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Title: From Forests to Floorboards: Trends in Industrial Roundwood Production and Consumption
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Forests supply the raw materials for the lumber, plywood, paper, packaging and other wood-based materials that are staples of modern life. Increasing demand for commercial timber and other wood and paper products has encouraged many countries to expand the area devoted to forest plantations, but pressures on rapidly-diminishing natural forests have not been reduced.

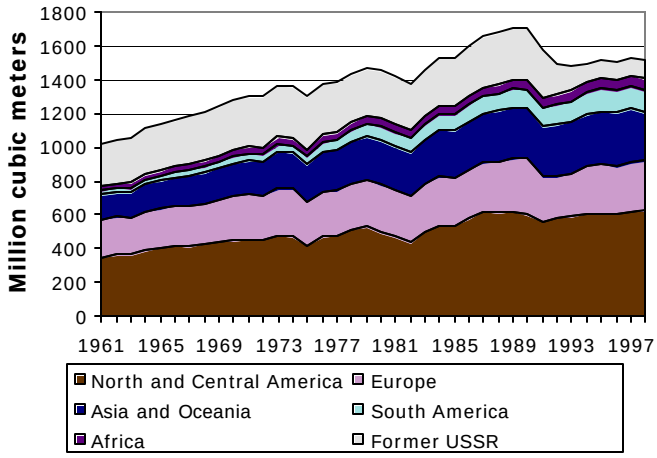
Demand for Industrial Roundwood

In 1998, global production of industrial roundwood—which includes all wood that is not used as fuel—was about 1.5 billion cubic meters (m^3) of fiber, or 44 percent of the wood harvested globally. Logs and sawn wood for construction comprised the largest use of industrial roundwood (about 56 percent), followed by pulp for paper and paperboard (about 24 percent), and processed wood products such as veneers, chipboard, and plywood (about 20 percent) (FAO 1998). Pulp includes wood manufacturing residues like sawdust and chippings.

Industrial roundwood production grew nearly 50 percent between 1961 and 1998, largely because of rising incomes. (See Figure 1: Global Industrial Roundwood Production, 1961-1998). Most industrial roundwood production and consumption occurs in the high-income countries, although consumption is leveling as markets for some products like lumber for construction become saturated. The development of more efficient technologies for producing paper products is also helping to slacken demand, although increased demand for paper and some hardwood products—driven by rising incomes—partially offsets the declines. Meanwhile, the rapidly growing economies of Asia and Latin America are where demand for construction timber, processed wood products, and paper and paperboard is rising fastest.

Demand for Wood Products Continues to Grow

Figure 1: Global Industrial Roundwood Production, 1961-98



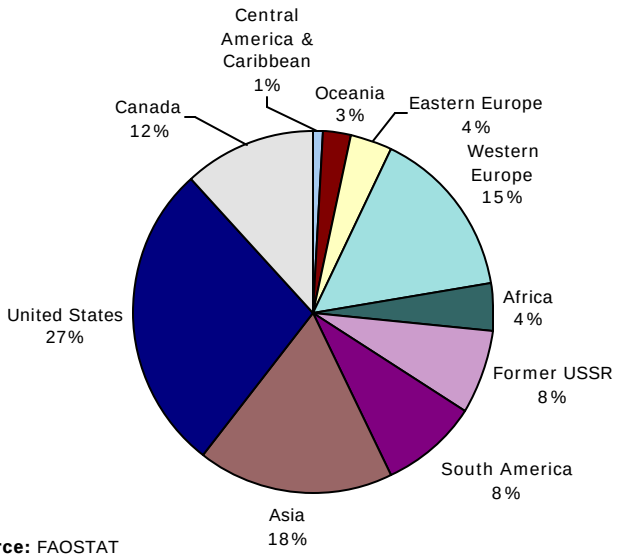
SOURCE: FAOSTAT

Of all industrial roundwood products, demand for paper and paperboard are growing the most rapidly. Globally, paper consumption increased by a factor of 20 in the 20th century and has more than tripled over the past 30 years (IIED 1996:20). Paper consumption in the industrialized countries is currently about 200 kilograms per capita per year (kg/capita/yr) in Western Europe, and more than 300 kg/capita/year in North America (WRI 2000). Per capita paper consumption is much lower in the developing world—on average about 17 kg/capita/year (WRI 2000). However, total paper and paperboard consumption in Asia already exceeds that in Europe, and is projected to grow nearly 4 percent per year until 2010. This rate of increase would make the region the biggest paper consumer in the world (FAO 1997a:78).

Commercial timber production is a major global industry. In the early 1990s, production and manufacture of industrial wood products contributed about $US400 billion annually to the global economy, or about 2 percent of global GDP (Solberg et al. 1996:48). North America, Asia, and Western Europe dominate industrial roundwood production (See Figure 2: Global Industrial Wood Production, 1998) but the timber industry is of relatively greater economic importance to some developing countries, where wood exports can account for up to 80 percent of foreign currency earnings. In the past 30 years, international trade in forest products has increased roughly threefold in terms of value,

High-Income Countries Produce and Use Most of the World's Wood

Figure 2: Global Industrial Roundwood Production, 1998



Source: FAOSTAT

Note: Industrial roundwood production in 1998 totaled 1.5 billion cubic meters

adjusted for inflation, and now accounts for about 3 percent of total world trade.

Perhaps one of the best indicators of our seemingly insatiable demand for wood and paper are long-term prices for timber in international commodity markets. Between 1975 and 1996, the price of timber products (in constant dollars) rose by 30 percent (WRI 1999:240). This increase indicates that demand is growing faster than supply, a unique trend among the major categories of commodities; real prices of fuels, metals and nonfuel minerals, and cereals have all decreased.

Sources of Industrial Roundwood

There are three main sources of industrial roundwood:

- Primary forests, sometimes known as "natural," "old-growth," or "virgin." The highest wood fiber yields come from clear-cutting mature trees in primary forests. This method of harvesting—though a one-time option—is still widespread, notably in parts of Amazonia, Canada, and Siberia.
- Secondary-growth forests, sometimes known as "seminatural." These are natural forests that have been cut but have regrown (sometimes several times), or have been partially replanted, and are now managed more or less intensively for wood production and other purposes.
- Plantations—forests that have considerable human intervention in their establishment and management (though no clear line divides a "plantation" from an intensively managed "secondary forest.")

Together, primary and secondary-growth forests produce about 78 percent of the world's industrial roundwood supply. There are no reliable breakdowns, at the global level, of the share of total industrial roundwood that each of the two types of forest supply. However, we do know that secondary-growth forests have replaced virtually all the original forests of eastern North America (including most of the United States), Europe, and large parts of South America and Asia. These areas produce the bulk of the world's wood supply (though an unknown quantity of wood enters the market via illegal logging in primary forests).

Estimates of available productive primary and secondary forests do not suggest any global scarcities of fiber for industrial roundwood in the foreseeable future, even without expansion of plantations. But various wood supply scenarios do warn of significant losses of primary forest and changes in forest condition. FAO's *Global Fibre Supply Model* estimated the world's forest cover (excluding plantations and forests in some countries with very low forest cover) at about 32 million km^2. If land that is legally protected or currently considered economically unproductive or physically inaccessible (a category that includes significant areas of undisturbed forest in some regions of the world) are excluded, the forest area available for wood supply is just 48 percent of this total. And, if fiber prices continue to rise with increasing demand or if technological advances reduce the costs of extraction from remote areas, more land may well fall into the "available" category. The various supply scenarios developed for the *Global Fibre Supply Model* all assume, to differing degrees, conversion of the world's remaining undisturbed forest to a disturbed state, and the extension of forestry management to currently inaccessible areas.

That is an ominous possibility from the perspective of ecosystem health. Undisturbed forest tracts—forest areas that present natural forest dynamics, such as natural tree composition, age

Box 1
Substituting Plantations for Forests: The New Zealand Experience

New Zealand provides a rare example of a country that consciously developed plantation forestry to protect its fast diminishing natural forests. Today, New Zealand's plantations comprise 19 percent of the country's total forest cover and provide 99 percent of its industrial roundwood production. Analysis of the transition by the New Zealand Ministry of Forestry offers key lessons:

- Substitution takes time. Harvesting in New Zealand's natural forests continued for some 70 years while plantations came on stream.
- Technical research and market development are required to assist product change-over and overcome industry and consumer resistance; plantations are controversial, unpopular with forest industries still using natural forest wood, and with environmental groups and local communities.
- Harvesting restrictions in natural forests are much easier to impose in state-owned natural forest land, and private landowners tend to demand compensation for implementing new forest management practices.

The success of a plantation strategy depends heavily on the end-product required. Tree species providing sawlogs or veneer logs are generally slower growing and more difficult to raise in plantations, while utility species, such as pine, generally yield more acceptable rates of return (FAO 1999:22).

structure and regeneration processes, and cover an area large enough to maintain these characteristics—generally provide a more complete slate of ecosystem good and services than disturbed areas.

Already, some timber extraction does sometimes take place in so-called "undisturbed" areas, and some forests that are currently classified as "unavailable" actually are disturbed in some way. But great reserves of timber remain that are currently unharvested—stands mainly in the hardwood forests of South America and the softwood forests of Russia and northern Canada. These forests are little exploited because of their remoteness and difficult terrain. For this reason, Brazil and the Russian Federation, despite their huge resources, account for only 6 percent and 5 percent respectively of total industrial roundwood production. (By comparison, more than 60 percent of Canada's forests are under logging tenures or within 10 km of development activity (Smith et al. 2000:23).)

History also warns of the vulnerability of these remaining unexploited old growth forests to industrial roundwood production and other uses. Already, the world's temperate and boreal forests have, to a large extent, been modified from a natural to a seminatural state, mainly for fiber production. Seminatural forests now account for about 80 to 90 percent of forested land in Europe. In Australia, seminatural forests make up nearly 90 percent of forests; they account for 85 percent in the United States, 60 percent in New Zealand, and 50 percent in Canada (FAO 2001).

Pining for Plantations

According to many forestry experts, the need for further exploitation of natural forests could be greatly reduced by expanding production from industrial wood plantations. The most intensive form of wood fiber production occurs in plantations, which can be highly profitable and are expanding rapidly.

The total extent of industrial wood plantations remains small—about 1.03 million km^2 worldwide, or about 3 percent of global forest area (Pandey 1997; Brown 1999).

[Note: the *Forest Resources Assessment 2000* (FAO 2001) provides a more recent estimate of global plantation area, but does not distinguish between industrial wood and other plantations, such as tree crop and woodfuel plantations.] However, plantations provide about 22 percent of the world's industrial roundwood supply (Brown 1999:41). Since 1980, plantation area in developing countries has risen by about 60 percent; in industrialized countries it has risen between 60 and 100 percent. In Oceania, 80 percent of industrial wood comes from plantations. Africa, South America, and Asia also harvest above-average proportions of industrial roundwood from plantations—35, 27, and 23 percent of their total production, respectively (Brown 1999:41).

Plantation productivity is generally higher than that of natural forests. While managed seminatural forests commonly yield between $1m^3$ and $3m^3$ per hectare, plantations of tropical species commonly yield between $5m^3$ and $20m^3$ per hectare annually; eucalyptus growth rates of $25m^3$ per hectare per year are not uncommon in South America. Trial plots in Brazil have recorded growth rates of up to $100m^3$ per hectare per year, though such results remain difficult to translate to the field.

The FAO estimates that current plantation area in the Southern Hemisphere has a potential annual growth of 1.1 billion m^3 (FAO 1998). Another estimate is that, assuming average annual growth rates of 10 cubic meters per hectare, the world's current demand for industrial roundwood could be met from plantations on 1.5 million km^2 of land, equivalent to just over 4 percent of global forest area (Sedjo et al. 1997:15-21).

However, the extent to which plantations displace—rather than simply complement—harvesting

from natural forests will depend on relative production costs under each system, the degree of legal forest protection, adoption of policy incentives, public acceptance, and the biological sustainability of plantations. Plantation forestry has expanded in response to favorable economic signals, but shifting wood production from natural forests to plantations is not a matter of straightforward substitution (See Box 1: Substituting Plantations for Forests: The New Zealand Experience.)

To date, wood fiber supplies from plantations have largely complemented, not substituted for, supplies from natural and seminatural forests. Demand for industrial wood fiber is projected to rise by between 20 and 40 percent by 2010. Most forestry analysts expect that demand will be met at the global level, but that regional shortfalls will occur, leading to higher fiber prices. If current financial incentives and patterns of production are not changed, demand pressure will result in supplies being drawn from the world's last remaining "frontier forests." The tropical forests of the Amazon and equatorial Africa and the boreal forests of Siberia and Canada will not survive in their current form.

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