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THE GLOBAL SUPPLY CHAIN

An Introduction to Global Wood Product Markets
and Trade for Timberland Investors

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Introduction

There is not a country in the world that does not rely on wood products. Goods made from trees are employed across the global economy – from the utility poles that deliver our electricity, to the books our children use in school, to the paper that is used to manufacture the currency we use to purchase goods. However, each part of the world uses wood differently. In North America, for instance, homes are largely constructed with wood frames, which require large quantities of stud lumber and paneling. In Latin America and Asia, however, residential dwellings are often built with concrete. Nevertheless, even in those parts of the world, wood is an essential element in the construction process because wood panels and lumber are used extensively to create concrete forms.

Understanding global end-use markets for wood products is important for timberland investors because the application of such knowledge empowers one to make informed decisions about where and how to place capital within the asset class. It also enables investors to recognize and

understand market trends and wood usage patterns and to employ these perspectives to capitalize on opportunities and to reduce fundamental investment risks.

This paper explores the global trade of timber and wood products. We begin with an assessment of how trees generate value. We then examine how timber moves up the value chain from a commodity and standing natural resource to a variety of end-use products that are purchased and utilized by individual consumers, businesses and even governments. This analysis is followed by a review of the dynamics that drive the global trade of wood and wood products. The paper also highlights some of the key macro-economic factors that are expected to influence timber and wood products markets over the coming decade – perhaps creating both opportunities and challenges for timberland investors. Finally, the paper concludes with some recommendations that are meant to help investors better meet their long-term investment needs and objectives.



The Timber Value Chain

To the uninitiated, the forest products sector offers a dizzying and complex array of wood categories and products. There are literally hundreds of tree species that have commercial value and that are being used to produce end-use products across

centimeters). In addition, the tops of large, sawtimber trees are usually categorized as pulpwood – as are sawtimber trees that are malformed and therefore unsuitable for the production of high value building products like

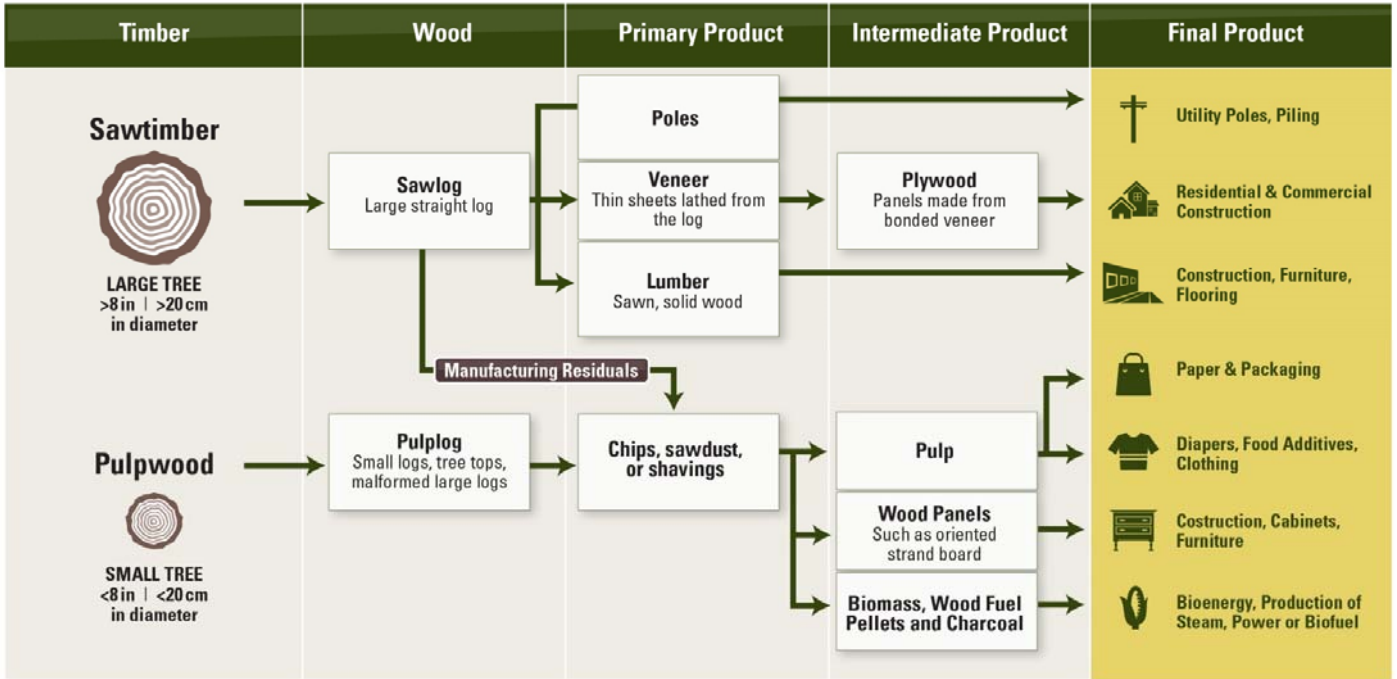


Figure 1. A flow diagram that shows how the main economic products of a timber harvest, sawtimber and pulpwood, become value-added products.

the globe. However, in the simplest sense, raw timber (cut logs that have not been processed) is organized into two grades – sawtimber and pulpwood – and two generalized species categories – hardwoods and softwoods.

Sawtimber and Pulpwood

Although the definition can vary between countries and markets, the sawtimber grade is typically defined as timber produced from large trees that have solid, straight forms and trunk diameters of 8 inches (20 centimeters) or larger. Pulpwood is a catch-all category. It typically consists of smaller trees that have trunk diameters less than 8 inches (20

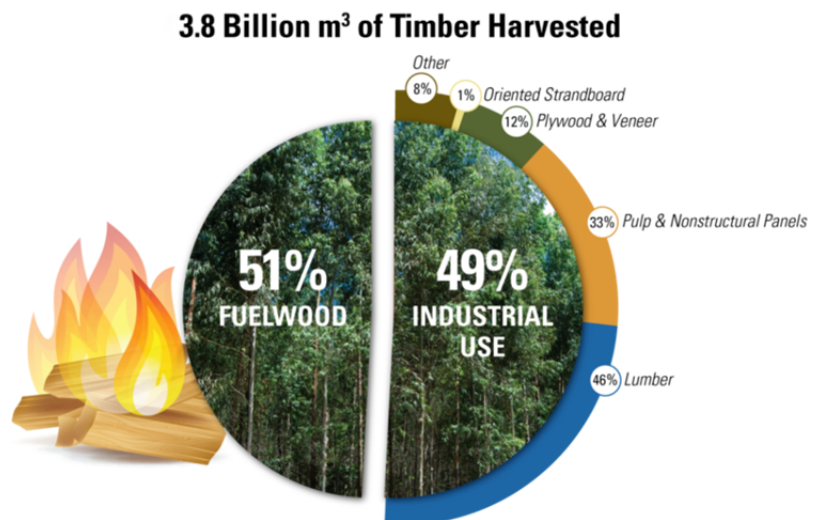


Figure 2. Global timber usage. Source: RISI



lumber or veneer. The flow diagram in Figure 1 shows the economic value chain for the two grades.

Approximately 38 billion cubic meters of wood are

U.S. Timber Harvest for 2013: Primary Products

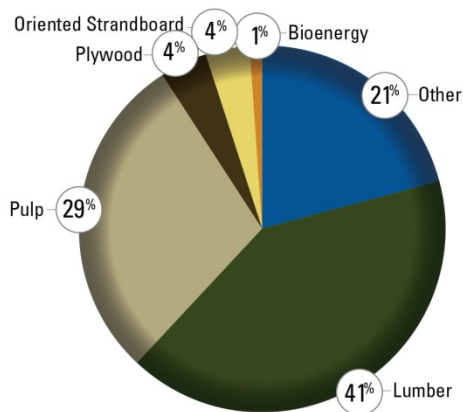


Figure 3. Breakout of the uses of the 2013 U.S. timber harvest (13.2 billion cubic feet or 347 million cubic meters). The “Other” category shown includes engineered lumber, poles, piles and other miscellaneous products.
Source: RISI

harvested each year globally from natural and plantation forests. This includes both sawtimber and pulpwood-sized trees. As the pie chart in Figure 2 demonstrates, half of this volume is used fuel wood – largely in developing countries – for heating and cooking. The other half is used for industrial purposes. About 46 percent of this total consists of sawtimber that is milled to produce lumber. Another one-third of the timber harvested for industrial purposes is used to make wood pulp and reconstituted wood panels such as medium density fiberboard (MDF) and particleboard.

Each region and country tends to use timber differently and these uses are influenced by a variety of factors, including the composition and extent of its own timber resources, its ability to access timber efficiently and cost effectively

through global import markets, the income levels of its citizens, and its traditions and cultural norms. For instance, the world’s largest producer and consumer of wood products, the United States, uses 4 percent of its domestic timber harvest to produce oriented strand board (OSB), a composite, structural panel product that is used for wall sheathing and floor underlayment in homes. On a comparative basis, however, this is significantly higher than the usage pattern for OSB observed globally. Only 1 percent of the timber harvested in other parts of the world is used to produce the product (Figure 3). Conversely, 12 percent of the timber harvested annually outside of the U.S. is used to manufacture plywood, another structural panel product that competes with OSB. By comparison, however, in the U.S., only 4 percent of the domestic timber harvest is dedicated to plywood production.

Softwoods and Hardwoods

Beyond its size, which determines whether it will be categorized as pulpwood or sawtimber, the species of a tree is equally important when assessing its economic value. This is because different species are used to produce different end-use products with different value characteristics. For instance, because it is so hard, northern white ash is often used to manufacture baseball bats. Likewise, in the Pacific Northwest, red cedar has traditionally been used for the production of shingles because of its strength, color and water resistance properties. In broad terms, however, tree species are divided into two categories, softwoods and hardwoods.

Softwoods include conifers – or trees that bear cones and that commonly have needle-like foliage. Pines, spruces and firs are all sub-species of the conifer family. Hardwoods include trees that flower and bear fruit. In temperate or seasonal climates, they also are often deciduous. This means they shed annually. Maple, oak, beech, ash, mahogany, teak and eucalyptus are among the more common and familiar hardwood species.

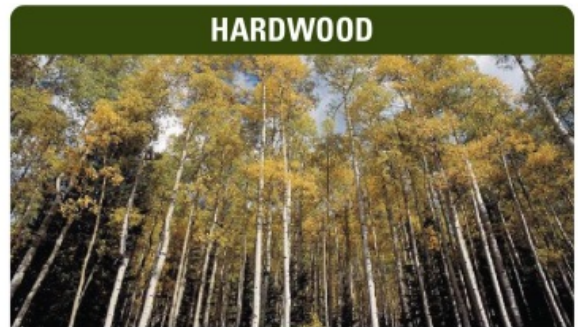
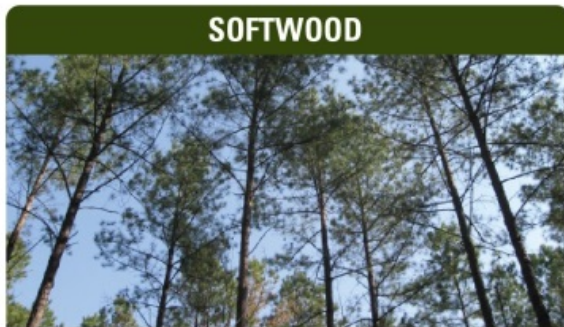


Figure 4. The differing uses of softwood and hardwood timber.

At a biological level, softwoods and hardwoods differ because they have differing wood fiber compositions. These properties, in turn, influence their respective commercial uses and value. Softwoods, for instance, have longer fibers, which gives them strength and flexibility. As a result, and as is illustrated in Figure 4, softwoods are the

preferred species for the production of framing lumber and packaging products, like corrugated boxes. Hardwoods, on the other hand, have shorter and tighter fibers. This makes them more suitable for the production of fine quality writing and publishing papers, like those used to produce books and glossy magazines. In addition,



because of their tight fibers, which produce attractive grains, and their relatively hard and inflexible physical characteristics, certain hardwood species are highly valued for the

production of cabinets, flooring and furniture.

The global structure of wood products markets and trade is largely affected by where softwoods and hardwoods grow. Brazil, for example, has become a leading producer of eucalyptus, a type of fast-growing hardwood. North America, on the other hand, is a leading producer of softwoods, especially pine and fir sub species. The bar charts in Figures 5 and 6 rank global regions based on their relative levels of hardwood and softwood production.

Annual Industrial Softwood Production by Region

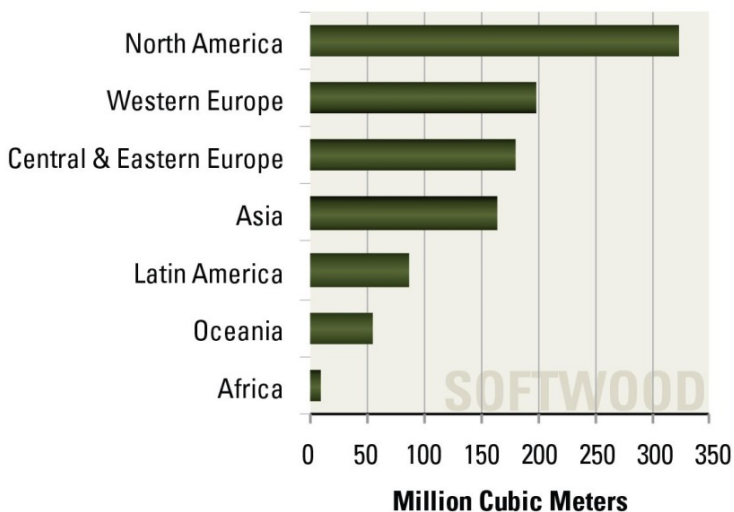


Figure 5. Annual harvest of industrial softwood timber by region.
Source: RISI

Annual Industrial Hardwood Production by Region

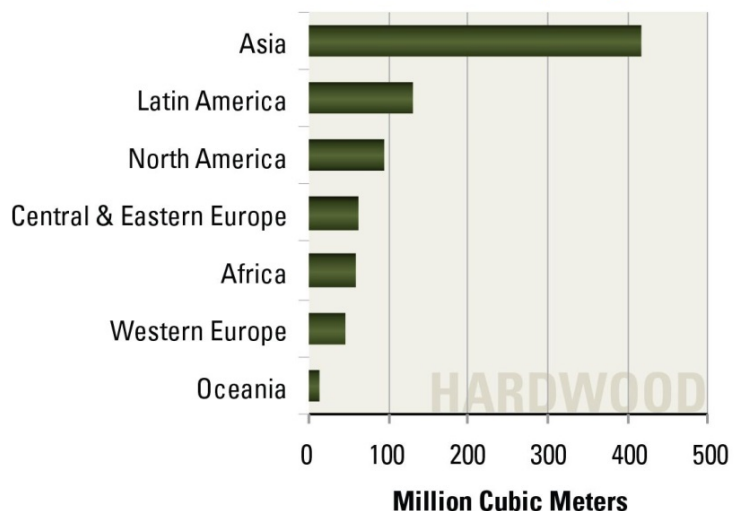


Figure 6. Annual harvest of industrial hardwood timber by region.
Source: RISI

Forest Products Industry Structure

Just as there are variations in wood usage by country and region, the structure of the global wood products industry is equally diverse. The flow chart in Figure 7 demonstrates how the timber product value chain differs from one region to another. The key point is that the world's timber-producing and wood product manufacturing regions have different levels of vertical integration from forest resource to final product. These differences are important for timberland investors to understand before they place capital in a particular market or region.

In Latin America, for instance, a large proportion of the commercial timberland asset base is held by large forest products companies. These include Arauco and CMPC in Chile and Fibria and Suzano in Brazil. This integration of timberland ownership with manufacturing assets means that investing in Chile or Brazil is likely to entail competing against, or acquiring timberland from, the major forest products companies operating in those countries. Conversely, in Central Europe, much of the private forestland asset base is held in small parcels by individual landowners. This is a consequence of the land restitution process that was initiated in the former Soviet bloc countries after the Cold War. As result, timberland investors who wish to place capital in countries like Romania, Slovakia, Poland and the Czech Republic may be required to aggregate a number of smaller holdings in order to create sufficient operational economies of scale.



Forest Products Sector Structure with Potential Segments of Integration

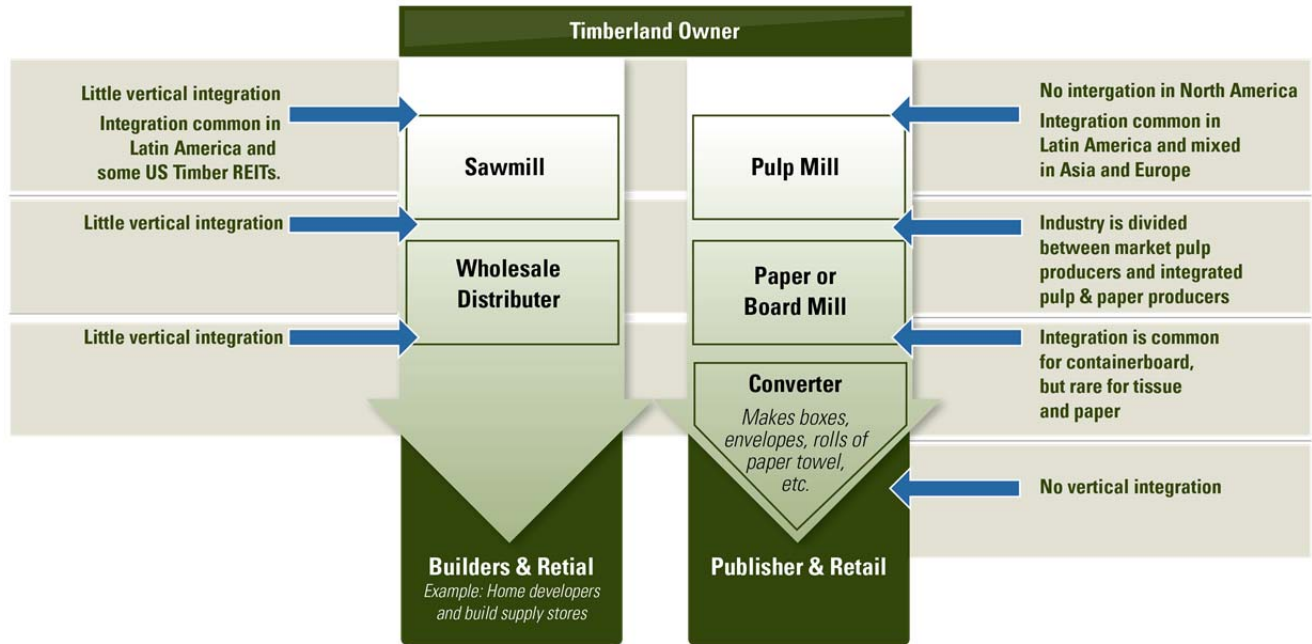


Figure 7. This diagram shows the timber value chain from the supplier of timber to the end product, with likely points of vertical integration noted.

There are exceptions in certain emerging markets, but the overall level of integration that exists between timberland ownership and the ownership of industrial processing and conversion assets is relatively low around the world. This helps create competitive and dynamic timber and timberland markets where economic gains could accrue directly to resource holders: the timberland owner. In this respect, the situation is analogous to other industries that rely on natural resources to manufacture their products. For instance, in the early twentieth century, tire companies like Goodyear, Firestone and Michelin, owned vast rubber plantations in sub-equatorial countries in Africa, Asia and South America. These investments were made to secure adequate supplies of raw rubber for tire manufacturing. However, such companies have long disposed of their rubber plantations. Today, natural rubber is a highly competitive, globally-traded commodity.

Market Dynamics of the Forest Products Sector

One important attribute timberland investors should recognize if they are to understand how global timber and wood products markets operate is that timber is a large, bulky commodity. Consequently, transportation costs are a significant financial factor for most timber processing businesses. Because wood procurement expenses often account for as much as half of the variable production cost incurred by a mill, timber processors need to be situated in close proximity to the timber resources, or have access to cost effective sources of bulk transportation, like ocean freight facilities or railways. For this reason, trees are generally not shipped more than 120 miles (200 kilometers) from the forest to the mill, port or rail node.



Given these challenges and considerations, timber markets are highly localized. Demand and pricing for timber, and timberland values, are often tied to the composition and characteristics of the surrounding mill infrastructure. Forest product companies tend to gravitate towards regional wood baskets with low wood costs. Likewise, areas with high wood costs may face limited new mill investment or mill closures.

This localized dependency between timberland owners and wood mills means there can be an interplay of market leverage when it comes to timber demand and pricing. Places with dense and varied mill populations, for instance, usually have competitive timber market demand and pricing characteristics, with timberland owners enjoying more power and leverage than timber buyers. However, when a regional market is dominated by just one or a limited number of mills, market leverage moves toward the timber users and timberland owners become price takers.

The dynamic changes once timber has been converted into higher-valued wood products such as lumber, panels and pulp. These products can be shipped efficiently. That allows for global trade and competitive markets. As a result, many final wood products such as furniture, tissue and corrugated boxes are often produced far from the wood resource, where factors such as labor costs, infrastructure and proximity to consumer markets are more important.

Another global wood market dynamic that should be of interest to timberland investors is the impact of raw material and product substitution. Raw material substitution occurs between timber grades and species. Product substitution occurs

between comparable wood products and between non-wood substitutes. For instance, timber buyers in China can import Douglas fir logs from the U.S. Pacific Northwest to meet their manufacturing needs. However, if Douglas fir prices become onerously expensive, Chinese buyers can easily substitute for that species with New Zealand-grown radiata pine. Likewise, with regard to product substitution, a home builder can use oriented strand board (OSB) in place of plywood in many home construction applications and a grocery store can substitute plastic bags for paper bags.

Timberland investors need to recognize how raw material and product substitution impacts are likely to influence the performance of their timberland assets because such knowledge can help them achieve better geographic and market diversification. It also can help them evaluate the competitiveness of particular wood baskets by providing them with an informed perspective on whether the mill base in an area or region is likely to expand, contract or remain stable in the future. In turn, as was referenced earlier, a regional market's mill composition can influence how much leverage a timberland owner will have when it comes to selling timber. This can have a direct impact on the long-term income-producing potential of a timberland owner's forest assets.

As important as it is for timberland investors to understand local timber and wood products demand drivers, it also is important for them to be knowledgeable about global market trends because these can have an equally significant impact on the performance of a single investment or an entire portfolio.



Global Wood Consumption and Trade

The forest products sector is broadly integrated across the global economy and consumption of its products is closely tied to economic growth in virtually every part of the world. As populations expand, per-capita income levels increase and the global economy expands, demand for wood products follows. During the upcoming decade, total consumption of timber for industrial uses is expected to grow at an average annual rate of at least 2.2 percent (Figure 8).

However, not all forest product segments will grow at the same pace. In fact, those segments that will face competitive challenges from product substitutes will show slower or declining growth. A prime example is the printing and writing paper segments, which will continue to see eroding demand globally because of the expanding use of digital media. The newsprint sector will be among the hardest hit by this trend as global newspaper circulation levels are projected to continue their precipitous decline over the coming decade. In contrast, some forest products have few viable substitutes or are highly cost competitive when compared with non-wood alternatives. Among others, these products include tissue and containerboard. As consumers in emerging markets like China, Brazil and Latin America achieve higher levels of disposable income, their demand for tissue, paper towels and disposable diapers (which use fluff pulp for absorbency) will continue to expand. Similarly, the need to ship more produce, packaged foods and merchandise will drive global consumption of containerboard and boxboard products. An

Total Industrial Timber Consumption
Projected Average Annual Rate of Growth 2.2 Percent

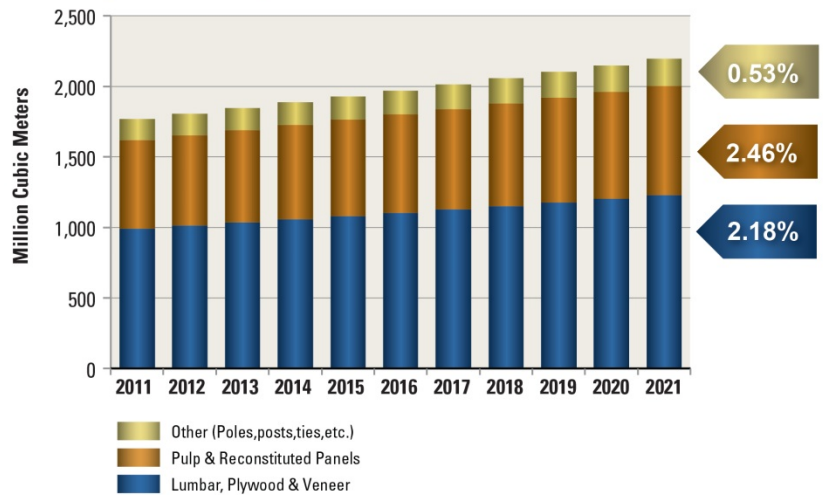


Figure 8. Expected growth in global demand for industrial timber – broken out by wood product. Source: RISI

overview of these market dynamics is provided in Table 1 below. It provides a perspective on the medium-term demand outlook for a full range of forest products.

Certain countries and regions have competitive advantages when it comes to producing wood or wood products. This creates a dynamic flow of trade in forest products. Although it is not comprehensive, the map in Figure 9 demonstrates some of the major global trade flows of timber and wood-based products. This globalization of forest industries means shocks in any one region or market can have spillover effects across other markets around the world.



Table 1. Global and North American outlook for forest products demand. *Source: Growth rate forecasts primarily from RISI; wood pellet forecast from Pöyry.*

Forest Product Sector	Demand Trend	Projected Annual Growth Through 2015	Leading Consuming Markets	Notes
Paper and Paperboard (Global)	↑	2.85%	Emerging markets	
Printing & Writing Papers	→	1.95%	Emerging markets	Substitution by electronic media has damped growth
Newsprint	↓	-1.00%	Latin America, Eastern Europe	Newspaper circulation continues to decline
Containerboard (for corrugated boxes)	↑	3.50%	Asia	Growth in industrialized nations remains flat
Boxboard (all packaging except corrugated boxes)	↑↑	4.00%	Asia, especially China	One of the better growth areas of the paper & board sector
Tissue	↑↑	4.50%	China	China dominates with 43% share of global volume growth
Specialty Pulp (dissolving and fluff pulp)	↑↑↑	10.00%	China, India, Indonesia	Inroads into the textile market helps drive demand higher
Lumber and Panels (North America)	↑↑		United States	
Lumber	↑↑	8.27%	Exports to China, U.S. housing	Canada's traditional supply role will become more constrained in the future
Plywood	↑↑	4.92%	Industrial use and commercial construction	The substitution between OSB and plywood has stabilized
Oriented Strandboard (OSB)	↑↑↑	13.03%	U.S. housing market	OSB's share of the structural panel market could approach two-thirds
Particleboard and Fiberboard (e.g., MDF)	↑↑↑	8.13%	U.S. housing market	Gradual recovery of U.S. domestic furniture industry is helping demand
Wood Bioenergy (Global)	↑			
Wood Pellets	↑↑↑	10.50%	United Kingdom	European Union's renewable energy goals is a key driver of demand
Biomass Power Generation	↑	??	Western Europe, Brazil	Low natural gas prices in the U.S. has hurt growth
Wood Based Biofuels (cellulosic ethanol, biodiesel, etc.)	→	??	United States	Commercially viable operations is eluding the nascent wood biofuel industry



Highlights of Global Trade Flows of Wood Products

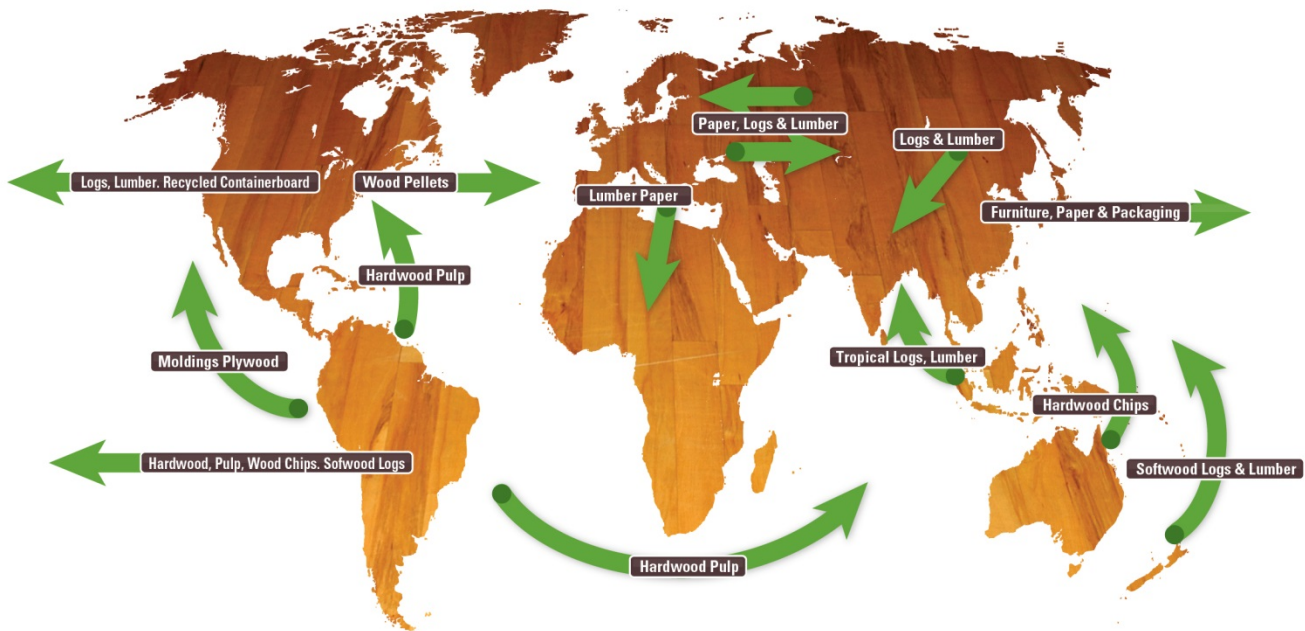


Figure 9. Highlights of global trade of timber and forest products across the globe.

Macro Trends in End-Use Markets

Understanding global trends in forest products markets allows investors to strategically position their portfolios to capitalize on emerging investment opportunities and to avoid emerging risks. Of the macroeconomic trends developing in the global forest products sectors today, five, in particular, could have a significant bearing on the performance of the timberland asset class in the future. These include:

1. China's rising wood fiber deficit
2. Growing global demand for wood bioenergy
3. Expanding usage of engineered wood products
4. The geographic shift of pulp and paper capacity to Asia and Latin America
5. The recovery of the U.S. housing market

These trends are briefly examined below and are followed by an assessment of the trend's implications for timberland investors.

China's Rising Wood Deficit

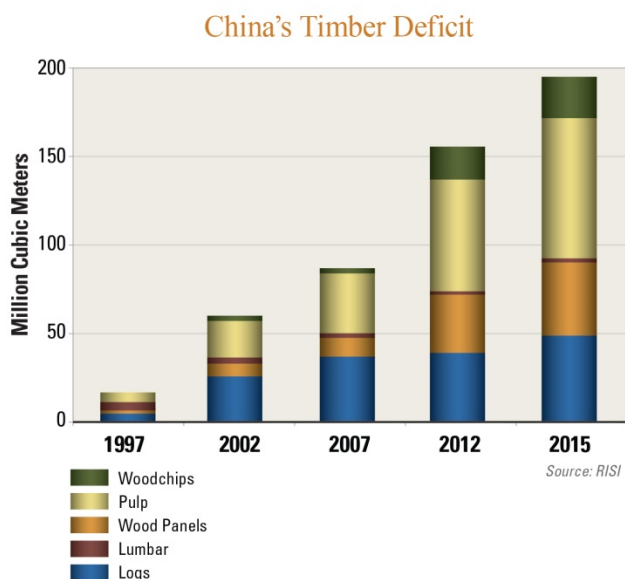
With a population of 1.38 billion, China is a rapidly developing nation that is being challenged by its inability to meet its domestic demand for timber and wood products. Much of China's arable land is dedicated to the production of food crops. As a result, the country does not have sufficient, domestic forest resources to meet growing internal demand for building materials, furniture, paper, packaging and other wood-based consumer products. Its deficit for all types of wood products – from logs and wood chips to lumber to pulp– has grown at an average annual rate of 16 percent since 1997 (Figure 10).



Although the nation's economic growth is expected to slow to a more moderate pace of 4 to 7 percent annually going forward, China's appetite for wood imports is expected to continue growing at a strong pace. According to one estimate by CIBC, China's total wood deficit is expected to rise at a rate of 9 percent per year, from 168 million m³ in 2013 to 198 million m³ by 2015.

construction also is creating demand for furniture and other finished building products, like cabinetry and flooring.

Table 2. Estimated sources of housing demand for China as a result of demographic shifts and economic growth over the next 15 years. *Source: CIBC.*



Source of Housing Starts in China for the Next 15 Years (millions per year)	
New Urban Migration	5.00
Replacement Housing	2.42
Filling Pent Up Demand for Homes	3.33
Estimated Total Annual Housing	10.75

Figure 10. China's historic and projected timber deficit has to be met through imports of timber and wood products. Measured in the equivalence of million tons of whole logs. *Source: RISI.*

Implications for timberland investors...

- **OPPORTUNITY:** Investing in regions that are well positioned to export timber or building products to China, including New Zealand, the U.S. Pacific Northwest, Australia, Western Canada, and Chile may produce attractive returns.
- **RISK:** Although the long-term outlook remains robust, China is vulnerable to a real estate downturn or a severe economic correction, either of which would curtail log and lumber imports in the near and intermediate terms.

Demand for wood in China is driven, in large part, by its need for building materials – a response to its burgeoning commercial and residential construction sectors. China's own census projections anticipate its urban population reaching 1 billion within 15 years. This means that 5 million new homes will be needed per year to accommodate new urban households (see Table 2). When this trend is considered in conjunction with China's need to replace old and dilapidated housing, the nation's rate of new home construction is expected to exceed 10 million per year. This translates into more wood use as lumber is needed for concrete forms, interior walls, roofing systems and trusses. New

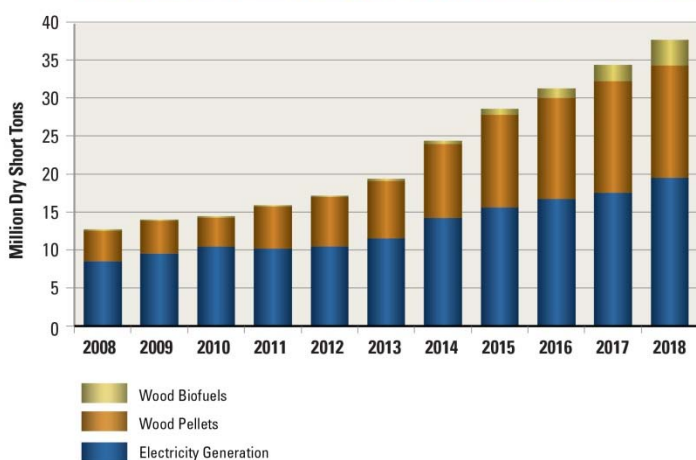


Growing Global Demand for Wood Bioenergy

Another trend of which timberland investors should be aware is the expansion of the global wood-based bioenergy sector. This trend is particularly evident in the European Union (EU), which has adopted renewable energy goals that are commonly referred to as the 20-20-20 targets. This framework mandates that by 2020 each EU nation reduce its output of carbon dioxide (CO₂) emissions by 20 percent from 1990 baseline levels. It also mandates that 20 percent of all electricity production come from renewable energy sources by 2020. Furthermore, the European Commission also has recommended a 40 percent cut in carbon emissions by 2030 and an 80 percent reduction by 2050. Because wind and solar – being intermittent sources of power – are insufficient to meet the 20 percent energy generation target, many EU members have embraced wood-based renewable energy technologies to meet their base-load power requirements. The most frequently used energy source in this regard is wood fuel pellets and because of their large and accessible wood resources, Canada and the United States have

million tons in 2013. In addition, by one estimate, this figure could grow to 14.7 million tons by 2018, with much of this pellet volume being exported to the European market (Figure 11). To put this trend in perspective, a large wood pellet mill that produces 500,000 tons of pellets per year can consume as much wood as a modern pulp or

Wood Demand from Bioenergy Production in North America



quickly responded to meet this demand. In the U.S. alone, wood pellet production has grown from 0.7 million tons in 2005 to an estimated 5.4

Figure 11. Historic and forecasted wood demand for the production of bioenergy in North America. *Source: RISI.*

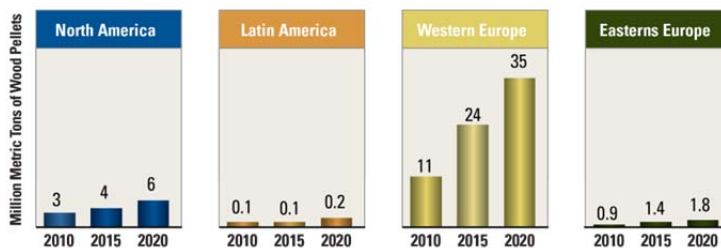


Figure 12. Historic and projected consumption of wood fuel pellets for 2010, 2015 and 2020 globally and by region. *Source: Integro Earthfuels.*

paper mill.

Interest in wood bioenergy applications is also growing in North America. At present, 31 U.S. states have adopted Renewable Portfolio Standards (RPS), or Alternative Energy Portfolio Standards, and these frameworks are being used to set targets for renewable energy production by utilities.

Moreover, the shift towards wood bioenergy extends beyond Europe and North America. Asia and Latin America also have shown growing interest in wood-based energy generation. Brazil, for instance, has rapidly adopted plantation-grown Eucalyptus as a primary fuel wood. Eucalyptus is



used extensively in the nation's agricultural regions to dry crops like soya.¹ It is also used to produce charcoal, which is utilized by the nation's steel industry in the pig iron production process. In East Asia, Japan and South Korea have both adopted policies to promote renewable energy sources. For instance, Japan's utilities are testing the use of a three percent mix of wood pellets in their coal-fired generation plants. The Republic of Korea has also begun importing pellets as it prepares to adopt a carbon emission trading scheme in 2015. Its goal is to reduce its CO2 emissions by 30 percent by 2020.

When viewed collectively, the global shift toward renewable energy sources can be expected to augment global demand for pulpwood. Worldwide wood pellet demand alone could more than triple from 2010 levels by the end of the decade.

Implications for timberland investors...

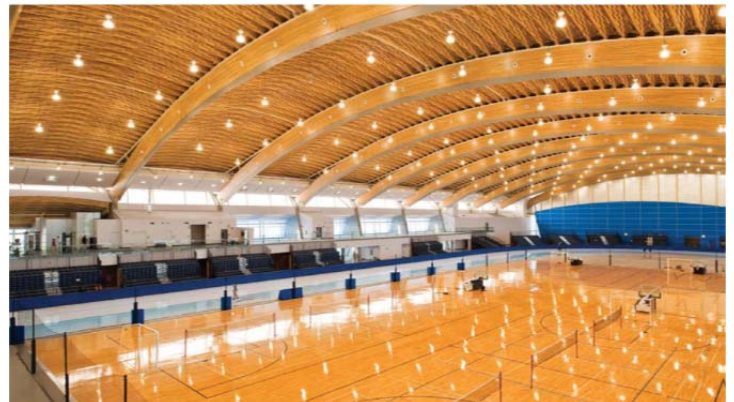
- **OPPORTUNITY:** Regions that have strong pulpwood markets, like certain areas in Brazil and especially the U.S. South, could benefit significantly from the global expansion of the wood bioenergy sector.
- **RISK:** A retreat from, or delays in implementing, renewable energy policies and subsidies that are designed to support the adoption of wood bioenergy could cause demand for pulpwood and wood residuals to decline rapidly in select global markets.

Expanding Usage of Engineered Wood Products

The rising acceptance among architects and builders of engineered wood products (EWP) is another trend that should be of interest to timberland investors. Such products are not only cost-effective substitutes for certain types of solid

¹ Drying of crops like soybeans reduces the moisture content in order to minimize spoilage and germination under storage. It also reduces weight for transportation.

wood products, like panels and lumber, they also can be used in place of certain non-wood building materials, such as steel and concrete. In fact, recent technological advances in the EWP sector have significantly expanded the universe of such applications. This has made it possible for society to build structures and manufacture products that previously would not have been feasible (see photo below). Engineered wood products are composites of wood elements, like wood strands, veneers and studs. These elements are then combined in technologically sophisticated manufacturing processes to create building products that have unique properties – like superior structural strength or the capacity to span great lengths. Some examples of EWPs include cross laminated timber (CLT), glue laminated timber (Glulam), wood I-joists, laminated veneer lumber (LVL), oriented strand lumber (OSL) and laminated strand lumber (LSL).



Advances in engineered wood product technologies has enabled the design and building of structures like this modern gymnasium, which previously would have been impossible to construct if traditional solid wood products manufactured from sawn timber were the only building materials available. *Photo credit: Canfor*

Because wood is often promoted for its environmentally friendly characteristics and low-carbon footprint, there has been growing interest in utilizing wood for both commercial and residential construction. Certification programs, such as the Green Building Initiative (GBI), encourage the use of wood and this combined with the unique and impressive properties of EWPs suggests that wood's potential as a



building product is likely to expand in the coming decades. Although the adoption of EWPs has been slow and gradual because government building codes must be adjusted to accommodate the new products and technologies, the trend toward greater wood usage in building and construction is evident in many parts of the world. In fact, while it was once unimaginable, large, multi-story structures are being using EWPs in many parts of the world (see photo below).



The Forté Tower in Melbourne, Australia, which is the largest modern apartment building in the world built of wood and makes extensive use of cross laminated timber (CLT). *Photo credit: Lend Lease.*

Implications for timberland investors...

- **OPPORTUNITY:** While expanded use of EWPs will not be a primary and significant driver of most wood markets in the near future, the sector's growth will help generate incremental demand for pulpwood and small sawlogs.
- **RISK:** The rising use of EWPs could erode long-term demand for wide-dimension solid lumber and the raw sawtimber products used to produce it.

The Geographic Shift of Pulp and Paper Capacity to Asia and Latin America

For much of the last decade, the global pulp and paper sector has been undergoing a gravitational

shift away from North America and Western Europe towards Asia and Latin America. The significant investments being made in pulp and paper mills in these two regions are a result of the competitive advantages they offer: (a) swifter environmental permitting, (b) lower labor costs, and (c) access to cost competitive sources of wood fiber from fast-growing forest plantations.

Six new pulp mills will come on-line in Latin America between 2012 and 2016. These facilities will be located in Brazil, Uruguay and Chile and will add 4.9 million tonnes of additional bleached eucalyptus pulp (BEK) capacity to the marketplace. This will represent a significant increase in the global production of bleached hardwood kraft pulp, which totaled just 59 billion tonnes in 2011. More facilities are also being built in the region and these projects will have a combined capacity of 7.8 million tonnes. In addition, another 19.9 million tonnes of potential output is being planned.

In Asia, much of the new capacity that is coming on-line is focused on the production of finished paper products rather than pulp. Between 2012 and 2016, China is expected to see its paper production capacity expand by 16 million tonnes – largely in the tissue and paperboard sectors. This will make China increasingly dependent upon the importation of market pulp, a need upon which Latin American producers will be well positioned to capitalize.

Asia and Latin America's expansion in the hardwood pulp and hardwood-based paper sectors will displace some of the production capacity for these products that is currently resident in North America and Western Europe. As the spread between hardwood and softwood pulp widens, hardwood pulps will increasingly be used as substitutes for softwood pulps. European and North American producers will likely respond by closing older and uncompetitive mills and by shifting their machines to focus on the production of paper products that are not easily subject to substitution, like containerboard, which is made from softwood kraft pulp.



Implications for timberland investors...

- **OPPORTUNITY:** Investors could benefit from investing in fast-growing hardwood plantations that supply pulpwood to new pulp mills in Latin America, or that are near ports where large volumes of wood chips are likely to be shipped to Asia to meet rising demand.
- **RISK:** If the addition of new capacity in Asia and Latin America outpaces the growth in global demand, market prices could weaken, which could create challenges for new mills and the timber plantations that supply them with wood fiber.

Recovery of U.S. Housing Sector

The final market development that requires investors' attention is the recovery of domestic U.S. timber demand, which is being buoyed by improving conditions in the U.S. housing sector. After hitting a record peak in 2005 when annual housing starts reached more than 2 million, the U.S. residential construction market collapsed when after the global financial crisis occurred. By 2009, annual housing starts in the U.S. had dropped to approximately one-quarter of the previous record high (Figure 13). Since that time, the excess inventory of homes that has been accumulating had been absorbed by the market and pent-up demand for housing has been building. This is largely a consequence of U.S. population growth. The U.S. population currently stands at 318 million and has been growing at a rate of 0.9 percent per year. This means that 2.5 million to 3 million people are being added annually, which is leading to the formation of 1.3 million new households each year. According to economists, this, coupled with the fact that 200,000 to 300,000 older homes are being replaced annually across the nation, means that actual, underlying demand for new homes in the U.S. is in the range of 1.5 million per year.

However, this demand has not been met for the past several years. In fact, by some estimates, at the end of 2013, the U.S. housing market was 2.8 million units short of actual demand. Given the gradual recovery of the U.S. economy, improvements in employment and the declining inventories of distressed homes and foreclosures,

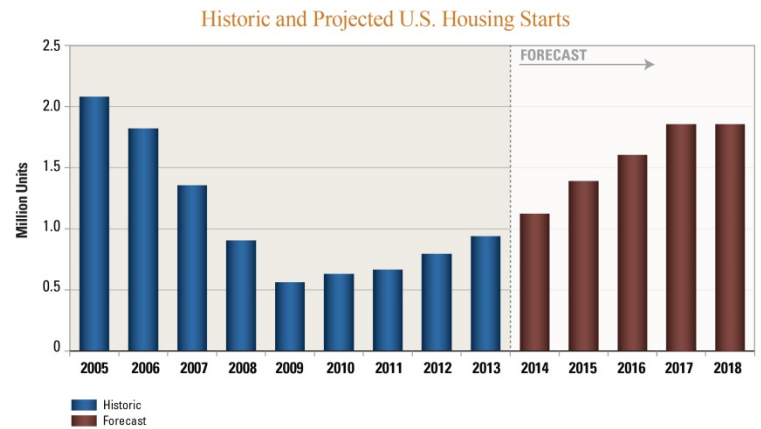


Figure 13. Historic and forecasted new home construction starts in the United States. Sources: U.S. Census Bureau, Forest Economic Advisors.

this sets the stage for a sustained recovery of new home construction. In a study released in January 2013, economists at Fannie Mae projected U.S. housing starts would average 1.76 million over the period from 2015 to 2020. This will be a crucial driver in wood demand. The forecasting firm Forest Economic Advisors projects that North American lumber consumption will grow at an average annual rate of 9 percent over the next three years. Likewise, consumption of both OSB and plywood is expected to grow 10 percent and 4 percent respectively over that same period.

Beyond the housing market, the growth in the overall economy will provide a tailwind for other wood-using sectors. For instance, spending on home repair and remodeling is expanding, as is demand for furniture and packaging products.



What makes these developments more impactful for timberland owners is the fact that the United States is among the lowest-cost producers of wood in the world (Figure 14). Forest products companies recognize this and are making capital investments in U.S. mill capacity to take advantage of the favorable pricing differential. Building products producers such as West Fraser, International Forest Products (Interfor), Georgia-Pacific and Klausner have already announced new mills or mill expansions in the United States, mainly in the U.S. South where the pricing advantage is the strongest.

As U.S. mill capacity ramps up, there also could be rising demand for U.S. timber resources. This may be augmented by the fact that Canada (a traditional supplier of lumber to the U.S.) may be limited in its ability to meet U.S. demand. The softwood timber resource in Canada's western province of British Columbia has been decimated by a region-wide infestation of mountain pine beetles in recent years. Salvage operations in the province have kept timber flowing into the market, but these operations are expected to wind down beginning in 2016, which will create pressure on timber supplies (Figure 15). In addition, timber production in Canada's eastern provinces, including Quebec, Ontario and New Brunswick, could be restrained as new environmental restrictions have lowered the Annual Allowable Cut (AAC) levels in those locations.

This combination of market forces – a sustained upturn in U.S. home construction, strong export demand from Asia, new mill investments, and supply limitations from Canada – may set the stage for an extended period of robust timber demand in certain parts of the United States.

Global Delivered Softwood Sawlog Prices in 2013 Q4

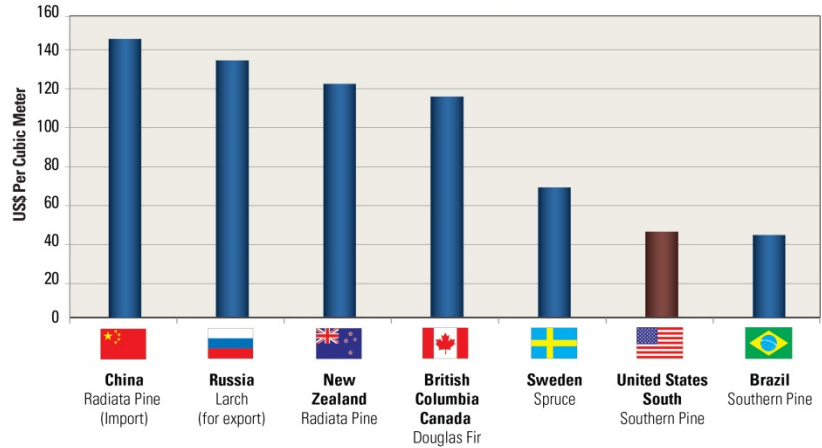


Figure 14. Sample of prices of softwood sawlogs delivered to mills or ports in the fourth quarter of 2013. Source: World Timber Price Quarterly.

Historic and Projected Canadian Lumber Production

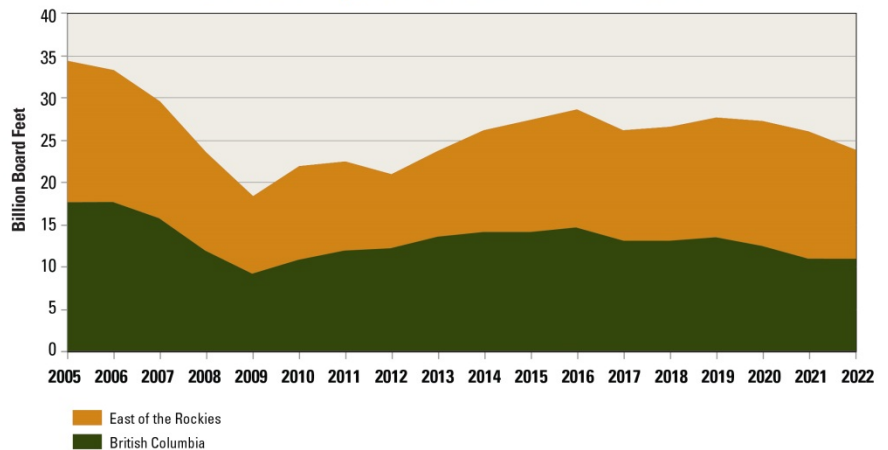


Figure 15. Historic and forecasted lumber output from Canadian sawmills, 2005 through 2022. Source: RISI.

Implications for timberland investors...

- **OPPORTUNITY:** Timber and timberland values could appreciate in regional wood baskets in the U.S. over the next 5 to 10 years, especially in areas where mills hold a competitive advantage and are expanding production.



- **RISK:** If the U.S. economy suffers a slowdown, or if the U.S. housing market loses momentum because of factors like rising interest rates, timber prices may

weaken again as harvest rates fall below the growing inventory of timber.

Integrating Knowledge of End-Use Markets in Investment Decisions

This brings us back to the relevance of wood product markets for timberland investors. Knowing end-use markets for timber is valuable both in developing an effective timberland investment strategy and in making the right investment decisions. The five trends discussed above provide insight on the types of macroeconomic factors that are likely to have a bearing on timber prices and timberland values over the next decade and beyond. With that as context, here are some recommendations timberland investors may wish to consider as they assess the impact of global market movements on their portfolios and investment choices.

- **Diversify Across End-Use Markets:** Managing risk exposure through diversification is crucial for any investor in any asset class. For timberland investors, one of the most effective ways to reduce volatility is to have a portfolio's forest assets exposed to different end-use markets. In fact, in many ways, market diversification can be more important than geographic diversification. For example, an investor may own two eucalyptus plantations, one in Australia that sends woodchips to pulp mills in China and one in Brazil that feeds domestic pulp mills. While these two investments offer geographic diversification, they are both exposed to the same global bleached hardwood kraft pulp market. This means that the prices the investor is receiving for timber in both Australia and Brazil are likely to be highly correlated, which increases the investor's overall exposure to market risk. If, however, the investor's Brazilian eucalyptus plantation was primarily focused on supplying timber to domestic producers of medium density fiberboard (MDF) as well as charcoal to domestic producers of pig iron, its portfolio would have a better risk profile because of the

broader market diversification that had been achieved.

- **Understand the Cost Competitiveness of Wood Consumers:** The long-term health of any timber market depends upon the health and vitality of the mill infrastructure that surrounds it. When developing a regional allocation for a timberland portfolio, it is important to recognize how cost competitive that market is relative to others. In most cases, it is highly advisable to avoid making timberland investments in regions and sub-regions where governmental regulation is a potential impediment to efficient operations, where production and labor costs are high, and where the transportation infrastructure is weak or insufficient. In contrast, any wood basket that is the recipient of large inflows of new investment capital from the forest products industry is likely to be an attractive place to own timberland assets.
- **Leverage Trade Flows and Macro Trends:** Investing in long-term, hard assets like timberland entails a measure of uncertainty. However, the development of an investment strategy should entail completing a detailed analysis of the global macroeconomic factors that are likely to have an impact on timber and associated wood product flows in the future. For instance, it may be important to have a point of view on how rising demand for lumber, furniture and tissue products within developing and urbanizing economies like China and India will impact demand dynamics for certain types of timber. Likewise, it may be helpful to gauge how the continuing, global erosion of printing and writing paper demand is likely to influence the short and long-term performance of timberland investments in a particular region. Such perspectives can help



an investor better target what geographies, timber species and log products to target for inclusion in a portfolio.

- **Perform Due Diligence on Resident Mill Infrastructure:** Finally, when evaluating prospective timberland investments, it is important to conduct careful due diligence on the local mill infrastructure that will be served by each investment. It is especially important to understand what products are produced locally and what the long-term market outlook is for them. Two other things that should be evaluated is the diversity of nearby wood

markets and the degree to which timber buyers are positioned to exert market leverage. It may be advisable, for instance, to exercise caution when buying into regional log markets that are monopolized by one or a limited number of timber buyers. In some such cases, establishing long-term fiber supply agreements (or forward contracts) may be an option for “leveling the playing field” because they typically tie log prices to a transparent and mutually-established benchmark.

For questions and additional information

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