



100% SUSTAINABLE TIMBER MARKETS THE ECONOMIC AND BUSINESS CASE

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About the author

Charles Dean is an independent consultant working at the boundary of natural resource / commodity economics and ecosystem management. He received his PhD in chemical engineering from Imperial College London and has been advising clients in his field for the last 8 years. He is a published author in a number of high-profile academic journals.

The purpose of this research is to gather evidence to support one of the objectives of the Forest Priority campaign of encouraging UK businesses to shift 100% of their trade in timber and timber products to both sustainable and legal sources by 2020.

WWF'S FOREST GOALS

WWF wants to see zero net deforestation and forest degradation, or ZNDD, meaning no further loss in the quantity or quality of the world's forests. The target is to achieve this by 2020, and maintain it from then on. As part of this, the Forest Priority campaign is encouraging UK businesses to shift 100% of their trade in timber and timber products to legal, sustainable sources by 2020.

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If we want forests to continue to provide us with resources, keep our climate stable and conserve biodiversity, then we need to tackle the threats they face, urgently and decisively. All stakeholders should look at how we can use forests wisely. Businesses need to understand and manage their impact on forests: while this requires an investment of company resources, the benefits they can expect to receive in return more than justify the expenditure. This report demonstrates how.



HEADLINES

THE ECONOMIC CASE AT THE INTERNATIONAL LEVEL

- Sustainable timber markets are a means to preserving existing economic activity.
- Understanding of the critical role that forests and timber play in economic activity is incomplete. This needs to be addressed and factored into decision-making.
- Sustainable timber markets can help support economic activity within countries, enabling international trade and development.
- The future of current timber trade patterns is in doubt unless sustainable forestry management becomes more widespread as a means of securing supply.
- Primary forest is being depleted at an alarming rate and is not being replaced by proportional levels of other forest, indicating that more can be done on the supply side to mitigate future pressures.
- Trade patterns indicate a stark difference in consistency between UK imports from countries likely to have adequate forest management and those less likely. Addressing this could help stabilise both forest cover and supply of timber.
- Sustainable timber markets are a means to mitigating and adapting to climate change, which has significant implications for the global economy.

THE BUSINESS CASE

- Some businesses are starting to report net financial gain by addressing sustainability in their organisation, including sustainable sourcing of timber.
- Addressing these issues makes an initial demand on company resources, but our evidence indicates that this input can be compensated in a number of ways.
- Businesses need to look at how their timber is sourced if they want to play their part in securing supply for the future and in keeping supply and prices stable.
- A collective effort will ensure that businesses and industries remain viable and healthy, and will safeguard the future economic context in which they operate.
- Tangible business benefits of following this advice include advantages in regulatory position, easier raising of finance, brand value and an engaged workforce.
- These business benefits can translate to material company value through improvements in performance and ultimately the bottom line.

This is an initial scoping report to establish what framework could be developed for encouraging businesses to show a greater interest in sustainable timber. There is clearly scope for adding detail to the broad-stroke themes drawn out here, and we invite you to join the discussion.

INTRODUCTION

The economic value of natural capital is beginning to be integrated into decisions by policy-makers and corporate leaders. Forests are a particularly valuable natural capital asset, providing timber while also supplying a range of ecosystem services, such as carbon sequestration, water provision, flood prevention, erosion control and biodiversity.

This initial scoping report investigates the potential for motivating businesses to commit to sustainable timber from a business case perspective. The report aims to inform decision-makers of the benefits that expanding markets for sustainable timber could bring to the global economy, the domestic UK economy and UK businesses. It also aims to promote discussion on how to create sustainable timber markets, which we invite you to join. By sustainable timber markets, we mean the buying and selling of timber and timber-derived products sourced from forests where forest management practices have the following three objectives:

i) Securing long-term supply

In this report, long-term supply refers to supply secured by addressing supply chain integrity, as opposed to that secured through long-term contracts with suppliers.² Supply chain integrity implies that timber is derived from locations where on a net basis, the growth rates of commercial species in source forests exceed removal rates – that is, timber-dependent industries are generating profit from forest growth rather than forest stocks.

ii) Protecting wildlife and the natural world

Forests play a fundamental role in preserving biodiversity, sequestering and storing CO₂, water cycle regulation, nutrient cycling, soil stability and local climate regulation. To be sustainable, timber harvesting should not contribute to the degradation of these vital ecosystem services, but actively protect, manage and restore them.

iii) Protecting social benefits

People benefit from forests in many ways. The benefits range from meeting basic human needs for food, shelter and firewood, to improved quality of life and health. Globally, over 1.5 billion people depend on forests for their livelihoods:³ sustainability in this context refers to management practices which protect their rights and livelihoods.

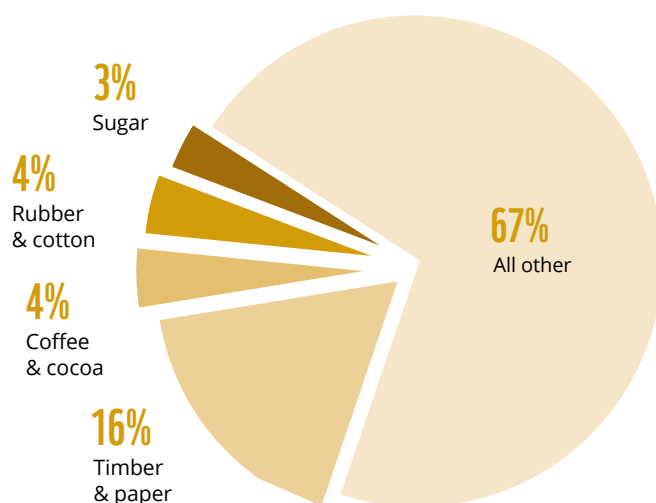
To date, commitments to responsible forest trade have largely been driven by environmental and social concerns. This report aims to present the economic case. It begins by introducing the most important factors globally, then presents why UK businesses should pay particular attention to their own connection to the sustainable forest agenda.

THE ECONOMIC CASE AT THE INTERNATIONAL LEVEL

SIGNIFICANT: THE ECONOMIC CONTRIBUTION OF THE WORLD'S FORESTS

TIMBER AND PAPER COMPRISE 16% OF INTERNATIONAL TRADE IN COMMODITIES

Figure 1.
Breakdown of international soft commodities trade (percentages).



Timber industries make an important contribution to economies across the globe, both in terms of supporting domestic industries and through international trade. Sustainable supply of timber generates revenue, supports employment and contributes to economic activity which improves the international economic outlook. Sustainable timber supplies contribute to local poverty mitigation, which in turn drives political stability⁴ and economic prosperity.⁵

Timber/paper is by far the single largest internationally-traded soft commodity by value, making up more than 16% of the total value of soft commodity markets (Figure 1) at more than US\$250 billion (2013).⁶

This excludes economic value generated through trade of timber within countries. It also excludes the value of forest ecosystem services: when these are included, the value of forests increases to US\$17.6 trillion (2009 – see Annex A).⁷ This is equivalent to around a quarter of global GDP. Timber provision accounts for around 10% of this total.⁸

Globally, timber growth vastly exceeds removals, as we will discuss later. However, this is not true of all regions, and specific premium hardwood species are increasingly scarce due to overexploitation and habitat destruction. These include natural forest teak, some types of mahogany, merbau, Siberian oak, Siberian ash, ramin, mpingo and African blackwood. To some extent these are substitutable with other species of similar physical or aesthetic properties,⁹ suggesting that these potential shortages are not necessarily a threat to the economic profitability of the timber trade. Sustainable forests and timber also play a pivotal role in how we manage climate change (see Box 1), which has implications for the global economy. The IPCC suggests that a mean surface temperature increase of 2.5-3°C could result in a drop in equivalent income of up to 3% (US\$2.3 trillion a year) due to climate-induced changes to crop yields.¹⁰ Forests regulate the climate mainly through sequestration of CO₂, valued globally at US\$2.4 trillion.¹¹ The loss of climate regulation due to deforestation is expected to cost the global economy US\$1 trillion by 2100.¹²

Box 1. The role sustainable timber markets can play in mitigating climate change

There is more carbon stored in the world's forests than in the planet's atmosphere. Trees sequester CO₂ as they grow; around half of tree biomass is carbon. If a tree is harvested and turned into a timber product before it dies and decomposes, in theory this carbon is stored for the life of the product. However, this storage depends on the life-cycle of the product – how long it lasts, the purpose it fulfils after its primary use, how it is disposed of. Also, the harvesting process itself can be a source of CO₂ emissions if soil is disturbed, particularly if harvesting involves loss of carbon-rich peatlands.¹³ There is much research demonstrating the carbon benefits of trees, including into their old-growth phase.¹⁴ All this means sustainable commercial forestry and timber markets are important mechanisms for reducing CO₂ levels.

IN A NUMBER OF LOCATIONS, LEGAL AND SUSTAINABLE SUPPLY OF TIMBER TO THE UK IS AT RISK OF DEPLETION.

Timber is also on the agenda of potentially large, growing industries, such as biomass for energy. The annual value of these industries in the EU and China combined is predicted to reach ~US\$60 billion by 2020 and will continue to grow.¹⁵ With forests already facing diverse pressures, it's essential that these industries are developed within ecological constraints.¹⁶ In particular, safeguards need to be put in place to ensure meeting energy from biomass does not lead to biodiversity loss as a result of large-scale conversion of land to plantation forest.¹⁷

Genetic resources are another valuable forest ecosystem service. The countless unique species found in the world's forests provide medicines, products for materials science, horticultural varieties of plants and other resources valued at US\$270 billion per year.¹⁸ The potential future economic value of these resources is immeasurable.

Other forest products are also hugely valuable, both to local forest-dependent people and economically. Non-timber forest products (NFTPs) include game animals, nuts, fruits, berries, edible mushrooms, medicinal plants, resins, sap – from rubber to maple syrup – and fibres like rattan. Estimating accurately the

economic significance of NFTPs is problematic owing to the varied nature of their prevalence in different locations and the fact that many products may serve a subsistence function rather than entering into market supply chains. However, attempts to make such estimates put the economic value of NFTPs at between US\$363 and US\$814 per hectare,¹⁹ suggesting a global value in the region of US\$410–910 billion annually.

To ensure forests continue to provide us with these multiple values, it's vital that they are managed responsibly and sustainably. The timber industry – and by extension all companies that use timber products – can play a central role in this.

QUESTION: WILL THE UK'S IMPORT SUPPLY OF TIMBER BE STABLE?

While UK businesses need to consider the wider role of forests, the most immediate concern for many is to secure an affordable, reliable and long-term supply. As a result, forests are routinely valued in a narrow way, for the value of standing timber only.

The world's forests contain around 385 billion cubic metres of wood, and an additional 17 billion cubic metres of new growth is added each year.²⁰ However, only a fraction of this wood can be legally and sustainably exploited. Just 3.4 billion cubic metres are harvested each year, most of it for subsistence fuel use.

In a number of locations, legal and sustainable supply of timber to the UK is at risk of depletion. The years of supply remaining for primary, secondary and plantation forest has been estimated in countries that supply a significant proportion of UK timber and timber product imports through bilateral trade. These indicate that a number of source countries are on the verge of depleting their reserves of forest available for production,²¹ factoring in the percentage area of forest designated for logging and for forest protection and conservation.

LEGITIMATE SUPPLY FROM A NUMBER OF COUNTRIES IS AT THE POINT OF EXPIRY

Figure 2. Modelling of years remaining. Countries presented in order of significance to the UK economy by value of total timber trade flow (> US\$5 m). Please refer to Annex B for supporting methodology and statistic base references used. Methodology used based on modelling of forest resources and historic timber production factoring in conservation areas.

Figure 2. Modelling of years remaining												
Central & South America				Africa				Asia & Pacific				
	pri.	sec.	pla.		pri.	sec.	sec.		pri.	sec.	pla.	
Brazil	16	10	14	S. Africa	p	3	7	Malaysia	p	7	+	
Chile	p	p	12	Cameroon	d	33	19	Indonesia	30	20	24	
Uruguay	p	p	9	Côte d'Ivoire	p	+	+	Philippines	p	+	24	
Paraguay	p	d	10	Ghana	-	+	+	India	p	p	21	
Argentina	p	d	11	Congo	p	+	21	Thailand	p	-	9	
Guyana	+	p	1	Nigeria	d	2	11	S.Korea	d	d	+	
Colombia	d	d	12	DRC	d	d	+	Vietnam	d	+	26	
Ecuador	23	13	4	Tanzania	d	23	8	PNG	24	+	d	
Cuba	p	p	+	Tunisia	d	d	+	Myanmar	p	21	19	
Honduras	d	d	d	Senegal	25	23	+	Pakistan	d	4	10	
Trinidad	+	13	+	Gambia	d	+	5	Sri Lanka	d	5	+	
Peru	+	+	+	CAR	+	-	-	Nepal	9	2	31	
Mexico	d	d	9	Key d = depleted 8 = 10 yrs or less remaining 18 = less than 35 yrs remaining + = more than 35 yrs remaining p = protected - = not applicable								
Suriname	+	+	+									
Guatemala	9	+	+									
Dom. Rep.	-	p	+									

Supply of timber from a number of countries key to the UK is either at the point of expiry or running at a deficit. Your business may be familiar with these countries as supply sources.

A deficit here is where the total area of forest used in a country since 1990 exceeds the area of that forest type reported by the FAO as being designated for production. Any further supply from these forests can only be coming from

areas designated for forest conservation,²² indicating that sustainable and legal timber is no longer available.

Other countries, such as Indonesia and Peru,²³ have exchanged primary or secondary forest for extensive plantation resources. While this may ease timber supply constraints, it has implications for biodiversity and other important forest ecosystem functions.

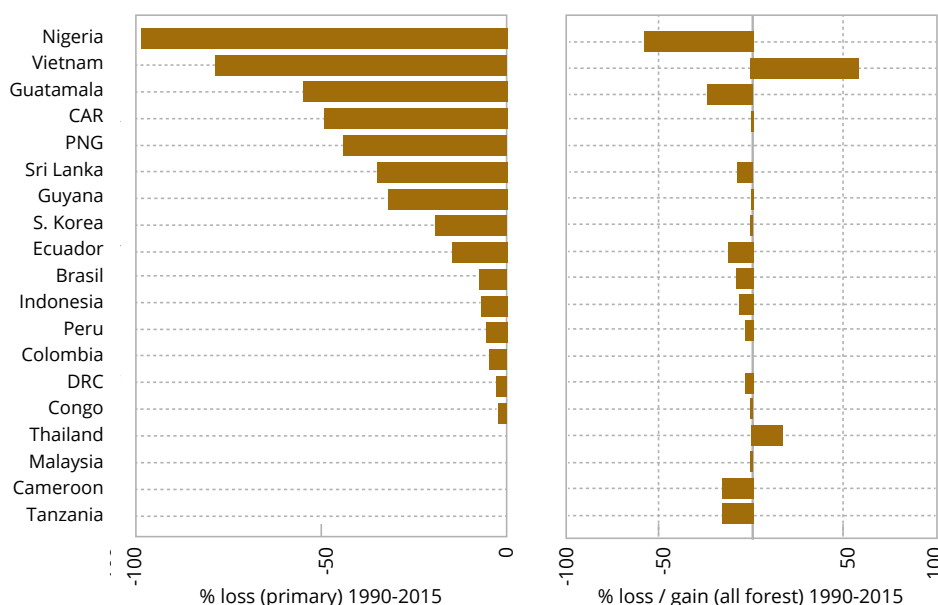


Figure 3. Percentage change in primary and aggregate forest area over a 25-year period (1990–2015). Aggregate forest area includes all recorded forest types (primary, other naturally regenerated forest and plantation area). Based on FAO Global Forest Resource Assessments 1990–2015.²⁴

Deforestation rates of 19 countries surveyed over the period 1990–2015 also reflect forest depletion in important countries for UK timber supply (Figure 3). Many countries continue to lose primary forest cover at alarming rates. This is rarely being replaced with comparable levels of naturally regenerated forest or plantations.

Particular concern needs to be shown for Vietnam and Nigeria, which lost almost 80% and 99% of primary forest cover respectively – a total of almost 2 million hectares. Nigeria has also lost nearly 2 million hectares in other natural (i.e. secondary) forest, which has not been matched with similar levels of plantation forest development. Notably, Vietnam's net increase in total forest area of 58% amid such extensive loss in primary forest is due to the replacement of natural forest with plantation area, which increased by over 2.5 million hectares over this period.

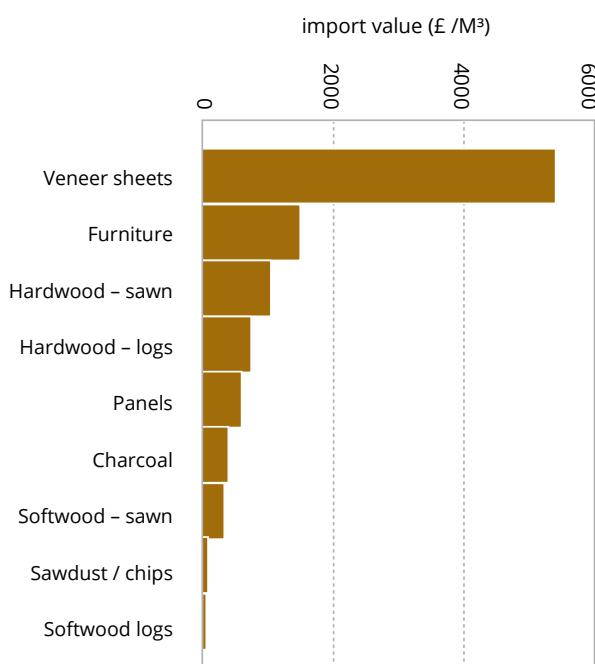
The UK consumes large volumes of imported timber. This demand may be a factor in the rate of forest loss, but also means the UK has a role to play in tackling deforestation overseas, especially in places where threats of deforestation and degradation are greatest.²⁵

HIGHER VALUE PRODUCTS IMPLY GREATER RISK

Figure 4. Variation in the value of different types of timber products

WHERE COULD BUSINESSES START TO FOCUS ACTION FOR UK IMPORTS?

Imported softwood mainly comes from within the EU. Hardwoods, on the other hand, particularly premium hardwoods, often come from further afield, and from places where less is known about the conditions of harvest and where there may be a greater risk of illegality.²⁶



There is also considerable uncertainty surrounding secondary products such as imported furniture. The largest furniture exporter to the UK is China, a key trade country often implicated in illegally sourced wood.²⁷

Premium hardwoods comprise a small fraction of UK trade volumes. However, though small in volume, these products can retail in the UK in excess of £8,000/m³ even as basic sawnwood before conversion into other products; by comparison, joinery-grade pine retails at ~£700/m³.²⁸ Similarly, the cost per unit of hardwood veneer sheets, furniture and other processed products greatly exceeds that of trade flows where sustainability is better understood (sawnwood/panels).

In terms of UK end-use industries, construction, fencing, paper and some types of furniture are well covered with availability of certified products in the UK market. Availability of other certified wood products, such as some types of furniture²⁹ and wooden flooring,³⁰ is promising but these end uses are still problematic; evidence suggests that despite certified options becoming available, wooden seating and some wooden flooring products still come from sources where forestry practices are not monitored.³¹ There are also challenges in achieving comprehensive coverage, for example in the manufacturing of pallets; pallets are manufactured from both nascent timber and material recovered from damaged or disused units, making certification of these products challenging.

So where should efforts be focused? Something to consider is the nature of supply relationships between the UK and the countries where timber comes from. Stable supply relationships between countries and the income these guarantee can be used to ensure forests in source countries are managed sustainably, which in turn stabilises supply for the future for businesses.

With this in mind, we looked at the consistency in trade volumes between the UK and source countries to determine where stable, long-term supply relationships have developed, and where more immediate incentives such as price point are more likely to form the basis for purchasing decisions. Looking at the average percentage change in trade volumes between the UK and other countries indicates a distinction between trade with certain countries and the rest of the world (Figure 5). While trade with the EU, US and Canada stays relatively constant over a 15-year period, variations in trade with the rest of the world is much greater (Figure 5).

Timber trade with the EU, US, Canada

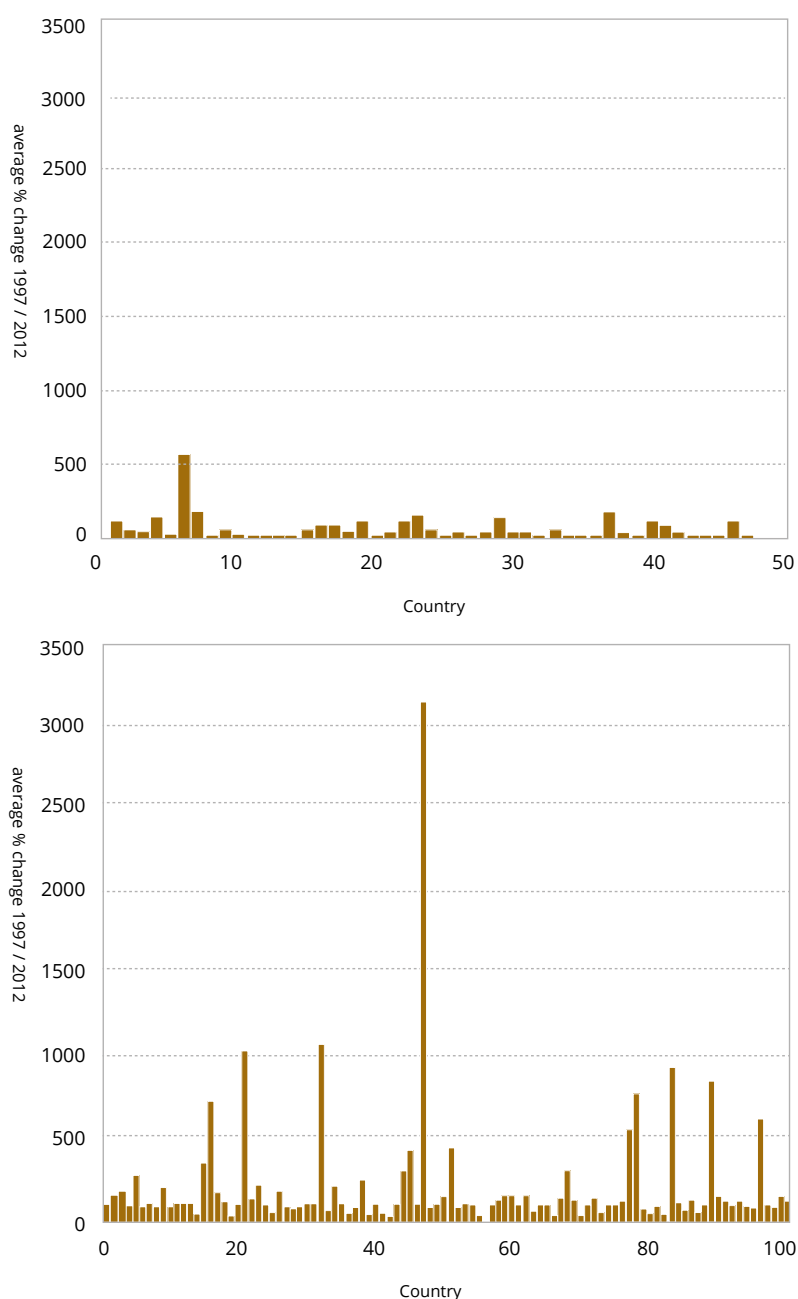


Figure 5. Average percentage change year-on-year on trade volumes between the UK and key export countries. Created using FAO data.³²

One possible mechanism to support positive change is **the development of stable supply relationships, combined with sustainable forest management, with countries sensitive to deforestation. This can reduce the UK's ecological footprint in these countries, and promote stabilisation of forest cover at the same time.** Doing this secures wider business and economic health, stability and resilience, as well as benefiting local producers and wildlife.

Stabilising forest cover and supply of timber are often viewed as a deal which mainly benefits the people and places where growing or extraction takes place³³ – but this is now as much about meeting demand as protecting producers. Though protecting people in source countries is part of the equation – as are the local skills and knowledge they bring in managing natural resources³⁴ – sustainable timber is also about ensuring that significant increases in demand can be met 20 or 30 years from now.

WWF's *Living Forests Report* series indicates that the tripling in per-capita GDP by 2050 will increase demand for commodities such as timber, paper and fuel.³⁵ It analyses the potential implications for forests, and the effect of this on human well-being, economic development and the wider environment.

In the face of these increasing pressures on forests, sustainable timber markets are crucial for maintaining supply. The next section further explores how this contributes to the health of the timber industry and the global economy.

THE BUSINESS CASE

THE BENEFITS TO UK BUSINESSES CAN BE FELT ON DIFFERENT TIME-SCALES

Figure 6. Business benefits of supporting sustainable timber markets: commercial and communication strategy benefits over different timeframes. Source: Authors’ own analysis

Sustainable timber markets enable timber-dependent businesses to turn some of the material and reputational risks associated with deforestation in their supply chains into benefits and opportunities. It is increasingly evident that corporations and investors appreciate the potential benefits of such developments. For example, a recent programme has seen 162 companies with a combined market value of US\$3.24 trillion making commitments to deforestation-free supply chains.³⁶

For some large multinationals, this has already led to action. For example, Marks & Spencer’s “Plan A” campaign is an organisation-wide approach to sustainability, which includes a commitment that by 2020 all their wood will come from the most sustainable sources, including FSC certified and recycled material.³⁷ Plan A reported net revenue by year 3 of £50 million³⁸ (see Annex C for details), due in part to the development of new product lines discovered by taking a systemic approach to sustainability.

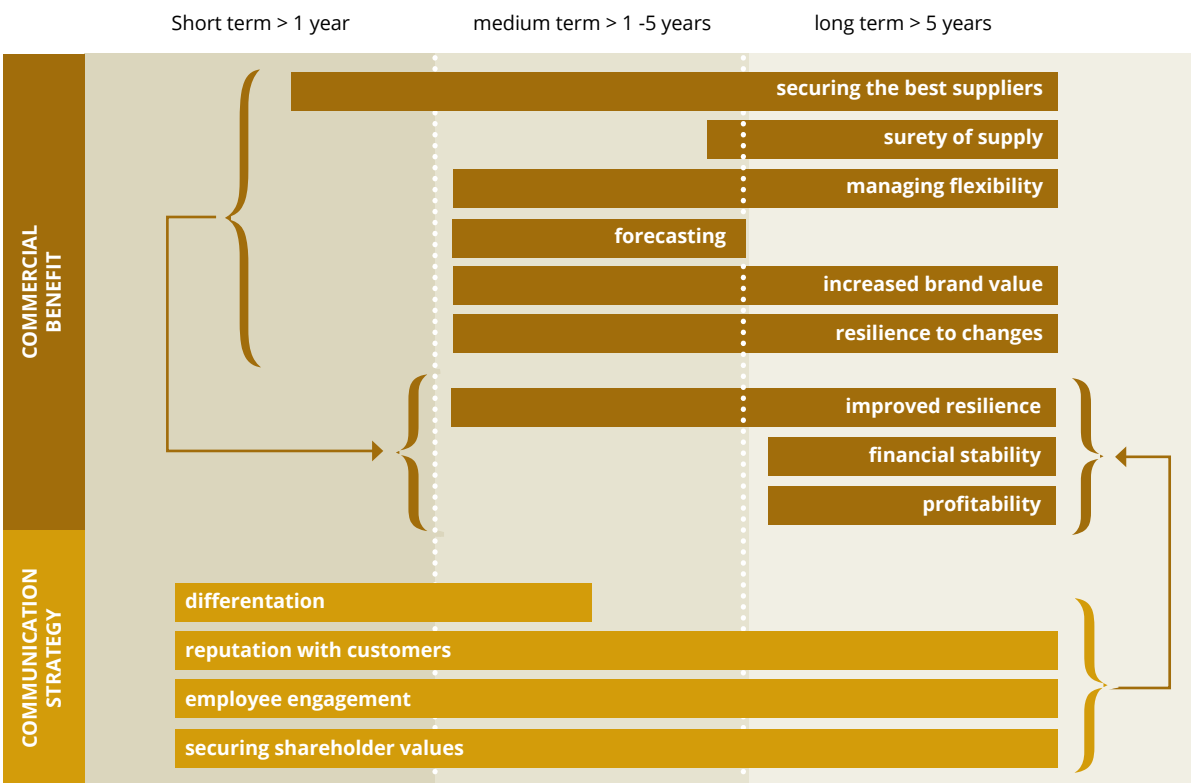
At the SME level there is still a need for greater awareness, and to encourage SMEs

to extend their approach from traditional “green” activities to the broader range of sustainable business practices in areas such as procurement. Encouragingly, however, out of 1,000 UK SMEs interviewed by Lloyds Bank,³⁹ 54% believed sustainability strategies have helped lower costs, with 30% believing they increased profitability.

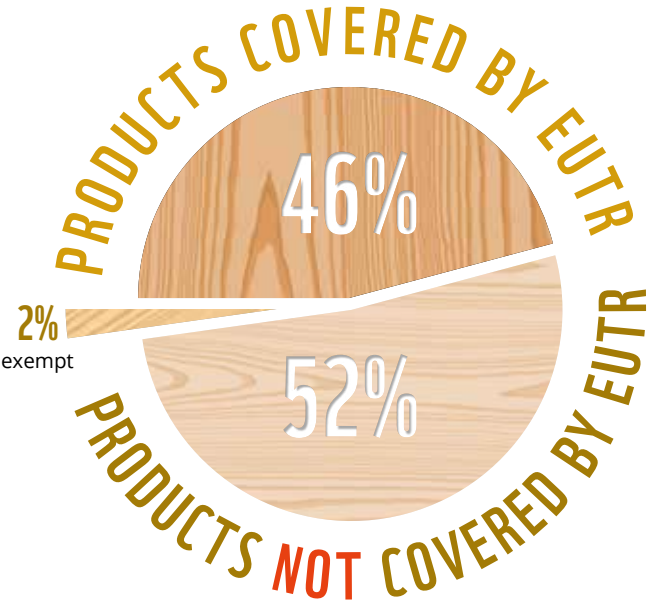
Advocating sustainable timber markets can benefit UK businesses both commercially and in terms of their communication strategy. The benefits operate on different time-scales and are interconnected. Most benefits are felt in the medium to long term, though some are experienced sooner – this is particularly true for the benefits directly relevant to communication strategy (Figure 6).

These benefits are rarely valued – but they become very clear when a business incurs direct costs as a result of interruptions to supply or losses due to regulatory changes or reputational issues. Businesses should actively consider the financial benefits of a sustainable supply chain for timber and timber products.

FIGURE 6



**NOT ALL
PRODUCTS
ARE COVERED BY
THE EUTR, BUT
WWF IS CALLING
FOR THIS TO
CHANGE**



REGULATORY ADVANTAGES - OR ADVANTAGES IN REGULATORY POSITION

The EU Timber Regulation (EUTR), introduced in 2013, presents a significant legislative change to procurement of timber in the UK.⁴⁰ The EUTR is a legal framework which prohibits companies from placing illegally sourced timber or timber products on the EU market. Currently, not all timber and timber products are covered by the EUTR; two recent WWF studies⁴¹ detail which CN product codes⁴² are included and which are likely to be covered in the future. There are calls to extend the range of products covered, meaning that companies involved in the manufacture or trade of products currently outside the scope could be affected.

Companies who already have systems in place⁴³ for reducing the likelihood of material coming from illegal sources, and who have been active in mitigating risks in their supply chain, will have a competitive advantage. They can avoid the risks and unpredictability of outsourcing or the costs of remediation. This enables a structured approach to meeting the demands of regulatory requirements and in making changes to their supply chains, without unplanned or unaccounted for costs.

In a recent survey,⁴⁴ 60-70% of operators believed due diligence to be a challenging part of complying with the EUTR – suggesting that they expect some outlay in terms of company resources in complying. But companies that assign resources to planning, establishing and refining their own information or due diligence systems are making a sound investment. Firstly, they avoid the significant business risk, unpredictability and potentially spiralling costs of outsourcing the work to a third party.⁴⁵ They also minimise the likelihood of being forced to undertake expensive compliance remediation.⁴⁶ In addition, developing these skills in-house supports better decision-making on appropriate sourcing in a timely and systematic manner, avoiding potential future risks to the business.

As the economic benefits of sustainable timber markets at the international and UK level become better understood, this might also lead to strengthened policy frameworks and regulation. Committing to sustainable sourcing can make businesses more resilient and reduce the costs and disruption of these regulatory changes. Some existing developments in policy are detailed below (Table 1). One pertinent question is whether going beyond the minimum requirements of the EUTR and further timber regulation⁵¹ results in improved business performance. Interestingly, evidence from other industries suggests that companies that go beyond the minimum requirements of regulation perform better (Figure 7), most likely because effective regulatory management goes hand in hand with good business management.⁵²

**ENVIRONMENTAL
REGULATION IS
BECOMING MORE
PREVALENT & COULD
IMPACT TRADE**

Table 1. Examples of shifting sentiment in policy toward deforestation

OECD research on environment in trade	A 2014 study by the OECD ⁴⁷ found that environmental provisions in regional trade agreements increased fourfold during the period 2007–12. This includes specific bilateral agreements between countries to factor environmental protection into trade agreements. ⁴⁸
EU Environmental Accounting regulation	Opportunities are available in 2016 and 2019 for adding additional modules (e.g. water, forest, ecosystem services) to the environmental accounting and reporting requirements of member states. ⁴⁹
UK Natural Capital Accounting	In 2015, Defra agreed on a 25-year plan presented by the Natural Capital Committee to ensure UK natural resources are protected, including a commitment to integrating natural capital thinking into policy. ⁵⁰

RESEARCH
SUGGESTS THAT
COMPANIES THAT
GO BEYOND THE
REGULATORY
MINIMUM
PERFORM
BETTER

Figure 7

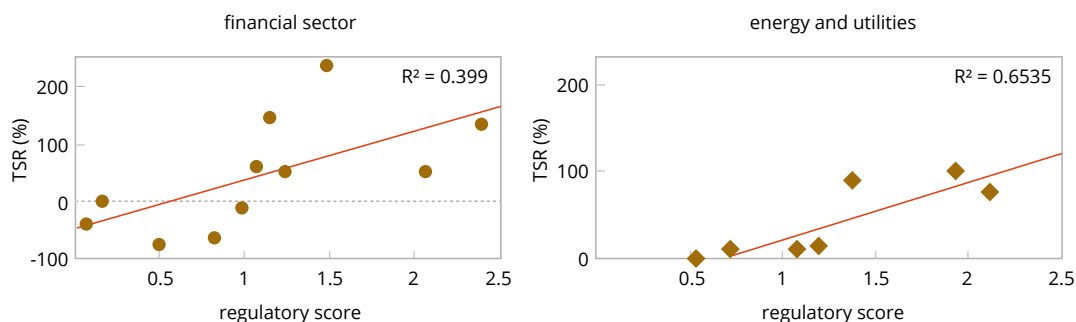


Figure 7.

Correlations between regulatory and financial performance. 50 companies interviewed worldwide. Performance refers to total shareholder returns (TSR). Regulatory score based on fines and notices received over the past 10 years and on management attitudes.⁵³ R2 value is a measure of correlation strength where 1 = strongest correlation.

RECENT
INITIATIVES
SUGGEST THAT
THE FINANCE
INDUSTRY
RECOGNISES
THE BENEFITS
IN PROTECTING
NATURAL
CAPITAL
INCLUDING
FORESTS

Table 2. Examples of shifting sentiment in financial institutions toward deforestation

Soft Commodities Compact (April 2014)	A commitment by 12 banks now comprising 50% of global trade finance (up from 20% in 2012) whose aim is zero net deforestation in commodity supply chains by 2020, raising industry-wide banking standards and market norms on commodity-driven deforestation.
HSBC forest policy⁵⁴ (March 2014)	FSC/PEFC certification mandatory for commercial banking and global banking customers regardless of supply chain position. The two arms of the organisation have been instructed to close relationships with non-compliant customers.
Ecosystem Markets Task Force⁵⁵ (March 2013)	This advises UK businesses on developing goods and services which reduce impacts on natural capital, and financing mechanisms which protect ecosystem services.
Development of an environmental bonds market	The UK Ecosystem Markets Task Force recommends that tax conditions associated with environmental bonds be revised.

SECURING INVESTMENT

Recent initiatives in the banking industry are an indication that awareness surrounding the material and reputational risks of deforestation is reaching financial institutions (Table 2, p14). These initiatives will make securing investment from traditional sources of finance – private capital – more difficult unless a firm can legitimately claim that it understands what impact its procurement activities have on other people and on the natural environment.

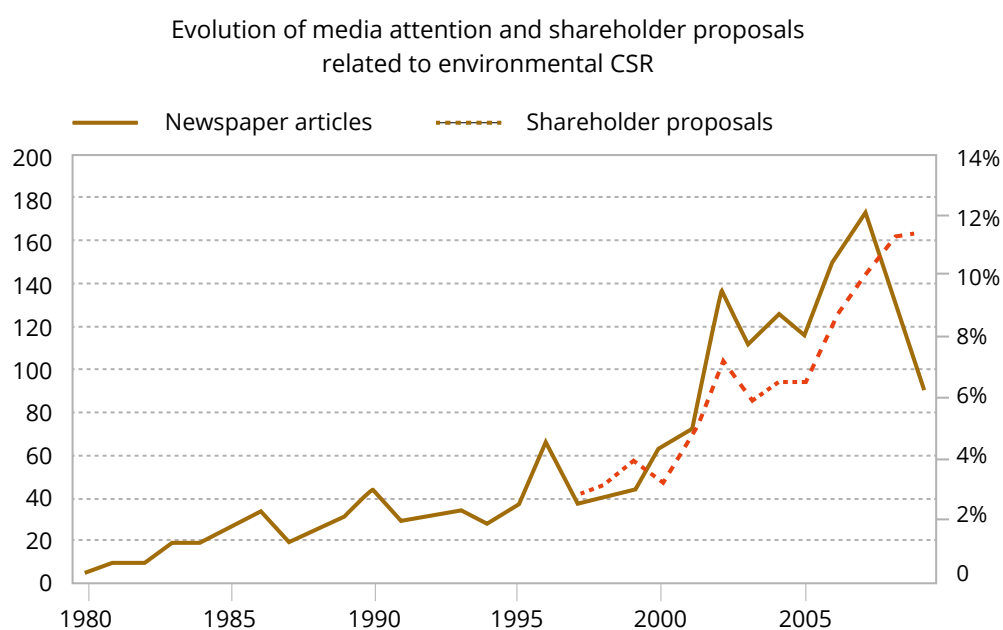
This is also true for companies wishing to raise capital through public trading. Shareholders and investors are showing increasing interest in companies' attitudes towards environmental sustainability. This is evident in the increasing proportion of shareholder-sponsored proposals

relating to sustainability as a percentage of total proposals related to corporate responsibility: from ~ 1% in 1980 to almost 12% in 2010 ⁵⁶ (Figure 8); it continues to grow.

A study of 900 shareholder proposals by Ernst and Young during the first half of 2013 gives an indication of the sort of changes in company activity shareholders wish to see; increased disclosure on sustainability (reporting) was one of the three most highly sought-after changes.⁵⁷ Addressing supply chain integrity is therefore quickly becoming fundamental to commodity-dependent companies if their commercial activity is to be aligned with shareholders' shifting opinion, see Figure 8 p17.

SHAREHOLDER PROPOSALS RELATED TO THE ENVIRONMENT HAVE GROWN SIGNIFICANTLY

Figure 8.
Percentage of shareholder proposals relating to the environment (dashed line, right axis) and number of newspaper articles relating to the environment (solid line, left axis).



REPUTATIONAL BENEFITS

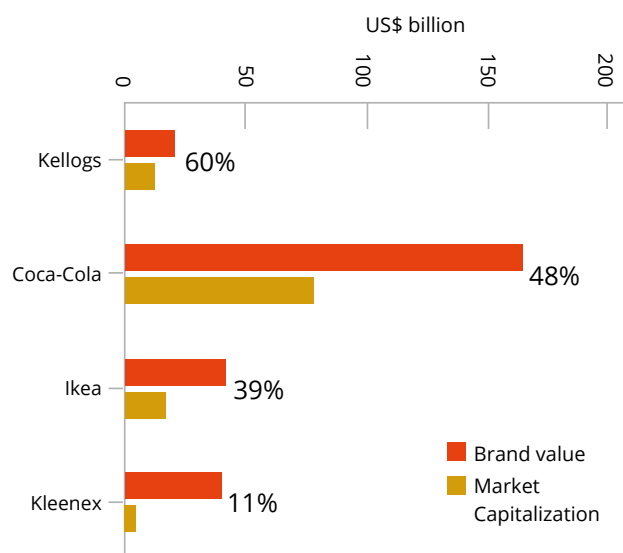
As pressure on the natural environment grows more acute, indiscriminate use of unsustainable timber presents reputational risk: that is, the risk of financial loss as a result of damage to a firm's reputation. For consumer-facing retailers of timber and timber-based products, publicly advocating sustainable timber markets is a means to managing this risk, and presents an immediate benefit in terms of customer perception and developing trust.⁵⁸

The growth of FSC in the UK was driven by demand from big players such as B&Q in the 1990s. For a customer-facing company like B&Q, one of the key business benefits of advocating sustainable timber was the impact on its reputation and brand.

Commercial brands are the mechanisms by which consumers characterise and relate to businesses. Brand value is an estimation of the cumulative increase in cost-per-unit (price premium) achievable by having a well-known brand over a less well-known brand, and is considered by some to be one of the most valuable assets a company can own.⁵⁹

In commodity-dependent organisations, including those heavily dependent on timber, brand value can range between 11 and 60% of total market value for some businesses (Figure 9).⁶⁰ There is also an overall trend towards the ever-increasing tangible market value of brand value; intangibles or “non-financials” (such as brand value and reputation) as a percentage of total market value have increased dramatically over the last few decades from an estimated 5% in 1978 to 75% in 2009.⁶¹ However, this trend is

Figure 9. Brand value as a percentage of total market capitalisation for four leading commodity-dependent companies (2015).⁶²



not through chance; brand value is something that many successful companies invest in heavily, and commitments to sustainability can be a part of those efforts.

Advocating sustainable timber markets is a means for UK businesses with a dependency or visible trade in timber and/or timber products to increase their brand value, which in turn enables them to strengthen relationships with clients.⁶³ It can help build shared values, trust and a sense of personal connection with customers – an important aspect of brand value.⁶⁴

By publicising their support for sustainable timber markets, companies can differentiate themselves from their competitors. Differentiation is the ability of a brand to stand apart from its competitors and is another central component of brand value.⁶⁵ Supporting sustainable timber offers companies an immediate benefit by creating opportunities with new, concerned clients, though this advantage may lessen as more firms recognise the opportunity.

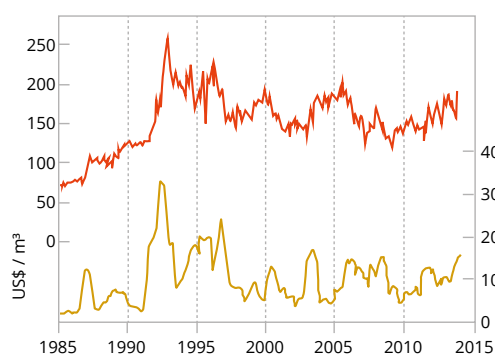
Another important component of strong brand value is “product familiarity”⁶⁶ which enables customers to understand what a brand is about. Certification and sustainability convey a positive message about a company to customers. Certification is often seen as a mark of quality,⁶⁷ so this positive association can lead to price premiums.

BUSINESS AND INDUSTRY HEALTH

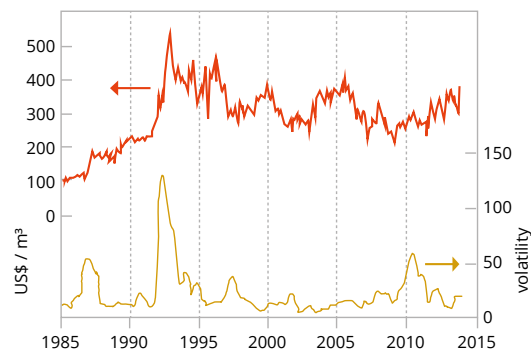
The health of a business is a measure of its ability to generate economic value in the future,⁶⁸ as opposed to business performance, a measure of value creation in the past. Corporate managers are increasingly concerned with the former, owing in part to the financial turmoil of the past decade. A range of metrics have been developed to enable managers and investors to measure the health of their businesses, alongside performance.

For a timber-dependent company, one way of safeguarding future value creation is to ensure access to the raw materials it needs at a price it is able or willing to pay in the long term. Sustainable timber markets are a means of securing such supply. **Ensuring long-term availability of supply gives manufacturers maximum scope for product development, and provides retailers with a full range of tradable products. These enable stronger revenues, a stronger market presence, good relationships with stakeholders, and ultimately, healthier businesses.**

**COMMODITY PRICE
SPIKES LEAD TO
INCREASES IN
PRICE VOLATILITY
- INCLUDING FOR
TIMBER**



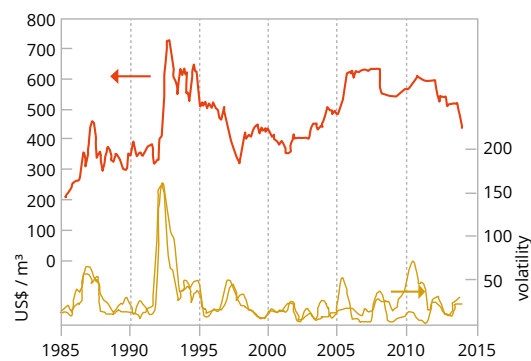
A. Softwood logs



B. Hardwood logs

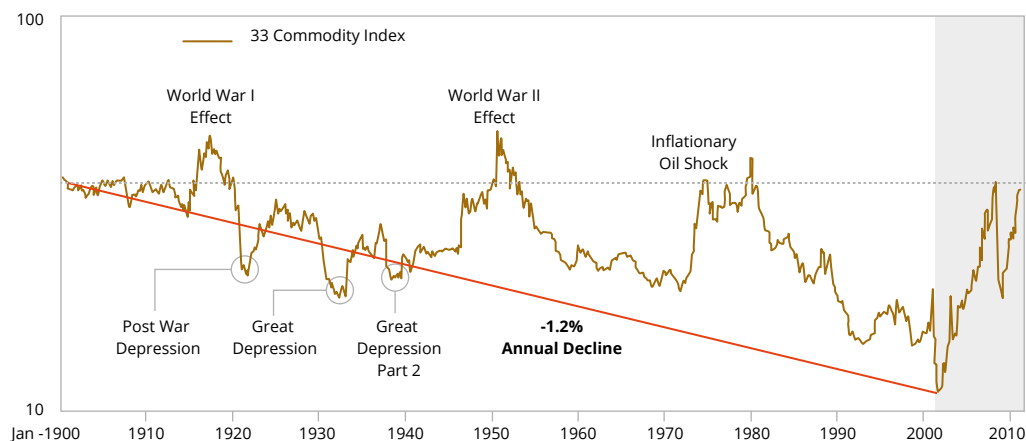
Figure 10. Commodity price time series and corresponding price volatilities. a. softwood logs; b. hardwood logs; c. plywood; d,e. all commodities. 6a-c from authors' own analysis⁶⁹. 6d-e sourced from elsewhere⁷⁰ – grey shading indicates corresponding time period (2004 – 2012)

The health of a business is also related to the overall health of the industry it belongs to. One measure of this is the level of investment into activities such as infrastructure development and research. A barrier to investment is uncertainty, such as the volatility of prices of raw materials or final goods. Rapid and sustained increases in input prices result in an increase in price volatility for all commodities, including timber (Figure 10).

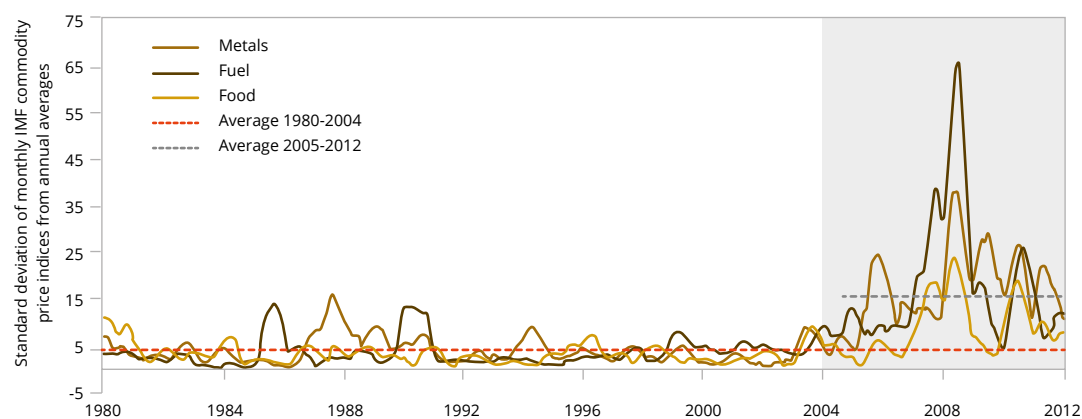


C. Price volatility time series all commodities⁷²

D. Price time series all commodities⁷¹



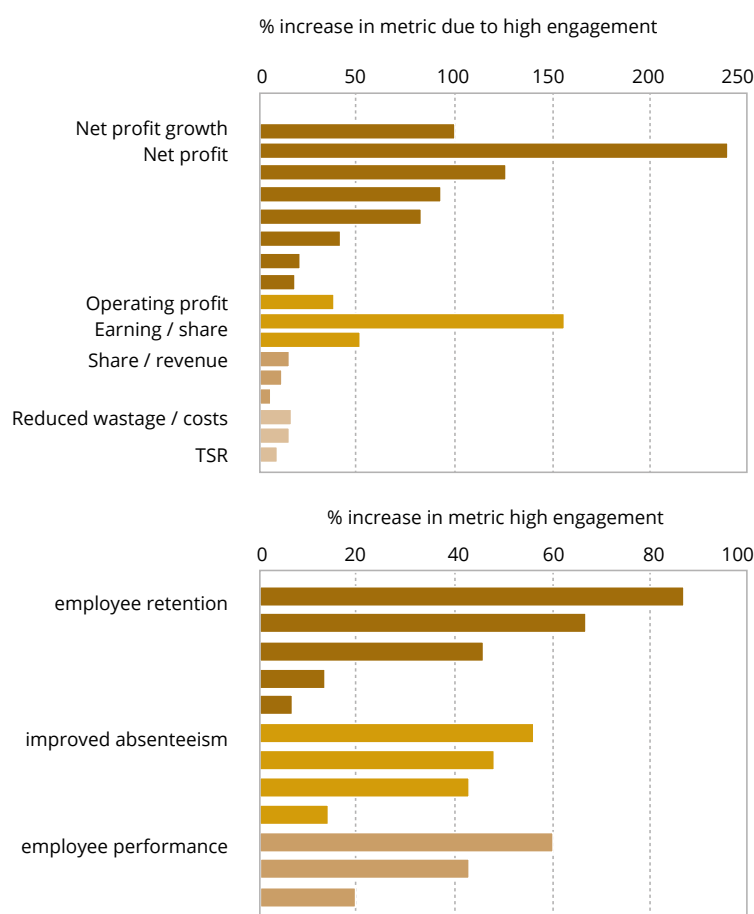
E. Below: Price volatility time series all commodities⁷²



It is important to understand that price volatility and the uncertainty this brings can have a long-term detrimental impact on industries by putting off investors, limiting access to capital and therefore activities which help to augment long-term supply. This was evident recently in the non-energy minerals sector; in 2014, the number one ranked risk to the non-energy minerals industry was access to capital,⁷³ owing in part to the increased price volatility over the previous 10 years. Ample supply reduces the risk of price constraints and volatile prices, and keeps an industry attractive to investors. This in turn guarantees supply. The health of the timber industry depends on ensuring that global supply of timber, harvested from forest growth rather than forest stock, is able to meet increases in demand.

As shown previously, supply of legal and sustainable timber from a number of countries could expire in the next decade, while global demand is increasing significantly. The two most significant drivers of growing demand are the timber deficits of expanding Asian economies, particularly China,⁷⁴ and the burgeoning global biomass energy industry.

Figure 11.
Performance metrics
associated with
workforce engagement⁸⁵
a. Financial, b. Human
resources.



China has a huge timber deficit which is currently growing year on year (nearly 200 million m³ in 2015 – larger than Canada’s entire annual harvest).⁷⁵ China is importing more and more timber, driving up demand (and often implicated in illegal deforestation).⁷⁶ From 2009 to 2015, China’s demand for hardwoods for pulp production alone increased by over 260% (from 15 million m³ to almost 40 million m³);⁷⁷ this rate of increase in demand is now forecasted to slow though demand for hardwood for pulp is expected to increase by around another 125% by 2020 to around 50 million m³. India also has a wood fibre deficit,⁷⁸ with considerable demand for premium hardwoods such as teak.

Meanwhile, many countries have set national targets for increasing the use of bioenergy. Meeting these will have a significant impact on demand and will lead to higher prices,⁷⁹ and potential price volatility.

Price volatility can also be transmitted between markets.⁸⁰ Similar demand pressures and supply constraints are likely to affect other natural resources, and land in particular, raising the risk of even greater insecurity and instability in the market.

In short, timber demand is going up while supply is becoming constrained. To secure supply and keep prices affordable in the medium to long term, sustainable timber markets are vital. UK businesses need to start building strong supply relationships on a sustainable basis to get ahead of the game. With acute resource pressures likely to occur in 2040-50,⁸¹ the time to act is now.

OTHER BENEFITS OF SUSTAINABLE TIMBER

Workforce engagement

The link between credible corporate social responsibility (CSR), such as sustainable procurement, and high workforce engagement is an area receiving growing attention. Once employees’ basic security needs are fulfilled (e.g. wages or salary), other factors come into play, some of which can be satisfied through CSR strategies such as sustainability.⁸² Satisfying these priorities is a means to connecting and engaging an individual with an organisation.⁸³ Large private and public UK organisations with high workforce engagement enjoy better performance across key metrics (Figure 11), for example experiencing almost double total shareholder returns (TSR – 22% vs. 12%).⁸⁴

WORKFORCE ENGAGEMENT HAS MEASURABLE FINANCIAL AND HR BENEFITS

SUPPLY CHAIN PERFORMANCE HINGES ON COSTS WHICH COULD TRIPLE BY 2035

Employee engagement in the UK remains low across the board. In 2009 less than a quarter of UK employees surveyed said they felt involved in their organisation⁸⁶, and no significant change has been seen since.⁸⁷ These UK engagement trends are in accord with global engagement over the last few years (2011-14).⁸⁸ Recent research indicates that the size of an organisation is not a factor in the level of employee engagement,⁸⁹ although there appears to have been a drop in the number of employees in UK SMEs willing to recommend their firms as a place to work: down from 74% to 52% (2005-2009).⁹⁰ This suggests a need – and opportunity – for new mechanisms to increase workforce engagement, particularly among the SMEs that dominate the UK timber industry.

Workforce engagement mechanisms are a way of fulfilling basic human tendencies. These include a search for meaning in work, “distinctiveness” in an organisation (organisational identity) and a sense of belonging.⁹¹ Fulfilling these can improve productivity by up to 61%, improve retention rates by up to 87% and reduce absenteeism by up to 59% (Figure 11b).⁹² As issues of deforestation continue to grow in the public consciousness,⁹³ supporting sustainable timber markets could be one way to bring company goals in line with the human tendency to show concern for others and their surroundings.⁹⁴ This could increase workforce engagement and in turn improve company performance, especially for businesses with a high use of or dependency on timber.

Supply chain management and performance

The UK timber industry is by nature rather fragmented, made up of many SMEs. A SWOT analysis of the industry carried out by

TRADA⁹⁵ identified “partnering” as a major opportunity as yet unexploited. This is the process of enabling closer cooperation and communication with suppliers, often associated with forming strong, reliable relationships with a small number of trusted, dependable suppliers.

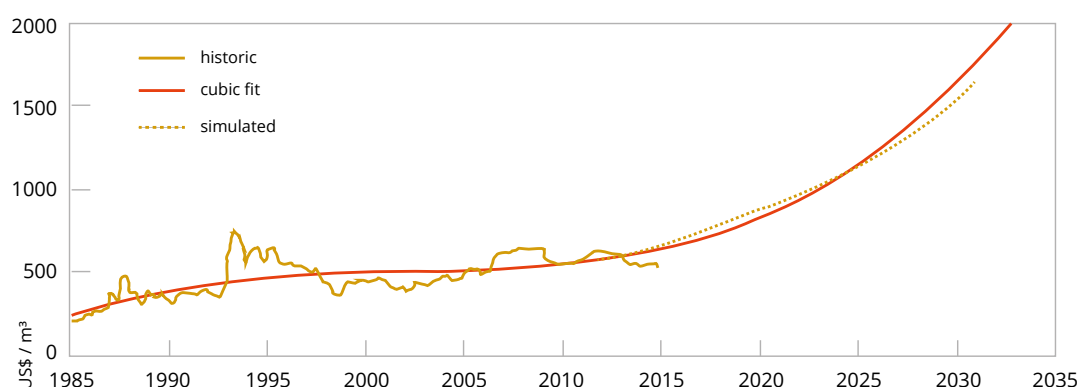
FSC and PEFC certification are two frameworks which offer businesses a means to establish or consolidate healthy relationships with suppliers. This process may improve efficiency by reducing supply-chain length through direct deliveries, resulting in less volatile input costs, or supporting and requiring changes in practices of existing suppliers.

The performance of the supply chain is a measure of company performance.⁹⁶ It can be measured using the supply chain performance index, which comprises three metrics:⁹⁷ profitability, “inventory turns” and return on investment capital (ROIC) (see Annex D). All three metrics hinge on cost of goods sold (COGS), which is largely determined by the cost of raw materials such as timber.⁹⁸

As discussed earlier, the price of commodities such as timber is expected to increase over the next few decades. For example, the cost of plywood is expected to triple over the next two decades (Figure 12). Fig 12 below

These cost increases can be minimised by augmenting supply to match demand. Supporting sustainable timber markets is a means to developing a deeper understanding of the issues,⁹⁹ enabling companies to contribute to debates over how to augment supply without impacting future availability or failing to protect, conserve, sustainably use and govern the world’s forests in the 21st century.

Figure 12. Historic and simulated projections of plywood prices. Historic prices extracted from indexmundi. Simulated projections carried out as part of this research using the University of Wisconsin Global Forest Products Model (GFPM – for description of the model and assumptions see: Annex E).



Pros... and cons

There is strong evidence that sourcing sustainably delivers short, medium and long term benefits to business in financial terms, and strengthens business resilience.

However, we acknowledge that this commitment requires an investment of time and resources, and has financial implications. A lack of detailed data on either the financial costs or the benefits for specifically delivering against a sustainable timber procurement commitment means we cannot present detailed analysis of the resulting balance.¹⁰⁰

There will also be losers: service providers who do not deliver sustainable timber will lose business, while a more efficient supply chain for some means lower margins for others.

In addition, the benefits of long-term security of supply may only be achievable through temporary constraints on the plentiful supply we have grown accustomed to and some increases in input costs in the short term. For example, as sustainable forest management is pursued, some forest areas particularly important for other ecosystem services and habitat will cease to be available for production. This might lead to price increases in the short term.

Businesses will need to decide on a case-by-case basis whether they are prepared to sacrifice some degree of short-term performance for the sake of longer-term business health and a product line's longevity, and to pre-empt possible regulatory measures from countries that are seeing their forests disappearing. In the case of timber, this is more likely to be the case for high-value hardwood timber – which is slower-growing and under greater threat of scarcity.

Timber constraints have already been seen in recent years; in 2013/14, home construction in the US ran up against timber supply chain constraints owing to a single bout of pests in British Columbia, Canada;¹⁰¹ a situation expected to continue.¹⁰² This limited what Canada could export, reducing America's housing construction ambitions by almost 30% and increasing prices by 23% over the following two years.

In other commodity markets, we have already seen real-world scarcity. The 2007/08 and 2011/12 food crises saw scarcity-induced price hikes and price volatilities so severe that millions were driven into food poverty from Panama to the Philippines. The resulting national protectionism, export quotas and outright export bans prevented trade and exacerbated the global situation.¹⁰³ The factors which resulted in these crises and their interactions – climate and weather, low reserve stocks, recent policies in connected sectors and prices elsewhere¹⁰⁴ – are still poorly understood and could potentially converge on any resource-based industry, including timber. Scarcity of commodities can occur quickly and unpredictably when unrelated, undetectable factors converge.

LEARNING FROM THE UK TIMBER INDUSTRY

The UK's own timber industry – meaning, forestry operations leading to harvesting and primary processing of timber (sawmills, panel mills and pulp/paper mills) – can offer insights into the economic contribution made by sustainable forestry. It also shows some of the challenges that arise from a lack of investment, resources or adequate planning to maintain supply.

Timber scarcity may be easier to imagine if we look at the current situation in our own country, where forest management is generally well structured and resourced, and underpinned by good governance.

The economic significance of the UK's domestic timber industry

The UK timber industry contributes significantly to the domestic economy, directly and indirectly. The total gross value added (GVA) generated in the UK economy by the timber industry was ~ £21.0 billion in 2013/14, or around 1% of UK GDP.¹⁰⁵ This breaks down as value generated through the use of timber in downstream industries (£14.36 billion), the direct contribution of the timber industry itself (forestry, harvesting and primary processing - £4.1 billion), value generated by the timber industry through its spending in upstream industries ("spending multiplier") (£1.51 billion), and the spending power of individuals employed (£0.78 billion) – see Annex F for calculation of these values.

Notably, the contribution of the UK forest industry itself of £4.1 billion highlights its significance to the UK economy when compared with GVAs of other key industries, e.g. recycling (£ 2.2 billion, 2012),¹⁰⁶ the UK airline industry (£5.1 billion, 2009)¹⁰⁷ and refuse management (£5.4 billion, 2013).¹⁰⁸ The timber produced domestically then contributes £112 billion in GVA (5% of GDP) in downstream industries dependent on forestry, namely construction (£103 billion, 2014);¹⁰⁹ printing (£6.1 billion, 2014);¹¹⁰ furniture (£2.5 billion, 2013);¹¹¹ joinery (£0.4 billion, 2013).^{112 113}

This does not include additional contributions through other trading (e.g. children's toys, kitchen utensils, boxes, caskets), recreation

or tourism. A recent study by the Woodlands Trust which included all amenity benefits of UK woodland valued recreation and tourism at £2.2–7.6 billion.¹¹⁴

The direct timber industry (forestry, saw-milling and pulp production) employed 150,000 full-time staff in 2012.¹¹⁵ When indirect contributions to the economy are taken into consideration, forestry and primary processing businesses employed 560,000 workers, and forest tourism a further 18,000. This means that UK woodland supports almost three-quarters of a million full-time jobs or nearly 2% of the UK working population.

All studies available assessing the economic impact of the UK timber and forest industries use similar methods but are somewhat out of date (10–20 years); a reassessment of the industries' economic impact and future economic potential is required, factoring in the emergence of new market incentives such as biomass for energy.

Is sustainable forest management practised in the UK? And are domestic timber output levels sustainable?

UK forestry is largely overseen by the Forestry Commission.¹¹⁵ The Forestry Commission provides a set of guidelines for forestry practice known as the UK Forestry Standard (UKFS) covering biodiversity, climate change, historic environment, landscape, people, soil and water. Of the 3.15 million hectares of woodland in the UK in 2015, 2.28 million are held and managed privately (72%), with the remaining 0.87 million hectares managed publicly by (or on behalf of) the Forestry Commission, Natural Resources Wales or Forest Service Northern Ireland.¹¹⁶ The forests in Commission care are managed by Forest Enterprise agencies, and are

A POSSIBLE FUTURE FOR UK DOMESTIC SOFTWOOD SUPPLY

currently certified against the UK Woodland Assurance Standard (UKWAS), an independent certification based on the UKFS.¹¹⁷

Output of timber in 2014 was 11.4 million green tonnes of softwood (60% of which was sourced from privately held woodland) and 0.5 million green tonnes of hardwood (92% from private woodland). This production included sawnwood (32%), wood-based panels (26%) and paper products (42%).¹¹⁸

There is, however, an acute awareness among businesses at the top of the supply chain in the UK that the current extent of domestic commercial operations may not be sustainable in the long term. This poses a threat to some of the economic contributions of the industry shown previously. All UK foresters interviewed as part of this research expressed grave concerns over the future of domestic softwood supply over a timescale of 10–30 years, posing a direct threat to the viability of sawmills and other primary processors, particularly in southern Scotland (an issue also raised by Confor).¹¹⁹

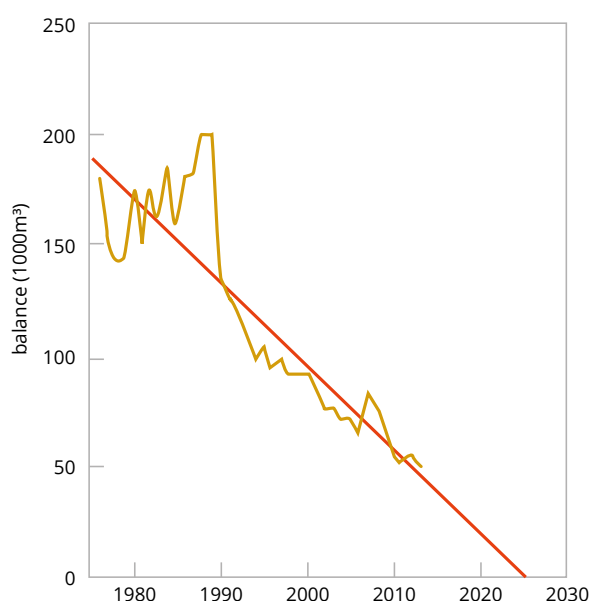


Figure 13. Historic “balance” between domestic removals and domestic timber growth; red line indicates extrapolation to 2030 according to the historic trend.¹²⁰

These concerns are reinforced by looking at time-series data of domestic removals subtracted from the volume of commercial species growth (new planting and re-stocking) to give an annual “balance” of available forest growth (see Figure 13). Looking at the trend over the last 40 years and extrapolating forward, domestic production levels will fall significantly over the coming decades in response to constraints on supply of home-grown domestic commercial timber.

Comparing projections of supply from UK forests¹²¹ against simulated domestic demand growth of ~5.5% to 2030¹²² reinforces these concerns. It suggests that the current ratio of domestic to imported supply (40 : 60 in 2014)¹²³ can at best be sustained until 2030. Assuming this modest growth stays roughly the same to 2050, the proportion of domestic timber will reduce by between a third and a half to ~22% by 2050, if not sooner.

These issues are essentially due to new planting falling by a third since the 1970s. This was followed with changes to the tax benefits from owning forests in the UK introduced in the 1988 Finance Act. Though the area of new planting in the UK has increased in Scotland since 2010 following the introduction of Rural Development Contracts, action is needed if the decline in commercial timber is to be prevented.

To increase the UK’s capacity for commercial timber growth without impacting on forests’ other social and ecological values, UK forestry needs to take action in three key areas. The first is utilising unused forest space. One analysis shows that 40% of forests resources in the South West of England are unmanaged or under-managed,¹²⁴ suggesting unused capacity which could be brought on line. At a national level, this unused capacity is largely in the hands of private owners, who may not be aware of the income potential in bringing their resources on line, and who may need help in ensuring that timber harvested meets criteria for environmental sustainability.

A second component is landscape-scale planning of forestry and other competing land uses.¹²⁵ Landscape management focuses on coordinating multiple ecosystem functions and services across a landscape rather than managing individual sites, each with a single purpose.¹²⁶ Though requiring a greater level of planning in decision-making and stakeholder engagement, this approach could enable the UK to develop areas of forest for multiple uses, of a higher quality than previously seen.¹²⁷

The third component would be to plant tree species with both commercial and ecological value. While examples of this exist, it is an area that would benefit from more research.¹²⁸

What does the UK domestic timber industry case tell us about investing in sustainable forestry, to meet demand for timber?

The case of the UK domestic timber industry shows that sustainable practice can still result in supply issues, despite there being unused forest resources alongside potential market mechanisms for increased growth. This scenario highlights the need to get forest management right on the supply side alongside the development of market mechanisms for increased growth on the demand side; this can be driven by developing a comprehensive understanding of the benefits they create.

Enabling widespread better management of forests and woodlands requires organisation. In 2011 government invited an independent panel to advise on the future direction of forestry and woodland policy in England. From its recommendations, one initiative that developed was Grown in Britain, set up to encourage businesses to work together with woodland owners to use more British timber in their supply chains. Grown in Britain's main objective is to improve the condition of UK woodlands through more active management, with economic and social benefits accompanying environmental ones.

New, sustainable markets for timber can help incentivise private owners of forest to see their wooded land as a means to generating income, encouraging them to invest in bringing these resources on line and to investigate options for sustainable forest management. Demand for timber can help justify the upfront costs to put sustainable forest management practices in place.

So what are the potential market mechanisms on the demand side? Projects are being launched to establish what potential there is for a sustainable domestic UK biomass industry. This has the potential to contribute an estimated £1 billion in GVA by 2020¹²⁹ and to create 60,000 jobs.¹³⁰ A sustainable wood-fuel industry is also one of five priority recommendations by the UK government's Ecosystem Markets Task Force;¹³¹ it advises that wood fuel could be a market solution to initiating greater investment into woodland management in the UK. There are, however, complex issues surrounding the use of energy from biomass (bioenergy), and careful planning is needed to ensure it delivers genuine climate and environmental benefits.

Another growth market is timber frame housing. The number of new timber frame houses built has increased by 16 % for two years consecutively (2012-14) to 43,000 units in 2014¹³², the largest number built in a single year. This has increased timber housing's new build market share of total house builds by 1.5 percentage points on the previous year (6 %); this is now forecast to reach a record 27% of all UK new builds in 2017 (50,000 homes).¹³³ Growing demand for timber frame housing therefore offers another potential market incentive for structural timber.

The value of ecosystem services provides an additional economic incentive for expanding the woodland area in the UK, which in turn can help build timber supply, particularly in areas where timber production alone cannot compete financially with other land uses.¹³⁴ Trees and forests are a natural way of managing water run-off and can in some circumstances manage floodwaters.^{135 136} Recent analysis indicates that developing new forest area within the Thames catchment could provide flood damage reduction worth between £350 and £500 per hectare.¹³⁷

Forests and trees also present benefits to human health, for example in improving air quality.¹³⁸ Trees filter air pollution,¹³⁹ which costs the NHS £ 9–20 billion a year¹⁴⁰ due to respiratory diseases, and have even been linked to the birth of healthier children.¹⁴¹ Forests also offer valuable recreational benefits. An analysis for the Natural Capital Committee showed that planting 750,000 hectares of new woodland close to towns and cities would yield net economic benefits of nearly £550 million per year.¹⁴²

Maintaining a domestic timber industry can also help to minimise national carbon costs. UK import emissions are believed to be the highest in Europe.¹⁴³ If and when national CO₂ budgets incorporate emissions from imports/exports, the UK will struggle to meet its climate targets between now and 2050. The UN agreement in Paris to limit climate change to well below 2°C has put carbon markets back on the agenda, making import emissions all the more relevant.

CONCLUSIONS

Maintaining our remaining forests in the long term isn't going to be easy – but ignoring the issues won't make them go away. There will be some difficult trade-offs as we try to balance competing pressures and demands. Businesses that get involved are more likely to make sure they are on the right side of these trade-offs.

There are strong ethical arguments for committing to sustainable timber in order to preserve forests for the local people and wildlife that depend upon them. But there is also a strong business case that permeates timber-dependent organisations. It starts with securing supply to keep costs low, ensuring business health and the ability to create value in the future. It extends to all the stakeholder relationships which make a business, from complying with regulatory authorities, to satisfying the expectations of shareholders and finance providers, to connecting with employees and customers.

We have looked at the business case from multiple angles – purchasing, compliance, finance, marketing and workforce management – and have found evidence to support sustainable timber sourcing across the board. Businesses need to show an interest in how timber is sourced, to ensure its availability and affordability 10 or 20 years from now. Regulation and policy around environmental sustainability in trade is clearly on the increase, giving a competitive advantage to companies with the will and know-how to keep on top of the issue. Shareholders and financial institutions are no longer willing to accept the risk of unrestrained depletion of natural resources such as forests. Lastly, the people who make businesses successful – the employees who do the work and the customers who buy the products – now expect a higher standard of business attitudes towards these issues.

The business case is there for companies with the foresight to assign resources at a level they can afford to building sustainable timber supply chains. We suggest to any business that has not done so already, to sit down and discuss the themes provided in this report with a view to establishing them as core organisational principles.

As indicated at the outset, this is an initial scoping report to establish what framework could be developed for encouraging businesses to show an interest in sustainable timber. There is clearly scope for adding detail to the broad-stroke themes drawn out in this report, and we invite you to join the discussion.

There is also a need for other initiatives to harness the range of available business benefits outlined in this report. Forests are critical to value creation in the UK and global economy – not just as a source of timber, but for the myriad other ecosystem services they provide. However, this economic value is not guaranteed for the future owing to rapid deforestation in key locations around the world. Our domestic capacity to supply timber to meet demand in Britain will also be affected by the past decline in replanting in the UK and the need to bring more private woodlands into better management and production.

Existing and new markets for timber in the UK and worldwide are an ideal opportunity to build sustainability into timber markets – in fact, this is a necessity. It is critical that we make sustainable timber the norm rather than the exception if supply is to be maintained in the face of increasing demand and recognition of the need to preserve natural environments.

ACRONYMS	
CAR	Central African Republic
CGE	computable general equilibrium
CIPD	Chartered Institute of Personnel and Development
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CN	Combined nomenclature
CSR	corporate social responsibility
EU	The European Union
EUTR	EU Timber Regulation
FLEGT	Forest Law Enforcement, Governance and Trade
FAO	The Food and Agricultural Organization
FC	Forestry Commission (UK)
FS	Forest Service (UK)
FSC	Forest Stewardship Council
FTE	Full-time equivalent
GFPM	Global Forest Products Model
GVA	Gross value added
IPCC	Intergovernmental Panel on Climate Change
MDF	Medium density fibreboard
NHS	The National Health Service (UK)
NVC	National Vegetation Classification
PEFC	Programme for the Endorsement of Forest Certification
QPELPS	quadratic price endogenous linear programming system
SFM	Sustainable forestry management
SME	Small or medium enterprise
SWOT	Strengths, weaknesses, opportunities, threats
TRADA	Timber Research and Development Association
UKFS	UK Forestry Standard
WRME	Wood raw material equivalent (underbark)

GLOSSARY	
Bioclimatic zones	Ecological Site Classification (ESC) zones; “lowland”, “foothill”, “upland”, defined by annual precipitation
Chips	Wood particles larger and thicker than sawdust produced from larger pieces of wood or logs using a chipper.
Deforestation	Forest loss/deforestation: Conversion of forest to another land use or significant long-term reduction of tree canopy cover. This includes conversion of natural forest to tree plantations, agriculture, pasture, water reservoirs and urban areas; but excludes logging areas where the forest is managed to regenerate naturally or with the aid of silvicultural measures.
Deliveries	The quantities of roundwood that are delivered to processors (mills) or for other uses (such as wood-fuel or exports). NB for sawmills and round-fencing mills, delivery figures are actually the quantity of roundwood consumed by the mill; this may differ from the true deliveries figure if the levels of input stocks vary. ¹⁴⁴
Ecosystem services	The benefits people obtain from ecosystems; provisioning services such as food and water; regulating services such as flood and disease control; cultural services such as spiritual, recreational, and cultural benefits; and supporting services, such as nutrient cycling, that maintain the conditions for life on Earth.
“Green” tonne	The weight of timber immediately after cutting, i.e. before moisture is lost.
Gross value added	The difference between the value of goods and services produced and the cost of inputs used in production, calculated by summing the gross profits (value of goods) and subtracting gross wages and salaries (input cost).
Market capitalisation / equity	The market value of a company's outstanding shares, found by taking the stock price and multiplying it by the total number of outstanding shares.
Natural capital	The stock of natural ecosystems that yields a flow of valuable ecosystem goods or services into the future.
Operating profit	Profit from business operations (gross profit minus operating expenses) before deduction of interest and taxes.
Primary processor	Sawmill, panel mill, pulp / paper mill.
Reputational risk	The risk of financial loss as a result of damage to a firm's reputation.
Round-wood	Trunk or branch wood, generally with a top diameter of 7 to 14 cm.
Saw logs	Material of > 14 cm top diameter destined to be sawn into planks or boards
Shareholder proposal	A resolution put forward by a shareholder or group of shareholders for consideration at a company's annual meeting, presented to express a desire to initiate change on a certain company issue.
Soft commodities	Commodities which are grown rather than extracted (e.g. agricultural or forest products).
Underbark	Wood volume minus wood bark.

ANNEX A – VALUE OF FORESTS

Our analysis suggests that forests and timber contribute ~ US\$17.6 trillion to the global economy through ecosystem services, which are the services derived by society from nature. This represents 21% of global GDP, making the economic significance of forests and timber comparable to that of the global financial service sector (Figure 14).¹⁴⁵

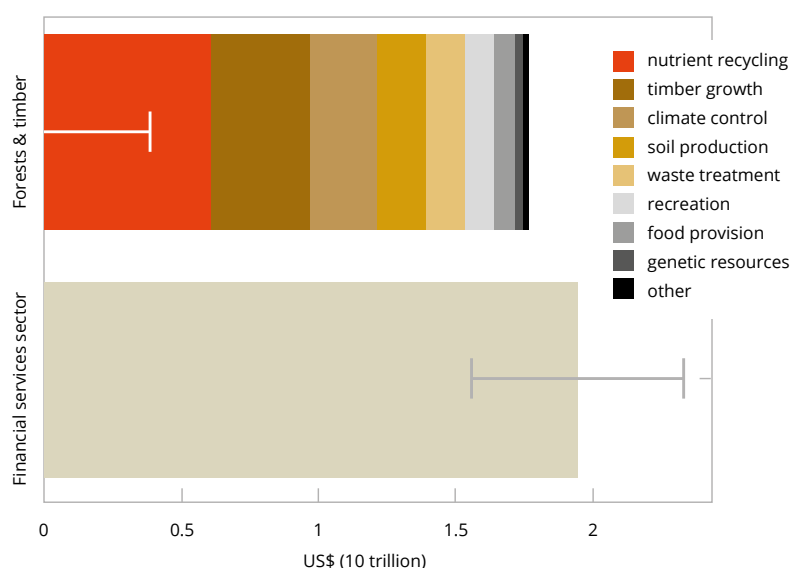


Figure 14. Contribution of forests and timber to world GDP. Breakdown discussed in text.

Nutrient cycling

The largest part of this US\$17.6 trillion is the forest function of converting nutrients into forms available for vital uses such as food production (nutrient cycling) valued at over US\$6 trillion.¹⁴⁶ Tropical deforestation is a threat to this value given that the only natural mechanisms for performing nutrient cycling inland are tropical forests; continued forest loss would render land currently used for food production bereft of naturally occurring nutrients.

Timber growth

Timber growth is the next most economically significant forest ecosystem service which our analysis values collectively at ~ US\$3.7 trillion. The largest component of this is timber's contribution to construction GVA at just over US\$1.1 trillion.¹⁴⁷ Timber growth also enables the direct timber industries such as growing, harvesting and primary processing. Domestic direct timber industries are collectively valued at US\$0.65 trillion.¹⁴⁸ Timber growth then contributes US\$0.24 trillion to furniture GVA.¹⁴⁹ Timber growth supplies virtually all

material inputs to the pulp and paper sector valued at US\$0.23 trillion (2013) with a growth forecast of ~30% by 2020.¹⁵⁰ Biomass for energy is another market for timber growth. According to industry analysts, the global biomass industry could be worth as much as US\$1.25 trillion by 2020 and continue growing to 2030.¹⁵¹ Timber growth also supports international trade of timber, worth more than US\$0.25 trillion (2013).¹⁵²

Other economic benefits

Forests perform climate regulation mainly through sequestration of CO₂,¹⁵³ particularly in their old growth phase.¹⁵⁴ This is valued at US\$2.4 trillion.¹⁵⁵ The loss of climate regulation due to deforestation is expected to cost US\$1 trillion by 2100¹⁵⁶ due to climate-induced changes to crop yields.¹⁵⁷

Other contributions of forests to the global economy include soil formation and erosion control, valued at US\$1.8 trillion.¹⁵⁸ Trees form soil by accumulating organic material as they grow and perform erosion control by retaining the soil formed. Forests are responsible for over 90% of natural soil formation and erosion control processes. Continued forest loss would therefore impact other natural and man-made processes dependent on soil.

Forest ecosystem services also include waste treatment such as pollution control (US\$ 1.5 trillion), recreation and cultural services (US\$1.1 trillion) food production (US\$ 0.71 trillion) and provision of genetic resources (US\$0.27 trillion). Genetic resources are the unique biological materials provided by nature, e.g. medicine and products for materials science. Notably, the economic value of such resources currently undiscovered is potentially immeasurable.

The remaining 'other' forest ecosystem services are water regulation, biological control (biodiversity) and disturbance regulation, collectively valued at US\$1.34 trillion.¹⁵⁹

ANNEX B – METHOD FOR CALCULATING ESTIMATIONS OF YEARS REMAINING

Estimations of years remaining were arrived at using a Matlab® simulation of forest resources and timber removals. Data on forest resources was taken from the FAO 2015 Global Forest Resource Assessment.¹⁶⁰ Data on removals from primary and secondary forests was taken from FAOSTAT (2013) and removals from plantations from a 2014 FAO assessment.¹⁶¹ Data on estimated levels of illegality was taken from various sources.¹⁶² The results of the model have been compared to a 2004 report which advised similar results for Cambodia and PNG.¹⁶³

Model inputs (forest resources):

- Primary forest area (ha)
- Secondary forest area (ha)
- Plantation forest area (ha)
- Fraction of forests for production (% range)
- Forest density (m³ / ha)

Model inputs (forest removals)

- Official removals (m³, 2013)
- GDP (%)
- Estimated level of illegality (%)

Determining the forest resources available

- 1 First the total forest area is separated into four categories (1990); primary production, primary protected, secondary production and secondary protected.¹⁶⁴
- 2 The amount of primary and secondary forest area used from 1990 – 2010 was calculated and subtracted from the production areas to give the remaining amounts of production areas to be used in determining estimated years remaining. In cases where the area used over this 20-year period exceeded the area deemed available for production, the forest type for that country was defined as in deficit (a “d” symbol in the table).
- 3 Primary, secondary and plantation forest area for each country (ha) was converted to total forest volume (m³) using FAO volume densities for each country.

Determining the demand on these resources going forward

- 1 The total legitimate production for each country and for all product types (m³ / year) was calculated for 2013 (where necessary weights were converted to volumes) and were extrapolated to 2114 using country-specific GDP-inflation ratio forecasts provided by the World Bank.¹⁶⁵ Plantation removal volumes were subtracted from legitimate production.
- 2 Illegal production was added on using the percentages reported in the references above.
- 3 Where countries showed net afforestation (rather than deforestation) over the period 1990 – 2010, these afforestation rates were incorporated into the change in forest area to 2114.
- 4 The total production in each year was then subtracted from the remaining forest area until the forest area reached zero; production extracted from primary and secondary forest was weighted according to the historic weighting.
- 5 The year in which forest area reached zero was taken to be the year in which this supply runs out.

ANNEX C – COST-BENEFIT ANALYSES ON UK RETAIL SUSTAINABILITY INITIATIVES

Company	Campaign	Size (£ m)	Timber commitment	Campaign element	Costs	Benefits	Net cost / benefit to date / expected
Tesco	Tesco and Society	43.5	Due diligence	Overall	ns	ns	-
				Fuel efficiency	ns	290 mn over 8 years	-
				Cleaner textiles manufacture (Bangladesh)	£130,000	£520,000	● £390,000
				Energy efficiency	ns	£3.9 mn / year	
Sainsbury's	20x20	23.3	100% FSC toilet rolls	Overall	£1 bn	ns	
				Farm efficiency	£30 mn	£21 mn in savings for suppliers	● £9 mn
				Fair-trade small supplier relationships	£1 mn	£1.6 mn in fair-trade premiums	● £0.6 mn passed on to fair-trade suppliers
				Reducing waste	ns	£4.4 mn over 5 years	
Asda	The Big Green Journey	22.8	100% of outdoor furniture and charcoal FSC-certified	Overall	ns	ns	● £800 mn in savings passed on to consumers by 2020
				Reducing waste	£100 mn	£100 mn over 9 years	● Break even in 2015
				Energy efficiency	7 mn	£2.6 mn	● £4.4 mn
				Supply chain	ns	1.1 mn per supplier	
Morrisons	No specific campaign - general CSR activities	18.1	Ns	Fuel efficiency	ns	10 mn / year	
				Overall	ns	ns	
				Vertical supply chain integration	£200 mn	ns	
				Farm R&D investment in sustainability	£2 mn	ns	
M&S	Plan A	9	95% FSC	Investment in price reductions for healthy food	£1 bn	ns	
				Reducing food waste for consumers	ns	£720 mn in one year alone	
				Managing waste	ns	£2.25 mn for 2014 so far	
				Energy efficiency ("Energy Wise")	ns	£3.07 mn over two years	
John Lewis	John Lewis / Waitrose Foundation	8.3	100% of outdoor furniture FSC-certified	Overall	£200 mn	£385 mn	● £185 mn
				New revenue	ns	ns	ns
				Innovation	ns	ns	ns
				Addressing cotton security of supply	£500,000	ns	
The Co-op	Various CSR schemes	5.4	98% of own-brand wood or paper products are FSC or recycled	Supporting UK manufacturing	ns	£47 mn for a single UK manufacturer	
				Overall	ns	ns	ns
				Energy efficiency	ns	£70.7 mn / yr.	ns
				Removing food waste		£3 mn / yr.	ns
Home Retail*			Homebase outdoor furniture 100 % FSC-certified; Argos moving towards certified.	Water management	£80,000	ns	ns
				Overall	ns	ns	ns
				Energy efficiency / waste reduction	ns	ns	ns
				Eco-products	ns	£30 mn	ns
Kingfisher	Net Positive		96% responsibly sourced timber; working towards 100%.	Energy efficiency products for consumers	ns	£500 mn in sales	ns
				Kingfisher future homes	ns	£450 mn / a in customers' homes	ns
				Sustainable farming**	ns	£15.5 mn in revenue in first year	ns
				Overall	£25 mn		

ns = no statistics * Note: Since this research was undertaken, Home Retail Group has undergone ownership/structural changes. It is included still as an historic example.

**This investment by the Kingfisher Pension Scheme (KPS) reflects the scheme's commitment to the company's broader Net Positive initiative.

ANNEX D – SUPPLY CHAIN PERFORMANCE INDEX METRICS

Metric 1: Profitability

Profitability is commonly measured as operating margin:

$$\text{Operating profit} = \text{revenue} - \text{COGS} - \text{labour} - \text{other costs}$$

Metric 2: Inventory turns

One of the metrics used in the supply chain index is inventory turns, a measure of the number of times the supply of inventory is sold each year. It is also dependent on low input costs, calculated as COGS divided by the value of current supply inventory.

Metric 3: Return on investment

Return on invested capital (ROIC) is the fourth and final metric used in the supply chain index and tells us how successful a company has been at turning capital into profits. It is also dependent on cost of goods sold and therefore on low input costs:

$$\text{return on investment (ROIC)} = \frac{(\text{revenue} - \text{COGS})}{\text{COGS}}$$

ANNEX E – DESCRIPTION OF THE GLOBAL FOREST PRODUCTS MODEL (GFPM)

The Global Forest Products Model (GFPM)¹⁶⁶ is a partial equilibrium model of the forest sector simulating demand, supply, production and trade of forest products in 180 countries. Because of increasing uncertainties, partial equilibrium models of the forest sector tend to be used in “what-if” analysis, comparing the impact of demand and supply shocks to a baseline scenario. Such scenario analyses have been the subject of recent international outlook studies for North America and Europe.¹⁶⁷

The model maximises producer and consumer surplus in each country and time period. For each product, the maximisation is constrained by equilibrium between demand, supply and international trade. The GFPM simulates paper production from two primary products: industrial roundwood and waste paper. The production of other products such as sawnwood and wood panels is based on industrial roundwood. An outlook study by the model authors¹⁶⁸ provides more information on the methodology. The study below is based on an updated version of GFPM calibrated on a 2011 base year (the base year is an average of three years of consumption, production and trade volumes for each product and country).

Assumptions

Historical time series of production and trade from FAO serve as the main input for the calibration. Additionally, exogenous changes are driven by scenarios of forest area changes on the supply side (based on FAO Global Forest Resource Assessment 2010)¹⁶⁹ and GDP scenarios on the demand side (IPCC scenario B2). A detailed explanation of the steps involving GFPM calibration is available

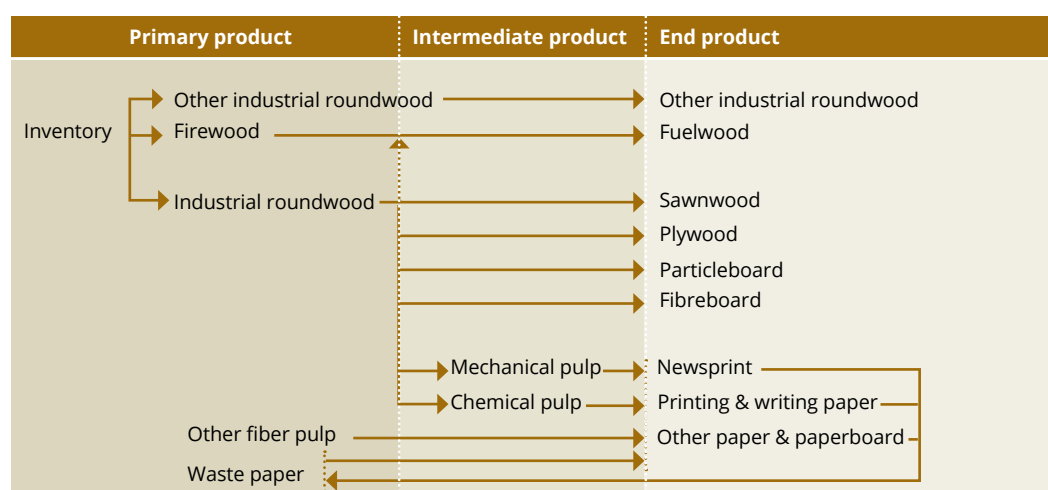
as a technical report from the model authors.¹⁷⁰ For supply and demand elasticities used in this study please see the tables below.

Limitations

On the demand side, the development of new wood products and the influence of other sectors such as information technologies drive changes in aggregate consumption behaviours. In the last decade, some economists have estimated that significant structural changes are on-going for forest products demands, including sawnwood, wood panels, wood energy sector, paper and paperboard.¹⁷¹ Patterns of demand are changing at different times in various countries and in opposite directions for various forest products. Models for printing and writing paper could be overestimating demand. On the opposite side, models for biomass energy products are likely to be underestimating demand in the current model. Demand model for other paper and paperboard (used in packaging) would remain less uncertain. Because of structural changes, the uncertainty of demand scenarios increases.

On the supply side, the forest supply model consists of projections of forest area growth and growth of forest stock. These projections don't take into account various grades of industrial roundwood. Therefore the simulated increase of industrial roundwood supply may be overestimating wood availability for production requiring higher grades, such as structural timber. Fuel wood demand doesn't take into account wood pellets. Until 2012 no statistics were available for wood pellets. With only two years of historical data, the model could not be calibrated to take into account these products. Therefore wood energy demand and imports are largely underestimated in the simulation.

Figure 15. Flow diagram of the GFPM



ANNEX F – BREAKDOWN OF UK FOREST VALUE

Table 3. Breakdown of UK forest economic value (£ billions)		
Direct (from “Grown in Britain”)		4.10
Upstream		
upstream 2005 ¹⁷²	3.50	
2005 – 2015 contraction of direct industry (%)	0.43	
upstream 2015		1.51
Downstream		
<i>Construction</i>		
Construction GVA ¹⁷³		103.00
Timber contribution to construction GVA ¹⁷⁴		0.13
Domestic timber contribution to construction GVA ¹⁷⁵	0.40	
Domestic timber contribution to construction GVA		5.36
<i>paper</i> ¹⁷⁶		6.10
<i>furniture</i> ¹⁷⁷		2.50
<i>joinery</i> ¹⁷⁸		0.40
<i>Downstream total</i>		14.36
Employee spending ¹⁷⁹		
employee spending 2005	1.80	
2005 – 2015 contraction of direct industry	0.43	
employee spending 2015		0.78
TOTAL		20.74

ANNEX G – MATERIAL-FLOW ANALYSIS OF UK SOFTWOOD TRADE

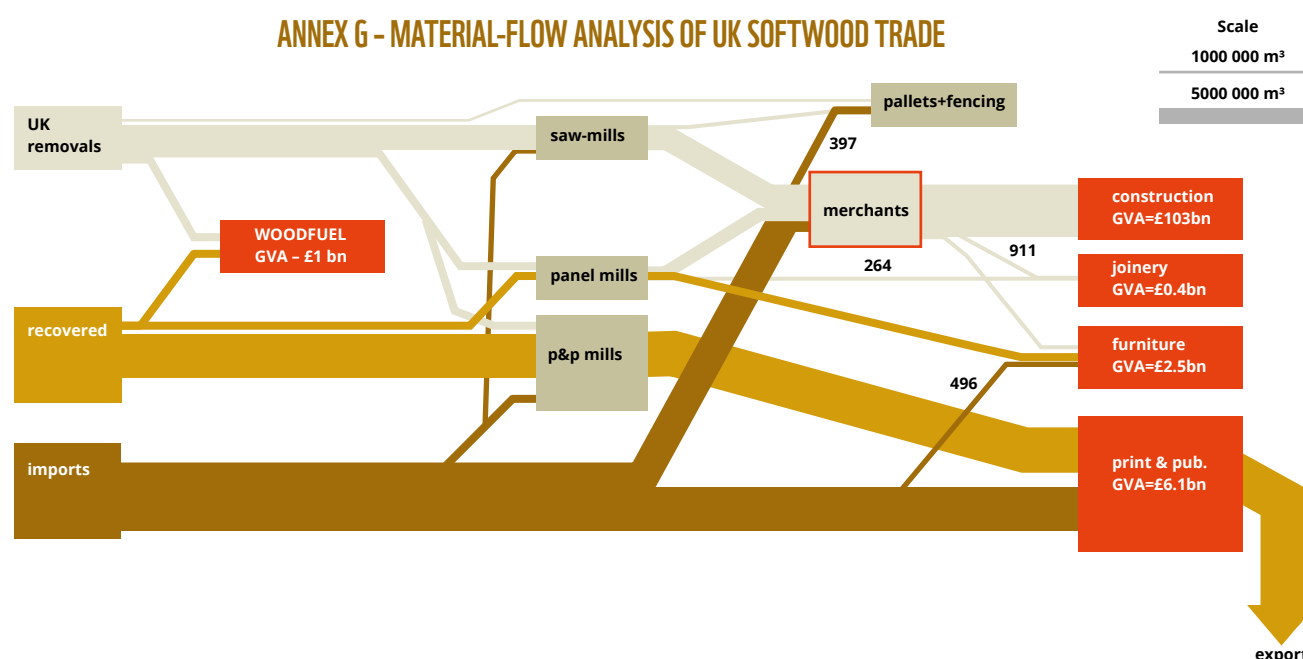


Figure 16. Material-flow analysis of the UK softwood trade network and resulting industry GVAs. Source: authors' own analysis. Data¹⁸⁰.

All timber and timber products start life as a standing tree, either in a natural forest or plantation. Trees are categorised either as “softwood” or “hardwood”, a distinction which essentially is a product of how the two classes of trees produce seeds and fertilise rather than their respective hardness (Table 3). Timber is also defined as “tropical” if it grows within the region of the tropics. ~ 80% of global timber usage by volume is softwood.

Once removed from the forest, trees are first de-branched and de-barked to produce logs, except material to plywood production which is often used with bark. Strictly speaking, logs under 14 cm in diameter are termed “roundwood” and above 14 cm ‘saw-logs’ though frequently the term roundwood is used to refer to all felled and de-branched trees. Saw-logs are passed to sawmills to be converted into ‘sawnwood’; uniform lengths ready for use in a range of applications including construction,

manufacturing (esp. furniture / fencing) and joinery. Sawnwood is used throughout construction from open-panel “post-and-beam” walls to ceiling and flooring joists, roof trusses, beams and rafters, cladding, floorboards and flooring, the majority of which is softwood. Sawnwood is also used in joinery applications such as staircases, kitchen worktops, windows and doors, shuttering and outdoor decking. Manufacturing use of timber is dominated by furniture, fencing and pallets, though other significant uses include tools/cutlery, picture frames/mirrors, crates/drums, ornaments/statues and clothes hangers, among many others. Roundwood is passed either to panel mills to be converted into wood-based panels (plywood; particle-board/chipboard; oriented-strand board; and fibreboard/MDF,) or to pulp mills to be converted into pulp ready for manufacture of paper and sanitary products. Plywood is produced by shaving roundwood into thin sheets (“ply”) which are then bonded together; plywood can be made either from softwood or hardwood. Around half the timber-based material used in plywood production leaves the process as waste (termed “trim”) and is passed to a fibreboard mill; fibreboard can be produced from nascent roundwood though predominantly it is made using waste streams from other processes. Particle board is generally produced from wood-based agricultural waste. Wood-based panels are used predominantly in construction though some is used in manufacturing such as furniture. The production of veneer sheets used in furniture is similar to the process of producing plywood; saw-logs are shaved into thin sheets and used to laminate other less expensive timber or wood-based panels.

Table 4. Defining “softwoods” and “hardwoods”

Softwoods

- Gymnosperm (“open” seeds)
- Coniferous, i.e. pine, spruce or fir

Species

- All evergreen (except bald cypress and larch)
- Needles instead of leaves
- Generally lower in economic value Hardwoods
- Angiosperm (“closed” seeds with fruit / flowers)
- Non-coniferous, i.e. any species not pine, spruce or fir
- Deciduous at temperate latitudes; evergreen in the tropics
- Usually broad-leaved, i.e. it has leaves rather than needles
- More complex structure than softwood; pores / vessels

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