in the EU – have used their public procurement policies to grow the market for legally (and often sustainably) sourced timber, as noted above in Section 3.2. Although precise data of course does not exist, studies suggest that the extent of illegal logging peaked in about 2006–08 and then declined under the impact of the policy measures described above and improved levels of law enforcement in many producer countries.<sup>39</sup> More recently, however, the illegal extraction of timber appears to have risen again, as incentives have grown for the illegal clearance of forests for agriculture (as noted above in Section 2.3, clearance for agriculture is the main global driver of deforestation) and as domestic markets and markets in Asia have both expanded strongly.<sup>40</sup>

### 3.4 Private-sector initiatives

Many private-sector companies have also taken action to exclude illegal and unsustainable wood products from their supply chains. Although in the 1990s there was some take-up of the voluntary forest certification schemes (see further in Section 3.5), mainly in Western Europe, and particularly in countries that imported the bulk of their timber (such as the UK and Netherlands), it was the increasing focus on illegal logging in the 2000s that encouraged wider action. Individual companies and trade associations slowly began to adopt responsible purchasing policies – sometimes under pressure from NGO campaigns (leading to the fear of the entire sector's brand being damaged), sometimes in response to government procurement policies, and sometimes in the awareness that certified suppliers tended to be more reliable in delivering guaranteed supplies of high-quality products. From the late 2000s the introduction of legislation such as the US Lacey Act and the EUTR strongly reinforced these developments, at least in the US, EU and a few other countries.

These developments form part of the wider move towards responsible supply chains now being seen across many different sectors. This is particularly true of retailers and traders – aware of the reputational risk of being seen to handle illegal products – but it can also be seen in the behaviour of some producer companies. In 2010, the Consumer Goods Forum, a global industry network of retailers, manufacturers and service providers, adopted a target of achieving zero net deforestation in its membership's supply chains by 2020.<sup>41</sup> In September 2014, the New York Declaration on Forests, signed at the UN Climate

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<sup>39</sup> Alison Hoare, *Tackling Illegal Logging and the Related Trade: What Progress and Where Next?* (Chatham House, July 2015).

<sup>40</sup> Sam Lawson et al, *Consumer Goods and Deforestation: An Analysis of the Extent and Nature of Illegality in Forest Conversion for Agriculture and Timber Plantations* (Forest Trends, September 2014).

<sup>41</sup> See <http://www.theconsumergoodsforum.com/sustainability-strategic-focus/climate-change/deforestation>.

Summit by governments, corporations and NGOs, committed its signatories collectively to ‘at least halve the rate of loss of natural forests globally by 2020 and strive to end natural forest loss by 2030’.<sup>42</sup>

Many companies have now adopted purchasing policies aimed at sourcing sustainably produced timber and wood products and, increasingly, agricultural commodities associated with deforestation, such as palm oil or cocoa. Many such supply-chain controls, including those in public procurement policies, make use of the main international voluntary forest certification systems (and similar schemes for agricultural commodities), as a relatively straightforward way of identifying sustainable or legal products, and in turn this has helped boost the market penetration of certified products.

### 3.5 Certification and labelling

Any measures designed to grow the market for legal and sustainable wood products, whether government procurement policies or private sector commitments, must rest on means of identifying them and enabling purchasers to distinguish between legal and sustainable and illegal and unsustainable products. In practice, as noted above, the simplest way to achieve this has been to rely on the private forest certification schemes which have developed since the mid-1990s in response to the growing demand for environmentally friendly timber: those of the Forest Stewardship Council (FSC) and the Programme for the Endorsement of Forest Certification (PEFC; essentially a mutual recognition arrangement for national certification schemes).

These two schemes now dominate the global market.<sup>43</sup> By May 2017 the proportion of global forest area certified under either or both of them reached almost 11 per cent (429 million hectares). This represented a slight fall from the previous year, though this may be a result of more accurate data, particularly on the area certified by both schemes. In 2016 it was estimated that production of certified industrial roundwood amounted to 511 million m<sup>3</sup>, around 29 per cent of global industrial roundwood production, though this may have been an over-estimate due to overlapping certification, and the figure is now being re-evaluated.

Nevertheless, the penetration of certified products into national markets has grown, particularly in the EU, under the impact of the public policies and private-sector initiatives examined above. Although detailed consumer-country data is not generally available, the Netherlands, a country with an ambitious timber procurement policy and an industry highly sensitised to concerns over illegality and sustainability, has tracked the penetration of certified products. Between 2005 and 2015, the proportion of sawnwood and panels on the Dutch market certified by either of the two main global certification schemes rose from 13 per cent to 83 per cent, and the proportion of certified paper rose from less than 1 per cent to 64 per cent.<sup>44</sup>

The regional distribution of certified forest area is highly uneven, though less so than a few years ago. In 2017 North America and Europe between them accounted for 71 per cent of certified forest area.

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<sup>42</sup> Climate Summit (2014), *Forests: Action Statements and Action Plans*. New York: United Nations.

<sup>43</sup> All figures in this section unless otherwise noted: *Forest Products Annual Market Review 2016–2017* (FAO and United Nations Economic Commission for Europe, 2017).

<sup>44</sup> ‘Dutch sustainably sourced timber production grows to 83% in a decade’ (Probos, bosberichten 2017 No. 3).

Although a number of developing countries, including Brazil, Malaysia and China, all possess significant areas of certified forest, the penetration of certification in the developing world is low; in 2017 Africa, Latin America, Asia and Oceania between them accounted for only 15 per cent of certified forest area, equivalent to about 2 per cent of tropical forest in total.

Both FSC and PEFC are complex schemes with a wide range of criteria and indicators, requiring that products have been produced in accordance with the principles of SFM and are traceable throughout their entire supply chain. They have been particularly difficult to apply in developing countries, and amongst smaller forest enterprises, and as a result a number of simpler legality verification schemes have been developed to help meet demand for legal (though not sustainable) products from both public and private sectors; examples include schemes run by Smartwood, Bureau Veritas and SGS. As discussed above in Section 3.3, countries which have agreed VPAs with the EU are in the process of establishing legality assurance systems designed to identify legal timber products and license them for export to the EU (and, in practice, to all other export destinations), although to date only Indonesia has started to issue FLEGT licenses.

### 3.6 REDD+ initiatives

‘Reducing emissions from deforestation and forest degradation, plus conservation’ – REDD+ – is a simple concept which is proving difficult in practice to implement. First introduced to the climate change negotiations in 2007, donor countries have to date pledged billions of dollars to forest-rich developing countries to help them prepare for a fully fledged REDD+ mechanism mobilising private-sector finance through a global forest carbon market – yet the emergence of that mechanism still seems to be many years off.

REDD+ is essentially a performance-based mechanism, aiming to incentivise countries to reduce emissions from deforestation and forest degradation, the source of an estimated 10 per cent of global emissions. It aims to create a financial value for the carbon stored in forests, thus offering incentives to keep trees standing and increasing the opportunity costs of deforestation, thereby counteracting agricultural expansion and other drivers of deforestation, at least in principle.

A variety of international institutions and initiatives have evolved to channel REDD+ funding to developing countries, including three World-Bank-administered funds (Forest Investment Programme, Forest Carbon Partnership Facility and BioCarbon Fund Initiative for Sustainable Forest Landscapes) and the UN-REDD partnership. In 2017 the Green Climate Fund also began to draw up plans for its own REDD+ financing activities. Several donor countries maintain sizeable bilateral REDD+ programmes and some are increasingly collaborating in deploying their support – for example, Germany, Norway and the UK through the REDD Early Movers Programme.

The vast bulk of the funding pledged to date (an estimated US\$10 billion by 2014<sup>45</sup>) has been devoted to ‘readiness’ activities, including building stakeholder capacities, developing measuring, reporting and verification systems, and supporting increased understanding of drivers of deforestation and the development of national strategies. In a few countries, REDD+ activities are now moving into the second,

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<sup>45</sup> Marigold Norman and Smita Nakhoda, *The State of REDD+ Finance* (CGD and ODI, May 2015).

or investment, phase, scaling up policies and measures designed to address the direct and indirect drivers of deforestation and forest degradation. The third and final phase, however – performance-based payments for verified reductions in emissions – is in place in very few countries; sub-national, or ‘jurisdictional’, projects in Colombia and Brazil are almost the only examples. Furthermore, the original hopes for the development of forest carbon markets at a global scale have not been realised; at least 90 per cent of the financing pledged to date has derived from public sources.<sup>46</sup>

In general, national REDD+ programmes have been far slower to develop than many of their proponents originally anticipated. Their implementation has faced major methodological, practical and political challenges, including the definition of reference levels against which the reduction in emissions will be measured; systems of measuring, reporting and verifying reductions in emissions; problems of leakage, where a reduction in deforestation in one area may simply lead to an increase in deforestation in another, and of permanence, the need to guarantee the protection of trees throughout their growing lifespan; the implementation of safeguards to ensure that REDD+ activities do not negatively effect the benefits forests provide to local communities and indigenous peoples; and governance and law enforcement, the lack of which in many countries can fatally undermine the intentions of REDD+ programmes. It is for reasons like these that the private sector has to date displayed only very limited enthusiasm for investing in REDD+ activities and developing a global forest carbon market. Although these challenges do appear to be overcome in a few countries, this has proved a slow and resource-intensive process which seems likely to take many years to deliver – if it ever does – the supposedly easy and cheap reductions in emissions that were hoped for at the start of the UN process.

### 3.7 International institutions

While no legally binding multilateral agreement on forests or the global timber trade exists, the activities of a number of international institutions are relevant to the implementation of SFM, as well as the international processes which have set out the principles for SFM for different regions (see Section 3.1).

The **UN Forum on Forests** is the successor to the Intergovernmental Panel on Forests (1995–97) established after the Earth Summit in 1992, and the Intergovernmental Forum on Forests (1997–2000) which followed it.<sup>47</sup> Designed to act as a universal-membership policy forum for discussions and the exchange of experience on the promotion of SFM, it has hosted the negotiations which led to agreement on the UN Forest Instrument in 2007 and the UN Strategic Plan for Forests 2017–2030 in 2017 (see box). The UNFF aims to encourage implementation of the Forest Instrument and the Strategic Plan, including by monitoring, assessing and reporting annually on progress made, mobilising resources and sharing technical advice.

#### **UN Strategic Plan for Forests 2017–2030: Global Forest Goals<sup>48</sup>**

1. Reverse the loss of forest cover worldwide through sustainable forest management, including protection, restoration, afforestation and reforestation, and increase efforts to prevent forest

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<sup>46</sup> Ibid.

<sup>47</sup> <http://www.un.org/esa/forests/index.html>

<sup>48</sup> Resolution adopted by the Economic and Social Council on 20 April 2017: United Nations strategic plan for forests 2017–2030 and quadrennial programme of work of the United Nations Forum on Forests for the period 2017–2020 (E/RES/2017/4, July 2017).

- degradation and contribute to the global effort of addressing climate change. [This includes the specific goal of increasing global forest area by 3 per cent by 2030.]
2. Enhance forest-based economic, social and environmental benefits, including by improving the livelihoods of forest dependent people.
  3. Increase significantly the area of protected forests worldwide and other areas of sustainably managed forests, as well as the proportion of forest products from sustainably managed forests.
  4. Mobilise significantly increased, new and additional financial resources from all sources for the implementation of sustainable forest management and strengthen scientific and technical cooperation and partnerships.
  5. Promote governance frameworks to implement sustainable forest management, including through the UN Forest Instrument, and enhance the contribution of forests to the 2030 Agenda.
  6. Enhance cooperation, coordination, coherence and synergies on forest-related issues at all levels, including within the UN System and across Collaborative Partnership on Forests member organisations, as well as across sectors and relevant stakeholders.

The **Food and Agriculture Organisation** is a specialised agency of the UN whose goals include helping to eliminate hunger, food insecurity and malnutrition, making agriculture, forestry and fisheries more productive and sustainable, reducing rural poverty, enabling inclusive and efficient agricultural and food systems and increasing the resilience of livelihoods to threats and crises.<sup>49</sup> It is a major source of knowledge and information, including the FAOSTAT database, from which most of the data in Chapter 1 and Annexes 1 and 2 of this paper has been drawn. It also implements various technical assistance programmes, including projects on forest law enforcement, providing support to a number of countries to strengthen their forest policy framework, build institutional capacity to foster better forest law compliance and gather additional data on their forest resources.

The **International Tropical Timber Organisation** (ITTO) was established in 1986, when the first International Tropical Timber Agreement came into force; it has since been revised twice.<sup>50</sup> ITTO's membership includes both producer and consumer nations engaged in the trade in tropical timber products, between them representing about 80 per cent of the world's tropical forests and 90 per cent of the global tropical timber trade. Its resources are highly limited, however, and its activities mainly focus on collecting data on trade in wood products, and attempting to improve its reliability, on developing internationally agreed policy documents to promote SFM and forest conservation and on assisting tropical member countries to adapt such policies to local circumstances and to implement them.

The **UN Convention on Biological Diversity** (CBD), or Biodiversity Convention, was agreed in 1992, and now has 196 parties, which represents almost universal participation. It aims to promote the conservation of biodiversity, the sustainable use of its components and the fair and equitable sharing of benefits arising from genetic resources; in 2002 it agreed a programme of work on forest biodiversity around these aims. In 2010 it adopted the 'Aichi targets' – twenty targets under five strategic goals, designed to stimulate 'effective and urgent action to halt the loss of biodiversity in order to ensure that by 2020 ecosystems are resilient and continue to provide essential services ...'. Parties to the CBD are

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<sup>49</sup> <http://www.fao.org/home/en/>

<sup>50</sup> <http://www.itto.int>

invited to set their own targets within this framework. Although there are no real penalties for non-compliance or for any failure to implement meaningful policies and measures, the CBD has helped to raise the profile of biodiversity-related issues, encouraged the adoption of national strategies and mobilised financial support, mainly through the Global Environment Facility.

The 1973 **Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)** aims to protect endangered species from over-exploitation by controlling international trade, under a system of import and export permits.<sup>51</sup> Endangered species of wildlife – currently about 5,800 species of animals and 30,000 species of plants – are placed on different appendices depending on the extent to which trade threatens their survival. Until recently only a handful of tree species were listed, but in 2016 more than 300 rosewood and palisander species were added; many of these are used in high-value products such as musical instruments, most are highly endangered and many are subject to illegal trade. It is still too early to judge the effectiveness of these new controls on the international trade in timber. The CITES system suffers from many weaknesses, including a lack of capacity and corruption amongst some of its national management authorities, but it is also true that no species listed under CITES has ever become extinct.

Finally, international enforcement bodies, including the **World Customs Organisation (WCO)**<sup>52</sup> and the **International Criminal Police Organisation (Interpol)**<sup>53</sup> play important roles in combating illegal trade in timber products. Both encourage communication across borders amongst their national member agencies, and provide capacity-building and technical assistance with enforcement. Although wildlife crime is only one of their many priorities, both organisations, operating in particular in the WCO's case through its Regional Intelligence Liaison Offices (RILOs), have collaborated in joint wildlife crime enforcement operations. In 2015, for example, Interpol and two of the WCO's RILOs collaborated with other bodies in Operation Cobra III, the largest ever global operation targeting transnational wildlife and forest crime, including timber and other forest products.<sup>54</sup> The operation resulted in more than 300 arrests of suspects and over 600 seizures of wildlife contraband, and tip-offs leading to the discovery of crime networks and other criminal activities.

In 2010 the **International Consortium on Combating Wildlife Crime (ICCWC)** was founded by the CITES Secretariat, the WCO, Interpol, the UN Office on Drugs and Crime and the World Bank.<sup>55</sup> A collaborative consortium rather than an independent organisation, its aim is to strengthen criminal justice systems and provide coordinated support at national, regional and international levels to combat wildlife and forest crime. It has proved relatively successful in raising the profile of the issue, mobilising donor funding and providing resources, institutional support and capacity-building. The **UN Inter-Agency Task Force on Illicit Trade in Wildlife and Forest Products** was established in 2016 as a 'One UN' response designed to help integrate and leverage ongoing efforts carried out within the UN system. Its membership includes the UN Department of Economic and Social Affairs, which hosts the UNFF secretariat; UNFF represents the Department on the Task Force. A series of **international conferences on**

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<sup>51</sup> <https://www.cites.org>

<sup>52</sup> <http://www.wcoomd.org>

<sup>53</sup> <https://www.interpol.int/en>

<sup>54</sup> 'Successful operation highlights growing cooperation to combat wildlife crime', WCO press release, 18 June 2015; <http://www.wcoomd.org/en/media/newsroom/2015/june/successful-operation-highlights-growing-cooperation-to-combat-wildlife-crime.aspx?p=1>.

<sup>55</sup> <https://www.cites.org/eng/prog/iccwc.php>.

**the illegal wildlife trade**, starting in 2014 and culminating in London in October 2018, are also designed to raise the profile of the issue and maintain momentum.

## 4 Conclusions

Sustainable Development Goals 12 and 15 between them, and the more detailed targets set out in the UN Strategic Plan for Forests 2017–2030, provide a comprehensive framework of measures to support the sustainable production and consumption of forest products and the protection of the forests from which they are produced. A full listing of the detailed policies designed to implement these high-level goals would take many pages, and falls outside the remit of this paper, but in outline, key policies and measures include the following –

Measures to promote the sustainable production and consumption of forest products, including:

- Improvements in the utilisation of wood products, including the adoption and implementation of the ‘cascading principle’, implying that wood should be used in the following order of priority: wood-based products, extending their service life, reuse, recycling, bioenergy and disposal.
- Support for technological developments aimed at underpinning this principle, aimed for example at improving rates of reuse, recovery and recycling.
- The introduction of policies to support legally and sustainably produced wood products in consumer markets, through, for example, public procurement policy and building regulations, and wider border controls, such as the EUTR or US Lacey Act, designed to exclude illegal products.
- Support for private-sector initiatives to source legal and sustainable products (both wood products and agricultural commodities, such as palm oil or cocoa, often associated with deforestation); this includes encouragement for sustainability certification initiatives.
- Encouragement for national policies designed to support the sustainable production and consumption of non-wood forest products.

Measures to promote sustainable forest management, including:

- The reform of forest and land-use legislation, including the clarification of land tenure and access rights.
- Improvements in levels of transparency and the ability of all stakeholders to participate in the development and implementation of forest laws and practices.
- Support for improvements in forest governance and law enforcement, including the establishment of timber legality verification systems and capacity-building amongst enforcement agencies, including not only forest agencies but bodies such as police and customs and those responsible for combating corruption and financial crimes such as money laundering.
- Support for community forest management.
- Greater and more effective protection of critical areas of forest such as those of high conservation value and high carbon stock.
- The implementation of systems of payments for ecosystem services, including climate mitigation (through REDD+ initiatives), watershed management, biodiversity protection, etc.;

- The elimination of perverse incentives, e.g. for unsustainable deforestation caused by agricultural expansion or for the unsustainable use of bioenergy.
- Support for reforestation and afforestation initiatives, focusing on holistic approaches to natural forest landscape restoration, sensitive to local conditions and local communities, rather than expanding plantations of monocultures unsuited to local ecosystems and climates.

Needless to say, all these measures require resources and capacity-building assistance to be made available to developing countries, through donor agencies and governments, including the REDD+ institutions. The inclusion of these and related measures in national and international climate programmes, such as the Nationally Determined Contributions for the achievement of the goals set out in the Paris Agreement on climate change, could unlock further resources for their implementation.

## Annex 1 Wood-based products: production and trade by product type

The following pages show three charts (production, trade and transformation or end use; imports; exports) for the following product categories for the period 2000–16:

<i>Category</i>	<i>Page</i>
Wood fuel	46
Logs	48
Sawnwood	50
Veneer and plywood	52
Other wood panels	54
Wooden furniture	56
Wood pellets	57
Chips and residues	59
Wood-based pulp	61
Paper	63

Note that the Y axis (volume or weight) scale differs for each chart.

*Sources for all charts in Annexes 1 and 2 and Section 1.1: FAOSTAT, UN Comtrade, Alice Web (Brazil), Eurostat, Statistics Canada, China Customs, Trade Statistics of Japan, Korea Customs Service, Trade Statistics Search (Taiwan Customs Administration), Thai Customs, USITC.*

*Roundwood equivalent volume has been estimated by multiplying volume by (in m<sup>3</sup> per m<sup>3</sup>) 1.4 (particleboard), 1.8 (sawnwood and fibre board), 1.9 (mouldings and veneer) and 2.3 (plywood), and by multiplying weight by (in m<sup>3</sup> per tonne) 1.6 (wood chips and residues), 2.8 (wooden furniture), 3.5 (joinery and paper), 4.5 (wood-based pulp), etc. Where necessary, volume has been estimated from weight by assuming 1.4 m<sup>3</sup> per tonne. Estimates have been substituted for anomalous source data (for physical quantity).*

Figure A1.1 Production and trade of wood fuel, 2000–16

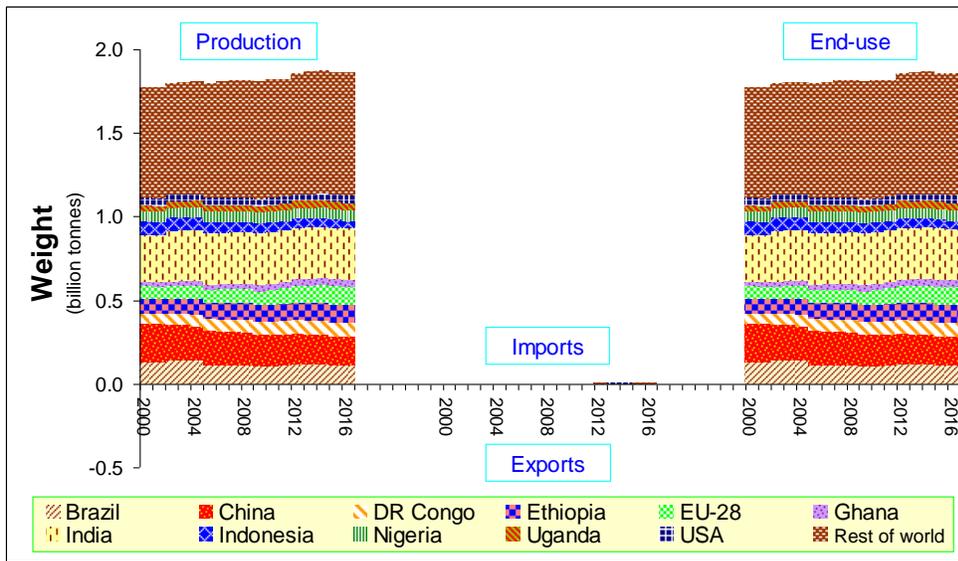
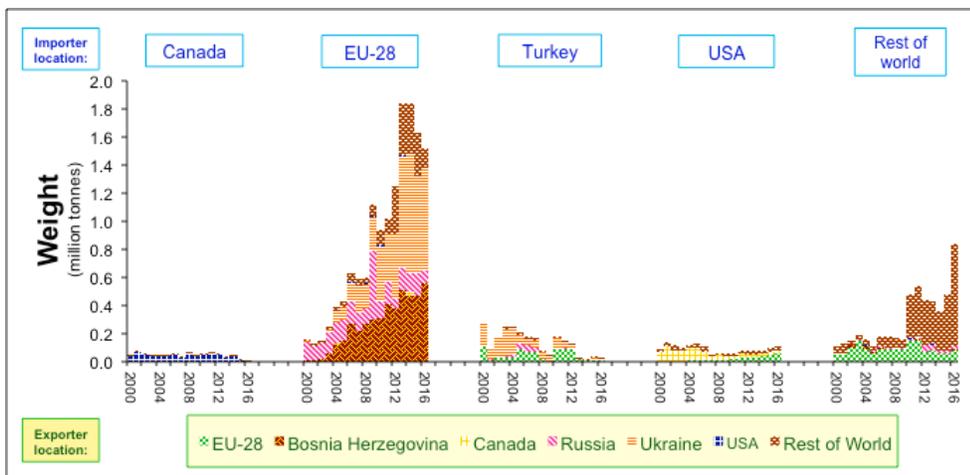


Figure A1.2 Imports of wood fuel (HS440110), 2000–16 (colours show country of export)<sup>56</sup>



<sup>56</sup> In the absence of source data, estimates have been made for Ukraine’s exports during 2016 (Figures A1.2 and A1.3).

Figure A1.3 Exports of wood fuel (HS440110), 2000–16 (colours show country of import)

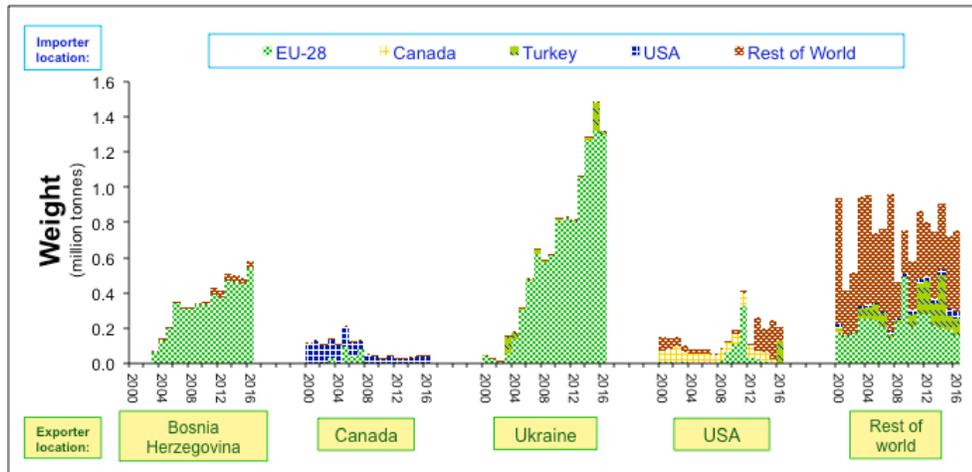


Figure A1.4 Production and trade of logs, 2000–16

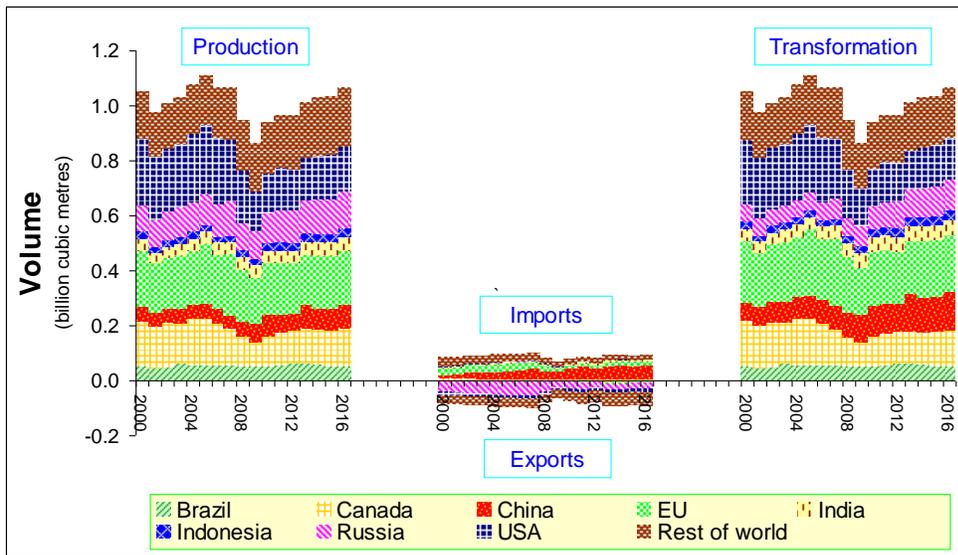


Figure A1.5 Imports of logs (HS4403), 2000–16 (colours show country of export)

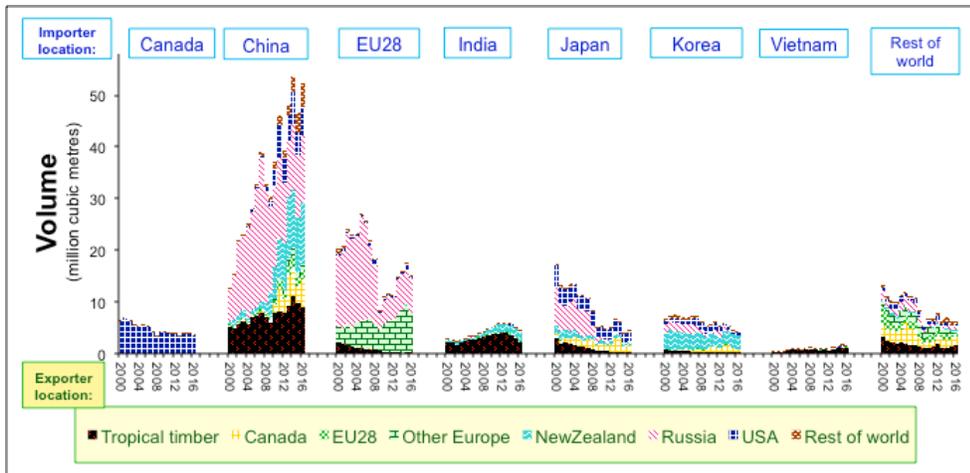


Figure A1.6 Exports of logs (HS4403), 2000–16 (colours show country of import)

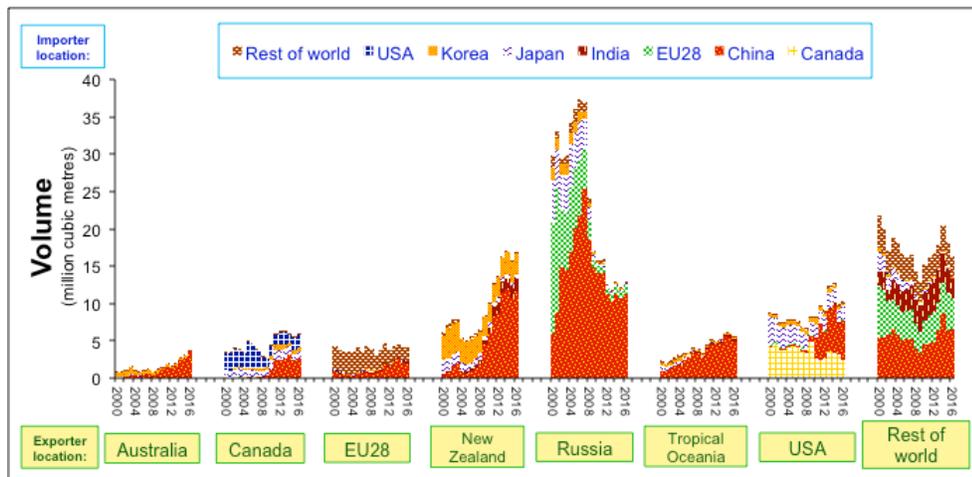


Figure A1.7 Production and trade of sawnwood, 2000–16

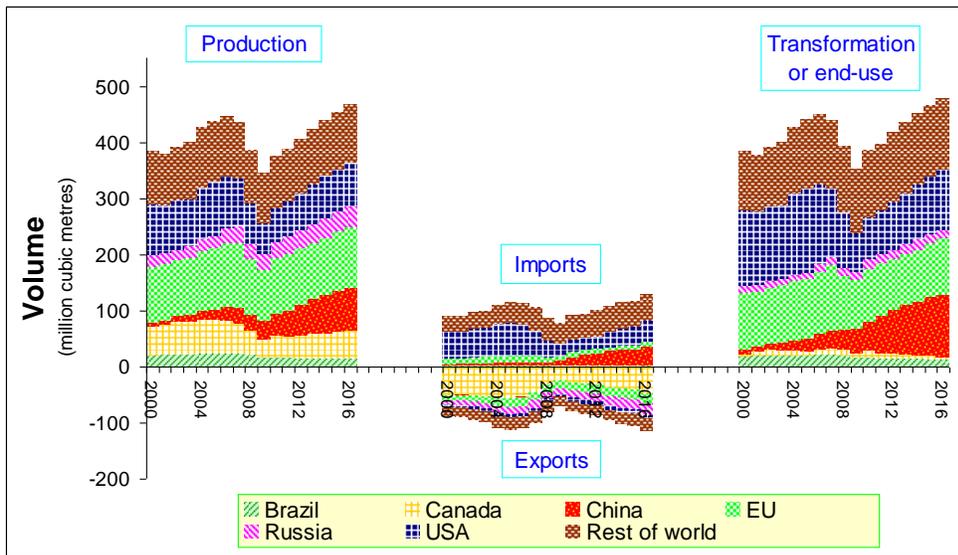


Figure A1.8 Imports of sawnwood (HS4407), 2000–16 (colours show country of export)

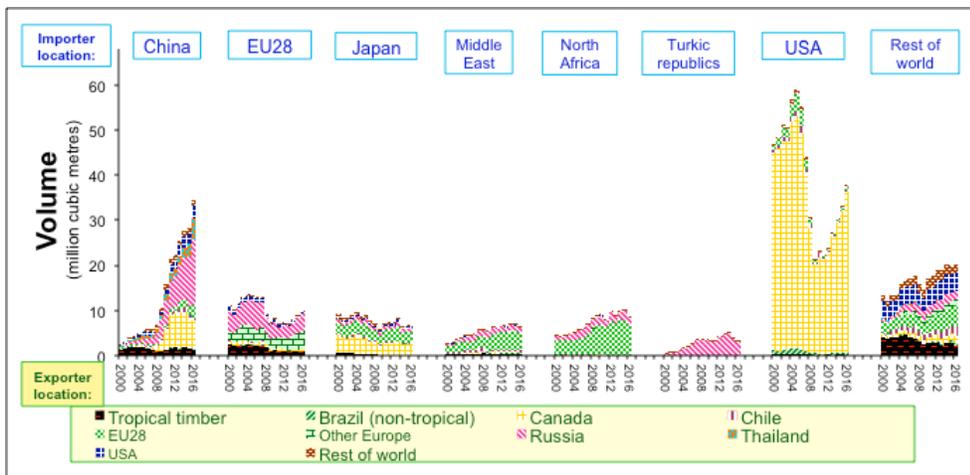


Figure A1.9 Exports of sawnwood (HS4407), 2000–16 (colours show country of import)

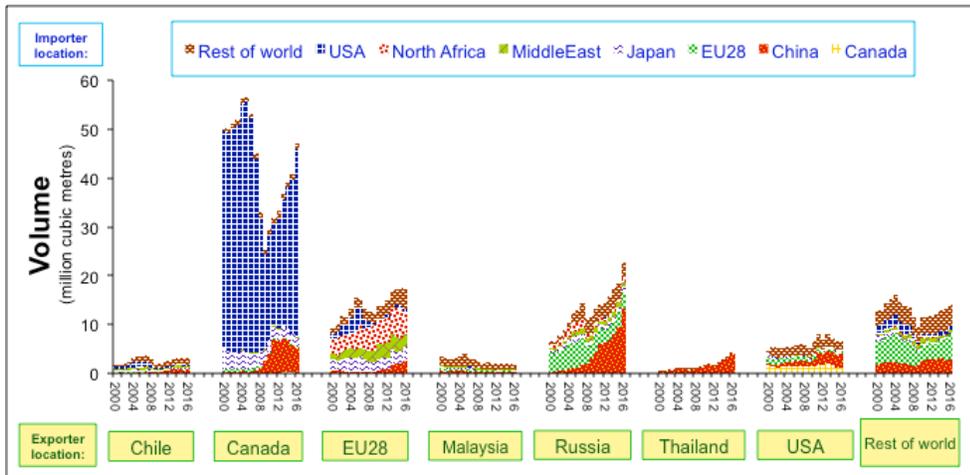


Figure A1.10 Production and trade of veneer and plywood, 2000–16

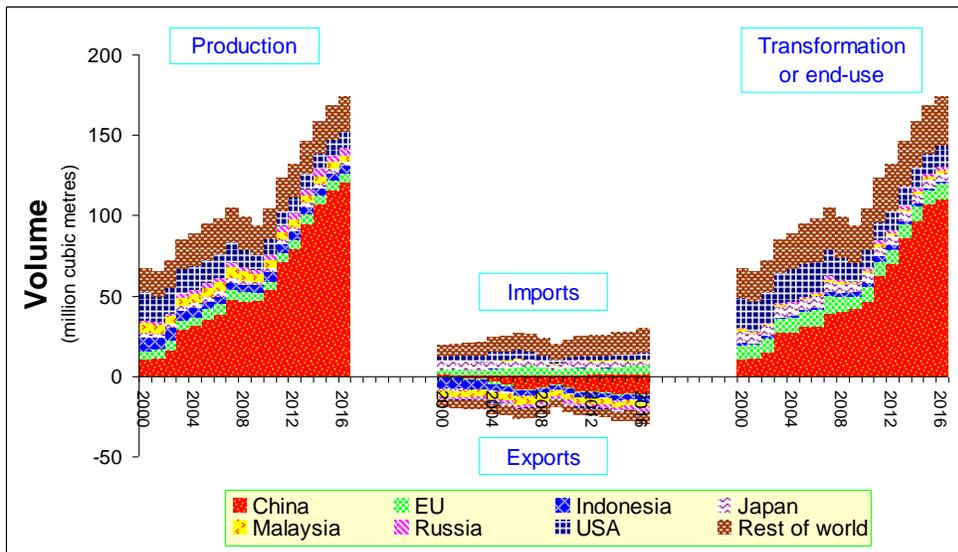


Figure A1.11 Imports of veneer (HS4408) and plywood (HS4412), 2000–16 (colours show country of export)

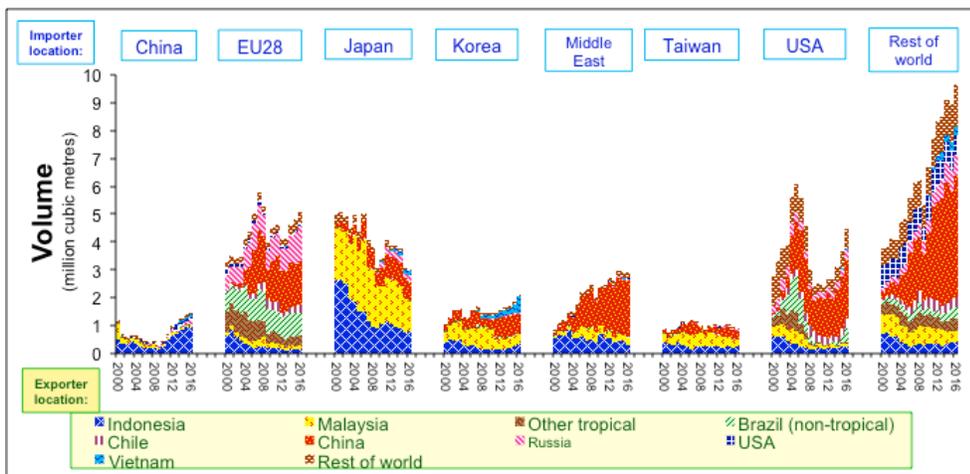


Figure A1.12 Exports of veneer (HS4408) and plywood (HS4412), 2000–16 (colours show country of import)

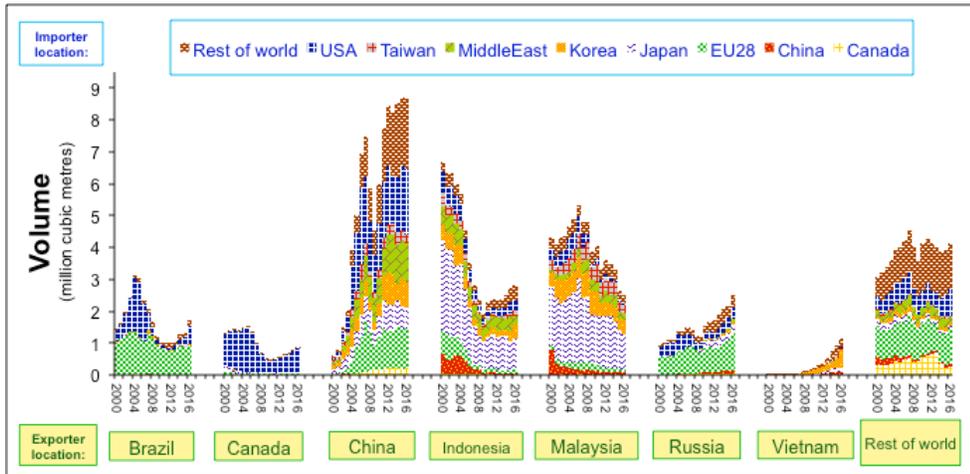


Figure A1.13 Production and trade of other wood panels, 2000–16

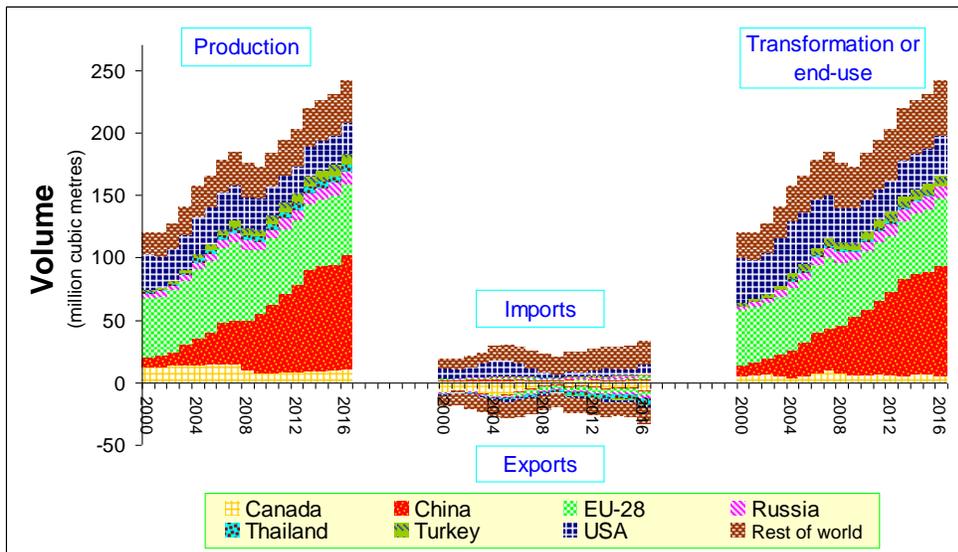


Figure A1.14 Imports of other wood panels (HS4410 and HS4411), 2000–16 (colours show country of export)

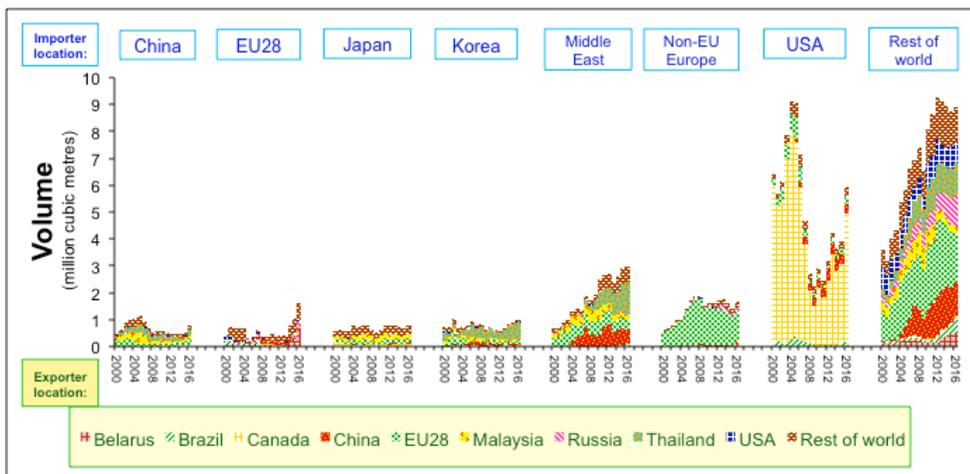


Figure A1.15 Exports of other wood panels (HS4410 and HS4411), 2000–16 (colours show country of import)

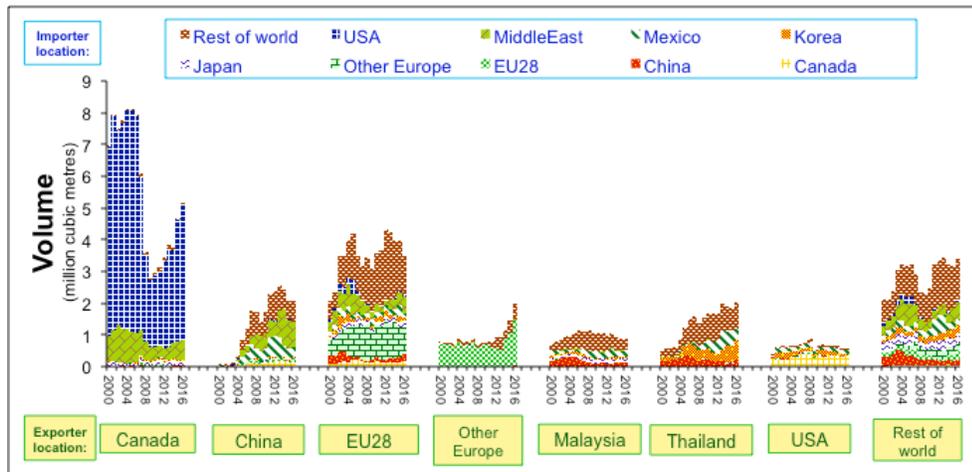


Figure A1.16 Imports of wooden furniture (various HS94), 2000–16 (colours show country of export)

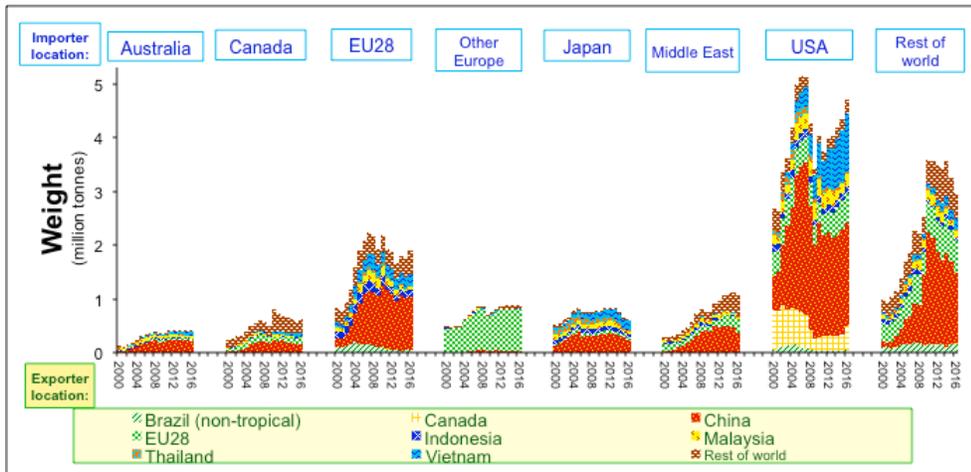
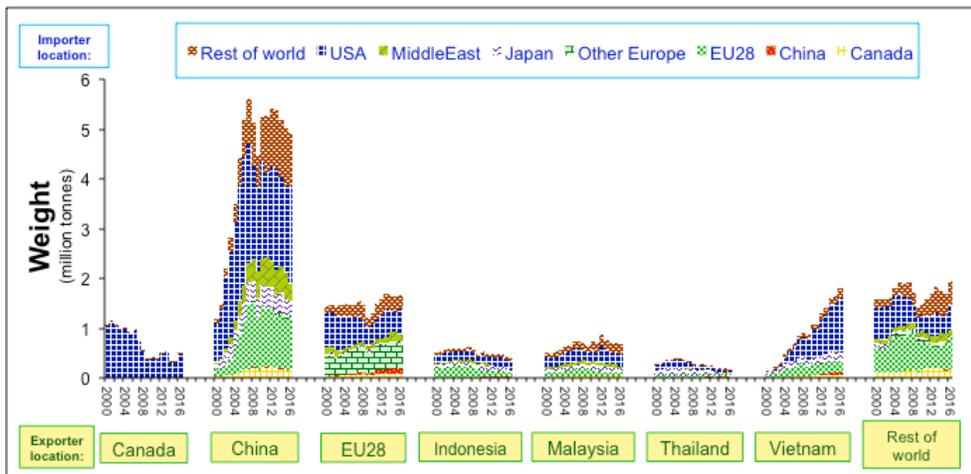


Figure A1.17 Exports of wooden furniture (various HS94), 2000–16 (colours show country of import)



(Production data for wooden furniture is not collected.)

Figure A1.18 Production and trade of wood pellets, 2012–16

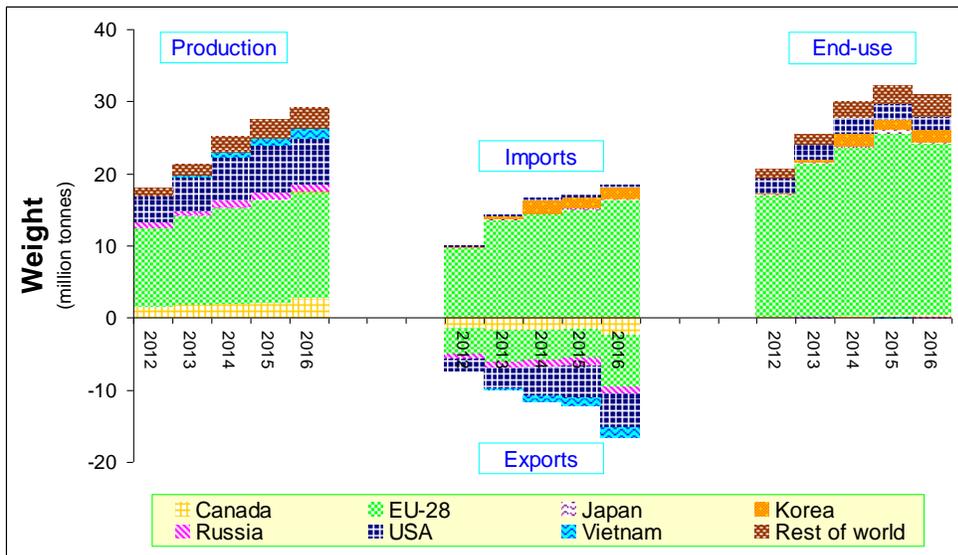


Figure A1.19 Imports of wood pellets (HS440131), 2012–16 (colours show country of export)

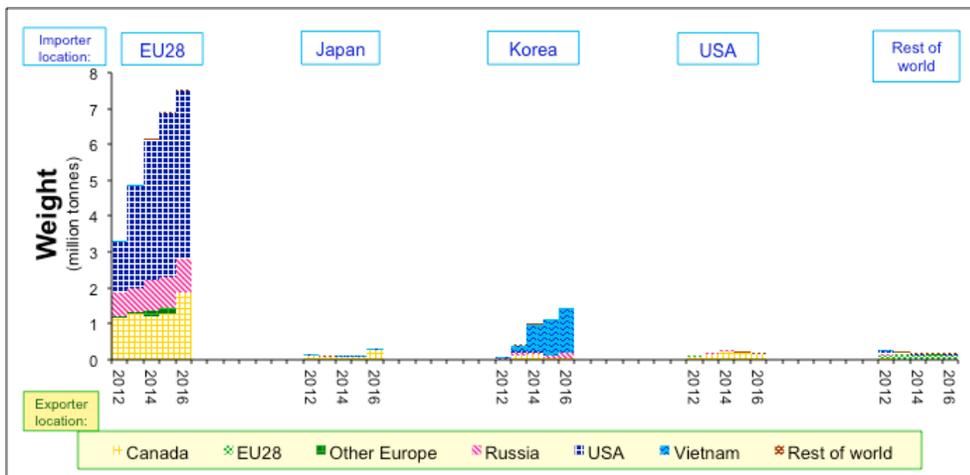
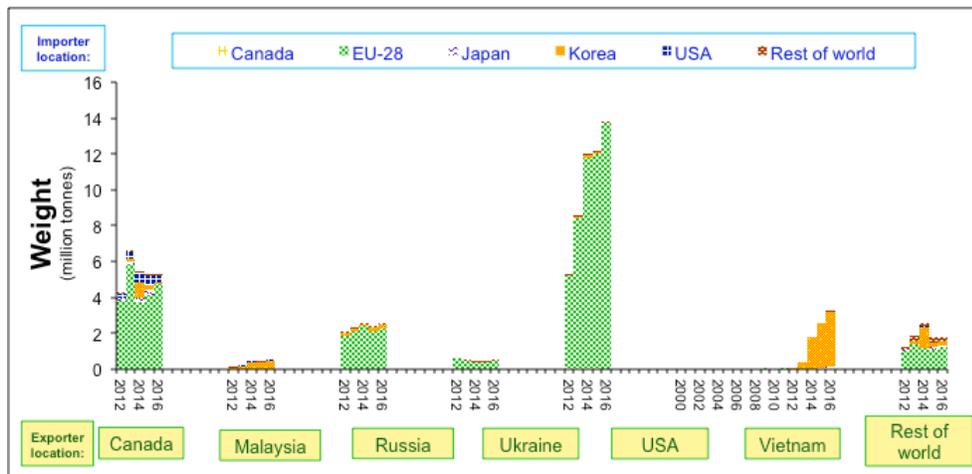
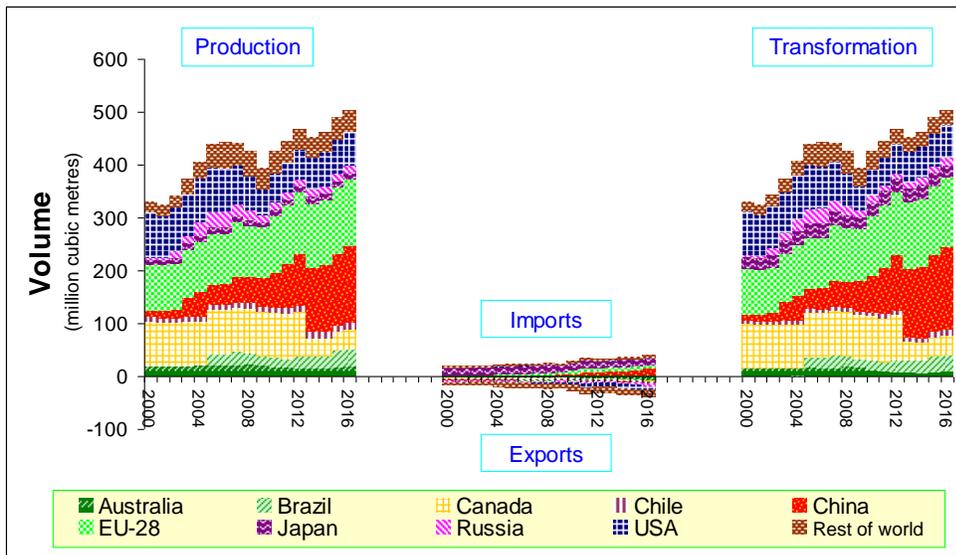


Figure A1.20 Exports of wood pellets (HS440131), 2012–16 (colours show country of import)



(Data for trade in wood pellets was only collected separately from 2012.)

Figure A1.21 Production and trade of wood chips and residues



(Source estimates for production in some countries (notably Canada and Vietnam) is unreliable.)

Figure A1.22 Imports of chips & residues (various HS4401), 2000–16 (colours show country of export)

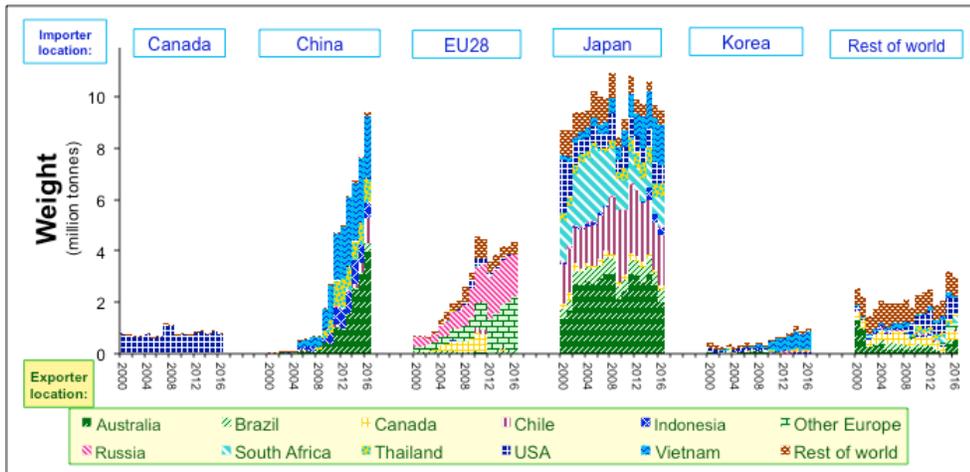


Figure A1.23 Exports of chips & residues (various HS4401), 2000–16 (colours show country of import)

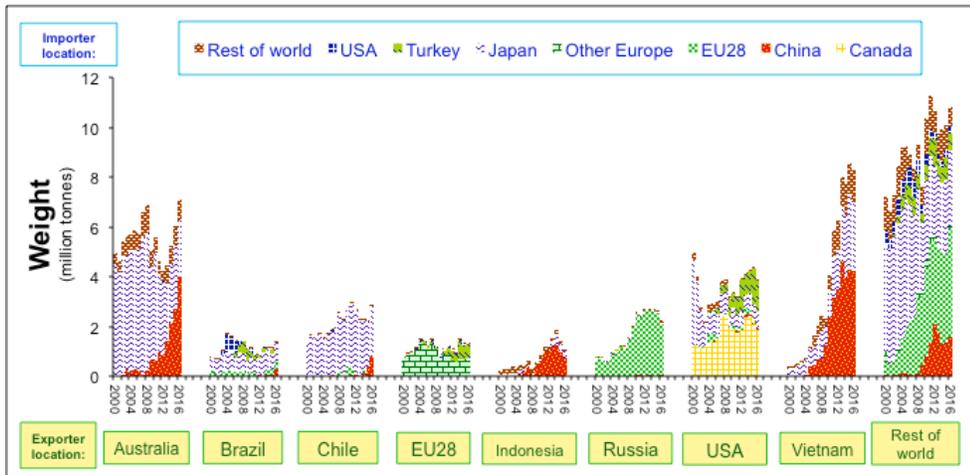


Figure A1.24 Production and trade of wood-based pulp, 2000–16

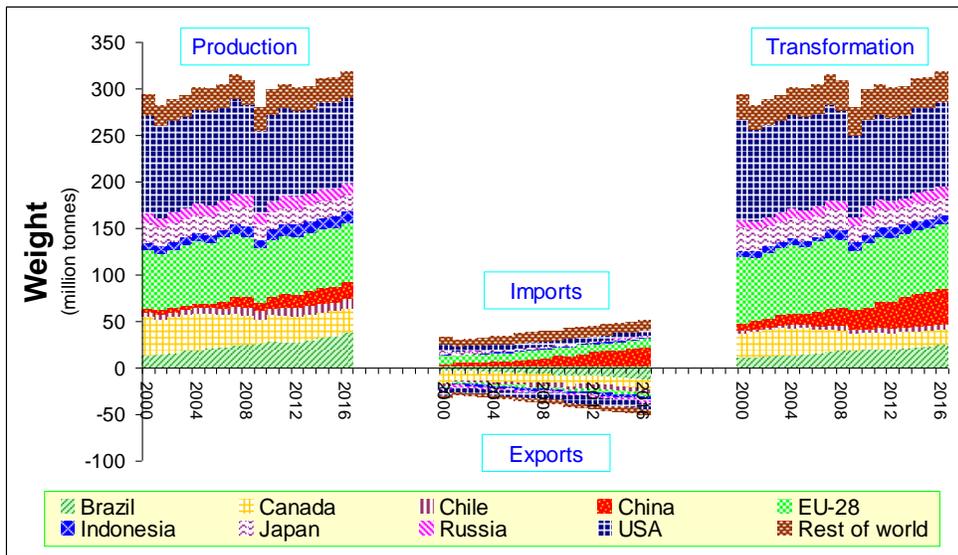


Figure A1.25 Imports of wood-based pulp (various HS47), 2000–16 (colours show country of export)

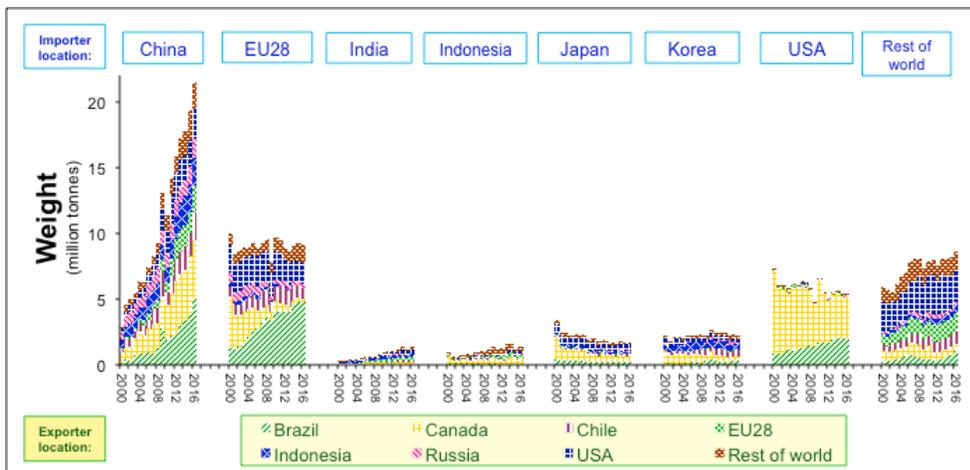


Figure A1.26 Exports of wood-based pulp (various HS47), 2000–16 (colours show country of import)

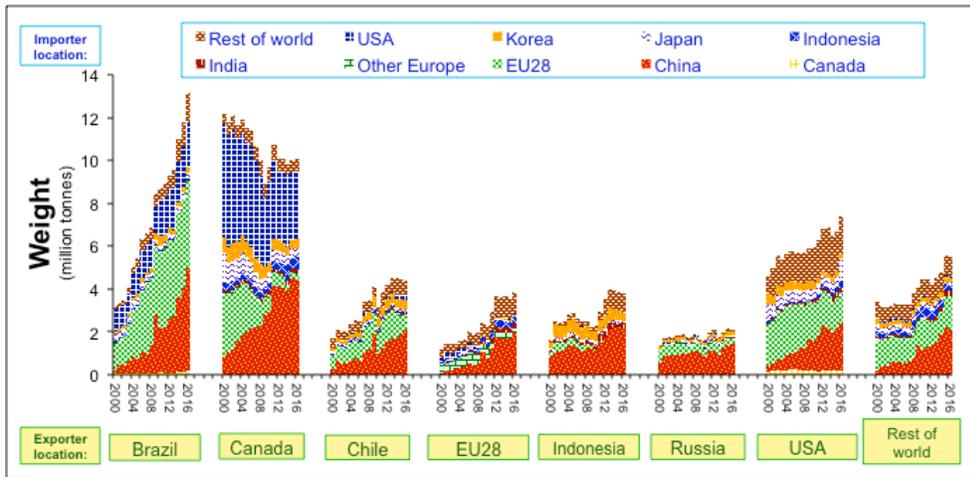


Figure A1.27 Production and trade of paper, 2000–16

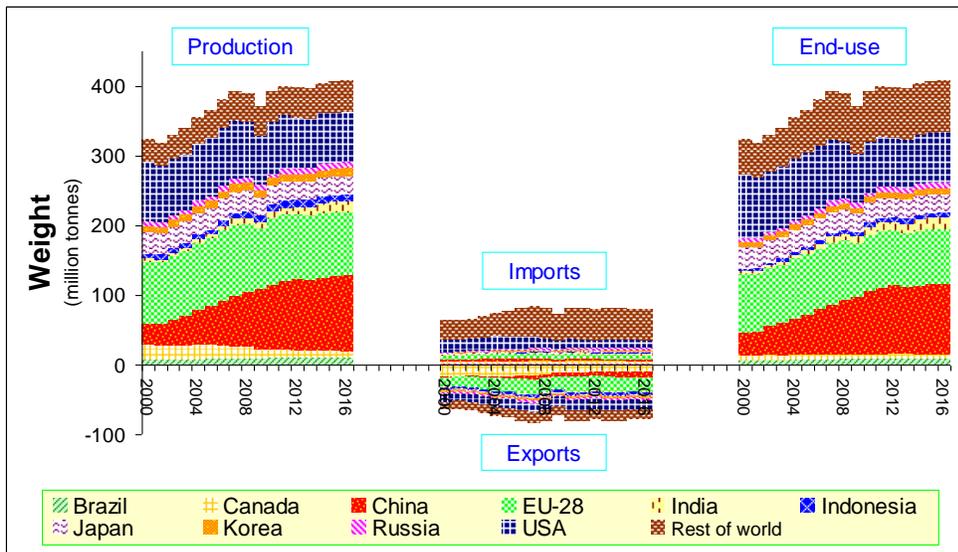


Figure A1.28 Imports of paper (HS48), 2000–16 (colours show country of export)

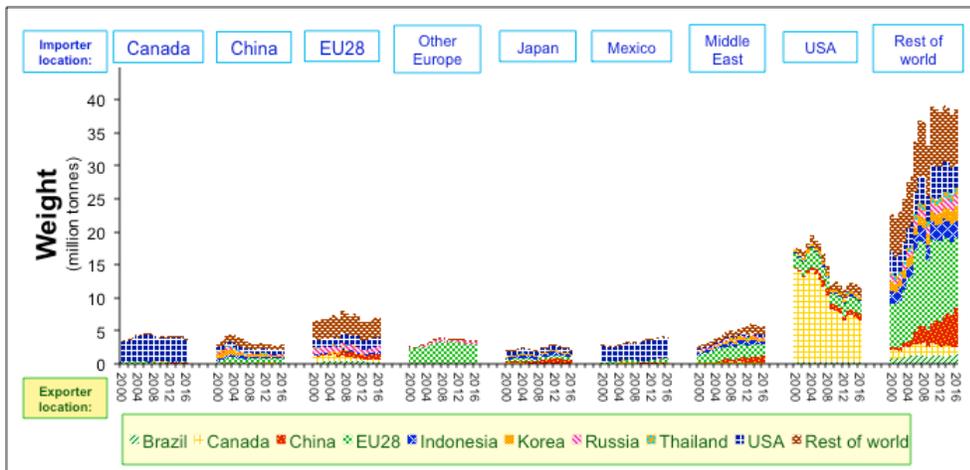
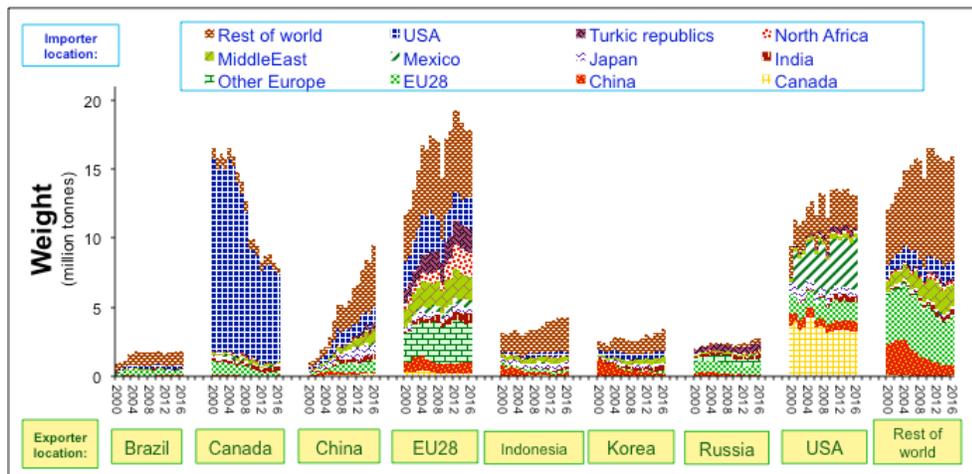


Figure A1.29 Exports of paper (HS48), 2000–16 (colours show country of import)



## Annex 2 Wood-based products: production and trade by country

The following pages show charts for production (of logs of various types, other industrial roundwood and wood fuel) and trade (in logs, sawnwood and other timber sector products, and chips, pulp and paper) for the following countries for the period 2000–16:

<i>Country</i>	<i>Page</i>
Brazil	66
Canada	66
China	67
India	67
Indonesia	68
Japan	68
Russia	69
US	69
EU	70

Note that the Y axis (volume) scale differs for each chart.

*Sources for all charts in Annexes 1 and 2 and Section 1.1: FAOSTAT, UN Comtrade, Alice Web (Brazil), Eurostat, Statistics Canada, China Customs, Trade Statistics of Japan, Korea Customs Service, Trade Statistics Search (Taiwan Customs Administration), Thai Customs, USITC.*

*Roundwood equivalent volume has been estimated by multiplying volume by (in m<sup>3</sup> per m<sup>3</sup>) 1.4 (particleboard), 1.8 (sawnwood and fibre board), 1.9 (mouldings and veneer) and 2.3 (plywood), and by multiplying weight by (in m<sup>3</sup> per tonne) 1.6 (wood chips and residues), 2.8 (wooden furniture), 3.5 (joinery and paper), 4.5 (wood-based pulp), etc. Where necessary, volume has been estimated from weight by assuming 1.4 m<sup>3</sup> per tonne. Estimates have been substituted for anomalous source data (for physical quantity).*

Figure A2.1 Brazil: production and trade in wood products, 2000–16

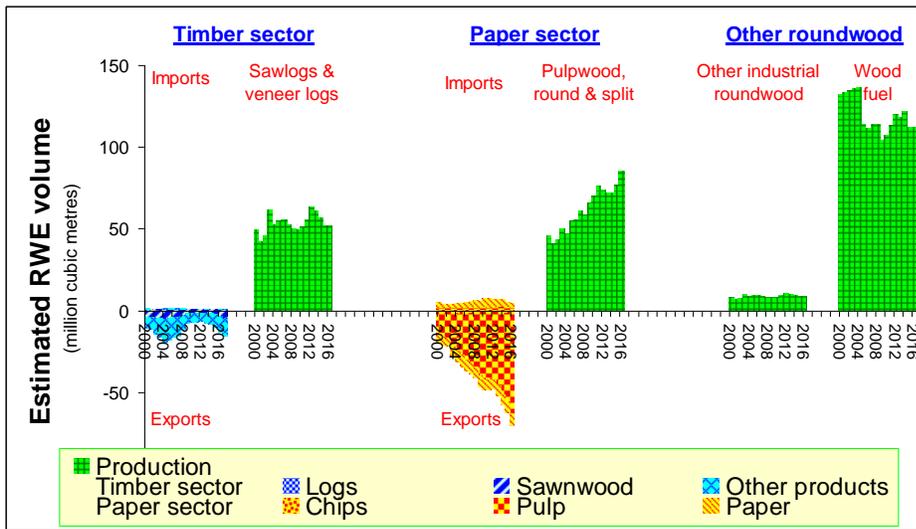


Figure A2.2 Canada: production and trade in wood products, 2000–16

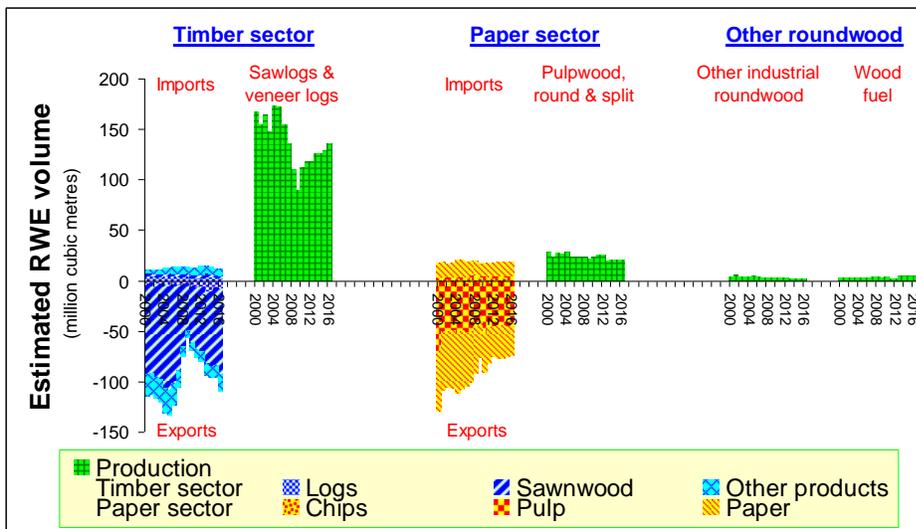


Figure A2.3 China: production and trade in wood products, 2000–16

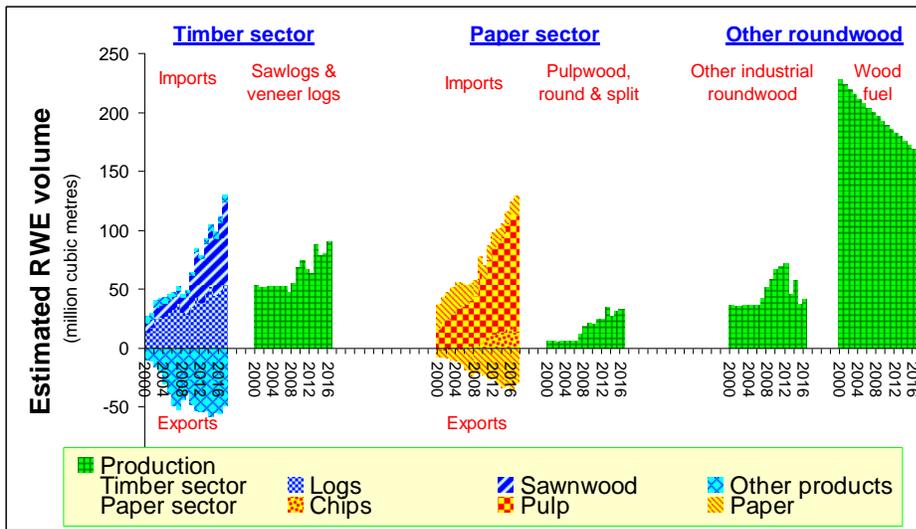


Figure A2.4 India: production and trade in wood products, 2000–16

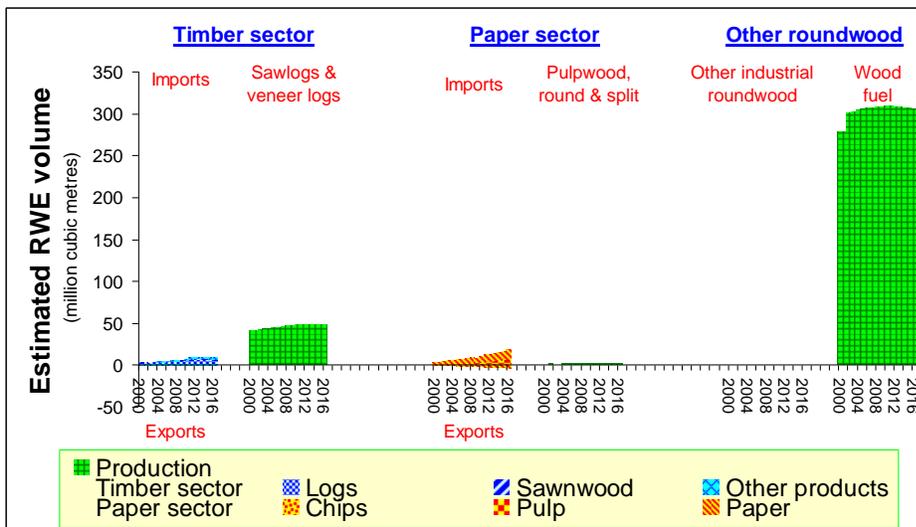


Figure A2.5 Indonesia: production and trade in wood products, 2000–16

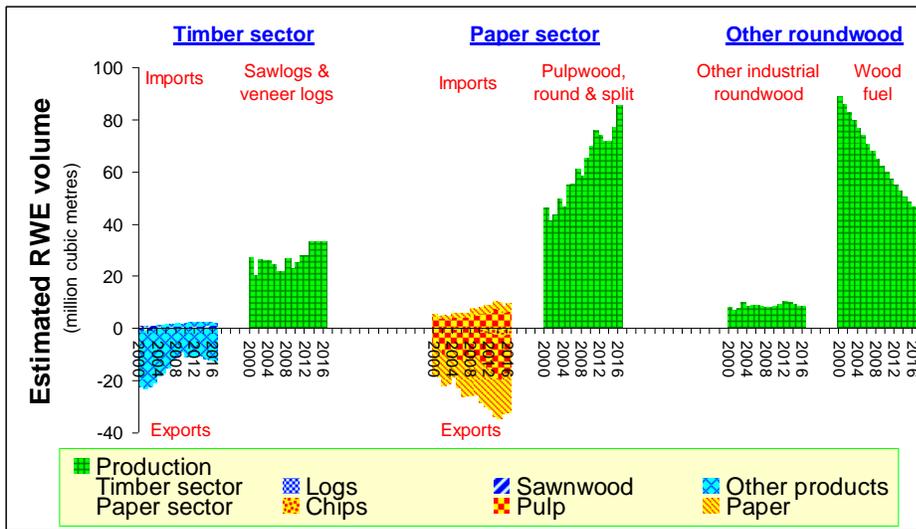


Figure A2.6 Japan: production and trade in wood products, 2000–16

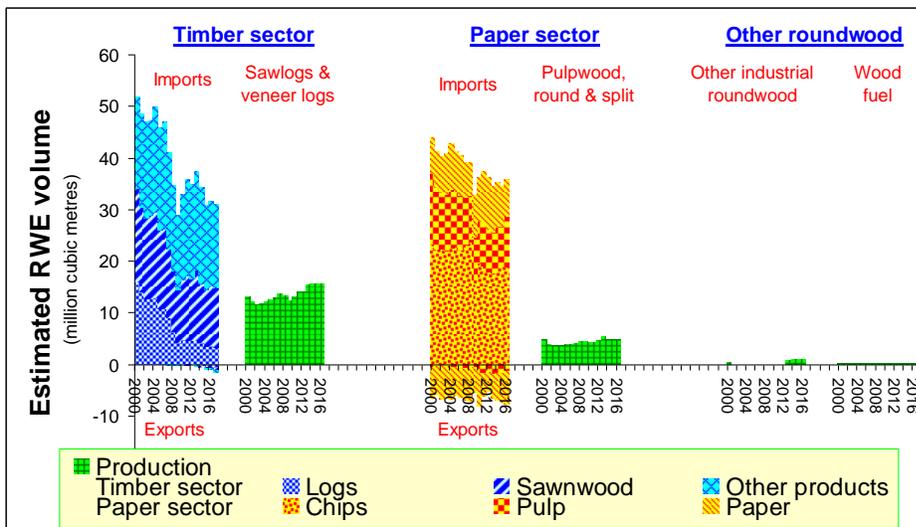


Figure A2.7 Russia: production and trade in wood products, 2000–16

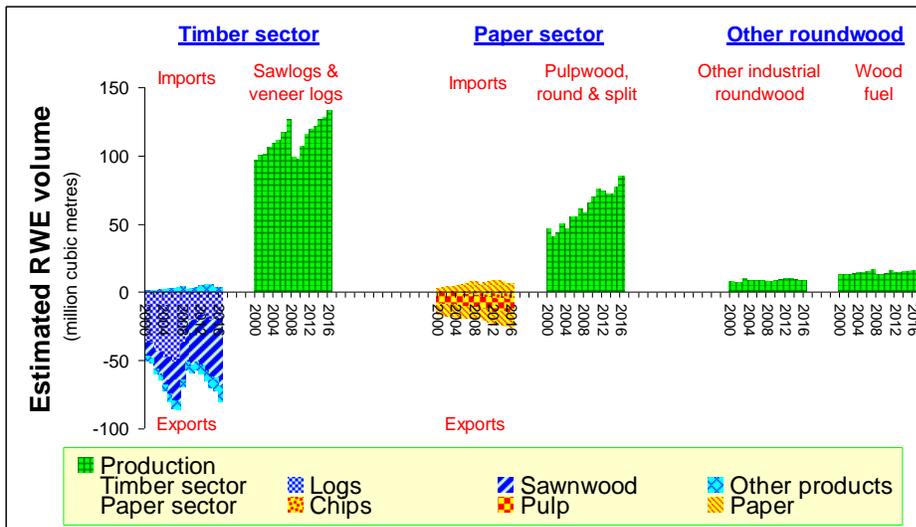


Figure A2.8 US: production and trade in wood products, 2000–16

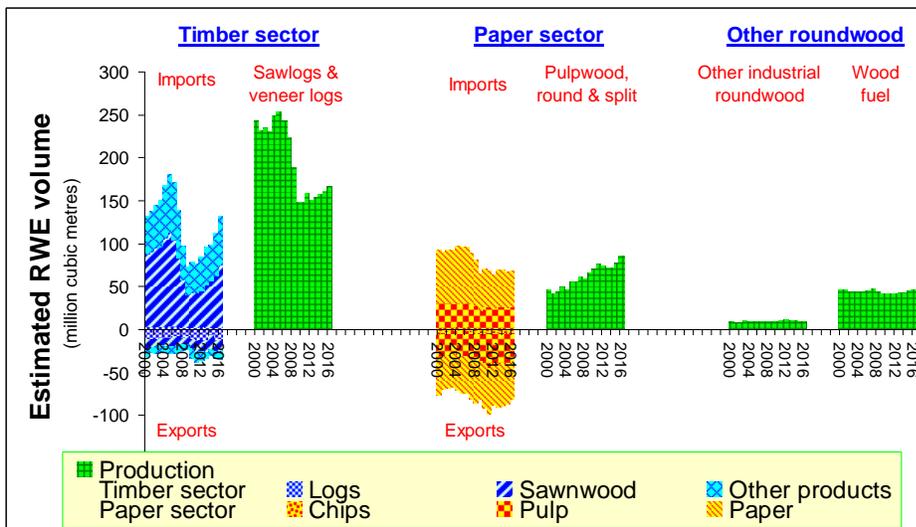
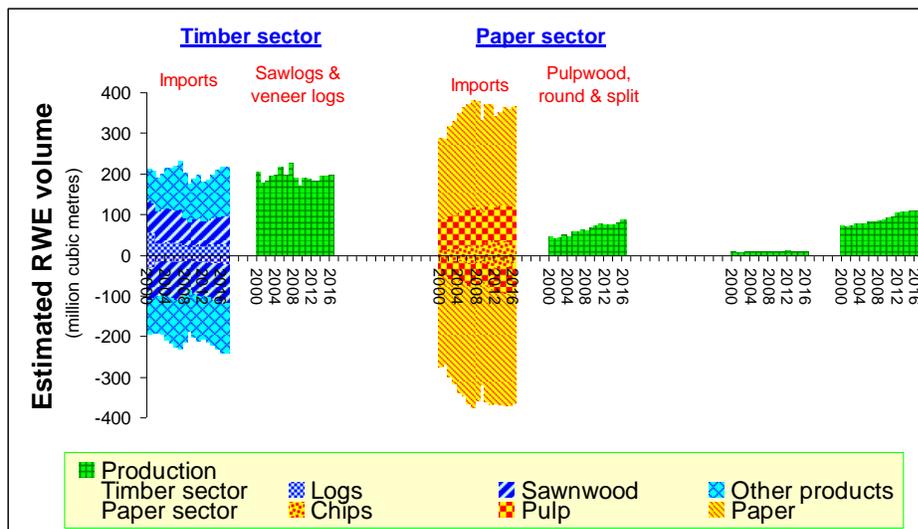


Figure A2.9 EU: production and trade in wood products, 2000–16



## Annex 3 Definitions

### A3.1 Wood products

These are abbreviated versions of the forest product definitions maintained and published by FAO.<sup>57</sup> They are listed in the order in which the categories are discussed in Section 1.1 and Annex 1.

Data on imports and exports included in this paper is classified by the Harmonised System (HS) of customs codes maintained by the World Customs Organisation; the appropriate HS codes are included in the charts in Annex 1. These may sometimes differ slightly from the FAO definitions; e.g. HS code 4403, included in Figures A1.4–6 for logs, may include, as well as sawlogs and veneer logs, some pulpwood and other roundwood.

#### **Roundwood**

All roundwood felled or otherwise harvested and removed. It includes all wood removed with or without bark, including wood removed in its round form, or split, roughly squared or in other form (e.g. branches, roots, stumps and burls (where these are harvested) and wood that is roughly shaped or pointed. It is an aggregate comprising wood fuel, including wood for charcoal and industrial roundwood (wood in the rough).

#### **Wood fuel**

Roundwood that will be used as fuel for purposes such as cooking, heating or power production. It includes wood harvested from main stems, branches and other parts of trees (where these are harvested for fuel) and wood that will be used for the production of charcoal (e.g. in pit kilns and portable ovens), wood pellets and other agglomerates. It also includes wood chips to be used for fuel that are made directly (i.e. in the forest) from roundwood. It excludes wood charcoal, pellets and other agglomerates.

#### **Industrial roundwood (wood in the rough)**

All roundwood except wood fuel. In production statistics, it is an aggregate comprising sawlogs and veneer logs; pulpwood, round and split; and other industrial roundwood.

#### **Sawlogs and veneer logs [referred to as 'logs' in this paper]**

Roundwood that will be sawn (or chipped) lengthways for the manufacture of sawnwood or railway sleepers (ties) or used for the production of veneer (mainly by peeling or slicing).

#### **Pulpwood, round and split**

Roundwood that will be used for the production of pulp, particleboard or fibreboard. It includes: roundwood (with or without bark) that will be used for these purposes in its round form or as splitwood or wood chips made directly (i.e. in the forest) from roundwood.

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<sup>57</sup> FAO, *Forest Products Definitions*; <http://www.fao.org/forestry/34572-0902b3c041384fd87f2451da2bb9237.pdf>.

### **Other industrial roundwood**

Industrial roundwood (wood in the rough) other than sawlogs, veneer logs and/or pulpwood. It includes roundwood that will be used for poles, piling, posts, fencing, pitprops, shingles and shakes, wood wool, tanning, distillation and match blocks, etc.

### **Sawnwood**

Wood that has been produced from both domestic and imported roundwood, either by sawing lengthways or by a profile-chipping process and that exceeds 6 mm in thickness. It includes planks, beams, joists, boards, rafters, scantlings, laths, boxboards and 'lumber', etc.

### **Veneer sheets**

Thin sheets of wood of uniform thickness, not exceeding 6 mm, rotary cut (i.e. peeled), sliced or sawn. It includes wood used for the manufacture of laminated construction material, furniture, veneer containers, etc.

### **Plywood**

A panel consisting of an assembly of veneer sheets bonded together with the direction of the grain in alternate plies generally at right angles. The veneer sheets are usually placed symmetrically on both sides of a central ply or core that may itself be made from a veneer sheet or another material.

### **Particle board, oriented strandboard (OSB) and similar board**

A panel manufactured from small pieces of wood or other ligno-cellulosic materials (e.g. chips, flakes, splinters, strands, shreds, shives, etc.) bonded together by the use of an organic binder together with one or more of the following agents: heat, pressure, humidity, a catalyst, etc. The particle board category is an aggregate category. It includes oriented strandboard (OSB), medium density particle board (MDP), waferboard and flaxboard.

### **Oriented strandboard (OSB)**

A structural board in which layers of narrow wafers are layered alternately at right angles in order to give the board greater elastomechanical properties. The wafers, which resemble small pieces of veneer, are coated with e.g. waterproof phenolic resin glue, interleaved together in mats and then bonded together under heat and pressure. The resulting product is a solid, uniform building panel having high strength and water resistance.

### **Fibreboard**

A panel manufactured from fibres of wood or other ligno-cellulosic materials with the primary bond deriving from the felting of the fibres and their inherent adhesive properties (although bonding materials and/or additives may be added in the manufacturing process). It includes fibreboard panels that are flat-pressed and moulded fibreboard products. It is an aggregate comprising hardboard, medium/high density fibreboard (MDF/HDF) and other fibreboard.

### **Wood pellets**

Agglomerates produced either directly by compression or by the addition of a binder in a proportion not exceeding 3% by weight. Such pellets are cylindrical, with a diameter not exceeding 25 mm and a length not exceeding 100 mm.

### **Wood chips and particles**

Wood that has been reduced to small pieces and is suitable for pulping, for particle board and/or fibreboard production, for use as a fuel, or for other purposes. It excludes wood chips made directly in the forest from roundwood (i.e. already counted as pulpwood or wood fuel).

### **Wood residues**

Other wood processing co-products. It includes wood waste and scrap not useable as timber such as sawmill rejects, slabs, edgings and trimmings, veneer log cores, veneer rejects, sawdust, residues from carpentry and joinery production, and wood residues that will be used for production of pellets and other agglomerated products.

### **Wood pulp**

Fibrous material prepared from pulpwood, wood chips, particles or residues by mechanical and/or chemical process for further manufacture into paper, paperboard, fibreboard or other cellulose products. It is an aggregate comprising mechanical wood pulp; semi-chemical wood pulp; chemical wood pulp; and dissolving wood pulp.

### **Paper and paperboard**

The paper and paperboard category is an aggregate category. In the production and trade statistics, it represents the sum of graphic papers; sanitary and household papers; packaging materials and other paper and paperboard. It excludes manufactured paper products such as boxes, cartons, books and magazines, etc.

## **A3.2 Non-wood forest products**

In 1999 the FAO adopted a working definition for this category: 'Non-wood forest products consist of goods of biological origin other than wood, derived from forests, other wooded land and trees outside forests.'<sup>58</sup>

The three components of the term 'non-wood forest products' were interpreted as follows:

- **Non-wood:** The term NWFP excludes all woody raw materials. Consequently, timber, chips, charcoal and fuelwood, as well as small woods such as tools, household equipment and carvings, are excluded. Non-timber forest products (NTFPs), in contrast, generally include fuelwood and small woods; this is the main difference between NWFPs and NTFPs.
- **Forest:** NWFPs should be derived from forests and similar land uses. FAO has elaborated definitions of 'forest' and 'other wooded land' in a working paper on terms and definitions for the *Forest Resources Assessment 2000*. Since plantations are included in the FAO definition of forest, NWFPs that are obtained from plantations, such as gum arabic (*Acacia Senegal*) or rubber (*Hevea brasiliensis*), are thus included in the definition of NWFPs. Many NWFPs are derived from both natural forests and plantations. The final definition of 'trees outside forests' (including trees

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<sup>58</sup> FAO, 'Towards a harmonized definition of non-wood forest products'; <http://www.fao.org/docrep/x2450e/x2450e0d.htm#fao%20forestry>.

originating from forests which are located out of the forest and other wooded land, such as *Acacia albida* and the Karité tree, *Butyrospermum parkii*) is still in the process of elaboration.

- Products: In the proposed definition, the term 'product' corresponds to goods that are tangible and physical objects of biological origin such as plants, animals and their products. Forest services (e.g. ecotourism, grazing, bioprospecting) and forest benefits (e.g. soil conservation, soil fertility, watershed protection) are excluded. Services and benefits are even more difficult to assess and quantify than NWFPs and have therefore already been excluded from most publications dealing with NWFPs. A clear definition of forest services and benefits is still lacking.

It should be noted, however, that the FAO uses a slightly different definition for country reports to the Global Forest Resources Assessment: 'Goods derived from forests that are tangible and physical objects of biological origin other than wood.'

As discussed in Section 1.3, there is no agreed single international definition of 'non-wood forest products'. An FAO paper published in 2017 reviewed the treatment of this category in various international and national statistical systems and concluded by calling for 'further actions to be undertaken in the medium to long term to improve NWFPs statistics, including: further clarify definition and classification issues'.<sup>59</sup>

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<sup>59</sup> Simone Sorrenti, *Non-wood forest products in international statistical systems* (Non-wood Forest Products Series no. 22, FAO, 2017).