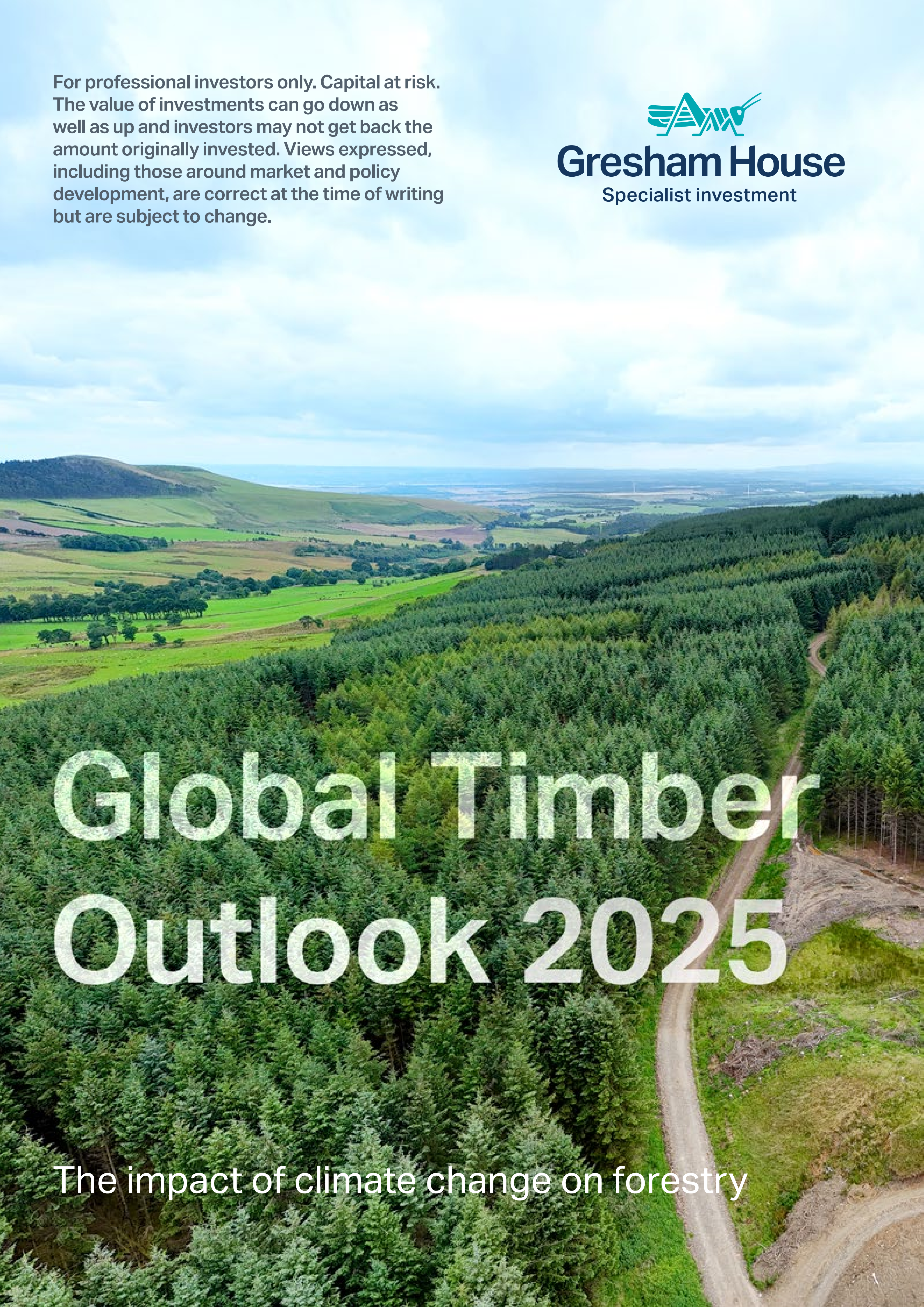
Gresham House
Specialist investment



Global Timber Outlook 2025

The impact of climate change on forestry

Executive summary

- Climate change introduces new dynamics to the timber market, presenting both opportunities and challenges. Opportunities include technological innovations in timber products, supportive policies promoting sustainability, and revenue generation through emerging carbon and biodiversity markets. Challenges include more frequent and severe forest disturbances, which increase the risk of stranded assets and highlight the importance of climate modelling
- This Global Timber Outlook evaluates how these new dynamics will impact the market for coniferous sawnwood, a key end-product for Gresham House Forestry
- Demand is projected to increase by 50-80% by 2050 compared to 2022 levels, depending on the extent of global warming and the policy responses implemented. This level of growth is high, but realistic, given that demand has grown by 40% over the past 25 years in a global environment that was less focused on decarbonisation. Demand has been modelled based on three Intergovernmental Panel on Climate Change (IPCC) Shared Socioeconomic Pathway (SSP) scenarios representing high, base, and low-case climate trajectories[1]
- By contrast, supply is only projected to increase by a maximum of 10% relative to 2022, with potential downside from forest disturbances. The limitations of the data on the supply side constrain calculations, creating additional potential for upside and downside
- The expected supply-demand gap may contribute to upward pressure on timber prices, which could enhance the value of forestry assets. However, this is subject to market, environmental, and policy uncertainties
- We believe these future supply-demand dynamics are likely to enhance timber's capacity to generate stable cash flows and provide returns that demonstrate low correlation with other asset classes, making it a valuable tool for portfolio diversification
- We anticipate an increased importance placed by policymakers on the environmental and social integrity of timber and other natural capital asset classes. We also expect an increase in reporting and disclosure standards
- To help address the projected gap, we engage with policymakers to take decisive actions, including incentivising afforestation, increasing private sector investment, fostering cooperation and knowledge sharing, promoting circular practices, and prioritising the development of alternative low-carbon building materials

Forecasts are not a reliable indicator of future performance.

Several studies have explored how climate change affects the outlook of various forms of harvested wood products, with key papers projecting an increase in demand. In 2020, Gresham House published the Global Timber Outlook, which forecast the consumption and supply of industrial roundwood to 2050.

Collectively, previous studies from the Food and Agriculture Organization of the United Nations (FAO) and the United Nations Economic Commission for Europe (UNECE) provide consensus about growing demand combined with constricted supply and offer valuable insights into the dynamics of harvested wood products. However, they also highlight a notable gap in specific research concerning the outlook for coniferous sawnwood, indicating a need for further investigation in this area.

1. FAO STAT, 2024

Introduction

As the impacts of global warming accelerate, understanding the implications of climate change on forestry has become increasingly critical.

The previous Gresham House Global Timber Outlook in 2020 examined the broader timber market, whereas this updated edition focuses specifically on coniferous sawnwood timber, which is a key end product for Gresham House forestry. Coniferous sawnwood, easily recognised as the standard 2x4 piece of construction timber, is the primary source of structural wood used globally.

Coniferous sawnwood stands out among other wood types due to its global economic importance and long-term carbon sequestration potential. With its carbon-negative footprint, it can play a pivotal role in climate change mitigation while supporting economic growth by supplying essential wood products across multiple sectors.[2]

Beyond assessing the evolving market dynamics driven by climate change, this analysis is essential for informing the strategic, long-term planning decisions required today given the decades-long timeframes between planting and harvesting forestry assets. Ultimately, the findings aim to guide both investors and forest managers as they adapt to a rapidly changing climate while unlocking the full potential of sustainable timber.

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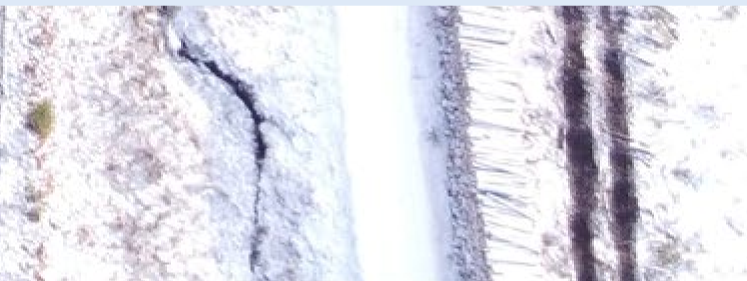


2. **Investments linked to timber are subject to market, environmental and regulatory risks.**

Historical forestry performance

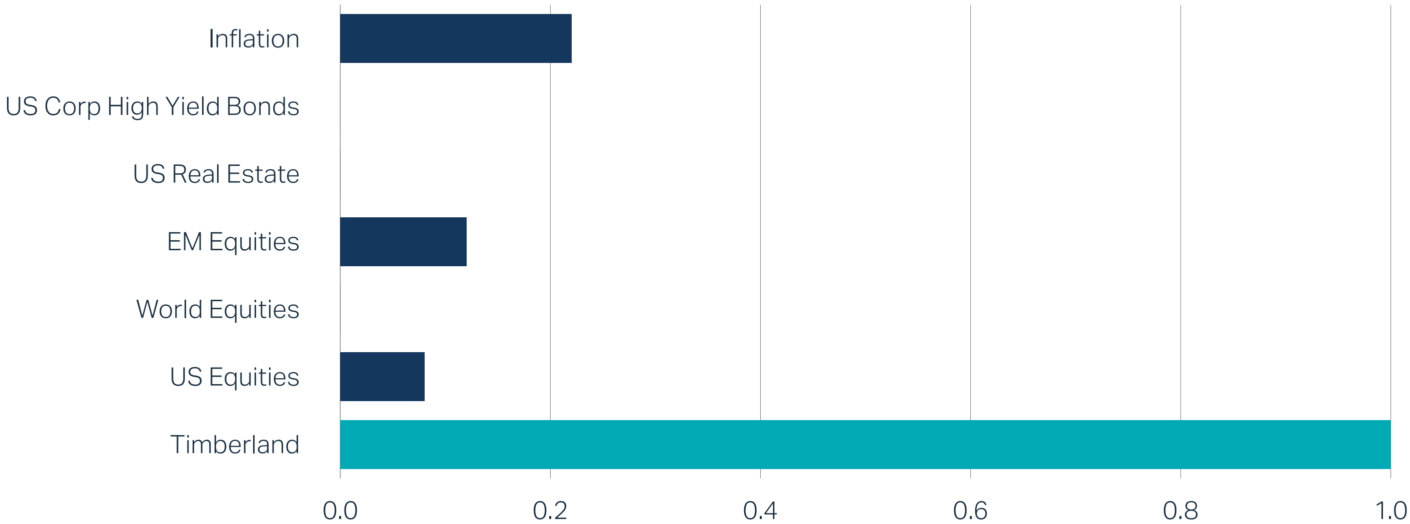
The uncorrelated biological growth of timber makes forestry a powerful portfolio diversifier with a high sharpe ratio.

Over the last few decades, interest in forestry investment has grown steadily, largely driven by increasing demand from institutional investors and the privatisation of forest land, particularly in developed countries.

This shift has contributed to the establishment of specialist investment vehicles that can access the economic benefits of forestry investments, including:

- Low correlation with other asset classes
- Positive correlation with inflation, and
- Potential to generate consistent financial returns

Figure 1: 35-year long-term forestry investment returns correlation[3]



The most recent demand from institutional investors has been enhanced by the increased interest in natural capital.

The forestry sector's financial performance over the past 35 years has rivalled that of the S&P 500 with lower levels of volatility, as seen in figures two and three on the next page.

In recent years, forestry has become a more dynamic asset class through the carbon and biodiversity markets. The additional revenue streams created by the monetisation of carbon credits and the potential for biodiversity net gain units have attracted additional investors. The pressing need to mitigate climate change and increase biodiversity conservation underscores the necessity to continue to scale up private sector investment.

3. **Past performance is not a reliable indicator of future performance. Capital at risk. Illustrations of the strong performance of Forestry relative to other asset classes do not represent any specific Gresham House financial product.** Note: The NCREIF Timberland Index, being the oldest and most widely used index in the forestry industry, is used as a proxy for the timberland asset class. Source: NCREIF, Bloomberg, and the Federal Reserve Bank of St Louis (FRED) from 31 December 1989 to 31 December 2024. Quarterly total return timeseries. Data sourced March 2025. The following indices are represented: Timberland (NCREIF Timberland Index (US)), US Equities (S&P 500 | SPX Index), EM Equities (MSCI EM | MXEF Index), US Real Estate (NCREIF Property Index | NPNCRE Index), World Equities (MSCI World | MXWO Index), US Corp Investment Grade Bonds (Bloomberg US Aggregate Bond Index | LD08TRUU Index), and US CPI for All Urban Consumers, Quarterly Not Seasonally Adjusted.

Figure 2: 35-year long-term forestry investment returns relative to other asset classes[4,6]

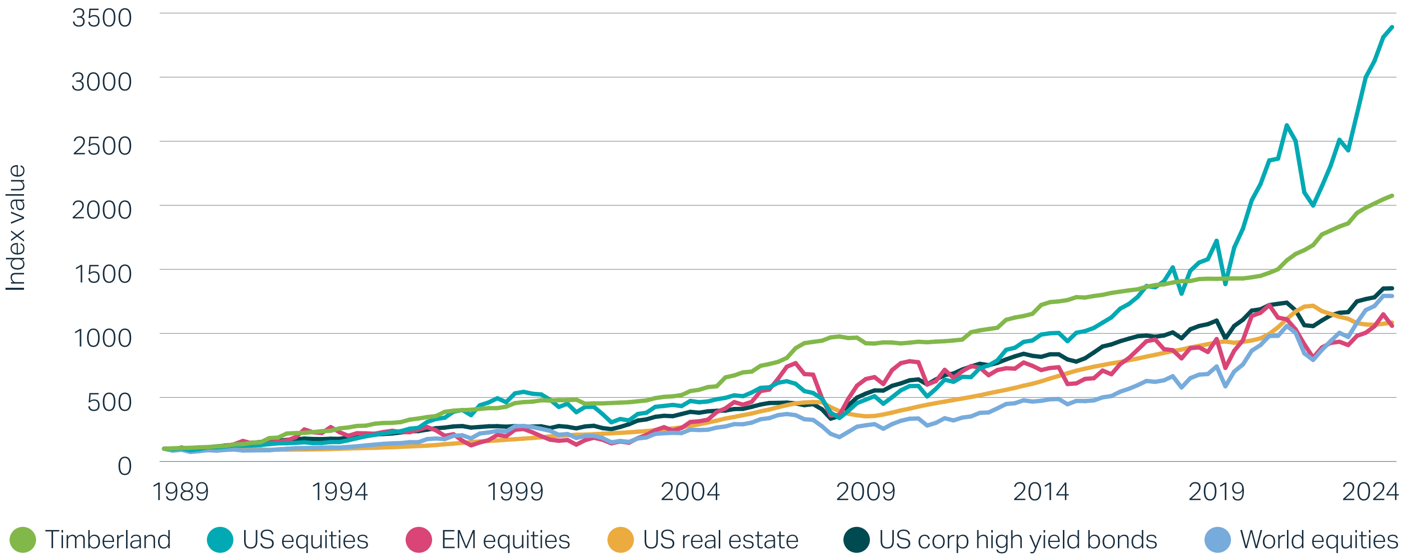
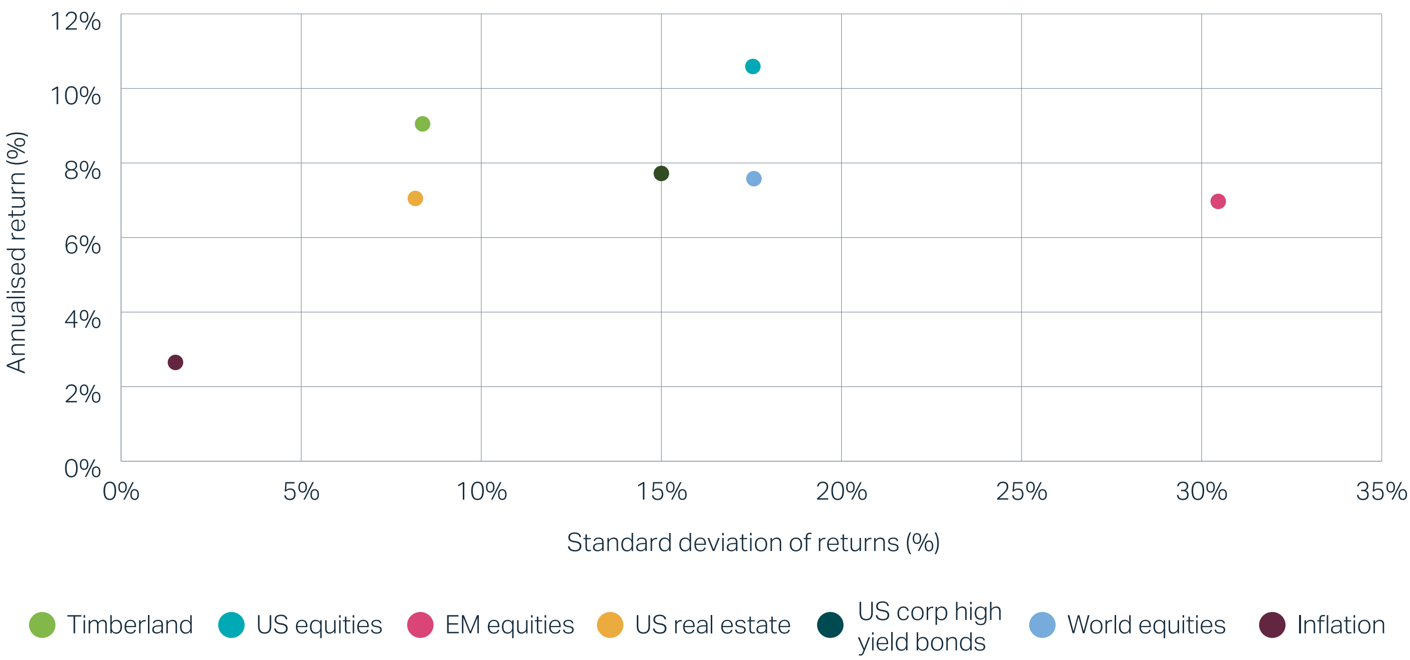


Figure 3: 35-year forestry risk return profile relative to other asset classes[5]

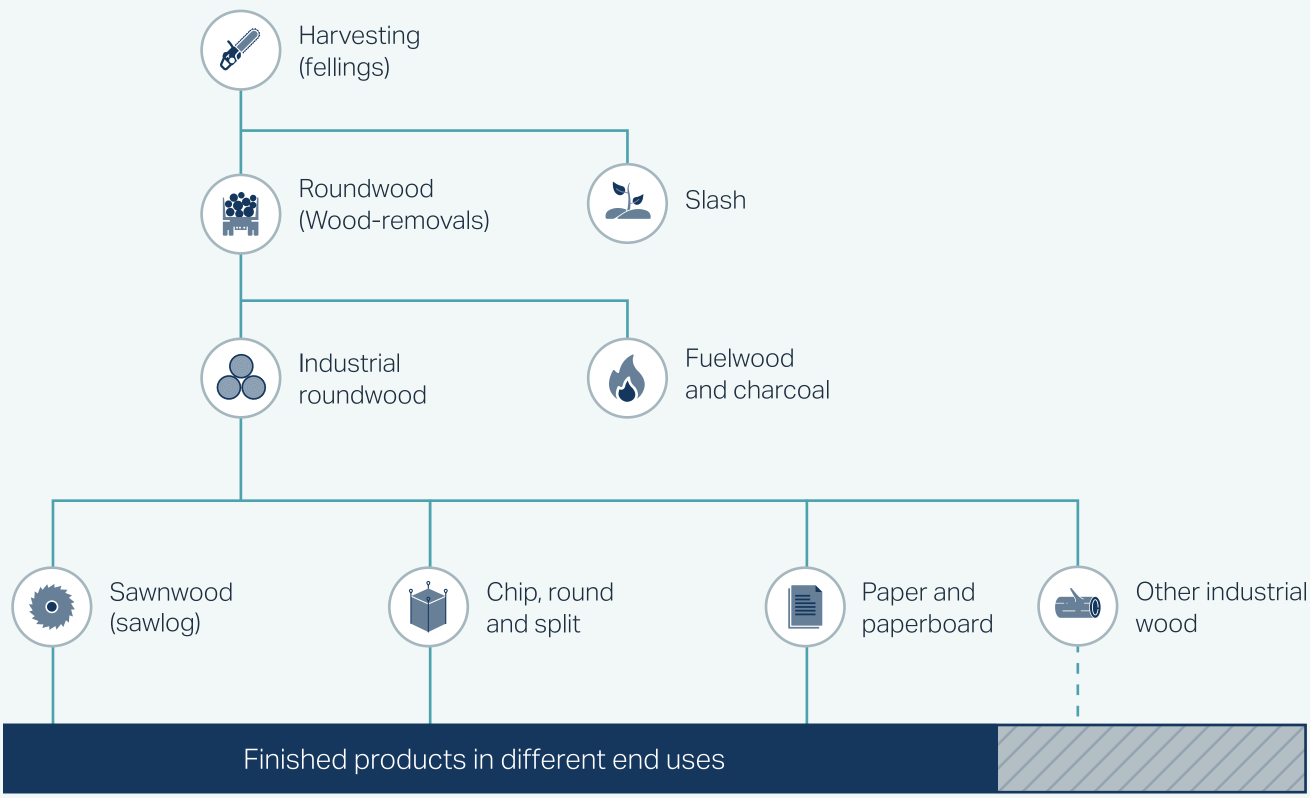


4. Gresham House Industry Returns Model, June 2025

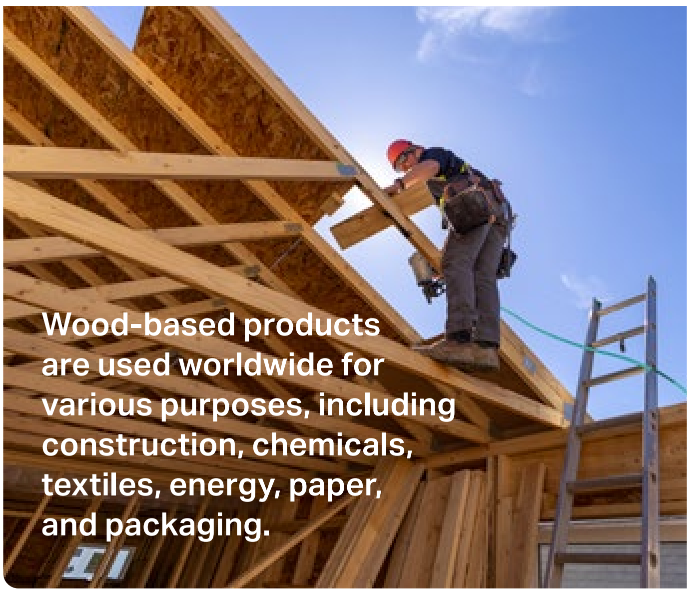
5. **Past performance is not a reliable indicator of future performance. Capital at risk. Illustrations of the strong performance of Forestry relative to other asset classes do not represent any specific Gresham House financial product.** Note: The NCREIF Timberland Index, being the oldest and most widely used index in the forestry industry, is used as a proxy for the timberland asset class. Source: NCREIF, Bloomberg, and the Federal Reserve Bank of St Louis (FRED) from 31 December 1989 to 31 December 2024. Quarterly total return timeseries. Data sourced March 2025. The following indices are represented: Timberland (NCREIF Timberland Index (US)), US Equities (S&P 500 | SPX Index), EM Equities (MSCI EM | MXEF Index), US Real Estate (NCREIF Property Index | NPNCRE Index), World Equities (MSCI World | MXWO Index), US Corp Investment Grade Bonds (Bloomberg US Aggregate Bond Index | LD08TRUU Index), and US CPI for All Urban Consumers, Quarterly Not Seasonally Adjusted.

Timber uses

A simplified classification of wood products



Source: Based on the Food and Agriculture Organization of the United Nations (FAO) forest products definitions, Rüter, et al., 2019



At a high level, timber is categorised into two grades: sawnwood and chip, under both the softwood (coniferous) and hardwood (broadleaf) species categories.

The grade of the timber is typically determined based on the size of the tree, with sawlog coming from larger trees with a trunk size minimum of 20cm in diameter and chip being a catch-all category.

Globally, roughly half of all harvested wood is used for fuelwood, with the remainder directed toward industrial uses.

From a Gresham House perspective, when we refer to timber, we are referring to coniferous sawnwood. Coniferous sawnwood is the main source of construction timber; it falls within the sawlog category and for simplicity can be recognised as the standard 2x4 piece of construction timber. The illustration above shows the flow of timber from the point of harvest to product.

Timber market overview

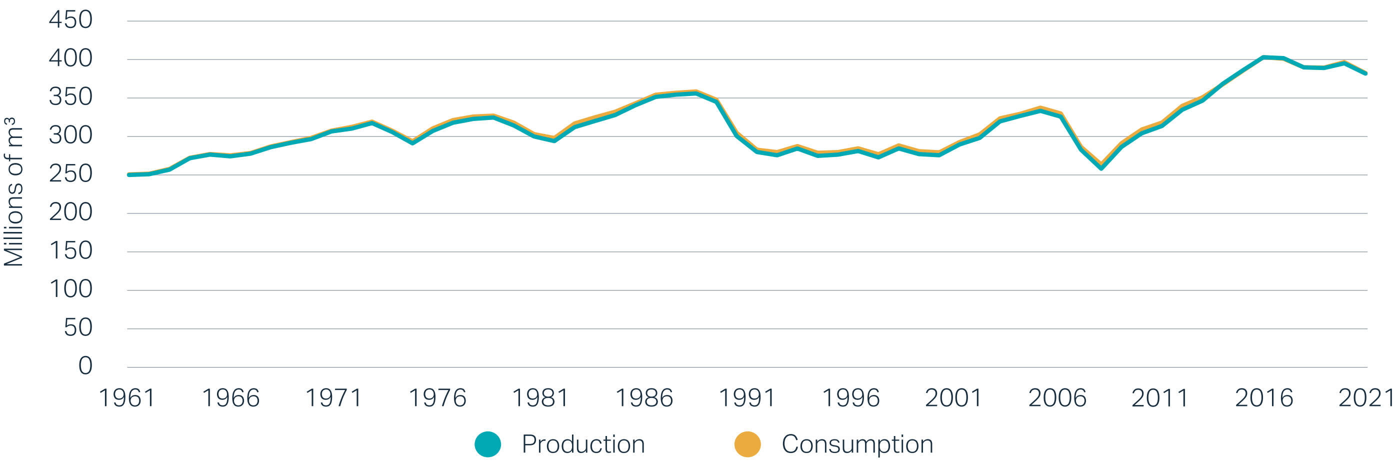
Historical supply and demand analysis

According to the Food and Agriculture Organization of the United Nations (FAO), the world consumed and produced approximately 388 million m³ of coniferous sawnwood in 2022. While market growth has not followed a linear trajectory, from 1961 to 2022 it experienced a compound annual growth rate of 0.7%, or a total growth of 54% as depicted in Figure 4. Note the market response following major economic events, including the 1973, 1979, and 1986 oil shocks as well as the 2008 great financial crisis.

The market for coniferous sawnwood is concentrated, with over 60% of supply and demand coming from the top ten consumers and producers. The vast majority of coniferous sawnwood comes from temperate forests in the northern hemisphere and plantations in Oceania, where mild and wet climates permit the growth of timber.

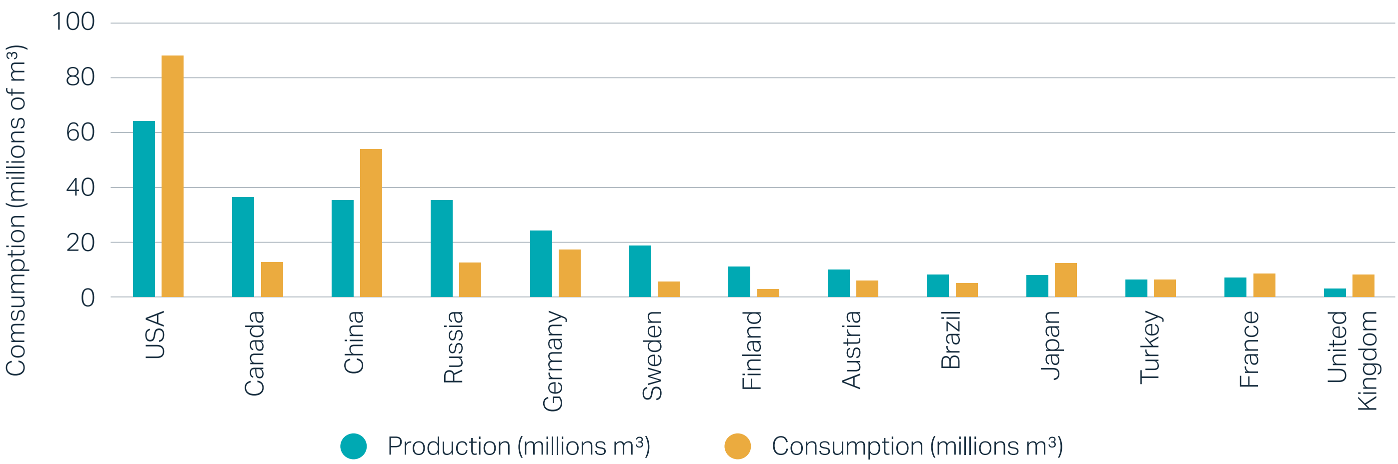
Figure 5 provides an overview of the largest global coniferous sawnwood consumers and producers. The US, China, Germany, Canada, and Russia are the top five for both categories, however, the US and China's domestic levels of production do not meet demand.

Figure 4: The historic consumption and production of coniferous sawnwood



Source: FAO STAT, 2024

Figure 5: The largest global producers and consumers of coniferous sawnwood



Source: FAO STAT, 2024

Climate change

Intergovernmental Panel on Climate Change (IPCC)

The ongoing increase in Greenhouse Gas (GHG) emissions from human activities since the industrial revolution is a major contributor to climate change and rising global temperatures. As of 2024, average global temperatures have risen by 1.2°C, and there is a strong global consensus that urgent and extensive action is needed, both to limit future warming and to adapt to a changing world to reduce the impact of climate change.

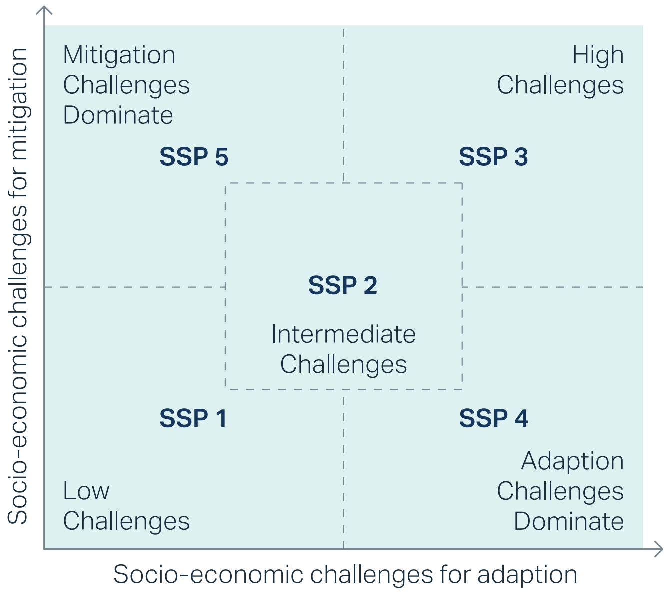
The latest IPCC reports outline the Shared Socio-economic Pathway (SSP) scenarios representing five climate trajectory narratives created by international climate scientists, economists, and energy system modellers. These describe the potential future trajectories based on consistent assumptions about population growth, economic development, education, urbanisation, and technological advancement.

The five distinct scenarios collectively illustrate the global elements that may lead to varying challenges for global climate change mitigation and adaptation efforts in the future. Of these five scenarios, the following three have been selected as low, base, and high-case scenarios for the Gresham House projections:

- SSP 1 represents a best-case scenario, characterised by sustainable development and significant efforts to reduce GHG emissions
- SSP 2 serves as a baseline scenario, where trends follow current patterns without significant intervention
- SSP 3 in contrast depicts a worst-case scenario marked by fragmented global efforts, high levels of inequality, and continued reliance on fossil fuels, resulting in severe challenges in addressing climate change

These scenarios provide valuable insights into the potential impacts of different policy choices and global developments on climate action.

Figure 6: A diagram overview of the SSP scenarios



Source: O'Neill, et al., 2017

Climate change and timber

Carbon sequestration of timber can either be short-term or long term, depending on the final harvested wood product. Trees grow through capturing carbon dioxide (CO_2) from the atmosphere and converting it into living biomass.

The carbon sequestration capacity follows an S-shaped curve, where sequestration increases rapidly after planting and plateaus as the tree matures. Coniferous tree species typically have faster growth rates, leading to a higher initial rate of CO_2 capture.

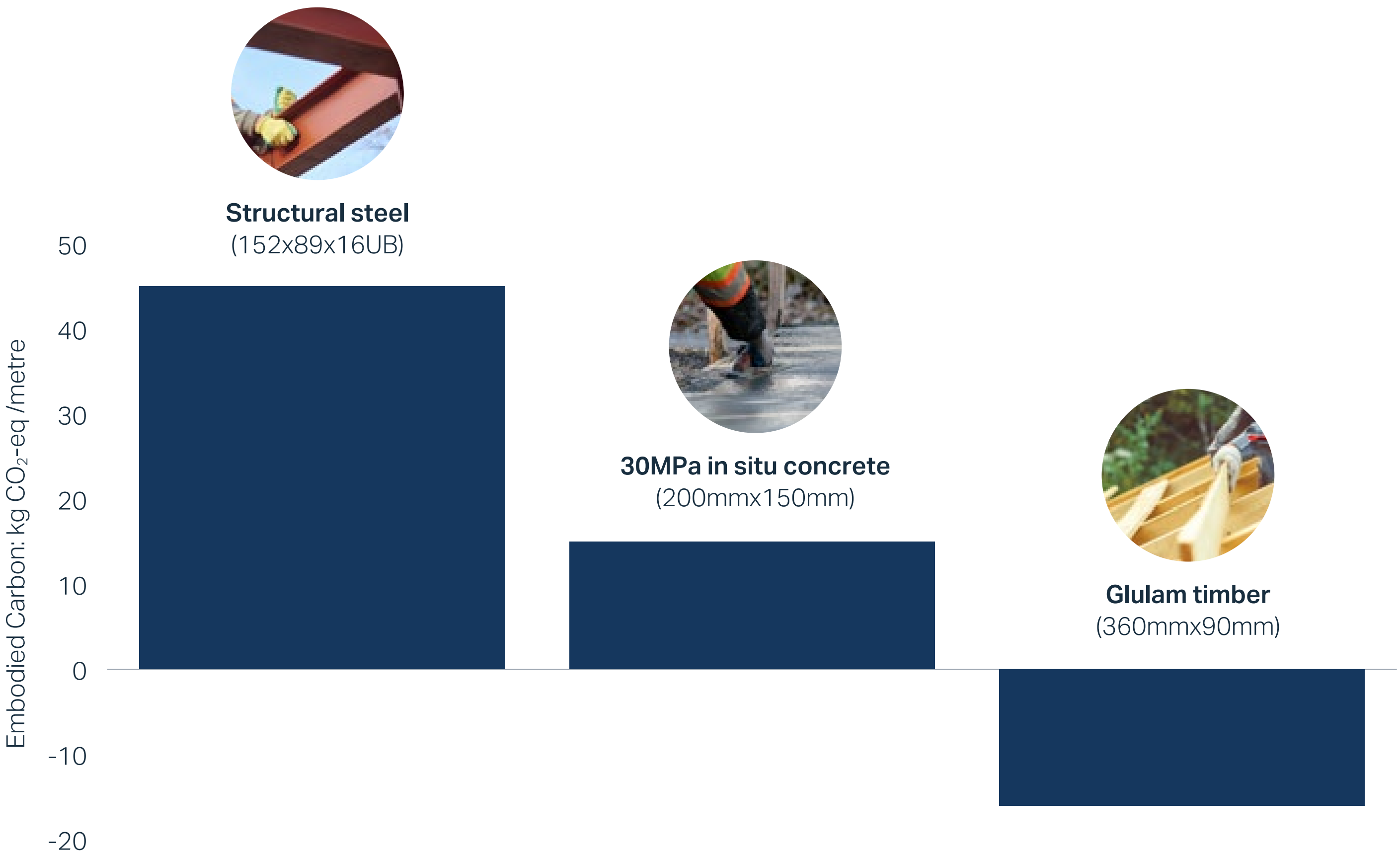
In commercial timber plantations, trees are harvested when a crop is considered mature and growth has plateaued along the S-curve, which typically occurs between 30- and 100-years following planting, depending on the climate conditions and tree species.

The Intergovernmental Panel on Climate Change (IPCC) is a global organization that studies climate change. It connects science and policy, giving decision-makers reliable and balanced scientific information. Shared Socioeconomic Pathways (SSPs) are scenarios that predict global social and economic changes up to 2100. These scenarios, outlined in the IPCC's 2021 Sixth Assessment report, help create different climate policy plans based on projected greenhouse gas emissions.

The rate at which sequestered CO_2 is released back into the atmosphere depends on the harvesting method and the final use of the harvested wood.

Products such as fuel, chemicals, paper, and textiles result in the immediate release of CO_2 into the atmosphere, whereas the use of timber in construction (as sawnwood) can trap the carbon for decades and can potentially hold CO_2 permanently if disposed of properly. Figure 7 provides a comparison of the emissions intensity of the respective materials.

Figure 7: Carbon emissions of equivalent steel, concrete and timber beams



Note: The graph provides an estimate of embodied carbon (kg CO_2-eq) of an equivalent concrete, steel, and timber beam. For the structure assessed, the timber beam absorbs 16kg CO_2-eq, whilst the equivalent steel beam emits 45kg CO_2-eq

Source: The New Zealand Wood Design Guides - Timber, Carbon and the Environment, 2020

Timber demand: three key drivers

1 Global population trends

According to the World Bank Group, the global population increased from 3.07 billion people in 1961 to 7.95 billion in 2022.[6] A growing, wealthier population in developing countries leads to a direct increase in the need for homes and public infrastructure, which in turn increases the demand for construction materials, like coniferous sawnwood.

The relationship between population growth and GDP growth is complex and depends on various factors, including productivity, labour force participation, technological advancement, and government policies. As GDP increases, governments typically invest in improving public infrastructure, driving the need for more construction materials including timber. Higher GDP can also lead to larger and higher-quality housebuilding, further increasing the demand for timber. However, these trends vary by region and are subject to economic, regulatory and environmental risks.

2 Housing stock shortage

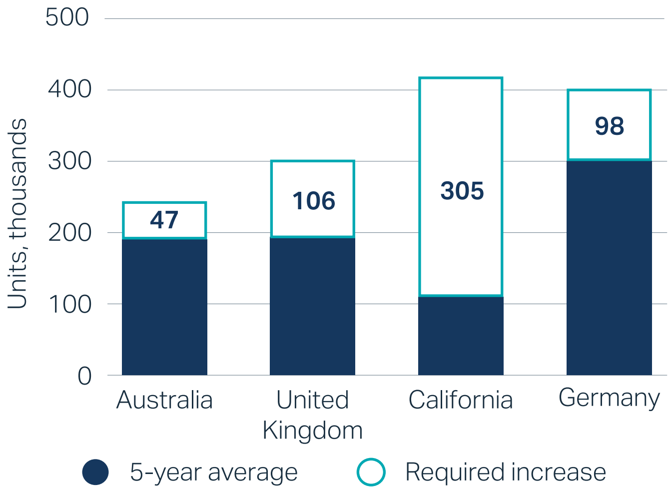
The housebuilding shortage will continue to drive demand for timber globally, independent of the additional uses of wood. For example, with only 229,700 new homes completed in the year leading up to June 2024, the UK fell short of its 300,000 target by approximately 70,300 homes and is even further from the current 370,000 target for 2025.

A similar housing shortage is seen in many developed countries. The number of young adults living with their parents is now at or near an all-time high. Worldwide, the most severe aspect of the global housing crisis is the more than one billion people who live in slums or informal settlements - more than the populations of the US and the EU combined.[7] At Gresham House, we expect residential construction to continue to increase in order to address the chronic shortage of new housing.

6. World Bank Group, 2024

7. World Economic Forum, 22 August 2023

Figure 8: Annual national dwelling units commenced versus targets



Source: **Australia**: Average refers to dwellings commenced. Source: Australia Bureau of Statistics, Target: 1.2 million new well-located homes over five years, from 1 July 2024. Source: Prime Minister of Australia; **United Kingdom**: Average refers to the number of new dwellings commenced. Source: Office for National Statistics, Target: 300,000 new homes per year. Source: Gov.uk; **California**: Average refers to the number of new private housing units authorized by building permits. Source: St Louis Fred, Target: 1.5 million homes by 2030, from Jan 31 2024. Source: Governor Gavin Newsom; **Germany**: Average refers to building permits for new dwellings. Source: Trading Economics, Target: 400,000 new homes per year. Source: Reuters, 2024.

3 Transition to a low carbon economy

As a renewable, low-carbon building material, timber has a significant role to play within global decarbonisation efforts. The construction industry today accounts for roughly 40% of global energy use and 37% of GHG emissions, largely because emissions-intensive steel and concrete are the most widely used building materials.[8]

There is an urgent need to reduce the emissions intensity of the construction industry, and the carbon-neutral or even carbon-negative properties of engineered timber that rivals the structural capacity of steel and concrete presents a clear opportunity to achieve this.

8. Abed, et al., 2022, UNEP; Yale University, 2023.

Opportunities may or may not materialise.

Supply: a finite resource

The vast majority of global commercial timber supply is sourced from temperate forests in the northern hemisphere (Canada, US, Northern Europe, Russia) and plantations in Oceania (New Zealand and Australia), where climates permit the growing of softwood timber.

The historic drivers of supply can be summarised into geography, historic afforestation rates, illegal harvesting, and price.

Table 1: Rotation lengths for coniferous species across key geographies

Region	Rotation length (years)
United States of America	30-45
Canada	46
Russia	100
Scandinavia	75
Europe (Continental)	70
Chile	22
United Kingdom	35
Ireland	30
New Zealand	28

Source: Romunde, 2020

Geography: global supply of coniferous sawnwood is finite and is dependent on growing conditions and geographic accessibility. Most of the current standing stock that has not yet been harvested for commercial purposes is inaccessible in cold regions of northern Canada and Russia (Romunde, 2020). The high cost of accessing stock in these regions often outweighs the potential benefits of harvesting.

Afforestation: due to the long rotation lengths required for timber growth, supply is constrained in the short to medium term. As can be seen in Table 1, even if afforestation rates were to increase rapidly today it would take a minimum of roughly 30 years to significantly impact the global supply of timber.

Illegal supply: one important limitation in calculating the existing global timber supply and projecting future capacity is the unquantified amount of timber that is illegally harvested worldwide. The most recent statistics from Interpol, in 2019, estimate that 15-30% of total global timber production is from illegal harvesting, with high rates in the eastern European and Russian softwood forests. The specific figures are challenging to estimate, however, in 2007 WWF estimated almost 1.7 million m^3 of the roughly 7.9 million m^3 of imported coniferous sawnwood in the UK was sourced illegally, primarily from Russia, Estonia, Latvia, Sweden, and Finland. This figure has likely decreased with the growing importance of certification and traceability, driven by the introduction of various regulations aimed at preventing the trade of illegally logged timber.

Price: timber prices are a key determinant of supply; short-term supply is relatively inelastic, however, sustained higher prices can increase afforestation and infrastructure development in hard to access regions.

New market dynamics

Opportunities for supply and demand

The timber industry is poised for growth with the potential for new technologies to address housing shortages. Supportive policies and emerging carbon markets further create opportunities, influencing both supply and demand dynamics towards more sustainable practices.

New technologies

The advancement of new technologies, such as mass timber and modular construction, is transforming the timber industry by enhancing material efficiency, reducing carbon emissions, and enabling innovative solutions for sustainable building practices.

- **Mass timber:** mass timber is an all-encompassing term for thick, compressed layers of timber that has superior construction properties to traditional sawnwood. The manufacturing process addresses the natural strength inconsistencies in wood and creates similar mechanical performance and superior fire resistance to steel and concrete. There is broad consensus that the use of mass timber as a substitute building material creates net carbon sequestration benefits. While specific estimates vary, one study found an 80-99% reduction in embodied emissions for the construction of a mid-rise office building when utilising timber compared to a steel design[9]. In conjunction with mass timber being adopted more broadly, building codes have been revised internationally to provide guidelines for using timber in high-rise construction. A recent example is the 10-storey George Brown College building in Toronto, Ontario, which is the province's first mass-timber, net zero institutional building. Demand may grow if sustainable development policies advance and precedence is set using mass timber to construct urban high-rise buildings
- **Modular housing:** demand for coniferous sawnwood will be driven by the expected increased demand for circular, modular housing solutions. This design method involves offsite construction with pre-fabrication in closed factory environments and onsite assembly, which increases the efficiency of construction. As countries work to meet national decarbonisation targets, housing shortages can be addressed by timber-based modular buildings

9. Abed, et al., 2022; Churkina, et al., 2020

Supportive policies

Various policies around the world show an increasing recognition of the need to move to sustainable, renewable and low-carbon products. These policies encompass a range of approaches, addressing both supply and demand sides of the market. Examples include:

- **Housing shortage:** the world is in a housing crisis with approximately one-fifth of the global population lacking adequate housing, as reported by the United Nations. New housebuilding policies have focused on incorporating sustainable design principles and carbon reduction measures. For example, in 2021 the city of Amsterdam mandated that 20% of all new homes must be constructed from wood or other bio-based materials from 2025 onwards
- **Sustainable building materials:** the use of sustainable building materials contributes to both emissions and waste reduction. A recent policy example was the construction mandate set for the 2024 Paris Olympics construction, where all buildings under eight storeys were required to be built using modular construction made from wood and glass
- **Biodiversity protection and deforestation reduction:** there is greater political willpower and legislation to address deforestation within global supply chains. These regulations increase the need for transparency and sustainable certification, leading to a tighter market and higher demand for high-quality coniferous sawnwood. For example, through the EU Regulation on Deforestation-free Products (EUDR) the EU has banned the placement of any products linked to deforestation or forest degradation in the EU market
- **Afforestation and planting grants:** many governments and Non-Governmental Organisations (NGOs) provide grant funding for afforestation, woodland management, and tree health. This form of funding encourages landowners to support woodland creation, improve carbon sequestration, and enhance biodiversity. For example, the UK Government provides up to 80% of the cost of a project to support woodland creation (Scottish Forestry, 2019)

Modular housing

Opportunities may or may not materialise.

Carbon fertilisation

Studies to date have observed a positive increase in wood volume from the higher levels of atmospheric CO_2, warmer climate, and longer growing seasons. For instance, Storms et al. (2022) observed an average wood volume increase of 13% and Davis, Sohngen, and Lewis (2022) reported up to a 21% increase in volume in specific species and regions. While these results are not conclusive and do not account for all influencing factors, there is evidence to suggest that further warming could have a net positive impact on coniferous sawnwood supply.

Globalisation and trade networks

Globalisation is widely recognised as a defining trend in the modern economy, with reduced trade barriers and transport costs having enabled increased exports of forest products (WWF, 2011). The increase in forest product trade has led to higher levels of competition in international markets, which has put cost pressure on producers. In some cases, this has led to sacrifices in the quality of forest management to decrease costs. Despite a recent resurgence of nationalism, accompanied by tariffs and trade restrictions, the growing global consumer and regulatory focus on sustainability is expected to drive demand toward forest products certified to international standards such as the Forest Stewardship Council and the Programme for the Endorsement of Forest Certification.

Emerging carbon markets

The carbon market landscape is rapidly evolving in both the compliance and voluntary segments. As of 2023, the compliance markets reached a valuation of $900 billion and generated over US$75 billion in revenue, while the voluntary carbon market (VCM) is projected to grow substantially from its current $2 billion valuation to between $10-40 billion by 2030, according to the Boston Consulting Group.[10]

10. Reuters, 2023

The growth in carbon markets could have both positive and negative effects on the supply and demand of coniferous sawnwood. On one side, in some markets the economics for shifting short-rotation hardwood crops to long-rotation softwood crops could become more favourable. For instance, investors can monetise Australia's carbon market through the conversion of short-rotation hardwoods to long-rotation softwood crops. Conversely, rising demand for credits could also compress the supply of coniferous sawnwood by making it more economical to leave forests standing to receive credits for permanent carbon sequestration.

Challenges for supply and demand

Climate change also poses threats to timber supply and therefore effective forest management practices are essential to mitigate these impacts and maximise yields. Growing populations and economic development heighten competition for land between timber production, agriculture, and urbanisation, with carbon markets further pressuring afforestation and preservation efforts. Geopolitical conflicts have led to trade restrictions, destabilising global timber supply chains and creating pricing pressures.

Forest disturbances

Climate change is expected to present challenges to the future supply of commercial timber through higher temperatures, changes to precipitation patterns, and increased frequency and severity of forest disturbances. This includes fire, drought, wind, snow and ice, pests, and pathogens; all of which can cause significant damage to standing forests.

The impact of climate changes on current and forecast forest disturbances is identified in Table 2 on the next page, recognising that the extent of effects will be dependent on both geography and the trajectory of future warming.

Table 2: The effects of climate on forest disturbances

Mechanism of disturbance	Effect of climate on likelihood of disturbance	Potential consequences of disturbance	Expected impact of climate change on disturbance
Fire	▪ Fuel moisture ▪ Ignition (lightning probability) ▪ Fire spread	▪ Complete consumption of timber ▪ Structural damage ▪ Negative impacts on ecosystem health ▪ Increased vulnerability to pathogens and pests ▪ Economic consequences	Increased frequency and severity
Drought/ water stress	▪ Occurrence and duration of limitations in water availability ▪ Intensity of water deficits	▪ Reduced tree growth ▪ Increased tree mortality ▪ Increased vulnerability to pathogens and pests ▪ Decreased timber quality ▪ Delayed harvesting and economic consequences ▪ Higher fire risk	Increased frequency and severity
Wind	▪ Occurrence, intensity and duration of wind events	▪ Windthrow ▪ Breakage ▪ Tree mortality ▪ Decreased timber quality through cracks or strains in the wood ▪ Increased vulnerability to pathogens and pests ▪ Economic consequences	Increased frequency and severity
Snow and ice	▪ Freezing rain ▪ Snow occurrence and duration	▪ Branch breakage, trunk splitting, and tree toppling ▪ Increased vulnerability to pests and pathogens ▪ Increased tree mortality ▪ Decreased timber quality ▪ Disruptions to harvesting schedules ▪ Economic consequences	Status quo or decreased frequency and intensity
Pests	▪ Changes to pest distribution and range ▪ Change to pest reproductive, metabolic and survival rates	▪ Increased tree mortality ▪ Decreased timber quality ▪ Increased vulnerability to secondary pests and pathogens ▪ Increased risk of fire ▪ Negative impacts on long-term supply ▪ Economic consequences	Increased frequency and severity
Pathogens	▪ Pathogenic agent metabolic rate ▪ Pathogenic agent abundance	▪ Increased and widespread tree mortality ▪ Decreased timber quality ▪ Increased vulnerability to other disturbances ▪ Increased risk of forest fires through deadwood ▪ Economic consequences	Increased frequency and severity

Source: Brack, 2019

Good forest management practices are important for minimising the effects of the increasing forest disturbances, and therefore maximising carbon sequestration and yields. This includes performing regional climate change analyses, careful selection of where to plant, genetic modification and selective breeding to improve drought and flooding resistance, and wildfire monitoring cameras in high-risk regions.

Global land use priorities

An increasing global population and GDP per capita puts increasing pressure on land-based resources. Timber production will face growing competition for other land uses, including agriculture and urbanisation. Additionally, the demand for afforestation and forest preservation created by the voluntary and compliance carbon markets will further intensify the competition for viable land for commercial timber production. A future shift in land use priorities could constrain future timber supply.

Geopolitics, conflict and trade barriers

The US-China tariff war, Russia's invasion of Ukraine, and more recently, Trump's ongoing tariff escalations - including a recent proposal for an additional 25% tariff on Canadian timber imports - have contributed to a rise in global trade restrictions. Continued geopolitical instability, nationalism, and protectionism threaten to further destabilise global coniferous sawnwood supply chains in addition dampening growth and creating pricing pressure.

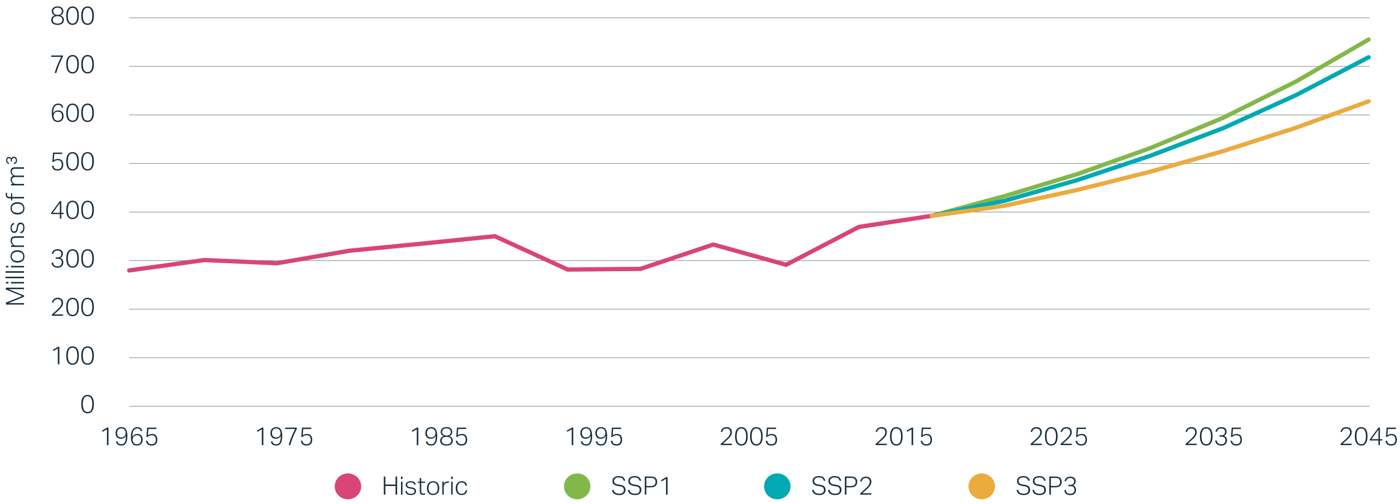
Projections

Demand forecasting

An analysis was performed using key historical demand drivers and future projections based on the independent variables aligned with various IPCC SSP scenarios, resulting in base case, upside, and downside timber demand projections through to 2050. Please refer to the appendix for the full methodology.

The analysis revealed a significant increase in demand for coniferous sawnwood across all scenarios, with projections ranging from a 1.5-1.8x increase. SSP1 showed the highest demand, SSP2 the moderate level, and SSP3 the lowest.

Figure 9: Historic and forecast coniferous sawnwood demand



Source: Historic data is sourced from FAO Stat, August 2024

The base case projection was based on SSP2, the 'Middle of the Road' scenario, which describes a path of social, economic and technological trends that follow a similar trajectory to historic patterns.

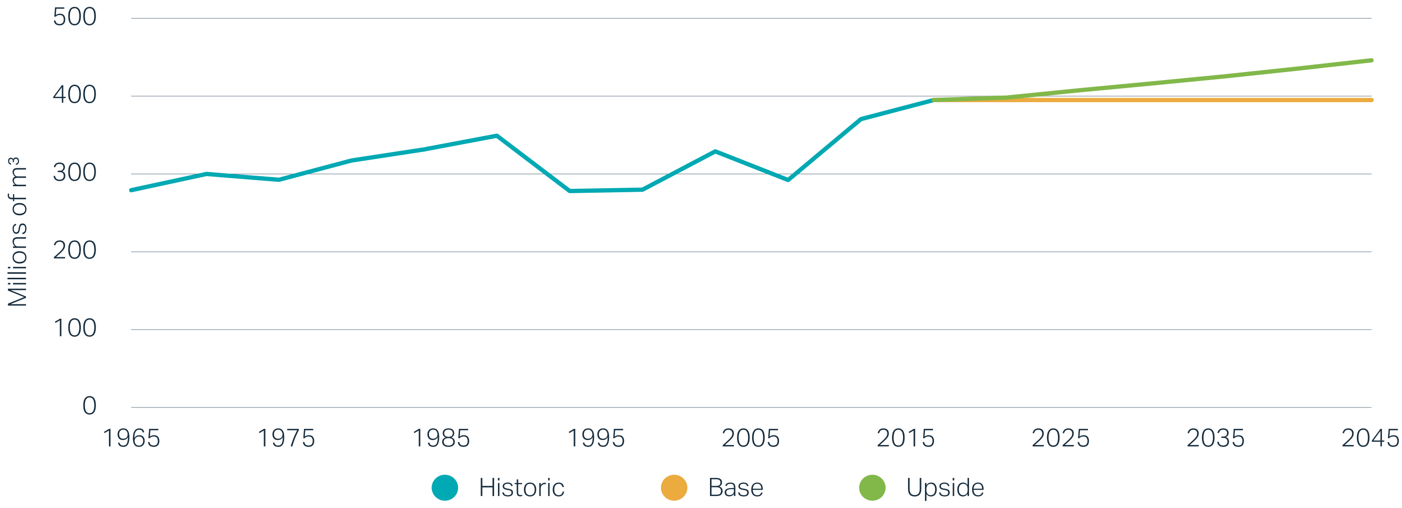
SSP1 represents the upside, 'green', scenario characterised by a global shift towards a more sustainable development path. This scenario emphasises respect for environmental boundaries, low material growth and a gradual move to a less resource-intensive lifestyle. While timber has not been explicitly addressed, the narrative aligns with higher uptake of the demand drivers previously discussed, including increased uptake of mass timber, timber-based modular construction, and favourable wood-based construction policies. Furthermore, the SSP1 narrative emphasises global cooperation, strong and effective institutions, and the reduction of inequality, which collectively suggest a lower volatility environment.

SSP3 represents the downside, 'unsustainable', scenario characterised by a global shift to nationalism and lack of global coordination to address global environmental concerns. This scenario was deemed appropriate for the downside given current global conflicts and the resurgence of nationalism.

In this scenario, growing fossil fuel dependency and resource intensity slow growth and imply high challenges to mitigation, counteracting the demand drivers previously described. Furthermore, the SSP3 narrative emphasises limited and weak global institutions, international fragmentation, and the potential for large conflicts which collectively suggest a high-volatility environment.

Forecasts are not a reliable indicator of future performance.
Past performance is not a reliable indicator of future performance.

Figure 10: Historic and forecast coniferous sawnwood supply



Source: Historic data is sourced from FAO Stat, August 2024

Supply forecasting

Forecasting future supply is challenging given inconsistency in data-reporting methodologies and a lack of conclusive literature about the future key determinants of supply. Due to these limitations, a simplified projection approach was adopted that relies on historic supply, tree growth, and potential for forest disturbance events. Please refer to the appendix for the full methodology.

Future supply is projected to fall short of demand, with the high scenario showing a 1.1x increase in supply, the base case remaining static at current levels, and the downside scenario assuming supply to fall below today's levels due to heightened forest disturbances.

The base case for supply assumes a constant level at approximately 390 million m^3. This assumption is based on observed low levels of historical afforestation, stability of global forest area dedicated to forestry production, and the historic consistency of 40% of coniferous industrial roundwood being transformed to coniferous sawnwood (FAO Stat, 2024).

The upside has been projected based on the 13% average increase in net primary production and subsequent wood volume determined by Storms et al. (2022). This 13% was considered appropriate as the study ran from 1987 to 2016, during which atmospheric CO_2 concentrations increased by 55 ppm (NOAA, 2024). Between 2020 and 2050 concentrations are expected to further increase by 87-124 ppm for SSP scenarios 1 to 3 (Riahi, et al., 2017).

Although this projected increase is greater than what was observed by Storms et al., the 13% has been used as a global proxy due to the lack of information on when CO_2 will no longer be a limiting factor for growth.

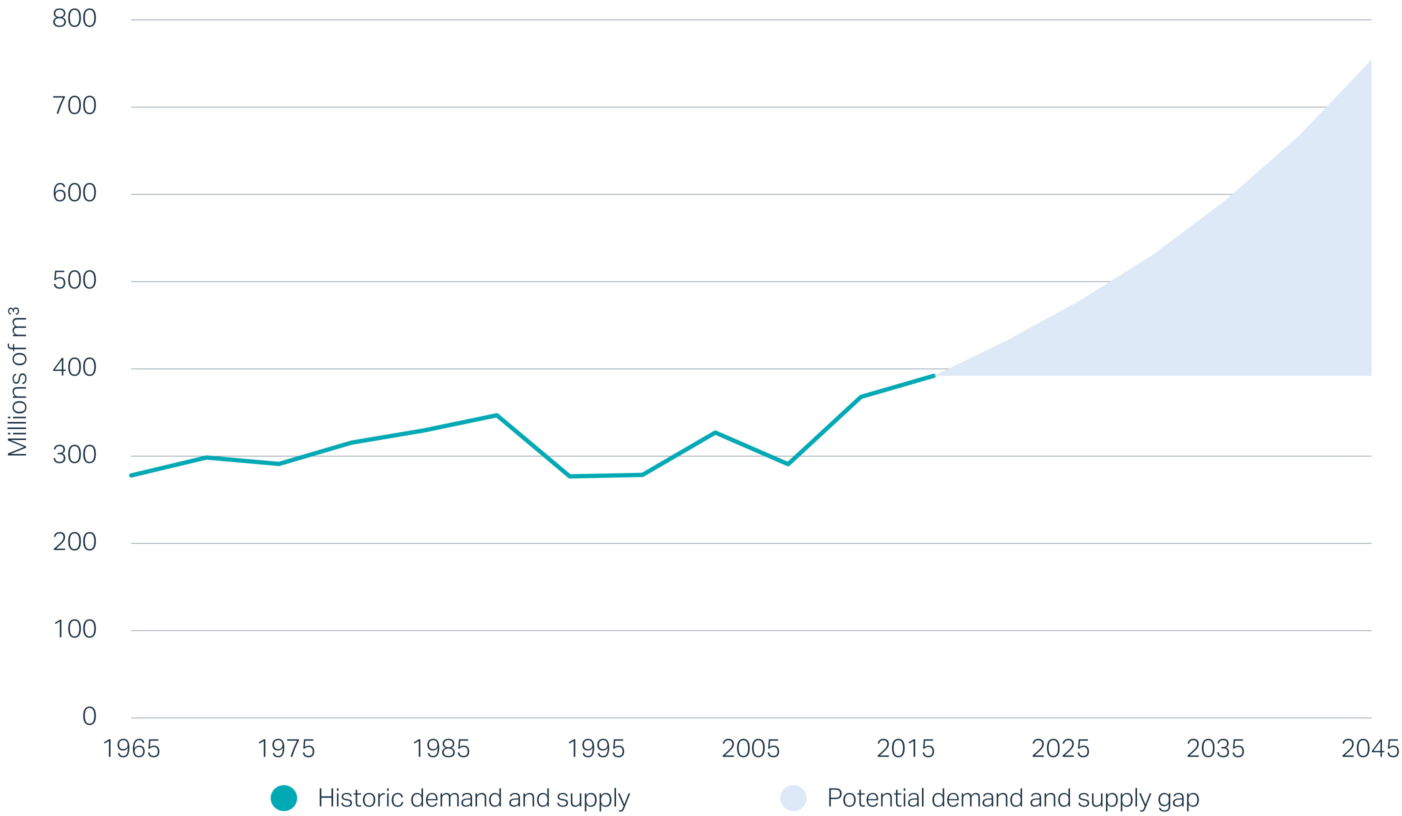
No downside scenario has been projected, as a quantitative downside scenario for future supply is not feasible due to the unpredictability of disturbance events. However, it is known that such events will impact tree species distribution, mortality rates and land availability for forestry production, all of which could result in a significant reduction of harvestable volume and negatively affect the supply of coniferous sawnwood.

**Forecasts are not a reliable indicator of future performance.
Past performance is not a reliable indicator of future performance.**

Projected coniferous sawnwood deficit

Putting the two projections together, the following figure shows the growing projected deficit of coniferous sawnwood, of 180% of current levels of production and consumption.

Figure 11: The maximum potential future deficit of coniferous sawnwood



Source: Historic data is sourced from FAO Stat, August 2024

Implications of demand-supply imbalance include the following:

- **Price increases**: prices would be expected to rise in a scenario where demand exceeds supply. This could either lead to the substitution of coniferous sawnwood with non-renewable materials or the expedition of technological development that enhances the efficiency, reuse, or recycling of construction materials. Higher prices could also encourage harvesting within current hard-to-access and remote regions where cost is the current barrier
- **Need for policy intervention**: to mitigate negative consequences, the imbalance in supply and demand will likely require policy intervention
- **Social changes**: increases in prices and demand limitations could give way to a social shift in housing with a migration from single-family to multi-family dwellings. Single-family dwellings use more timber per unit because of their size and spacing, whereas multi-family dwellings are more resource-efficient
- **Illegal logging**: high prices created by the gap in supply and demand could incentivise illegal logging or other unsustainable forest management practices such as overharvesting

Forecasts are not a reliable indicator of future performance.
Past performance is not a reliable indicator of future performance.

Conclusion

Although different in scope, this study aligns with previous sector outlooks in forecasting a widening supply and demand gap.

The projected 1.5x to 1.8x increase in consumption may not initially appear dramatic, however, it represents at least a 50% rise in coniferous sawnwood consumption. While this projection is based on various factors, the prevailing trend underscores timber as a crucial asset class for facilitating the transition to a net-zero economy.

Given these insights, coniferous sawnwood not only represents a valuable investment opportunity but also plays a vital role in promoting sustainable development and supporting the construction industry's shift toward a low-carbon future.

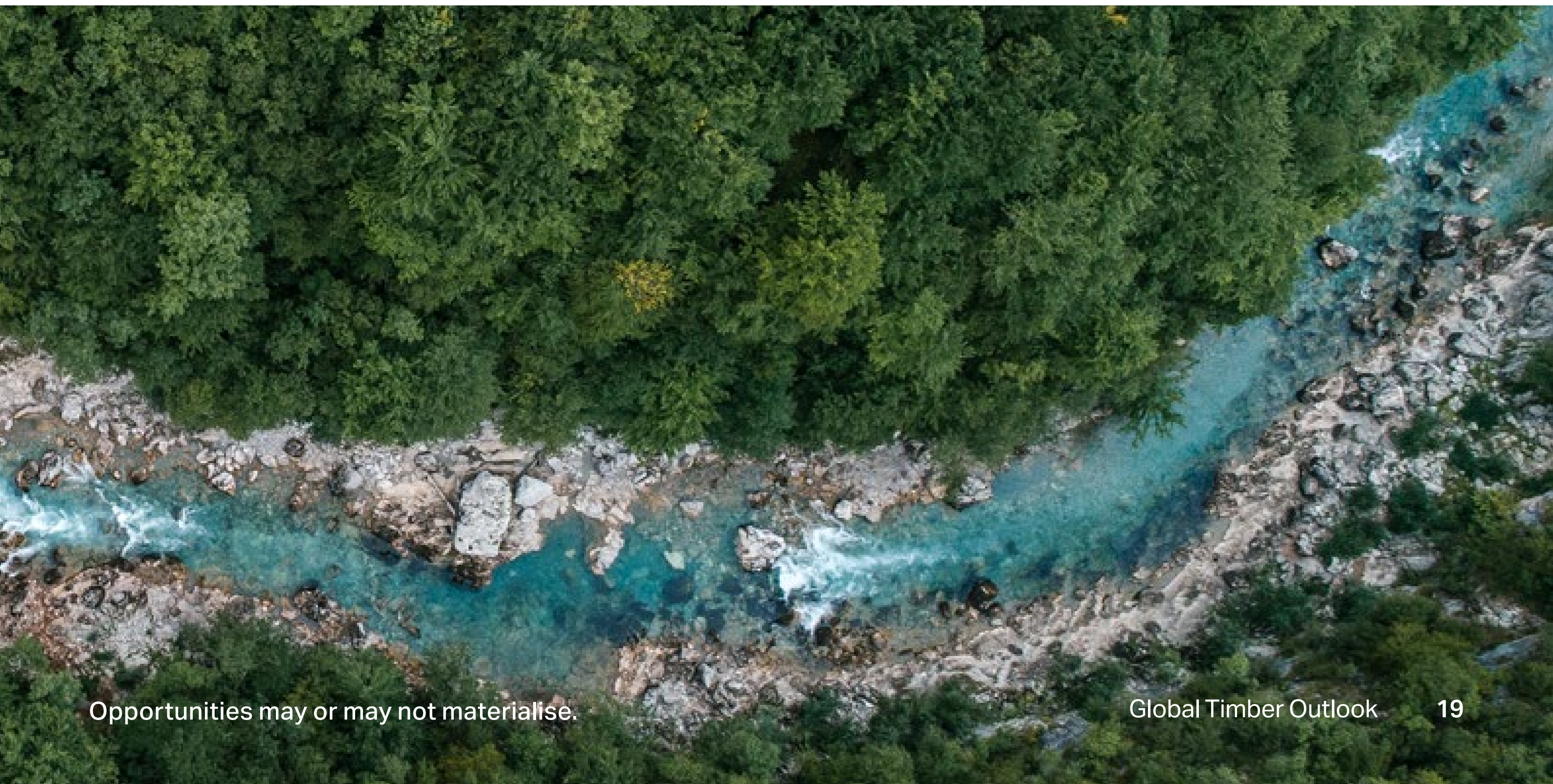
In summary, the anticipated gap between timber supply and demand has important implications for investors and underscores the need for proactive measures from policymakers and other stakeholders to address this challenge.

Key implications for investors:

- **Rising forest asset prices:** The expected demand-supply gap points to a future environment of sustained timber price growth, which is likely to enhance the value of forestry assets. Current forest owners are well-positioned to benefit from this appreciation. Moreover, as more investors seek exposure to this asset class, market liquidity is expected to increase[11]
- **Increased importance of ESG:** It is anticipated that there will be increased importance placed by all stakeholders on the environmental and social integrity of timber and other natural capital asset classes. Forestry assets certified under internationally recognised sustainable forestry management standards, such as the FSC and PEFC, are expected to become increasingly significant to stakeholders as global priorities shift toward sustainable development. Furthermore, we anticipate an increase in reporting and disclosure standards
- **Continued investment benefits of timber as an asset class[12]:** The findings of this study reinforce timber's appeal as an investment asset. The anticipated future supply-demand dynamics are likely to enhance timber's capacity to generate stable cash flows and provide returns that demonstrate low correlation with other asset classes, making it a valuable tool for portfolio diversification. In addition to traditional timber revenues, timberland assets are increasingly generating income from various sources, including renewable energy initiatives, ecotourism, strategic land sales, carbon credits, and payments for ecosystem services. This trend is expected to persist as the transition to a low-carbon economy continues, driven by government initiatives and policymaker efforts

11. **Forestry assets are typically illiquid and investors may not be able to realise value quickly or at expected levels" so the statement is balanced**

12. **Investment returns in timber are not guaranteed and may be affected by illiquidity, price volatility and policy changes**



Opportunities may or may not materialise.

Appendix: demand & supply projection methodology

Demand

Data collection, processing and projection methodology

To project the impact of climate change on future demand for coniferous sawnwood, a quantitative relationship was established between historical demand drivers and sawnwood consumption. A multiple linear regression model was developed using key historical factors influencing timber demand. Projections for timber demand were then generated by applying forecasts of the independent variables aligned with various IPCC SSP scenarios, resulting in base case, upside, and downside timber demand projections through 2050.

The steps taken are outlined below:

1. **Data sourcing:** country-level data on coniferous sawnwood production, imports and exports was sourced from FAOSTAT, covering the period from 1961 to 2022, and aggregated to a global level. Consumption was calculated using the following formula:

   Sawnwood Consumption = Production + Imports – Exports

2. **Demand drivers:** global data on the three primary drivers: population, GDP and urbanisation was sourced from the World Bank (2024) and Our World in Data (2024) for the same period
3. **Correlation analysis:** the historical relationships within the dataset were initially tested using a correlation table. This analysis revealed a strong correlation between the demand drivers and a moderate correlation between the demand drivers and sawnwood consumption
4. **Regression analysis:** multiple linear regression models were run to further explore the relationship between the demand drivers and sawnwood consumption. Although the R squared and multiple R values indicated moderate to strong relationships, there were concerns related to multicollinearity due to strong correlations between the independent variables which could affect model validity
5. **Consumption pattern analysis:** analysis of historical data identified that consumption of coniferous sawnwood was likely influenced by global macroeconomic cycles, particularly the 2008 financial crisis and the oil shocks of 1973, 1979, and 1990. Previous literature has focused on the price elasticity of sawnwood, but none to date has focused on the link between macroeconomic volatility and consumption
6. **VIX data:** to test the relationship between global macroeconomic cycles and sawnwood consumption, the CBOE Volatility Index (VIX) (2024) was used as a proxy for economic uncertainty. Daily VIX data from 1993 to 2022 was averaged annually to align with the GDP and sawnwood consumption data
7. **Further regression analysis:** a regression analysis was conducted with historic GDP (the independent variable with the highest correlation to sawnwood consumption), the VIX, and coniferous sawnwood consumption. The regression identified a strong statistical relationship, with a multiple R of 0.93 and an R square of 0.87. The low correlation between the VIX and GDP (0.039) removed the concerns of multicollinearity
8. **Future scenarios:** the shared socio-economic pathways (SSPs) were used to develop the narratives for future demand projections. GDP projection data for the various SSPs was sourced from the IIASA SSP public database, covering the period from 2010 to 2100 in five-year increments (Riahi, et al., 2017). In cases where current growth outpaced projections, figures were updated with the most recent available data and projected forward using the growth rate for the respective SSP scenario. All GDP figures were adjusted to constant 2015 USD, the baseline static currency provided by the World Bank
9. **VIX data processing:** the historic VIX data showed a large right skew. To remove some of the extreme outliers, the data was windsorized to the 5th and 95th percentiles and divided into quartiles for projections

Demand projections

The analysis revealed a significant increase in demand for coniferous sawnwood across all scenarios, with projections ranging from a 1.5-1.8x increase. SSP1 showed the highest demand, SSP2 the moderate level and SSP3 the lowest.

Demand projection: base case

The base case projection was based on SSP2, the 'Middle of the Road' scenario', which describes a path of social, economic and technological trends that follow a similar trajectory to historic patterns.

The following formula was derived from the regression analysis:

Sawnwood consumption (000's m³) = 220,893 + 3.03x -2480 z

Where x = GDP and z = average VIX

IIASA SSP2 GDP data along with the average VIX from the windsorized dataset were used for the projections. The average VIX was chosen due to SSP2's assumption of a trajectory that follows historical patterns.

Demand projection: upside and downside

The same analysis was performed using data for SSP1, 'Sustainability – Taking the Green Road', and SSP3, 'Regional Rivalry – A Rocky Road'.

SSP1: 'Sustainability – Taking the Green Road'

SSP1 represents the upside, 'green' scenario, characterised by a global shift towards a more sustainable development path. This scenario emphasises respect for environmental boundaries, low material growth and a gradual move to a less resource-intensive lifestyle (O'Neill, et al., 2017). While timber has not been explicitly addressed, the narrative aligns with higher uptake of the demand drivers discussed earlier in this report, including increased uptake of mass timber, timber-based modular construction, and favourable wood-based construction policies.

Furthermore, the SSP1 narrative emphasises global cooperation, strong and effective institutions, and the reduction of inequality, which collectively suggest a lower volatility environment. To represent this, an average of the VIX within the 0-75% quartiles of the windsorized data set was used as a proxy.

SSP3: 'Regional Rivalry – A Rocky Road'

SSP3 represents the downside, "unsustainable", scenario characterised by a global shift to nationalism and lack of global coordination to address global environmental concerns (O'Neill, et al., 2017). This scenario was deemed appropriate for the downside given current global conflicts and the resurgence of nationalism. In this scenario, growing fossil fuel dependency and resource intensity slow growth and imply high challenges to mitigation, counteracting the demand drivers described previously.

Furthermore, the SSP3 narrative emphasises limited and weak global institutions, international fragmentation, and the potential for large conflicts which collectively suggest a high-volatility environment. To represent this, an average of the VIX within the 25-100% quartiles of the windsorized data set was used as a proxy.

Supply

Forecasting future supply is challenging given inconsistency in reporting methodologies and a lack of conclusive literature about the future key determinants of supply. Historical global supply data is divided between plantation and native forests, despite productive forestry spanning across both. The SSP scenarios provide quantitative projections for total global forest area, however at this point they cannot be extrapolated to cover productive forestry specifically. Additionally, the literature to date has generally focused on individual supply drivers in isolation, without addressing how these supply drivers might interact in a world that is characterised by both higher forest productivity from elevated atmospheric CO_2 concentrations and increased frequency and severity of forest disturbances.

Given these limitations, a simplified approach to projecting supply was adopted. Future projections were informed by historic supply levels and growth levels to determine a base case and upside scenario. Projecting a quantitative downside scenario for future supply was determined to not be feasible due to the unpredictability of disturbance events.

Supply projection: base case

The base case for supply assumes a constant level at approximately 390 million m^3. This assumption is based on observed low levels of historical afforestation, stability of global forest area dedicated to forestry production and the consistency of 40% of coniferous industrial roundwood being transformed to coniferous sawnwood (FAOSTAT, 2024).

Supply projection: upside and downside

Upside

The upside has been projected based on the 13% average increase in net primary production and subsequent wood volume determined by Storms et al. (2022). This 13% was considered appropriate as the study ran from 1987 to 2016, during which atmospheric CO_2 concentrations increased by 55 ppm (NOAA, 2024). Between 2020 and 2050 concentrations are expected to further increase by 87-124 ppm for SSP scenarios 1 to 3 (Riahi, et al., 2017). Although this projected increase is greater than what was observed by Storms et al., the 13% has been used as a global proxy due to the lack of information on when CO_2 will no longer be a limiting factor for growth.

Downside

No downside scenario has been projected, as a quantitative downside scenario for future supply is not feasible due to the unpredictability of disturbance events. However, it is known that such events will impact tree species distribution, mortality rates and land availability for forestry production, all of which could result in a significant reduction of harvestable volume and negatively affect the supply of coniferous sawnwood.

About the Report

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Elise is a Forestry Investment Associate, focusing on international acquisitions and asset management of commercial and carbon forestry assets. Previously she spent three years at Mackenzie Investments, one of Canada's largest investment management firms, as an Investment Analyst on a $3bn Environmental Thematic fund where she specialised in sustainable agriculture and water investments. Elise holds first-class degrees in biology (BSc) and business administration (BA) from Western University (Canada) and a first-class MSc in Climate Change, Management, and Finance from Imperial College London.

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References

Abed, J., Rayburg, S., Rodwell, J. & Neave, M., 2022. A Review of the Performance and Benefits of Mass Timber as an Alternative to Concrete and Steel for Improving the Sustainability of Structures. Sustainability, 14(9), p. 5570.

Acosta, C. M., 2023. How Russia's timber trade is sidestepping the EU's Ukraine war sanctions, Online: ICIJ.

Araujo, V. D., 2023. Timber construction as a multiple valuable sustainable alternative: main characteristics, challenge remarks and affirmative actions. International Journal of Construction Management, 23(8), pp. 1334-1343.

ArcGIS, 2024. Map Viewer. [Online]
Available at: https://www.arcgis.com/apps/mapviewer/index.html?layers=df767379da81457f96354160ef2d2da0
[Accessed 24 10 2024].

Birkmann, J. et al., 2022. Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge, UK and New York, NY, USA: Cambridge University Press.

Boisvert-Marsh, L., Perie, C. & Blois, S. d., 2014. Shifting with climate? Evidence for recent changes in tree species distribution at high latitudes. Ecosphere, 5(7), p. 83.

Brack, D., 2019. Background Analytical Study: Forests and Climate Change, s.l.: UN Forum on Forests Secretariat.

CBOE Exchange Inc., 2024. Historical Data for Cboe VIX® Index. [Online]
Available at: https://www.cboe.com/tradable_products/vix/vix_historical_data/
[Accessed 20 08 2024].

Churkina, G. et al., 2020. Buildings as a global carbon sink. Nature Sustainability, 3(269-276).

Crook, L., 2021. dezeen. [Online]
Available at: https://www.dezeen.com/2021/11/02/amsterdam-new-buildings-20-per-cent-timber/
[Accessed 14 08 2024].

Davis, E. C., Sohngen, B. & Lewis, D. J., 2022. The effect of carbon fertilization on naturally regenerated and planted US forests. Nature Communications, Volume 13, p. 5490.

FAO, 2020. Global Forest Resources Assessment 2020, Rome: FAO.

FAOSTAT, 2024. Forestry Production and Trade. [Online]
Available at: https://www.fao.org/faostat/en/#data/FO
[Accessed 10 08 2024].

Forster, E. J., Healey, J. R., Dymond, C. & Styles, D., 2021. Commercial afforestation can deliver effective climate change mitigation under multiple decarbonisation pathways. Nature Communications, 1(12).

FSC, 2022. FSC welcomes the new EU Regulation on deforestation-free products – and is ready to work for effective enforcement on the ground. [Online]
Available at: https://fsc.org/en/newscentre/fsc-welcomes-the-new-eu-anti-deforestation-regulation
[Accessed 14 08 2024].

Fu, C.-H., 2014. The Global Supply Chain An Introduction to Global Wood Product Markets and Trade for Timberland Investors, s.l.: Timberland Investment Resources.

George Brown College, 2023. Ontario's first mass-timber, net-zero institutional building closer to completion. [Online]
Available at: https://www.georgebrown.ca/media-release/2023/ontarios-first-mass-timber-net-zero-institutional-building-closer-to-completion
[Accessed 12 08 2024].

Gresham House, 2024. Proprietary Research. London: s.n.

Han, X., Su, J. & Thia, J. P., 2020. Impact of Infrastructure Investment on Developed and Developing Economies, Beijing: Asian Infrastructure Development Bank.

Held, C., Meier-Landsberg, E., Alonso, V. & Nacke, J., 2022. Global forest sector outlook 2050, Rome: Food and Agriculture Organization of the United Nations.

Interpol, n.d. Forestry Crime. [Online]
Available at: https://www.interpol.int/en/Crimes/Environmental-crime/Forestry-crime
[Accessed 11 08 2024].

Iordan, C.-M.et al., 2018. Contribution of forest wood products to negative emissions: historical comparative analysis from 1960 to 2015 in Norway, Sweden and Finland. Carbon Balance and Management, Volume 13, p. 12.

Joeri Rogelj, R. L. C. B. J. B., 2024. Limiting temperature increase to 1.5°C above pre-industrial levels. [Online]
Available at: https://www.imperial.ac.uk/grantham/publications/background-briefings/limiting-temperature-increase-to-15c-above-pre-industrial-levels-/
[Accessed 12 08 2024].

Li, J., Andersen, L. V. & Hudert, M. M., 2023. The Potential Contribution of Modular Volumetric Timber Buildings to Circular Construction: A State-of-the-Art Review Based on Literature and 60 Case Studies. Sustainability, Volume 15, p. 16203.

Liqing Peng, T. D. S. J. Z. R. W., 2023. The carbon costs of global wood harvests. Nature, Volume 60, pp. 110-115.

Ministry of Forests, 2024. Wildfire-damaged wood recovery underway in B.C.. [Online]
Available at: https://news.gov.bc.ca/releases/2024FOR0015-000520
[Accessed 20 08 2024].

NOAA, 2024. Carbon Dioxide. [Online]
Available at: https://climate.nasa.gov/vital-signs/carbon-dioxide/?intent=121#:~:text=Since%20the%20onset%20of%20industrial,ice%20age%2020%2C000%20years%20ago.
[Accessed 22 08 2024].

O'Neill, B. C. et al., 2017. The roads ahead: Narratives for shared socioeconomic pathways describing world futures in the 21st century. Global Environmental Change, Volume 42, pp. 169-180.

O'Sullivan, F. & Che, H., 2024. Why the Paris Olympics Will Be a Modest Showcase of Wood Architecture. [Online]
Available at: https://www.bloomberg.com/news/features/2024-03-09/paris-summer-olympics-will-be-a-modest-showcase-of-wood-architecture
[Accessed 14 08 2024].

Our World in Data, 2024. Urbanization. [Online]
Available at: https://ourworldindata.org/urbanization
[Accessed 12 08 2024].

Peng, L., Searchinger, T. D., Zionts, J. & Waite, R., 2023. The carbon costs of global wood harvests. Nature, Issue 620, p. 110–115.

Purton, M., 2024. World Economic Forum: 4 practical solutions to the world's spiraling housing crisis. [Online]
Available at: https://www.weforum.org/agenda/2024/06/global-housing-crisis-practical-solutions/
[Accessed 27 08 2024].

Reliance Timber, 2023. The Impact Canadian Wildfires Will Play on the Timber Industry. [Online]
Available at: https://reliancetimber.com/the-impact-canadian-wildfires-will-play-on-the-timber-industry/
[Accessed 20 08 2024].

Reuters, 2023. Voluntary carbon markets set to become at least five times bigger by 2030 -Shell. [Online]
Available at: https://www.reuters.com/markets/carbon/voluntary-carbon-markets-set-become-least-five-times-bigger-by-2030-shell-2023-01-19/
[Accessed 07 10 2024].

Riahi, K. et al., 2017. The Shared Socioeconomic Pathways and their energy, land use, and greenhouse gas emissions implications: An overview. Global Environmental Change, Volume 42, pp. 153-168.

Romunde, R. (. v., 2020. Global Timber Outlook, London: Gresham House.

Rüter, S. et al., 2019. 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Volume 4: Agriculture, Forestry and Other Land Use, s.l.: IPCC.

Scottish Forestry, 2019. The Forestry Grant Scheme, s.l.: Scottish Governenment .

Searchinger, T., Peng, L., Zionts, J. & Waite, R., 2023. The Global Land Squeeze: Managing the Growing Competition for Land, Washington DC: World Resources Institute.

Storms, I. et al., 2022. Quantifying climate change effects on future forest biomass availability using yield tables improved by mechanistic scaling. Science of the Total Environment, Volume 833, p. 155189.

Svein, H. et al., 2021. New elasticities and projections of global demand for coniferous sawnwood. Forest Policy and Economics, Volume 122.

UN FAO, 2021. Forest Sector Outlook 2020-2040 study for the UNECE region, Geneva: United Nations.

UNEP; Yale University, 2023. Building Materials and the Climate: Constructing a New Future, Nairobi: United Nations Environment Programme.

UNEP, 2022. State of Finance for Nature. Time to act: Doubling investment by 2025 and eliminating naturenegative finance flows, s.l.: United Nations Environmnet Programme.

UNEP, 2023. State of Finance for Nature: The Big Nature Turnaround – Repurposing $7 trillion to combat nature loss, Nairobi: United Nations Environment Programme.

W. A. Kurz, C. C. D. G. S. G. J. R. E. T. N. A. L. C. T. E. &. L. S., 2008. Mountain pine beetle and forest carbon feedback to climate change. Nature, Volume 452, p. 987–990.

Wainhouse, D. & Inward, D. J., 2016. The influence of climate change on forest insect pests in Britain, Surrey: Forestry Commission UK.

World Bank Group, 2016. Forest Action Plan FY16-20, Washington DC: International Bank for Reconstruction and Development / The World Bank.

World Bank Group, 2024. Population, Total. [Online]
Available at: https://data.worldbank.org/indicator/SP.POP.TOTL
[Accessed 16 08 2024].

World Economic Forum, 2020. Nature Risk Rising: Why the Crisis Engulfing Nature Matters for Business and The Economy, s.l.: New Nature Economy.

WWF, 2007. Stopping Illegal Logging. [Online]
Available at: https://www.worldwildlife.org/initiatives/stopping-illegal-logging
[Accessed 11 08 2024].

WWF, 2011. Timber and Wood Products, s.l.: WWF.

Xiang, W. et al., 2022. Rotation age extension synergistically increases ecosystem carbon storage and timber production of Chinese fir plantations in southern China. Journal of Environmental Management, Volume 317, p. 115426.

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